The Analysis of Cross-Strait Trade Flow: An application of NRCA and Production Length

Hsing-Chun Lin [*], Sheng-Ming Hsu[**], Li-Chen Chou [***], Shih-Hsun Hsu[****], Wan-Hao Zhang [***]

Abstract

The Global Value Chains (GVCs) is the character which comes from the basic consequent on economic globalization, and the value-added estimation under the concept of GVCs also brings attention highly. Traditional import and export statistics indicate there has a huge trade deficit between the countries with final goods export and the importing countries, but the added value inherent in domestic (Value-Added) part of the country's exports statistics are not as much in the countries with assembly behavior on final goods. In order to evaluate the GVCs between Taiwan and China in cross-strait trade, this study applies the methodology by Wang *et al.* (2013, 2014) and the World Input-Output Database (WIOD) which constructed by Timmer *et al.* (2012) and EU. Evaluates the real possession of production and Revealed Comparative Advantage indicator in cross-strait trade and exactly measure the industrial competition in the process of trade including production length, location and times.

Keywords: Global Value Chain, Value Added, Revealed Comparative Advantage, Production Length

JEL Classification: C49, C67, F13, F14, F23, Q17, R15

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I. Introduction

1.1 Motivation

With both China and Taiwan have joined the WTO, cross-strait trade has increased year by year. Taiwan’s dependence on China’s exports has increased. The dependence on China’s exports (including Hong Kong) has increased from 18.9% in 1992 to 41.8% in 2010 and then decreased to 39.4% in 2015. However, with the development of global production and sales, from a country has arranged upstream and downstream manufacturing processes and exported finished products, changing to a country that is only responsible for several production sites in the upstream and downstream manufacturing processes, and outputs semi-finished products to other countries for reprocessing. This situation is called Global Value Chain(GVCs) or Vertical Specification(VS). Global value chains show the Geographical Fragmentation of Production and the importance of intra-industry trade increases. The statistics of traditional import and export show that the final fiscal producing countries have a huge trade deficit with their exporting countries. However, in their act of assembling, the added value (Value-Added) is not as much as that of traditional trade statistics because of the existence of bilateral or Multilateral trade statistics and duplicate calculations.

In 2014, the Ministry of Commerce of the People's Republic of China (MOFCOM) launched the Trade in Value Added (TiVA) program, a so-called value-added trade (TiVA), at the APEC meeting to address the lack of double-counting of intermediate good trade using foreign trade statistics. It means that the export product deems as final demand (consumption or investment) by the importing country, but it does not matter that the export product directly or through a third country arrives indirectly in the importing country, and the exporting country obtains its due added value from the importing country. The plan is mainly based on the same steps as the OECD-WTO, using Supply and Use Tables (SUTs) that more highly entrench in national accounts, which requires the use of bilateral and sectoral data from countries, rather than using countries' already purified input-output tables (such as Taiwan). In 2015, the Technical Group established under the Committee of Trade and Investment (CTI) of APEC. The technical team will with experts of WTO, UNCTAD, OECD, G20, World Bank, IMF, and ADB maintain a close relationship to establish an international consistency of cross-country input-output table.

Therefore, the global value chain is the basic achievement of economic globalization and the distinctive features of the contemporary world economy. The value-added trade calculation based on the concept and structure of the global value chain has received considerable attention. In the past, traditional statistics on imports and exports showed that the final goods producer countries had a large trade deficit with their importers, but the part of value-added of the final goods producing countries in assembly behaviors is not as much as its export statistics. Across-strait trade has influenced by the global value chain and contains a high proportion of imported intermediate components and raw materials from other countries, which has pushed up the export amount of Taiwan to China or China to the United States and the favorable balance of trade. Under the current statistical method, the amount of imported intermediate products is implied in the total export volume, increasing export statistics. As a result, the increase in the total amount does not necessarily mean that the ability of domestic industries to create added value has increased. It is the biggest blind spot in the traditional method of foreign trade statistics.

1.2 Methodoloy

In order to understand how the value-added portion on cross-strait actually occupies in the production of global value chains, this paper first examines the analytical methods proposed by Wang *et al.* (2013) and Wang Zhi (2014) using Timmer *et al*. (2012) and the European Union established a global input-output database (WIOD) in 56 industrial sectors and 44 countries or regions from 2000 to 2014 to calculate the new RAC indicators measured by value-added of the foreign trade on cross-strait, to measure the industrial competitiveness of the foreign trade of cross-strait. Secondly, we will discuss the global value-added chain characteristics of foreign trade on cross-strait, including the production length, location, and cross-border analysis.

From the perspective of the global value chain, the traditional index of Revealed Comparative Advantage (RCA) ignores both the domestic production division and the international production division. Specifically, first, the traditional RCA index does not consider the fact that the added value of a country or sector can be implicitly exported to other parts of the sector and achieve indirect exports. Second, the traditional RCA index does not consider the total exports in a country or sector contain some part of foreign value (FVA and FDC). Therefore, a method for correctly measuring the explicit comparative advantage of a country or a sector not only needs to include indirect exports of added value implicitly in the exports of other sectors in

the country but also excludes the total exports from sources of foreign added value and purely double counting.

To this goal, this paper intends to use the value-added decomposition method proposed by Wang *et al*. (2013). From the point of view of the global value chain, the export value of China's foreign trade decomposes according to its connotation, and its domestic value-added (DVA) calculated. To comprehensively consider the domestic and international production division of export production, Wang Zhi *et al*. (2014) defined a new indicator for measuring the new reveal comparative advantage (NRCA) measured value added by a country and sectors. The forward linkage calculates the relative value of the added value of the sector's export as a percentage of the country's total added value of domestic exports, relative to the ratio of the added value created by the sector's exports of all countries to the global total added value.

Based on this, the research framework of this paper divides into three parts in addition to the forward and the conclusion. First, review the literature on the integration of vertical specialization and value-added trade. Second, introduce the method of Wang Zhi *et al*. (2014) to measure the added value of the trade. Furthermore, the discussion estimated the reveal comparative advantages of Taiwan and China as measured by added value.

II. Literature Review

The predecessor of the global value chain is Vertical Specialization (VS). It is a comprehensive statistical index that is widely used in international trade-related research to measure the division of labor across international production. It first proposed by Hummels *et al*. (2001). It considers that the added value is belonging to a foreign country in the export of a country, that is, the added value directly or indirectly generated by other third countries should be attributed to it. Its research under VS results from the global division of labor, resulting in intermediate products with frequent imports and exports among different countries, the VS index was set to measure the proportion of imports using intermediate export goods for manufacturing export, and 14 more developed countries selected as samples. The results of the study found that the share of VS was about 0.165 in 1970. It rose to 0.211 in 1990 and rose 28% in 20 years. However, with the expansion of the global production chain, for example, in today's global supply chain, Japan ranks upstream in the global supply chain, and export intermediate goods to other countries as an intermediary source, providing final global consumption. Therefore, The VS indicator proposed by

Hummels *et al*. (2001) has been unable to measure the current status of vertical trade correctly.

Kenneth *et al*. (2011) found that a global division of labor produces the Apple iphone4. If the analysis based on an added value chain, Apple's profits in the United States account for about 58.5%, Taiwan and Japan each account for 0.5%, and the final goods export statistics. China, which is the target country and has a huge trade deficit with the United States, accounts for only 1.8% of incited income, and only 3.5% of non-incited income. Under the rise of intra-industry trade and intermediary trade, the geographical fragmentation of the global vertical division of labor and production has led to more frequent import and export between countries. However, traditional import and export trade statistics cannot be considered under GVCs, the difference between added value trade and traditional final goods import and export trade. To solve the trade frictions caused by this new production method, OECD (2012) proposes to use the Inter-country Input-Output (ICIO) model to study the trade balances of value-added trades under GVCs. The results of the study show that about 40% reduces the U.S. trade balance deficit with China.

Koopman *et al*. (2012) believes that the key to the use of vertical specialization indicators proposed by Hummels *et al*. (2001) is to assume that the economy has the same tendency to use imported intermediate goods input to produce export goods as to produce domestic goods, but in practice due to the characteristics of processing trade, the economic policy prefers to have tariff reductions and policy subsidies on imported inputs to produce exports, making this assumption untenable. In the study, new measurement methods proposed and it was found that the added value of China's manufacturing export products increased by nearly 50% from 1997 to 2002, which is almost double the Hummels *et al*. (2001) method; and after the accession to the WTO from 2002 to 2007, the domestic added value of China manufacturing exports increased from 51% to 60%. It can find that the extent and degree of Chinese manufacturers in the global value chain have increased.

Later, Johnson and Noguera (2012) used the input-output table and bilateral trade data to calculate the connotation of the value added of bilateral trade and measured the international production by using the Ratio of Value-Added to Export (VAX). Based on the intensity of international production process sharing, the study found that manufacturing exports have a lower proportion than the agriculture and service industries. Bilateral trade uses the VAX ratio to measure results, which varies greatly from country to country. For example, the US-China trade deficit in 2004 decrease by 30% to 40% when measuring by added value. Stehrer (2012) studied the direct and indirect Domestic Trade in Value Added (TiVA) and Value Added in Trade

(VAiT) methods for the final goods export to the United States, China, and Japan compares with 27 EU countries. It found that with a bilateral trade net value study, the U.S. trade deficit with China decreased from US$151.6 billion in VAiT to US$117.50 billion in TiVA and 25% in 2005. However, U.S. trade deficit with EU-27 rose from US$112.9 billion in VAiT to US$141 billion in TiVA and 20%. Antràs (2013) uses industry surveys and input-output table data to calculate the Upstreamness indicator. It measures an industry's status in the upstream or downstream of the industry value chain. Intermediate goods are usually located in the upper reaches of the industry and are mostly a capital-intensive industry.

