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**On Economic Growth, Service exports in China**

Lianling YANG and Cuihong YANG

(Academy of Mathematics and Systems Science, Chinese Academy of Sciences)

## **Abstract**

With the formation of the global service economy, service industry, instead of manufacturing, is becoming the focus of international competitiveness and the important force for economic development of countries. China has achieved high economic growth for a prolonged period of time. However, although the service trade keeps rapidly increasing in China, the overall development is low and it is in a situation of deficit for a long time, with a sharp contrast with the huge surplus of China's goods exports. Therefore, quantitatively analyzing China's service trade is extremely urgent and important. At first, this paper analyses the services exports structure change in China. It shows that the exports structure change is very slow during the decade from 2002 to 2012. Traditional services such as transportation and travel are still taking up the dominant advantage, but the modern services such as computer and information service trade are developing very quickly. With the data from International Trade Statistics Database (WTO), this paper tries to link the service data with China's input-output sectors for the first time. Then, based on the current research which applied the Input-Output method in analyzing the goods trade contribution to economy, this paper analyses the contribution of Chinese service exports to GDP and employment. The results show that, compared to goods exports, 1000 US \$ service exports trade can generated about more than a quarter on China's value-added and a half on employment. For every US\$1000 of Chinese service exports in 2012, DVA and employment are estimated to be US\$848 and 0.1048 person-year respectively.

## 1. Introduction

With the formation of the global service economy, service industry, instead of manufacturing, is becoming the focus of international competitiveness and the important force for economic development of countries. In the lowest-income countries, services generate some 35 percent of GDP. Meanwhile, it rises to over 70 percent of national income and employment in OECD countries (Hoekman and Mattoo, 2008). International trade in services is becoming more and more important. The total volume of services trade accounted for 18.7% in global trade in 2012. The expansion of global trade in several past decades is characterized by increasing international fragmentation of production. Economists and economic policymakers are very concerned with accurate measurement of value-added generated by trade. However, about the question that who gains more profit in international trade, researchers are more focused on the goods trade.

The main reason is international trade in services is still poorly covered in official statistics. Measurement of trade in services is inherently more difficult than measurement of trade in goods, in as much as services are more difficult to define. In the case of trade in services, unlike that of trade in goods, there is no package crossing the customs frontier with: an internationally recognized commodity code; a description of the contents; information on quantity, origin and destination; and an invoice. Nor is there an administrative system associated with customs duty collection that is practiced at assembling these data (Manual on Statistics of International Trade in Services (MSITS) 2002). Hoekman (2008) pointed out that services have unique characteristics that affect their tradability, which include intangibility, nonstorability, differentiation and joint production.

Realizing the importance of services in growth, a body of research has developed. Daniel Mirza (2004) argued that trade in services has a specific feature that does not apply to trade in goods, and explained why bilateral commerce in tradable-services is typically weaker than bilateral trade in goods. Hoekman (2008) discusses the role of services in economic growth, focusing in particular on channels through which openness to trade in services may increase productivity at the level of the economy as a whole, industries and the firm. Mishra (2011) studied the phenomenon that increasing sophistication in service exports lead to economic growth. Fixler and Siegel (2004) have examined the specific services exports and productivity gains from outsourcing. Many literatures explored the relationship between service exports and economic growth. However, there is almost no literature studied the effects of service exports on the economy for a specific country, namely, the domestic value added (DVA) and domestic employment generated by US\$1000 of service exports to the world. Not identical to the previous work, this research tries to measure the domestic value added and employment generated by service exports instead of trade volumes.

China has achieved high economic growth for a prolonged period of time. And China's export growth in the first decade of the 21st century has been remarkable. The exports of goods have reached US\$ 2050 billion in 2012. Since 2009, China has grown to become the world's largest exporter and the second largest importer of goods just followed by the United States. The remarkable growth of foreign trade in the past decades and the high share of processing trade have made China a very special case in world trade market. A great deal essays have been published about the methodology of measuring the impact of exports on economic growth (Lau, et al. 2009;

Chen, et al. 2012; Koopman, et al. 2012).