Koopman *et al*. (2014) believe that all of the estimated trade added value derives from the method proposed by Leontief. This method proves that through the input-output structure between different countries and different departments, it estimates the quantity and type of intermediate inputs needed to produce each unit of output, and traces the output of each stage in the process of producing the final product. However, this method is only suitable for calculating the added value of only one country’s total exports, and cannot provide a calculation method that can decompose the intermediate goods transactions between different countries into various added values that are ultimately consumed by different countries and sectors. Therefore, Timmer *et al*. (2012) used the data of the World Input-Output Database (WIOD) from 1995 to 2011 to conduct bilateral and multilateral trade in 41 countries and 35 industrial sectors. The decomposition of the value, which trades all bilateral intermediate goods, is broken down according to its ultimate destination of consumption and becomes a part of the final product used by different sectors in different countries. This key decomposition technology has succeeded in the endogenous changes in total exports have changed beyond the final demand. And by using the decomposition results, we can track the widely used VS indicators of Hummels *et al*. (2001). With the structural changes over time, this trade value calculation method can further carry out various multinational production divisions and GVCs. In-depth study of the issue further decomposes the domestic and foreign added value contained in exports and distinguishes the flow of products after export. According to the empirical data in 2004, the foreign added value of U.S. exports accounted for only 9% of the export value and returned to the country after export, the added value accounted for 11.3%, indicating that most of the U.S. exports contained domestic value added. In contrast, China and Mexico accounted for 4.65 billion U.S. dollars and 55.8% of their foreign export value in processing exports. The percentage of used foreign middle goods in its exports accounted for 10.1% and 7.6%, indicating that the value of the domestic added value in processing exports accounted for less than half of their exports.

At present, OECD (2012) and Koopman *et al*. (2014) use the viewpoint of value-added to calculate the global supply chain, but the difference lies in: OECD (2012) emphasizes that the exports calculate the impact on output through the degree of concern about the industry, and multiply the added value per unit of output to obtain the contribution of the export to the added value; and Koopman *et al*. (2014) proposes that the added value be used as the final goods or intermediary for export goods for dismantling solution, such as: After the products produced in Taiwan are exported to China, their use may be two types. One is the final goods, and the second one is processed in China as an intermediate good. After processing by Chinese manufacturers, this product may be directly China's domestic sales or return sales to Taiwan or third countries, and these added values can calculates by the dismantling method proposed by Koopman *et al*. (2014). This method is more complex and requires the preparation of a cross-country input-output table (ICIO) can calculate.

In order to decipher the export value of the added value obtained by the exporting country (the country) actually from the importing country (other country), and to disassemble the total export of the exporting country (domestic) to the importing country (other) as a meaningful share; these two topics are in the literature. They are called "trade in value-added (TiVA)" and "value-added in trade," respectively, by Stehrer (2012). Specifically, trade in value-added is to explore whether export goods are considered as final needs (consumption or investment) by the importing country and whether the export product reaches the importing country directly or indirectly via a third country, and the exporting country obtains its added value due from the importing country. Value-added in trade is to analyze the value-added contents contained in the total bilateral exports. The sources of such shares include the direct rival countries and the foreign countries that have exported other countries.

To achieve this goal, it is not a matter of direct dismantling of export data, but rather the use of input-output tables and relatively devious steps. The main reason for the lack of value-added information in export data, together with current export statistics, cannot track the use of imports by importing countries. In contrast, the input-output table has the cost structure, production and sales, and import and export information. It is an indispensable tool for tracking product flow and calculating added value. However, the single country input-output table is not enough to deal with bilateral trade issues. The solution is to establish an Inter-country Input-Output table (ICIO), such as Asian International Tables (IDEJETRO, 2006) compiled by the Asian Economic Research Institute of the Japan External Trade Organization, GTAP tables prepared by Purdue University, OECD's Multinational Input-Output Database (OECD,

2012), , World Input-Output Database (WIOD) prepared by Timmer *et al*. (2012), etc. Use the cross-country input-output table to calculate the added value that the exporter receives from the importing country. Johnson and Noguera (2012) call it "value added export value" (VAX), and take the ratio of VAX to the total value of exports (VAX ratio) as a measure of the ability of a country/department to create added value, this method is relatively straightforward, relying only on Leontief's forward linkage effect, and will also shed light on the added value that the exporting country receives from the importing country. However, there are many ways to dismantle the share of value added in the total export amount and other meaningful information, and there are many different items. The simplest is to treat the export product vector as an exogenous mutation, multiplying directly by the product of the added value rate vector and the Leontief inverse matrix; for example, Foster-McGregor and Stehrer (2013). However, this method does not consider the issue of "return," that is, the country first exports to foreign countries. After that, the export goods are processed abroad and then written back to the country as final consumption. Under this method, the country will receive added value from foreign countries. However, in fact, the added value originated in the country. Also, the information on intermediate goods exports in various countries has been implied in Leontief's inverse matrix. When calculating the share of total exports, it considered as part of the exogenous impact (the other part is the final goods). Whether the intermediate goods exports are endogenous or exogenous, the division is not clear. Koopman *et al*. (2014) divided the total export value of a country into nine sub-items, which can be combined into three major items: value-added exports, shares returned to domestic and foreign ownership. Wang *et al*. (2013) further divided the country's exports into 16 sub-items and analyzed them from the perspective of bilateral and sectoral perspectives. This approach is more rigorous than Koopman et al. (2014) only focusing on a single export volume.

III. Methodology

3.1 The decomposition of total export

This study applies the decomposition of value added (see figure 1 and figure 2) that developed by Wang *et al*. (2013) with the global value chain perspective, to decompose Taiwan's foreign trade export amount and calculate the Domestic Value-added (DVA). To discuss the method of adding value in the export of countries/departments based on the forward linkage of the industrial sector, it will naturally lead to the conceptual revision of the National/ Sectional Revealed

Comparative Advantage (RCA). The traditional RCA index of a country/department is the comparative value of the country's total exports of this sector in the country's total exports and the global share of the sector's total exports in total global exports (TRCA). When the RCA index is greater than 1, it indicates that the export of the sector in the country has a dominant comparative advantage; when the RCA index is less than 1, it indicates that the export of the sector in the country has a dominant disadvantage.

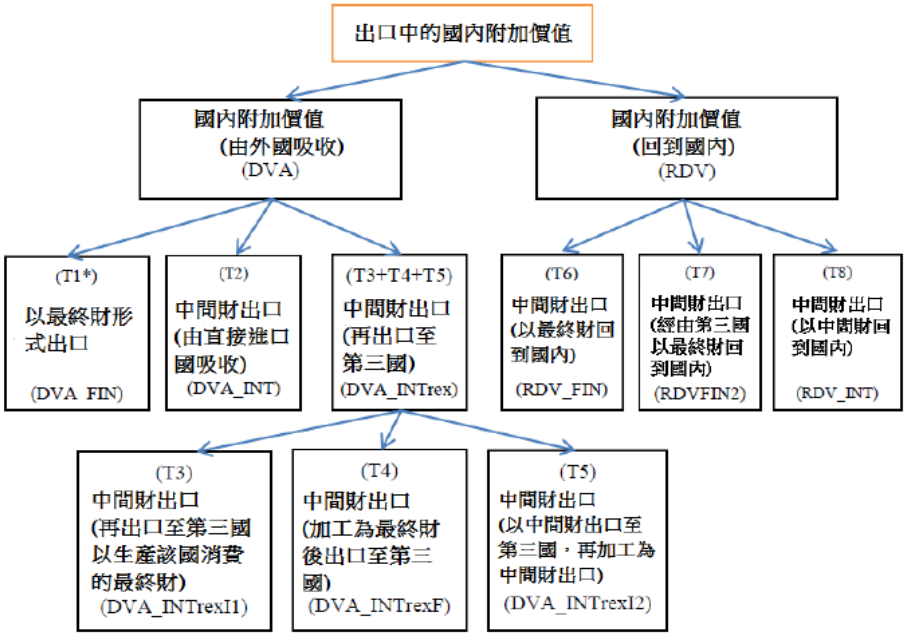

Figure 1 Domestic added the value of total export decomposition

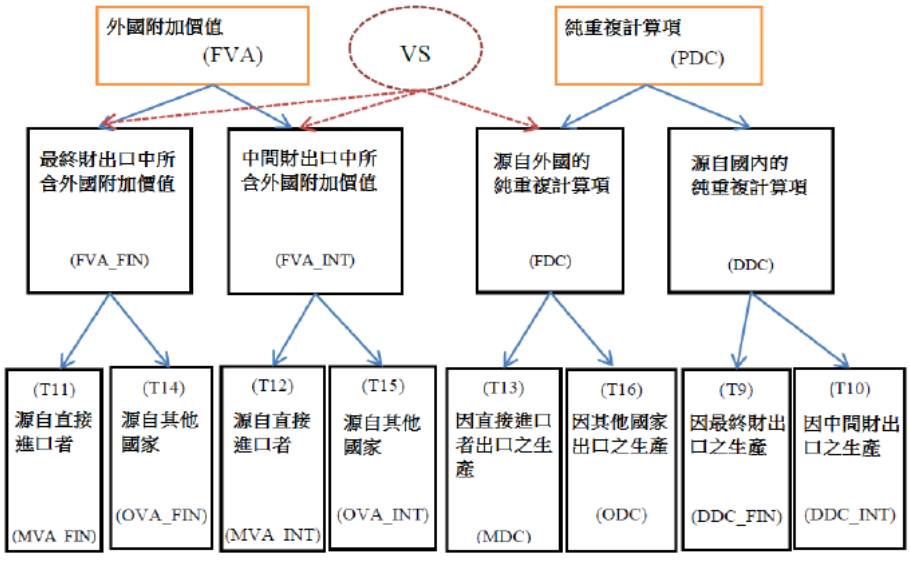

Figure 2 Foreign added value of total export decomposition

3.2 The new indicator of Revealed Comparative Advantage

From the perspective of global value chains, the traditional RCA index ignores both the domestic production division and the international production division. Specifically, first, the traditional RCA index does not consider the fact that the added value of a country/department can be implicitly exported to other sectors of the country to achieve indirect exports. Second, the traditional RCA index does not consider a country/ The department's total exports contain facts of some foreign values (FVA and FDC). Therefore, a method of correctly measuring the dominant comparative advantage of a country/department requires not only indirect exports of the added value of the sector implicit in the exports of other sectors of the country but also the exclusion of foreign added value and purely double counting from the total exports.

$$\text{RCA\_}Gross_i^r = \frac{e_i^r / \sum_i^n e_i^r}{\sum_r^G e_i^r / \sum_r^G \sum_i^n e_i^r} \tag{3-1}$$

Considering the domestic and international production division of export production, we define a new indicator for measuring a country/sector's RCA (NRCA), which is the added value of that sector in a country's exports based on the forward linkages of the industry sector. The proportion of domestic added value in the country's total exports is a comparative value of the added value of the sector's exports to the total value-added exports of the world.

$$\text{RCA\_}Gross_i^r = \frac{dva\_f_i^r / \sum_i^n dva\_f_i^r}{\sum_r^G dva\_f_i^r / \sum_r^G \sum_i^n dva\_f_i^r} \tag{3-2}$$

3.3 Production chain length, location, and cross-border analysis

Wang *et al*. (2015) proposed that the total production chain length can be decomposed into a simple domestic production chain length and a GVC production chain length, while the latter includes domestic and international parts. In addition, it can be further divided into the length of the forward production chain (i.e., the total output driven by the unit added value), the length of the backward production chain (ie the total output driven by the unit final product), and the total length of the system production chain (ie total The ratio of output to GDP). Therefore, the length of the production chain is the sum of the added value of the unit involved and the footprint of the final product in each department (Footprint). Due to the minimum production, the chain is unit value added; we can demonstrate the value added of final good from i department added value to j department as:

$$\delta_{ij}v_i y_j + v_i a_{ij} y_j + v_i \sum_k^n a_{ik}\, a_{kj} y_j + \cdots \qquad \delta_{ij} = \begin{cases} 1, & i = j \\ 0, & i \neq j \end{cases} \tag{3-3}$$

Then we can demonstrate equation (3-3) as a matrix:

$$\hat{V}\hat{Y} + \hat{V}A\hat{Y} + \hat{V}AA\hat{Y} + \cdots = \hat{V}(I - A + AA + \cdots)\hat{Y} = \hat{V}(I - A)^{-1}\hat{Y} = \hat{V}B\hat{Y} \tag{3-4}$$

The smallest production chain unit adds value to the i department to the final product of the j department:

$$\delta_{ij}v_i y_j + 2v_i a_{ij} y_j + 3v_i \sum_k^n a_{ik}\, a_{kj} y_j + \cdots \qquad \delta_{ij} = \begin{cases} 1, & i = j \\ 0, & i \neq j \end{cases} \tag{3-5}$$

Rewrite (3-5) as matrix:

$$\hat{V}\hat{Y} + 2\hat{V}\mathrm{A}\hat{Y} + 3\hat{V}AA\hat{Y} + \cdots = \hat{V}(I + 2A + 3AA + \cdots)\hat{Y}$$
$$= \hat{V}(B + AB + AAB + \cdots)\hat{Y} = \hat{V}\mathrm{BB}\hat{Y} \tag{3-6}$$

The length of the smallest production chain unit is the length of the production chain in which the i department is initially invested in the final product of the j department.

$$\mathrm{vy}l_{ij} = \frac{v_i \sum_k^n b_{ik} b_{kj} y_j}{v_i b_{ij} y_j} = \frac{\sum_k^n b_{ik} b_{kj}}{b_{ij}} = (b_{ij})^{-1} \sum_k^n b_{ik} b_{kj} \tag{3-7}$$

If we add to the value-added department：

$$\mathrm{v}l_i = \sum_j^n \left(\frac{v_i b_{ij} y_j}{\sum_k^n v_i b_{ik} y_k} \times \frac{\sum_k^n b_{ik} b_{kj}}{b_{ij}}\right) = \sum_j^n \left(\frac{\sum_k^n b_{ik} b_{kj} y_j}{\sum_k^n b_{ik} y_k}\right) = x_i^{-1} \sum_j^n \sum_k^n b_{ik} b_{kj} y_j =$$

$$x_i^{-1} \sum_k^n b_{ik} x_k = \sum_k^n g_{ik} \tag{3-8}$$

If we add to the final good department: 若加總到最終品部門層面：

$$\mathrm{y}l_i = \sum_i^n \left(\frac{v_i b_{ij} y_j}{\sum_k^n v_k b_{kj} y_j} \times \frac{\sum_k^n b_{ik} b_{kj}}{b_{ij}}\right) = \sum_i^n v_i \sum_k^n b_{ik} b_{kj} = \sum_k^n b_{kj} \tag{3-9}$$

If we add to the whole economic system:

$$(uB\hat{Y}u')/(uY) = (uBY)/GDP = (uX)/GDP \tag{3-10}$$

Equation (3-11) describes the total length of the production chain:

$$(\mathrm{Vy}l^{sr})\#(\hat{V}^s \sum_u^g B^{su} Y^{ur}) = \hat{V}^s \sum_u^g \sum_t^g B^{st}\, B^{tu} Y^{ur} \tag{3-11}$$

The domestic part of the production chain:

$$(\mathrm{VAXL\_\_D}^{sr})\,\#(\hat{V}^s \sum_u^g B^{su} Y^{ur}) = \hat{V}^s L^{ss} B^{ss} Y^{sr} + L^{ss} \sum_{t \neq s}^g A^{st} \sum_u^g B^{tu}\, Y^{ur} \tag{3-12}$$

The international part of the production chain:

$$(\mathrm{VAXL\_\_F}^{sr})\,\#(\hat{V}^s \sum_u^g B^{su} Y^{ur}) = \hat{V}^s L^{ss} \sum_{t \neq s}^g \sum_u^g A^{st} B^{tv} \sum_u^g B^{vu} Y^{ur} \tag{3-13}$$

If the cross-border number of production chains is further calculated, the first round is the flow of added value (forward), which is used for domestic$\hat{V}Y^D$, for export $\hat{V}Y^E$, and the trade added value implied by exports.

$$\hat{V}Y^E = \hat{V}\mathrm{Y} - \hat{V}Y^D \tag{3-14}$$

Therefore we can multiply the cross-border number of production chains and trade value added:

$$0*\hat{V}Y^D + 1 * \hat{V}Y^E = \hat{V}(0* Y^D + 1 * Y^E) = \hat{V}Y - \hat{V}Y^D \tag{3-15}$$

The second round is the flow of added value (forward), which is used for domestic $\hat{V}A^DY^D$, for export $\hat{V}A^DY^E$, $\hat{V}A^EY^D$, $\hat{V}A^EY^E$, and the trade added value implied by exports.

$$\hat{V}A^DY^E + \hat{V}A^EY^D + \hat{V}A^EY^E = \hat{V}AY - \hat{V}A^DY^D \tag{3-16}$$

Therefore we can multiply the cross-border number of production chains and trade value added:

$$\begin{aligned} &0*\hat{V}A^DY^D + 1 * \hat{V}A^DY^E + 1 * \hat{V}A^EY^D + 2 * \hat{V}A^EY^E \\ &= \hat{V}A^DY^E + \hat{V}A^EY^D + \hat{V}A^EY^E + \hat{V}A^EY^E \\ &= \hat{V}AY^E + \hat{V}A^EY = 2\hat{V}AY - \hat{V}AY^D - \hat{V}A^DY \end{aligned} \tag{3-17}$$

The third round is the flow of added value (forward), which is used for domestic $\hat{V}A^DA^DA^D$, for the export $\hat{V}A^DA^DY^E$, $\hat{V}A^DA^EY^D$, $\hat{V}A^DA^EY^E$, $\hat{V}A^EA^DA^D$, $\hat{V}A^EA^DY^E$, $\hat{V}A^EA^EY^D$, $\hat{V}A^EA^EY^E$ the trade added value implied by exports.

$$\begin{aligned} &\hat{V}A^DA^DY^E + \hat{V}A^DA^EY^D + \hat{V}A^DA^EY^E + \hat{V}A^EA^DA^D + \hat{V}A^EA^DY^E \\ &+ \hat{V}A^EA^EY^D + \hat{V}A^EA^EY^E = \hat{V}AAY - \hat{V}A^DA^DY^D \end{aligned} \tag{3-18}$$

Multiply the cross-border number of production chains and trade value added:

$$\begin{aligned} &\hat{V}A^DA^DY^E + \hat{V}A^DA^EY^D + 2\hat{V}A^DA^EY^E + \hat{V}A^EA^DA^D + 2\hat{V}A^EA^DY^E \\ &+2\hat{V}A^EA^EY^D + 3\hat{V}A^EA^EY^E \\ &= \hat{V}AA(0 * Y^D + 1 * Y^E) + \hat{V}AA^EY + \hat{V}A^EAY \end{aligned}$$

$$= 3\hat{V}AAY - \hat{V}AAY^D - \quad \hat{V}AA^DY - \hat{V}A^DAY$$

(3-19)

Finally, add the total number of cross-border times per round of production chain in equation (3-20)

$$\hat{V}Y - \hat{V}Y^D + \hat{V}AY - \hat{V}A^DY^D + \hat{V}AAY - \hat{V}A^DA^DY^D + \cdots$$
$$= (\hat{V}Y + \hat{V}AY + \hat{V}AAY + \cdots) - (\hat{V}Y^D + \hat{V}A^DY^D + \hat{V}A^DA^DY^D + \cdots)$$
$$= \hat{V}BY - \hat{V}(I - A^D)^{-1}Y^D = \hat{V}(B - L)Y + \hat{V}LY^E = \hat{V}LA^EBY + \hat{V}LY^E$$
$$= \hat{V}LA^EX + \hat{V}LY^E = \hat{V}LE$$

(3-20)