In comparison with international trade in goods, trade in services of China is less developed, whereas after China's entry to the World Trade Organization (WTO) in 2001, it has developed rapidly. However, the overall development is low and it is in a situation of deficit for a long time. This is in sharp contrast with the huge surplus of China's goods exports. Therefore, quantitatively analyzing China's service trade is extremely urgent and important. Xu Xianchun (2004) described the scope of China's service industry and the revision of the classification of services for production measurement, and discusses the problems in its measurement. Chen Yi (2006) studied the contribution rate of Chinese services exports. Liu Dianxin (2013) analyzed the influence of China's services trade on employment. However, there are only a few researches have been published about measuring the impact of service exports on economic growth. With the limited data of China's service exports, this study will try to use an input-output methodology to estimate how Chinese exports affected the country's total domestic value added (DVA) and employment.

The remainder of this paper is organized as follows: Section 2 proposes a non-competitive IO model, gives the formulae for estimating the value added and employment generated by each unit of services exports; Section 3 shows the data resources and processing; in Section 4 the estimates of sector-specific DVAs of service exports are presented and interpreted; Section 5 draws a conclusion.

## **2. Methodology**

Service industries have strong backward linkages with supplying industries. The most straightforward way to estimate the total DVA generated by service exports (or their increase) is to sum up all the direct and indirect DVA generated by export demand (or its increase). Hence, an input-output model is well suited to measure the impact of service trade on economic growth. The input-output model assumes a classification of economic activity in a region whose interindustry transactions are described by means of a matrix  $A$  of technical coefficients (Leontief, 1986). And because imported goods and domestically produced goods are poor substitutes for each other, many studies choose to use the Non-competitive-Import Model, which imported goods and domestically produced goods are separately distinguished as intermediate inputs.

Considering the background of China's high proportion of processing trade with regard to total trade, a non-competitive input-output model where processing exports and non-processing exports were split up explicitly is proposed (Chen, etc. 2001). The superscripts D, P, and N denote the production for domestic use, production for the exports of processing trade and non-processing trade, and the production by foreign-invested enterprises for domestic demand (called the exports of non-processing trade and others for brevity), respectively. The framework of the non-competitive input-output table capturing processing trade (also called the DPN model) is shown in table 1.

[Table 1 about here]

Formally, the basic equations used for estimation are as follows:

If  $\bar{X}$  is the vector of output of all industrial sectors,  $I$  is the identity matrix,  $\bar{A}$  represents the direct input coefficients matrix and  $\bar{F}$  is the domestic final demand vector, then the standard static model is expressed as  $\bar{X} = \bar{A}\bar{X} + \bar{F}$ . Its solution is given by  $\bar{X} = \bar{B}\bar{F}$ , that is:

$$\begin{bmatrix} X^D \\ X^P \\ X^N \end{bmatrix} = \begin{bmatrix} (I - A^{DD}) & -A^{DP} & -A^{DN} \\ 0 & I & 0 \\ -A^{ND} & -A^{NP} & (I - A^{NN}) \end{bmatrix}^{-1} \begin{bmatrix} F^D \\ F^P \\ F^N \end{bmatrix} \quad (1)$$

where  $\bar{B}$  is the extended Leontief inverse matrix.

If we define the row vector of value-added as  $v' = [v^{D'} \quad v^{P'} \quad v^{N'}]$ , where  $v^{D'}$ ,  $v^{P'}$  and  $v^{N'}$  represent the row vectors of value-added for production of D, P, and N, respectively, then the row vector of value-added coefficients of D, P, and N can be written as  $A_v' = v'(\hat{X})^{-1}$ , and we can measure the domestic value-added generated by gross exports (i.e., the value-added by exports) as follows:

$$V^E = A_v' X^E = A_v' \bar{B} E \quad (2)$$

Where  $E$  is the column vector of exports.

In fact, the service is not included in the processing trade exports. In other words, service exports all belong in non-processing trade. If we denote  $E^S = (0 \quad 0 \quad F^{SE})'$  as the column vector of service exports, then the domestic value-added generated by  $E^S$  can be calculated as

$$V^{SE} = A_v' \bar{B} E^S \quad (3)$$

In a similar way, employment induced by one unit of exports by trade type can be calculated when the row vector of employment coefficients  $A_l'$  is employed instead of the vector of value-added coefficients, that is

$$L^{SE} = A_l' \bar{B} E^S \quad (4)$$

### 3. Data sources and processing

The General Agreement on Trade in Service (GATS) defines trade in services in terms of four modes of supply (Model 1: Cross-border supply, Model 2: Consumption abroad, Model 3: Commercial presence, Model 4: Presence of natural persons). However, national Balance of Payments Statistics identify only services transactions between residents and non-residents. Thus, only modes 1, 2 and part of mode 4 are actually reported. With a view to facilitating the analysis and compilation of service transactions between residents and non-residents by modes of supply, the MSITS suggested some simplified statistical criteria. The 11 main standard services

classification components in MSITS (2002) are:

1. Transport.
2. Travel.
3. Communications services.
4. Construction services.
5. Insurance services.
6. Financial services.
7. Computer and information services.
8. Royalties and license fees.
9. Other business services.
10. Personal, cultural and recreational services.
11. Government services, n.i.e.