And $L = (I - A^D)^{-1}$

Multiply the cross-border number of production chains and trade value added:

$$\hat{V}Y - \hat{V}Y^D + 2\hat{V}AY - \hat{V}AY^D + \hat{V}A^DY + 3\hat{V}AAY - \hat{V}AAY^D - \hat{V}AA^DY$$
$$-\hat{V}A^DAY + \cdots = \hat{V}BBY - \hat{V}BY^D - \hat{V}BA^DBY$$
$$= \hat{V}[B(I - A^D)B - I]Y + \hat{V}BY^E$$
$$= \hat{V}B[AB - A^DB]Y + \hat{V}BY^E = \hat{V}BA^EX + \hat{V}BY^E = \hat{V}BE = \hat{V}B^DE + \hat{V}B^EE$$

(3-21)

Equation (3-21) includes two parts: the first one is the domestic export component promoted by the added value of trade (the national value implies in the domestic export); the second part is the foreign export component promoted by the added value of trade (the national value implies in the foreign export). The value added of trade is multiplied by the number of cross-border times, which is the sum of the trade-offs of trade value added in the customs export statistics of each country. If added to the global level, the added value of the total global trade is:

$$u\hat{V}LE = VLE \quad (3\text{-}22)$$

Multiply global cross-border number of production chains and global trade value added

$$u\hat{V}BE = uE \quad (3\text{-}23)$$

The cross-border number of global total trade added value is the reciprocal of the value-added trade value. The relationship with the global vertical specialization rate is as follows:

$$\frac{uE}{VLE} = \frac{uE}{uE - VS} = \frac{1}{1 - VSS}$$

(3-24)

IV. Empirical Analysis

The source of the world IO table used in this paper is the world input-output database (WIOD) funded by the European Commission. The method is compiled by Timmer *et al*. (2015) and Dietzenbacher *et al*. (2013). The biggest feature of WIOD is its panel data. The latest information is from 2000 to 2014, covering 44 countries and other regions. The industry is divided into 56 departments.

Looking at the reasons why WIOD can provide time-stamped data, mainly because it uses the supply and use tables (SUTs) with higher national accounts in the initial stage, instead of using the purified inputs. The output table has the advantage that it is easier to calibrate the information in the supply and use tables when the national income account is revised. The former can be used as a control to interpolate the latter. Secondly, WIOD adopted the UNComtrade database compiled by the United States (United Nations, 2009) when the bilateral/departmental trades were concluded, but the Taiwan trade data was taken from the OECD database. Comtrade's products are classified into 6-bit code blending systems (HS), which are extremely detailed and help to blame the various products for intermediate products, final consumption or investment. Finally, WIOD uses the technical assumption of the fixed product sale structure to convert the world supply and use table of the rectangular shape into a square matrix input-output table and uses the benchmark as the database calculated in this paper.

4.1 The new indicator of Revealed Comparative Advantage

From 2000 to 2014, China's new indicators based on value-added calculations, NRCA greater than 2, were c06 textiles, garments and leather products, c07 timber, and wood products, and these sectors were China's more advantageous sectors, and still It is rising; c01 crop and livestock sector, c03 fishing, and aquaculture, c22 furniture manufacturing, although these sectors still have comparative advantages, but their indicators are showing a decline in decline.

Taiwan's calculations show that the new indicators of NRCA greater than 2 are c10 coke and refined petroleum products, c17 computers, electronic and optical products, c23 machinery and equipment repair and installation, these departments are more comparative advantage in Taiwan, and still It is rising; c03 fisheries and aquaculture, c29 wholesale industry, although this sector still has comparative advantages, but its indicators show a decline in decline. In the c17 computer, electronic and optical products, c23 mechanical equipment repair and installation to

calculate the RCA indicators with added value concept, the result is more than 3 to 6, which shows that Taiwan's manufacturing transformation and improvement in recent years is a significant improvement phenomenon.

In the agricultural sector, although China's NRCA indicators are higher than Taiwan's, the NRCA indicators of the agricultural sector on both sides of the strait have shown a decline, while the bilateral competitiveness is more fishing and aquaculture. In the industrial sector, the indicators of comparative interest in China's relevant industrial sectors are all greater than 1. It can be seen that using the value of the attached value to calculate, China's industrial production still has a comparative advantage, mainly because China manufactures factories for the world, so it is produced in a transnational way. Taiwan is mainly concentrated in the comparative advantages of electronics and machinery and other related industries. Regarding the service sector, China mainly focuses on wholesale and retail industries, water and land transportation, accommodation and catering, telecommunications and financial insurance; Taiwan is mainly engaged in wholesale and retail, warehousing and transportation, accommodation and catering. Although these cross-strait service sectors also have comparative advantages, their indicators are not as good as those of the industrial sector, and the overall is lower than the comparative advantage index of the industrial sector.

4.2 Production chain length, location, and cross-border analysis results

Comparing the empirical results, the industries with competitive development potential in the main trade industries of the two sides of the strait are c06 textiles, garments and leather products, c10 coke and refined petroleum products, c17 computers, electronic and optical products, c23 mechanical equipment maintenance and installation, c29 Wholesale trade. The results of the length, location and cross-border number of major industrial production chains on both sides of the strait are shown in Table 2. You can understand the role of cross-straits in the production chain and whether the products have a global division of labor. Through cross-border times, you can understand the roles played by cross-strait industries and global supply chains.

We can find the average backward correlation in industry c06 in China (textile, garment and leather products) are all higher than those in Taiwan. Taiwan's forward-linked average step size, upstream index, and production position are higher than China's. Due to the different connotations of the textile and garment industry on both sides of the Taiwan Strait, Taiwan's traditional labor-intensive cotton wool

textile garment industry has moved outwards. Currently, it is mainly based on the development of synthetic fiber textiles related to petrochemical raw materials. Therefore, in the global value chain perspective, the industry is in the upstream industry. It has the characteristics to support the development of related industries in the global downstream. China has maintained the development of traditional textile and garment industry due to its raw materials such as cotton and foreign wool. Therefore, from the perspective of the global value chain, the industry is in the downstream industry and has the characteristics of driving the development of upstream industries.

The industry c10 (Coke and refined petroleum products) in China also have better performance than Taiwan in all indicators. The main reason because China is rich in petrochemical energy, and Taiwan is mainly imported. Therefore, in the perspective of the global value chain, China's industry is also in the upstream and downstream industries, and it has the characteristics of supporting the supply of related industries in the global downstream and driving the development of upstream industries.

The industry c17 (Computer, electronics, and optical products) in China also have better backward correlation effect than Taiwan in all indicators. But Taiwan's forward-linked average step size, upstream index, and production location are higher than China's. Due to the different connotations of the computer, electronics and optics industries on both sides of the strait, Taiwan is developing an upstream industry of electronic components and components based on semiconductors and integrated circuits. Therefore, in the global value chain perspective, the industry is in the upstream industry and has the support to supply the global downstream with the characteristics of industrial development. China develops the downstream computer information industry with labor-intensive product assembly. Therefore, in the global value chain perspective, the industry is in the downstream industry and has the characteristics of driving the development of upstream industries.

China's c29 wholesale trade industry's forward-linked average step size, average transmission step size, and downstream index are all higher than those in Taiwan. Therefore, in the perspective of the global value chain, China's industry is in the upstream industry and has the characteristics of supporting the development of related industries in the global downstream. The support effect of Taiwan's industrial sector is not as good as that of China, mainly due to the current layout of China's global trade network business network is more dense.

In recent years, the average step size of the global production chain of the major

competitive foreign trade industries on both sides of the strait has shown an upward trend. Except for the decline of Taiwan's machinery and equipment industry, all other industries have shown an increase, indicating that the cross-strait participation in global professional divisions is deeper. The situation of global roundabout production is more frequent, but Taiwan’s participation in some industries, such as machinery and equipment, needs to be further strengthened.

V. Conclusion

As mentioned in Escaith (2008) and Maurer and Degain (2010), what is seen in the statistics is no longer available. According to Koopman *et al*. (2014), this paper proposes to replace traditional trade calculation methods with value-added methods, avoiding double counting of intermediate trade, to understand the actual division of labor among countries in global value chains, and to reduce international trade disputes because of bilateral or multilateral The overestimation of the trade deficit will lead to the requirement of the exchange rate change in the transnational country, or the pressure on the economic system due to the high trade deficit. This paper also uses the WIOD database to recalculate the new indicators of cross-strait product export display comparative benefits according to Wang (2014) value-added method.

Under the new RCA indicator, the RCA indicators of China's agricultural-related sectors are higher than those of Taiwan, but the RCA indicators of the agricultural sector across the Taiwan Strait are showing a decline, and the bilaterally more favorable ones are fisheries and aquaculture. In the industrial sector, China's industrial production still has a comparative advantage, mainly because China manufactures factories for the world, so transnational production plays a very important role. Taiwan is mainly concentrated in the comparative advantages of electronics and machinery and other related industries. Regarding the service sector, China mainly focuses on wholesale and retail industries, water, land and air transportation, accommodation and catering, telecommunications and financial insurance; while Taiwan is mainly engaged in wholesale and retail, warehousing and transportation, accommodation and catering.

From the above observations, it is shown that with the wave of globalization, the model of importing intermediate components and re-exporting has become a necessary condition for enhancing market competitiveness, but on the other hand, bilateral exports from the other side. It can be observed from the dismantling of the total amount that since China and Taiwan joined the WTO in 2002, the trade barriers

have been greatly reduced, and China's Daxie's active absorption of foreign investment in setting up factories and transformation has helped it increase its added value from foreign countries. Taiwan's export competitiveness is gradually weakening. Since Taiwan relies heavily on the import of upstream intermediate components and raw materials, if the traditional import control measures can be further removed or reduced, it is expected to increase the competitiveness of the industry. As for the way to enhance the competitiveness of the industry, it can be combined with information technology. With the automation, the establishment of a sales network to reduce production and sales, reduce the loss caused by delays, increase the proportion of value-added products of national products, expand and extend the value chain of the intermediate financial industry, and increase the proportion of related products retained in the domestic market, thereby enhancing China's global Industry value chain share.

In recent years, the average step size of the global production chain of the major competitive foreign trade industries on both sides of the strait has shown an upward trend. Except for the decline of Taiwan's machinery and equipment industry, all other industries have shown an increase, indicating that the cross-strait participation in global professional divisions is deeper. The situation of global roundabout production is more frequent, but Taiwan's participation in some industries, such as machinery and equipment, needs to be further strengthened.

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Table 1 The Comparison of China and Taiwan in NRCA：2000-2014

Year	c01 Crop and animal production, hunting and related service activities		c02 Forestry and logging		c03 Fishing and aquaculture		c04 Mining and quarrying		c05 Manufacture of food products, beverages and tobacco products		c06 Manufacture of textiles, wearing apparel and leather products		c07 Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials		c08 Manufacture of paper and paper products	
	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan
2000	2.193	0.211	2.131	0.042	2.418	2.705	0.942	0.043	1.153	0.278	3.462	1.784	1.420	0.229	0.860	0.548
2001	1.956	0.188	1.958	0.019	2.331	2.375	0.990	0.054	1.046	0.293	3.245	1.646	1.480	0.205	0.946	0.520
2002	1.888	0.166	1.727	0.029	2.218	3.222	0.984	0.054	0.983	0.276	2.985	1.483	1.445	0.205	1.025	0.569
2003	1.956	0.142	1.648	0.057	2.188	2.948	0.933	0.042	1.007	0.244	3.126	1.297	1.483	0.211	1.011	0.601
2004	2.011	0.137	1.799	0.041	2.279	2.361	0.819	0.036	1.035	0.223	3.163	1.139	1.667	0.194	0.996	0.582
2005	2.205	0.141	1.822	0.047	2.153	1.866	0.737	0.029	1.110	0.211	3.316	1.117	1.659	0.183	0.945	0.590
2006	2.197	0.126	1.609	0.052	2.151	1.343	0.663	0.026	1.127	0.189	3.324	0.995	1.872	0.182	0.975	0.545
2007	2.141	0.115	1.479	0.062	1.911	0.918	0.620	0.033	1.107	0.190	3.302	0.943	1.923	0.152	0.963	0.553
2008	1.951	0.129	1.513	0.058	1.750	1.120	0.648	0.027	1.105	0.217	3.235	0.971	1.916	0.169	1.004	0.617
2009	1.909	0.137	1.294	0.072	1.498	0.995	0.613	0.043	1.037	0.222	3.197	0.951	2.158	0.151	1.031	0.532
2010	1.776	0.126	1.203	0.047	1.302	0.970	0.563	0.021	1.087	0.232	3.139	0.891	1.805	0.137	0.973	0.615
2011	1.623	0.138	1.175	0.063	1.250	0.894	0.539	0.021	1.107	0.256	3.104	0.936	1.980	0.148	1.039	0.654
2012	1.612	0.144	1.227	0.068	1.185	0.800	0.490	0.020	1.155	0.291	3.027	0.932	2.137	0.144	1.086	0.651
2013	1.582	0.144	1.223	0.060	1.072	0.621	0.551	0.021	1.111	0.254	2.922	0.867	2.129	0.132	1.032	0.577
2014	1.567	0.161	1.172	0.053	1.171	0.679	0.616	0.021	1.067	0.262	2.760	0.810	2.016	0.118	1.010	0.559

Table 2 The Comparison of China and Taiwan in NRCA：2000-2014 (con.1)

Year	c09 Printing and reproduction of recorded media		c10 Manufacture of coke and refined petroleum products		c11 Manufacture of chemicals and chemical products		c12 Manufacture of basic pharmaceutical products and pharmaceutical preparations		c13 Manufacture of rubber and plastic products		c14 Manufacture of other non-metallic mineral products		c15 Manufacture of basic metals		c16 Manufacture of fabricated metal products, except machinery and equipment	
	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan
2000	1.434	0.397	1.190	2.005	1.184	1.560	0.335	0.053	1.555	1.606	1.800	0.559	1.374	1.311	0.723	1.400
2001	1.535	0.382	1.140	2.687	1.183	1.730	0.293	0.047	1.636	1.712	1.548	0.528	1.512	1.056	0.727	1.368
2002	1.615	0.451	1.159	2.754	1.155	1.650	0.270	0.044	1.672	1.579	1.382	0.525	1.605	1.194	0.745	1.326
2003	1.440	0.488	1.035	2.750	1.235	1.654	0.308	0.046	1.596	1.448	1.346	0.545	1.851	1.156	0.747	1.293
2004	1.273	0.473	1.084	2.844	1.205	1.955	0.303	0.049	1.585	1.384	1.385	0.610	1.902	1.185	0.821	1.241
2005	1.063	0.522	1.001	2.785	1.300	2.057	0.298	0.058	1.489	1.320	1.472	0.674	1.838	1.117	0.832	1.242
2006	1.040	0.600	0.998	2.154	1.310	1.630	0.312	0.066	1.502	1.133	1.521	0.736	1.801	1.236	0.882	1.170
2007	0.957	0.522	1.122	2.735	1.327	1.801	0.335	0.081	1.419	1.067	1.493	0.938	1.758	1.285	0.925	1.130
2008	0.989	0.563	1.034	2.032	1.430	1.494	0.346	0.077	1.425	1.207	1.581	1.206	1.958	1.408	0.915	1.242
2009	1.124	0.521	1.123	2.662	1.232	1.815	0.297	0.085	1.370	1.219	1.711	1.390	1.793	1.328	0.946	1.165
2010	1.118	0.580	1.336	1.964	1.195	2.117	0.323	0.104	1.335	1.187	1.692	1.559	1.706	1.469	0.880	1.261
2011	1.182	0.720	1.054	1.833	1.287	1.953	0.311	0.125	1.360	1.294	1.844	1.724	1.700	1.369	0.882	1.403
2012	1.311	0.717	0.974	1.962	1.211	1.655	0.327	0.150	1.370	1.371	1.940	1.718	1.590	1.214	0.956	1.290
2013	1.315	0.718	0.986	2.182	1.173	1.689	0.338	0.165	1.358	1.276	2.009	1.392	1.513	1.301	0.944	1.236
2014	1.282	0.650	0.977	1.805	1.154	1.544	0.320	0.149	1.304	1.212	1.872	1.142	1.512	1.346	0.912	1.210

Table 3 The Comparison of China and Taiwan in NRCA：2000-2014 (con.2)

Year	c17 Manufacture of computer, electronic and optical products		c18 Manufacture of electrical equipment		c19 Manufacture of machinery and equipment n.e.c.		20 Manufacture of motor vehicles, trailers and semi-trailers		c21 Manufacture of other transport equipment		c22 Manufacture of furniture; other manufacturing		c23 Repair and installation of machinery and equipment		c24 Electricity, gas, steam and air conditioning supply	
	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan
2000	1.060	3.809	1.394	0.717	0.834	0.820	0.248	0.239	0.394	0.988	2.273	0.271	0.000	3.772	1.150	0.957
2001	1.238	3.948	1.456	0.833	0.874	0.837	0.262	0.268	0.401	0.760	2.071	0.245	0.000	3.841	1.229	1.008
2002	1.351	4.424	1.501	0.874	0.941	0.839	0.281	0.283	0.442	0.800	1.930	0.224	0.000	3.850	1.297	0.928
2003	1.605	4.985	1.474	0.874	0.997	0.824	0.292	0.297	0.562	0.818	1.912	0.231	0.000	3.567	1.289	0.868
2004	1.785	4.919	1.499	0.846	1.050	0.750	0.285	0.291	0.564	0.778	1.562	0.207	0.000	3.676	1.373	0.694
2005	1.785	5.160	1.598	0.889	0.996	0.749	0.303	0.309	0.551	0.808	1.989	0.163	0.000	3.601	1.342	0.618
2006	1.817	5.808	1.531	0.990	1.084	0.769	0.325	0.255	0.588	0.663	2.132	0.148	0.000	3.738	1.323	0.540
2007	1.798	6.017	1.543	1.256	1.240	0.727	0.400	0.247	0.661	0.797	2.070	0.141	0.000	3.534	1.327	0.476
2008	1.789	6.782	1.686	1.163	1.288	0.725	0.443	0.285	0.736	0.960	1.789	0.151	0.000	3.625	1.036	0.252
2009	1.764	6.570	1.560	1.195	1.317	0.696	0.517	0.337	0.748	0.786	1.682	0.137	0.000	3.244	0.978	0.760
2010	1.908	6.126	1.751	1.182	1.268	0.748	0.570	0.293	0.901	0.708	1.266	0.133	0.000	3.240	0.959	0.689
2011	1.880	6.570	1.804	1.085	1.283	0.790	0.566	0.331	0.887	0.744	1.328	0.130	0.000	3.460	0.940	0.542
2012	1.902	6.530	1.857	1.167	1.170	0.895	0.534	0.350	0.813	0.800	1.596	0.142	0.000	3.740	0.902	0.575
2013	1.890	6.789	1.817	1.190	1.187	0.758	0.559	0.348	0.747	0.698	1.542	0.135	0.000	3.489	0.962	0.732
2014	1.836	6.981	1.800	1.075	1.154	0.753	0.547	0.348	0.689	0.766	1.494	0.128	0.000	3.496	1.003	0.783

Table 4 The Comparison of China and Taiwan in NRCA：2000-2014 (con.3)