The GATS list explicitly excludes some services that are supplied by Governments – those are supplied on a non-commercial basis and not in competition with one or more service suppliers. These services are included in government services (n.i.e.). So the data of international services trade in International Trade Statistics Database (WTO) exclude government services.

To get the structure of China's service exports, the first step is matching services categories with the China input-output industries respectively. For the vast majority of MSITS services categories, there are one to one mappings with the service sectors in China's DPN table for 2010.

However, there is a special service component has more complex mapping with IO sectors, as it is not commonly classified as a single industry. Travel is the largest single category within the service sectors encompasses all travel- and tourism-related businesses. This industry is diverse and relates to services in transportation, lodging, food and beverage, recreation, and purchase of incidentals consumed while in transit. So travel can be subdivided into expenditure on goods (belong to manufacture sectors) and expenditure on services (belong to service sectors, such as transportation, accommodation, beverage serving and etc.). According to data of foreign exchange earnings from international tourism obtained from China National Tourism Administration, travel subdivided into input-output industries respectively.

The service exports can be divided into two parts generally: one part is the consumption of goods by the part of travel, such as travel souvenirs, food and drinks; the other part is the consumption of services. For tourists' expenditure on goods, exports (in purchaser' price) don't equal to output as containing the trade margins. For services, the concept of FOB is equivalent to the concept of producer's price, because no wholesale, retail or transport distribution costs are involved. In this case, the circulation cost table was used to construct the matrix to convert trade data from FOB price to producer price. Based on the circulation cost matrix, the trade data of service exports classified by input-output sectors were obtained at producer price.

For this study, data of China's service exports were obtained from International Trade Statistics Database (WTO). And in this paper, we analyze service exports with the same 10 categories in MSITS (2002). With the structure of China's service exports and appropriate value-added and employment multipliers for China input-output industries obtained from China

National Statistics Bureau, we use the Chinese Non-competitive-Import DPN table for 2010<sup>1</sup> to estimate the value added and employment generated by each unit of service exports, as well as by service sectors.

### 3. Results and analysis

In the total volume of trade, the development of China's service sector is remarkable, but there is still a gap compared with developed countries. The service sector output to GDP is lower. With the development of the service industry in recent years, the proportion gradually increased, but is still around 50%. The United States, France, Germany and other developed countries, the service industry has become its main driving force of GDP growth, accounting for more than 75%. The underdeveloped service industries limit the development of China's service trade to a certain extent.

In 2012, China is the 3<sup>rd</sup> importer and 5<sup>th</sup> exporter of services trade. China's export and import volume in service trade jumped to US\$470.6 billion (5.6% of world total export and import volume in service trade) in 2012, with an annual growth rate of 18.6% during 2002 and 2012. Even so, trade in services has a low share in China's total trade volume, accounting for 12.2% in 2012, well below the world average of 18.7%.

Figure 1 provided data on services provided by and to the China in international markets from 2002 to 2012. No matter import or export of services, the trade volume increased significantly. However, there are two points worth noting. First, unlike getting surplus in goods trade, China has been in a deficit position in services trade, accurately, since 1995. Second, the deficits of services trade are expanding year after year. In 2002, service exports of China are 39.4 billion US\$, and service imports are 46.1 billion US\$. In the next decade, the average annual growth rate of China's imports of services was 19.8%, while that of exports of services was a little bit low with 17.1%. Especially affected by the financial crisis in 2008, service exports of China was represented a decrease of 12.2% of previous year. Subsequently the past two years, the growth rate was relatively slow. So the service trade deficits were 6.7 billion US\$ in 2002 and increasing to nearly 90 billion US\$ in 2012, with an annual average of 29.6 percent in the decade.

[Figure 1 about here]

Rapid technological advances in the past few decades in transport, computing and telecommunications, including the development of the Internet and electronic commerce, have resulted in enterprises availing themselves of resources for production at more distant locations and have enabled them to serve ever wider markets. Services become more tradable. In general, service industries can be divided into traditional parts and modern parts. Traditional service are Transport, Travel, Construction, Personal, cultural and recreational services. Modern Services include communication, insurance, finance, computer & information, royalties and license fees and other business services.