Year	c25 Water collection, treatment and supply		c26 Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services		c27 Construction		c28 Wholesale and retail trade and repair of motor vehicles and motorcycles		c29 Wholesale trade, except of motor vehicles and motorcycles		c30 Retail trade, except of motor vehicles and motorcycles		c31 Land transport and transport via pipelines		c32 Water transport	
	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan
2000	0.801	0.916	0.214	0.578	0.381	0.257	0.000	0.186	1.068	1.923	0.673	0.700	1.299	0.476	2.085	0.803
2001	0.896	0.990	0.214	0.618	0.356	0.250	0.000	0.186	1.103	2.044	0.684	0.689	1.262	0.516	2.097	0.822
2002	0.923	0.819	0.234	0.678	0.320	0.230	0.000	0.178	1.170	1.985	0.717	0.658	1.242	0.492	2.143	0.776
2003	0.852	0.804	0.257	0.770	0.275	0.222	0.000	0.175	1.061	1.902	0.637	0.638	1.093	0.437	1.979	0.769
2004	0.857	0.730	0.289	0.808	0.257	0.242	0.000	0.180	0.983	2.021	0.585	0.659	1.070	0.418	1.853	0.730
2005	0.828	0.704	0.319	0.926	0.223	0.246	0.000	0.194	0.981	2.084	0.590	0.692	1.027	0.424	1.721	0.596
2006	0.823	0.707	0.314	1.013	0.225	0.274	0.000	0.211	0.942	2.157	0.576	0.709	0.985	0.390	1.881	0.470
2007	0.816	0.728	0.272	1.004	0.252	0.282	0.000	0.214	0.938	2.119	0.564	0.685	0.952	0.388	1.831	0.544
2008	0.588	0.802	0.211	1.011	0.303	0.320	0.000	0.232	1.039	2.091	0.671	0.753	0.942	0.368	1.666	0.574
2009	0.564	0.775	0.205	0.976	0.313	0.257	0.000	0.207	1.146	1.865	0.814	0.790	0.941	0.364	1.627	0.243
2010	0.484	0.714	0.190	0.934	0.369	0.293	0.000	0.199	1.190	1.814	0.931	0.864	0.958	0.357	1.462	0.456
2011	0.426	0.731	0.201	1.053	0.434	0.335	0.000	0.203	1.279	1.857	0.993	1.065	0.987	0.363	1.614	0.239
2012	0.405	0.732	0.252	1.110	0.448	0.329	0.000	0.216	1.324	1.820	1.055	1.090	0.995	0.364	1.500	0.306
2013	0.435	0.683	0.254	1.006	0.477	0.254	0.000	0.214	1.310	1.843	1.028	1.005	0.997	0.359	1.496	0.290
2014	0.472	0.629	0.277	0.907	0.444	0.256	0.000	0.206	1.323	1.795	1.040	0.981	0.997	0.373	1.424	0.432

Table 5 The Comparison of China and Taiwan in NRCA：2000-2014 (con.4)

Year	c33 Air transport		c34 Warehousing and support activities for transportation		c35 Postal and courier activities		c36 Accommodation and food service activities		c37 Publishing activities		c38 Motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities		c39 Telecommunications		c40 Computer programming, consultancy and related activities; information service activities	
	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan
2000	1.248	0.671	0.044	1.445	0.310	0.337	1.158	0.838	0.000	0.275	0.000	0.481	1.019	0.686	0.194	0.102
2001	1.380	0.952	0.040	1.641	0.302	0.339	1.161	0.900	0.000	0.308	0.000	0.511	1.033	0.704	0.186	0.116
2002	1.312	1.014	0.035	1.532	0.283	0.327	1.220	0.929	0.000	0.277	0.000	0.462	1.049	0.646	0.188	0.112
2003	1.164	0.908	0.080	1.381	0.265	0.327	1.191	0.765	0.000	0.267	0.000	0.439	1.019	0.625	0.180	0.110
2004	1.077	0.829	0.130	1.190	0.275	0.336	1.228	0.778	0.000	0.282	0.000	0.422	1.070	0.582	0.186	0.115
2005	0.923	0.858	0.181	1.229	0.277	0.353	1.274	0.865	0.000	0.305	0.000	0.445	1.074	0.594	0.181	0.128
2006	0.900	0.789	0.218	1.187	0.290	0.369	1.279	0.851	0.000	0.336	0.000	0.463	1.088	0.581	0.197	0.136
2007	0.832	0.834	0.281	1.139	0.312	0.362	1.255	0.921	0.000	0.328	0.000	0.382	1.070	0.567	0.216	0.157
2008	0.933	0.626	0.342	1.075	0.313	0.381	1.252	1.021	0.000	0.346	0.000	0.417	0.940	0.609	0.204	0.190
2009	0.901	0.782	0.358	1.003	0.296	0.350	1.160	1.025	0.000	0.309	0.000	0.372	0.807	0.564	0.195	0.181
2010	0.896	1.135	0.392	0.988	0.318	0.374	1.051	1.037	0.000	0.335	0.000	0.427	0.734	0.572	0.215	0.195
2011	0.916	0.867	0.438	0.960	0.327	0.408	0.985	1.139	0.000	0.367	0.000	0.479	0.741	0.605	0.229	0.200
2012	0.839	0.902	0.470	0.992	0.326	0.412	0.972	1.146	0.000	0.382	0.000	0.478	0.755	0.617	0.230	0.205
2013	0.789	0.972	0.459	0.956	0.321	0.413	0.939	1.146	0.000	0.376	0.000	0.459	0.775	0.580	0.236	0.195
2014	0.738	1.074	0.457	0.935	0.313	0.393	0.932	1.242	0.000	0.394	0.000	0.467	0.797	0.573	0.208	0.198

Table 6 The Comparison of China and Taiwan in NRCA：2000-2014 (con.5)

Year	c41 Financial service activities, except insurance and pension funding		c42 Insurance, reinsurance and pension funding, except compulsory social security		c43 Activities auxiliary to financial services and insurance activities		c44 Real estate activities		c45 Legal and accounting activities; activities of head offices; management consultancy activities		c46 Architectural and engineering activities; technical testing and analysis		c47 Scientific research and development		48 Advertising and market research	
	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan
2000	0.910	0.996	0.590	0.855	0.000	0.404	0.538	0.543	0.946	0.119	0.000	1.196	0.050	0.347	0.000	0.423
2001	0.865	1.023	0.545	0.928	0.000	0.240	0.529	0.538	0.923	0.120	0.000	1.185	0.052	0.365	0.000	0.456
2002	0.838	0.932	0.510	0.833	0.000	0.222	0.528	0.480	0.964	0.113	0.000	1.068	0.062	0.340	0.000	0.442
2003	0.792	0.854	0.379	0.839	0.000	0.218	0.531	0.453	0.924	0.110	0.000	1.062	0.173	0.334	0.000	0.458
2004	0.760	0.855	0.309	0.782	0.000	0.248	0.525	0.446	0.946	0.112	0.000	1.051	0.281	0.335	0.000	0.473
2005	0.767	0.899	0.280	0.793	0.000	0.205	0.548	0.438	0.893	0.117	0.000	1.066	0.355	0.352	0.000	0.521
2006	0.859	0.813	0.309	0.899	0.000	0.266	0.642	0.481	0.920	0.125	0.000	1.205	0.416	0.405	0.000	0.584
2007	1.024	0.762	0.335	0.727	0.000	0.353	0.749	0.495	0.939	0.121	0.000	1.024	0.444	0.297	0.000	0.603
2008	1.112	0.813	0.355	0.714	0.000	0.391	0.694	0.556	0.999	0.126	0.000	0.856	0.498	0.238	0.000	0.659
2009	1.128	0.592	0.336	0.527	0.000	0.307	0.840	0.555	1.042	0.117	0.000	0.623	0.745	0.198	0.000	0.655
2010	1.175	0.651	0.336	0.493	0.000	0.344	0.926	0.568	1.042	0.121	0.000	0.461	0.936	0.122	0.000	0.707
2011	1.221	0.723	0.363	0.482	0.000	0.374	0.956	0.595	1.049	0.131	0.000	0.295	0.907	0.000	0.000	0.738
2012	1.261	0.733	0.365	0.448	0.000	0.306	0.996	0.618	1.046	0.132	0.000	0.302	0.922	0.000	0.000	0.765
2013	1.308	0.679	0.375	0.441	0.000	0.266	0.995	0.575	0.972	0.126	0.000	0.287	0.933	0.000	0.000	0.726
2014	1.355	0.669	0.394	0.482	0.000	0.273	0.979	0.568	0.984	0.120	0.000	0.272	0.972	0.000	0.000	0.688

Table 7 The Comparison of China and Taiwan in NRCA：2000-2014 (con.6)

Year	C49 Other professional, scientific and technical activities; veterinary activities		c50 Administrative and support service activities		c51 Public administration and defence; compulsory social security		c52 Education		c53 Human health and social work activities		c54 Other service activities		c55 Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use		c56 Activities of extraterritorial organizations and bodies	
	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan
2000	0.265	0.599	0.008	0.236	0.040	0.327	0.456	0.010	0.558	1.004	2.220	0.490	0.000	0.009	0.000	0.000
2001	0.285	0.672	0.008	0.267	0.049	0.367	0.446	0.019	0.542	1.006	2.683	0.531	0.000	0.006	0.000	0.000
2002	0.337	0.639	0.008	0.262	0.058	0.381	0.498	0.023	0.607	0.968	2.712	0.492	0.000	0.006	0.000	0.000
2003	0.554	0.586	0.010	0.262	0.055	0.373	0.447	0.033	0.673	0.913	2.215	0.472	0.000	0.015	0.000	0.000
2004	0.770	0.567	0.013	0.283	0.066	0.373	0.454	0.034	0.762	0.916	1.658	0.470	0.000	0.015	0.000	0.000
2005	0.942	0.584	0.016	0.311	0.072	0.385	0.512	0.024	0.906	0.950	1.664	0.479	0.000	0.016	0.000	0.000
2006	0.999	0.607	0.019	0.356	0.090	0.428	0.522	0.053	0.949	1.043	1.504	0.511	0.000	0.017	0.000	0.000
2007	0.998	0.606	0.019	0.352	0.094	0.522	0.482	0.115	0.996	0.738	1.404	0.535	0.000	0.028	0.000	0.000
2008	0.862	0.650	0.022	0.389	0.199	0.636	0.466	0.105	0.844	0.581	1.394	0.611	0.000	0.025	0.000	0.000
2009	0.798	0.617	0.026	0.361	0.293	0.636	0.477	0.126	0.638	0.332	1.379	0.566	0.000	0.035	0.000	0.000
2010	0.817	0.681	0.028	0.375	0.246	0.723	0.391	0.120	0.441	0.166	1.321	0.618	0.000	0.060	0.000	0.000
2011	0.790	0.762	0.028	0.408	0.226	0.797	0.343	0.131	0.347	0.043	1.325	0.684	0.000	0.102	0.000	0.000
2012	0.793	0.770	0.045	0.428	0.274	0.825	0.343	0.114	0.293	0.042	1.336	0.667	0.000	0.085	0.000	0.000
2013	0.870	0.796	0.043	0.414	0.260	0.681	0.346	0.098	0.299	0.037	1.303	0.624	0.000	0.139	0.000	0.000
2014	0.891	0.754	0.044	0.397	0.309	0.659	0.396	0.099	0.323	0.038	1.288	0.643	0.000	0.153	0.000	0.000

Table 2 Production on Length, Propagation Length and Production Position by Sectors in China and Taiwan

Sectors	Year	China								Taiwan							
		Average total production length (Forward Linkage)	Average total production length (Backward Linkage)	Average propagation length(Forward Linkage)	Average propagation length (Backward Linkage)	Antrans and Fally Upsteamness index	Antrans and Chor Downstreamness index	Production position index based on APL	Production position index based on TPL	Average total production length (Forward Linkage)	Average total production length (Backward Linkage)	Average propagation length(Forward Linkage)	Average propagation length (Backward Linkage)	Antrans and Fally Upsteamness index	Antrans and Chor Downstreamness index	Production position index based on APL	Production position index based on TPL
		PLv	PLy	APL_f	APL_b	Pos_up	Pos_dow	Pos_AP	Pos_TP	PLv	PLy	APL_f	APL_b	Pos_up	Pos_do	Pos_APL	Pos_TPL
c06	2000	2.22	3.00	1.91	2.09	2.22	3.00	0.91	0.74	2.44	2.69	1.74	1.76	2.44	2.69	0.99	0.91
	2001	2.17	3.01	1.88	2.08	2.17	3.01	0.91	0.72	2.43	2.70	1.75	1.78	2.43	2.70	0.98	0.90
	2002	2.07	3.01	1.83	2.04	2.07	3.01	0.89	0.69	2.44	2.72	1.75	1.77	2.44	2.72	0.99	0.89
	2003	2.11	3.08	1.86	2.08	2.11	3.08	0.90	0.68	2.45	2.86	1.77	1.81	2.45	2.86	0.98	0.86
	2004	2.13	3.13	1.88	2.09	2.13	3.13	0.90	0.68	2.55	3.04	1.81	1.87	2.55	3.04	0.97	0.84
	2005	2.18	3.24	1.93	2.16	2.18	3.24	0.89	0.67	2.67	3.05	1.84	1.88	2.67	3.05	0.98	0.87
	2006	2.26	3.30	1.97	2.20	2.26	3.30	0.90	0.68	2.70	3.18	1.87	1.92	2.70	3.18	0.97	0.85
	2007	2.35	3.38	2.03	2.25	2.35	3.38	0.90	0.70	2.69	3.20	1.87	1.92	2.69	3.20	0.97	0.84
	2008	2.47	3.38	2.09	2.27	2.47	3.38	0.92	0.73	2.66	3.25	1.86	1.92	2.66	3.25	0.97	0.82
	2009	2.74	3.42	2.24	2.35	2.74	3.42	0.95	0.80	2.77	3.04	1.90	1.89	2.77	3.04	1.01	0.91
	2010	2.61	3.38	2.16	2.28	2.61	3.38	0.95	0.77	2.83	3.21	1.92	1.94	2.83	3.21	0.99	0.88
	2011	2.61	3.37	2.15	2.27	2.61	3.37	0.95	0.77	2.85	3.26	1.92	1.95	2.85	3.26	0.98	0.88
	2012	2.75	3.38	2.21	2.30	2.75	3.38	0.96	0.81	2.95	3.19	1.95	1.95	2.95	3.19	1.00	0.93
	2013	2.80	3.48	2.25	2.35	2.80	3.48	0.96	0.80	2.93	3.21	1.96	1.95	2.93	3.21	1.01	0.91

Sectors	Year	China								Taiwan							
		Average total production length (Forward Linkage)	Average total production length (Backward Linkage)	Average propagation length(Forward Linkage)	Average propagation length (Backward Linkage)	Antrans and Fally Upsteamness index	Antrans and Chor Downstreamness index	Production position index based on APL	Production position index based on TPL	Average total production length (Forward Linkage)	Average total production length (Backward Linkage)	Average propagation length(Forward Linkage)	Average propagation length (Backward Linkage)	Antrans and Fally Upsteamness index	Antrans and Chor Downstreamness index	Production position index based on APL	Production position index based on TPL
		PLv	PLy	APL_f	APL_b	Pos_up	Pos_dow	Pos_AP	Pos_TP	PLv	PLy	APL_f	APL_b	Pos_up	Pos_do	Pos_APL	Pos_TPL
	2014	2.84	3.47	2.26	2.35	2.84	3.47	0.96	0.82	2.99	3.19	1.97	1.95	2.99	3.19	1.01	0.94
c10	2000	4.02	2.64	2.28	1.75	4.02	2.64	1.30	1.52	3.26	2.22	1.66	1.37	3.26	2.22	1.21	1.47
	2001	3.95	2.75	2.26	1.77	3.95	2.75	1.27	1.44	3.37	2.17	1.71	1.37	3.37	2.17	1.25	1.55
	2002	3.88	2.84	2.23	1.79	3.88	2.84	1.25	1.37	3.34	2.14	1.71	1.36	3.34	2.14	1.25	1.56
	2003	4.00	2.86	2.26	1.78	4.00	2.86	1.27	1.40	3.39	2.23	1.77	1.37	3.39	2.23	1.29	1.52
	2004	4.01	2.89	2.27	1.81	4.01	2.89	1.25	1.39	3.41	2.26	1.85	1.39	3.41	2.26	1.33	1.50
	2005	4.20	2.97	2.35	1.87	4.20	2.97	1.26	1.41	3.47	2.45	1.87	1.44	3.47	2.45	1.30	1.42
	2006	4.24	2.99	2.36	1.89	4.24	2.99	1.25	1.42	3.59	2.62	1.92	1.47	3.59	2.62	1.31	1.37
	2007	4.29	3.05	2.40	1.94	4.29	3.05	1.23	1.41	3.75	2.61	1.96	1.48	3.75	2.61	1.33	1.43
	2008	4.27	2.97	2.39	1.89	4.27	2.97	1.26	1.44	3.75	2.80	2.01	1.54	3.75	2.80	1.30	1.34
	2009	4.32	3.08	2.47	1.98	4.32	3.08	1.25	1.40	3.81	2.60	1.96	1.52	3.81	2.60	1.29	1.47
	2010	4.25	3.05	2.44	1.99	4.25	3.05	1.23	1.39	3.88	2.67	1.98	1.54	3.88	2.67	1.29	1.45
	2011	4.28	3.19	2.47	2.02	4.28	3.19	1.23	1.34	4.00	2.74	1.96	1.56	4.00	2.74	1.26	1.46
	2012	4.36	3.24	2.52	2.06	4.36	3.24	1.22	1.35	3.97	2.75	2.02	1.54	3.97	2.75	1.31	1.45
	2013	4.41	3.26	2.56	2.09	4.41	3.26	1.23	1.35	3.72	2.69	2.00	1.55	3.72	2.69	1.29	1.38

Sectors	Year	China								Taiwan							
		Average total production length (Forward Linkage)	Average total production length (Backward Linkage)	Average propagation length(Forward Linkage)	Average propagation length (Backward Linkage)	Antrans and Fally Upsteamness index	Antrans and Chor Downstreamness index	Production position index based on APL	Production position index based on TPL	Average total production length (Forward Linkage)	Average total production length (Backward Linkage)	Average propagation length(Forward Linkage)	Average propagation length (Backward Linkage)	Antrans and Fally Upsteamness index	Antrans and Chor Downstreamness index	Production position index based on APL	Production position index based on TPL
		PLv	PLy	APL_f	APL_b	Pos_up	Pos_dow	Pos_APL	Pos_TPL	PLv	PLy	APL_f	APL_b	Pos_up	Pos_do	Pos_APL	Pos_TPL
	2014	4.42	3.28	2.58	2.09	4.42	3.28	1.24	1.35	4.00	2.85	1.98	1.62	4.00	2.85	1.22	1.40
c17	2000	2.34	3.32	1.97	2.08	2.34	3.32	0.95	0.71	2.44	2.75	1.83	1.70	2.44	2.75	1.08	0.89
	2001	2.40	3.28	1.97	2.07	2.40	3.28	0.95	0.73	2.50	2.79	1.83	1.70	2.50	2.79	1.08	0.90
	2002	2.31	3.21	1.92	2.02	2.31	3.21	0.95	0.72	2.59	2.73	1.85	1.73	2.59	2.73	1.07	0.95
	2003	2.35	3.26	1.94	2.04	2.35	3.26	0.95	0.72	2.65	2.67	1.89	1.72	2.65	2.68	1.10	0.99
	2004	2.41	3.38	1.98	2.10	2.41	3.38	0.95	0.71	2.73	2.76	1.93	1.77	2.73	2.76	1.09	0.99
	2005	2.58	3.63	2.09	2.22	2.58	3.64	0.94	0.71	2.86	2.82	2.01	1.83	2.86	2.82	1.10	1.01
	2006	2.58	3.62	2.10	2.21	2.58	3.62	0.95	0.71	2.93	2.83	2.03	1.84	2.93	2.83	1.10	1.04
	2007	2.40	3.54	2.06	2.18	2.40	3.54	0.95	0.68	3.14	2.84	2.05	1.84	3.14	2.84	1.12	1.10
	2008	2.41	3.55	2.04	2.18	2.41	3.55	0.93	0.68	3.13	2.81	2.03	1.83	3.13	2.81	1.11	1.11
	2009	2.69	3.62	2.12	2.26	2.69	3.62	0.94	0.74	3.16	2.76	2.06	1.82	3.16	2.76	1.13	1.15
	2010	2.92	3.71	2.22	2.31	2.92	3.71	0.96	0.79	3.14	2.92	2.09	1.88	3.14	2.92	1.11	1.07
	2011	3.01	3.80	2.25	2.34	3.01	3.80	0.96	0.79	3.17	2.95	2.11	1.89	3.17	2.96	1.12	1.07
	2012	3.04	3.80	2.27	2.37	3.04	3.80	0.96	0.80	3.28	2.90	2.13	1.89	3.28	2.90	1.12	1.13
	2013	3.16	3.85	2.32	2.41	3.16	3.85	0.96	0.82	3.45	2.85	2.18	1.88	3.45	2.85	1.16	1.21