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<sup>1</sup> This is the latest one be compiled completed.

Figure 2 shows the industry structure of China service exports from 2002 to 2012. It shows that the export change is very slow during the decade. Traditional service trade such as transportation and travel is still taking up the dominant advantage, but modern service trade is developing very quickly such as business services, financial services and IT services. In 2002, in China's service exports 51.8% was travel exports. Although the volume of travel exports increased year by year, the proportion was declining. To 2012, this part accounted for 26.3%. After sustained growth from 2002 to 2008, the proportion of transportation exports is stabilized at around 20%. Other business services exports accounted for about one-third. It is obvious that the proportion of computer and information services exports is 7.6% in 2012 with sustainable growth from 2002. Other modern services still have small proportion in China's service exports.

[Figure 2 about here]

The results show that: although the share of China's service exports is relatively low, its DVA of per unit China's service exports is far higher than that of exports in goods<sup>2</sup> (See table 2). China's gross exports of goods and services is 2239.2 billion US\$ in 2012 (of which the shares of export in goods is 91.5%, and export in services 8.5%), accounting for 27.2% of China's GDP. US\$ 1000 of service exports in 2012 generates US\$ 848 of total DVA, in comparison, that of exports in goods is only US\$ 621. When measured in value-added, the share of export in goods is 88.7%, 2.8 percentages lower than that in gross terms, while share of export in services goes up to 11.3%.

[Table 2 about here]

Concerning the DVA by trade in services, China exports in Communication services, Insurance & Financial services, Computer & information services generate higher DVA, at US\$904, US\$949 and US\$908 per US\$1000 export respectively, while that for construction services, Royalties & license fees have relatively lower DVA, at US\$646, US\$783 respectively (see Table 2). However, in contrast, they are still higher than the average DVA content by export in goods. The reason of per US\$1000 construction services exports generated relatively low DVA is that in China's IO table construction sector is not a 'pure' service industry, which covers not only work performed on construction projects but also construction material inputs. Therefore, its intermediate inputs are higher than other services industry, and its DVA content is relatively low.

When looking at the service trade with very high DVA contents, we observe that their shares in gross exports in services are quite small. In 2012, exports in Communication services, Insurance & Financial services, Computer & information services account for only 0.9%, 2.7% and 7.6%, respectively, a little more than 10% in subtotal. The share of Royalties & license fees is

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<sup>2</sup> The method of estimating the contribution of China's goods exports is as the same as Lau (2010) proposed. And the data of China's goods exports are come from the Statistics Department of General Administration of Customs.



very minor, only 0.6%, which indicates that China is far behind in the ‘market’ of patent, royalties and industrial design. To some extent, this pointed out the direction of the transformation and upgrading of China's service industry. To develop and promote the modern service industries which have higher DVA content than traditional service industries will increase the DVA generated by service exports of China.

Table 3 shows the DVA composition by each service categories exports. In total DVA generated by per US\$ 1000 service exports, compensations of employees account for US\$ 382 (approximately 45%). The proportion of Gross operating surplus is 26.8%, while net taxes on production and depreciation of fixed assets both accounted for about 10% to 20%. In service industries, Royalties & license fees exports have the highest share of compensations of employees, which is about 56.1% in DVA. Per US\$ 1000 insurance and financial services exports has the highest grossing operating surplus with US\$ 463.

[Table 3 about here]

Among the employment generated by exports, a large share accrues to agricultural employment. In 2012, the average share is 34.9%, and that by service exports is lower (22.3%). The main reason is that service exports have higher proportion of value added during its production (much less domestic intermediate inputs from the other side), and thus generate less indirect agricultural employment. The employment induced by per US\$ million of service exports amounts to 104.8 persons in 2012, of which 81.5 persons accrues to non-agricultural employment. In comparison with China goods exports, per unit of China service exports generate more jobs. Per US\$ million of China's goods exports only generates 59.0 persons of employment directly and indirectly in 2012, a little more than one second of that by service exports (see in table 4). The total employment and non-agricultural employment by service export reaches to 20.0 and 15.5 million persons, respectively, accounting for 14.2% and 16.5% (of total employment and total non-agricultural employment induced by China's total exports respectively). The above analysis shows that service exports play a notable role in solving China's employment.