Sectors	Year	China								Taiwan							
		Average total production length (Forward Linkage)	Average total production length (Backward Linkage)	Average propagation length(Forward Linkage)	Average propagation length (Backward Linkage)	Antrans and Fally Upsteamness index	Antrans and Chor Downstreamness index	Production position index based on APL	Production position index based on TPL	Average total production length (Forward Linkage)	Average total production length (Backward Linkage)	Average propagation length(Forward Linkage)	Average propagation length (Backward Linkage)	Antrans and Fally Upsteamness index	Antrans and Chor Downstreamness index	Production position index based on APL	Production position index based on TPL
		PLv	PLy	APL_f	APL_b	Pos_up	Pos_dow	Pos_APL	Pos_TPL	PLv	PLy	APL_f	APL_b	Pos_up	Pos_do	Pos_APL	Pos_TPL
	2014	3.18	3.80	2.33	2.42	3.18	3.80	0.96	0.84	3.54	2.79	2.20	1.89	3.54	2.79	1.16	1.27
c23	2000	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.78	2.49	1.66	1.75	2.78	2.49	0.95	1.11
	2001	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.77	2.42	1.65	1.73	2.77	2.42	0.95	1.15
	2002	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.78	2.41	1.65	1.75	2.78	2.41	0.94	1.15
	2003	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.63	2.46	1.67	1.77	2.63	2.46	0.95	1.07
	2004	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.71	2.60	1.69	1.82	2.71	2.60	0.93	1.04
	2005	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.81	2.66	1.72	1.83	2.81	2.66	0.94	1.06
	2006	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.87	2.70	1.75	1.87	2.87	2.70	0.93	1.06
	2007	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.92	2.72	1.76	1.89	2.92	2.72	0.93	1.07
	2008	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.92	2.76	1.76	1.90	2.92	2.76	0.93	1.06
	2009	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.86	2.68	1.75	1.86	2.86	2.68	0.94	1.07
	2010	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.92	2.90	1.77	1.92	2.92	2.90	0.92	1.00
	2011	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.90	2.96	1.77	1.94	2.90	2.97	0.91	0.98
	2012	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	3.24	2.98	1.77	1.94	3.24	2.98	0.91	1.09
	2013	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	3.18	2.96	1.75	1.95	3.18	2.96	0.90	1.07
	2014	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	3.21	2.94	1.75	1.95	3.21	2.94	0.90	1.09
	2013	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.38	2.44	1.53	1.77	2.38	2.44	0.86	0.98

Sectors	Year	China								Taiwan							
		Average total production length (Forward Linkage)	Average total production length (Backward Linkage)	Average propagation length(Forward Linkage)	Average propagation length (Backward Linkage)	Antrans and Fally Upsteamness index	Antrans and Chor Downstreamness index	Production position index based on APL	Production position index based on TPL	Average total production length (Forward Linkage)	Average total production length (Backward Linkage)	Average propagation length(Forward Linkage)	Average propagation length (Backward Linkage)	Antrans and Fally Upsteamness index	Antrans and Chor Downstreamness index	Production position index based on APL	Production position index based on TPL
		PLv	PLy	APL_f	APL_b	Pos_up	Pos_dow	Pos_AP	Pos_TP	PLv	PLy	APL_f	APL_b	Pos_up	Pos_do	Pos_APL	Pos_TPL
	2014	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.40	2.46	1.53	1.78	2.40	2.46	0.86	0.98
c29	2000	2.89	2.38	2.40	2.11	2.89	2.38	1.14	1.22	2.41	1.56	1.87	1.43	2.41	1.56	1.31	1.54
	2001	2.85	2.26	2.38	2.09	2.85	2.26	1.14	1.26	2.42	1.52	1.89	1.42	2.42	1.53	1.33	1.59
	2002	2.79	2.14	2.31	2.05	2.79	2.14	1.13	1.31	2.41	1.53	1.89	1.41	2.41	1.53	1.34	1.58
	2003	2.66	2.08	2.31	2.02	2.66	2.08	1.14	1.28	2.43	1.54	1.92	1.42	2.43	1.54	1.35	1.58
	2004	2.59	2.03	2.32	1.99	2.59	2.03	1.16	1.28	2.49	1.56	1.97	1.43	2.49	1.56	1.37	1.60
	2005	2.63	1.81	2.41	2.03	2.63	1.81	1.19	1.45	2.53	1.56	2.01	1.45	2.53	1.56	1.39	1.62
	2006	2.64	1.93	2.44	1.99	2.64	1.93	1.23	1.37	2.57	1.57	2.04	1.46	2.57	1.57	1.40	1.64
	2007	2.64	2.03	2.47	1.94	2.64	2.03	1.27	1.30	2.65	1.59	2.06	1.46	2.65	1.59	1.42	1.67
	2008	2.71	2.01	2.44	1.90	2.71	2.01	1.29	1.34	2.64	1.61	2.05	1.46	2.64	1.61	1.40	1.64
	2009	2.85	2.00	2.54	1.91	2.85	2.00	1.33	1.43	2.58	1.57	2.05	1.47	2.58	1.57	1.40	1.64
	2010	2.89	1.99	2.49	1.87	2.89	1.99	1.33	1.46	2.61	1.59	2.09	1.47	2.61	1.59	1.42	1.64
	2011	2.93	1.99	2.49	1.85	2.93	1.99	1.35	1.47	2.62	1.61	2.09	1.49	2.62	1.61	1.40	1.63
	2012	3.00	1.98	2.54	1.84	3.00	1.98	1.39	1.51	2.64	1.61	2.12	1.49	2.64	1.61	1.42	1.64
	2013	3.07	1.99	2.61	1.86	3.07	1.99	1.40	1.54	2.63	1.61	2.12	1.49	2.63	1.61	1.42	1.64
	2014	3.10	1.99	2.63	1.87	3.10	1.99	1.40	1.56	2.66	1.61	2.14	1.49	2.66	1.61	1.44	1.65

Appendix 1-1 Countries of WIOD

NO.	Name		NO.	Name	
1	AUS	Australia	23	IRL	Ireland
2	AUT	Austria	24	ITA	Italy
3	BEL	Belgium	25	JPN	Japan
4	BGR	Bulgaria	26	KOR	Korea, Republic of
5	BRA	Brazil	27	LTU	Lithuania
6	CAN	Canada	28	LUX	Luxembourg
7	CHE	Swiss	29	LVA	Latvia
8	CHN	China	30	MEX	Mexico
9	CYP	Cyprus	31	MLT	Malta
10	CZE	Czech Republic	32	NLD	Netherlands
11	DEU	Germany	33	NOR	Norway
12	DNK	Denmark	34	POL	Poland
13	ESP	Spain	35	PRT	Portugal
14	EST	Estonia	36	ROU	Romania
15	FIN	Finland	37	RUS	Russia
16	FRA	France	38	SVK	Slovak Republic
17	GBR	United Kingdom	39	SVN	Slovenia
18	GRC	Greece	40	SWE	Sweden
19	HRV	Hrvatska	41	TUR	Turkey
20	HUN	Hungary	42	TWN	Taiwan
21	IDN	Indonesia	43	USA	United States
22	IND	India	44		Rest of World

Appendix 1-2 Sectors of WIOD

Code	Description	Code	Description
c01	Crop and animal production, hunting and related service activities	c29	Wholesale trade, except of motor vehicles and motorcycles
c02	Forestry and logging	c30	Retail trade, except of motor vehicles and motorcycles
c03	Fishing and aquaculture	c31	Land transport and transport via pipelines
c04	Mining and quarrying	c32	Water transport
c05	Manufacture of food products, beverages and tobacco products	c33	Air transport
c06	Manufacture of textiles, wearing apparel and leather products	c34	Warehousing and support activities for transportation
c07	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	c35	Postal and courier activities
c08	Manufacture of paper and paper products	c36	Accommodation and food service activities
c09	Printing and reproduction of recorded media	c37	Publishing activities
c10	Manufacture of coke and refined petroleum products	c38	Motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities
c11	Manufacture of chemicals and chemical products	c39	Telecommunications
c12	Manufacture of basic pharmaceutical products and pharmaceutical preparations	c40	Computer programming, consultancy and related activities; information service activities
c13	Manufacture of rubber and plastic products	c41	Financial service activities, except insurance and pension funding
c14	Manufacture of other non-metallic mineral products	c42	Insurance, reinsurance and pension funding, except compulsory social security
c15	Manufacture of basic metals	c43	Activities auxiliary to financial services and insurance activities
c16	Manufacture of fabricated metal products, except machinery and	c44	Real estate activities

Code	Description	Code	Description
	equipment		
c17	Manufacture of computer, electronic and optical products	c45	Legal and accounting activities; activities of head offices; management consultancy activities
c18	Manufacture of electrical equipment	c46	Architectural and engineering activities; technical testing and analysis
c19	Manufacture of machinery and equipment n.e.c.	c47	Scientific research and development
c20	Manufacture of motor vehicles, trailers and semi-trailers	c48	Advertising and market research
c21	Manufacture of other transport equipment	c49	Other professional, scientific and technical activities; veterinary activities
c22	Manufacture of furniture; other manufacturing	c50	Administrative and support service activities
c23	Repair and installation of machinery and equipment	c51	Public administration and defence; compulsory social security
c24	Electricity, gas, steam and air conditioning supply	c52	Education
c25	Water collection, treatment and supply	c53	Human health and social work activities
c26	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services	c54	Other service activities
c27	Construction	c55	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
c28	Wholesale and retail trade and repair of motor vehicles and motorcycles	c56	Activities of extraterritorial organizations and bodies