[Table 4 about here]

Table 5 shows how the employments by exports vary across different service sectors for 2012. The royalties and license fees generate 198.2 employment per US\$ million exports, which is the highest. And insurance and financial services, other business services, personal, cultural and recreational services, travel generate more than 100 employment per US\$ million exports. Some service categories generate a much less employment, lower than 60 per US\$ million exports: such as computer and information services (41.8), communication services (55.1). However, the volume of royalties and license fees exports is small, so the total amount of employment generated by it is relatively low with 207 thousand persons. Other business service exports generated the

maximum employment (8,390 thousand persons) in the aggregate, followed by travel exports (5,869 thousand persons).

[Table 5 about here]

#### **4. Conclusions**

There is a rapid increase in the service trade among international trade. However, measurement of trade in services is inherently more difficult than measurement of trade in goods, in as much as services are more difficult to define. International trade in services is still poorly covered in official statistics. Therefore, unlike the goods export, it is very difficult to quantify the contribution to economy by service export in a similar way. This paper tries to link the service data published by WTO with input-output sectors for the first time, making the input-output analysis with service exports become possible.

Despite the rapid expansion of foreign trade, China's trade imbalance is increasing prominent. There is more attention on the trade in goods which have huge surplus. On the other hand, the trade in service which have increasing deficit is less been concerned in some extent. Based on the current research which applied the Input-Output method in analyzing the goods trade contribution to economy, this paper analyses the contribution of Chinese service exports to GDP and employment. The results show that, compared to goods exports, 1000 US\$ service exports trade can generated about more than a quarter on China's value-added and a half on employment. The results show that service exports play a notable role in China's economy.

For China's service exports, the traditional such as Transport and Travel service are in dominant place with larger proportion. Modern Services such as communication, insurance, finance, computer and information, royalties and license fees and other business services are increasing gradually, but still low. But when look at the DVA contents by service exports by sector, the higher DVA per US\$ 1000 exports is modern service sectors. As the proportion of China's exports in services is still low, developing and promoting the service industries is the feasible and effective way for China's economic development.

There still has some aspects worth to improve. First, the mapping of service classifications in MSITS to China's IO service sectors is a rough one. The division of service sectors is not very detailed in China's 65 sectors DPN table. If we try to analysis more complete about a certain kind of service, more data is required. Second, the definitions of service classification and China's service sectors in IO table are not entirely consistent. Thus, there is some inevitable error in the estimation of service exports' contribution to China's economy by MSITS service classifications.

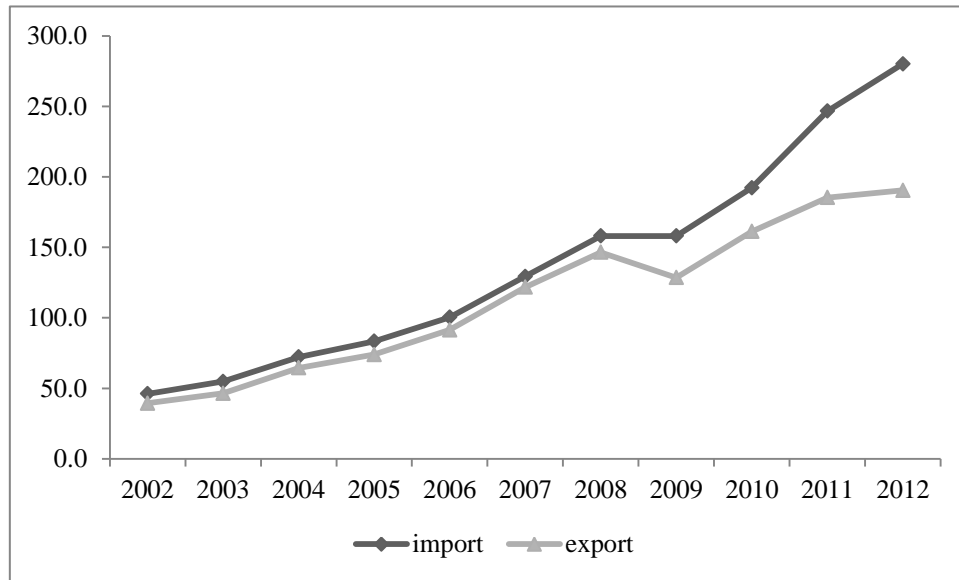
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Table 1. Non-competitive Input-occupancy-Output Table Capturing Processing (DPN Table)

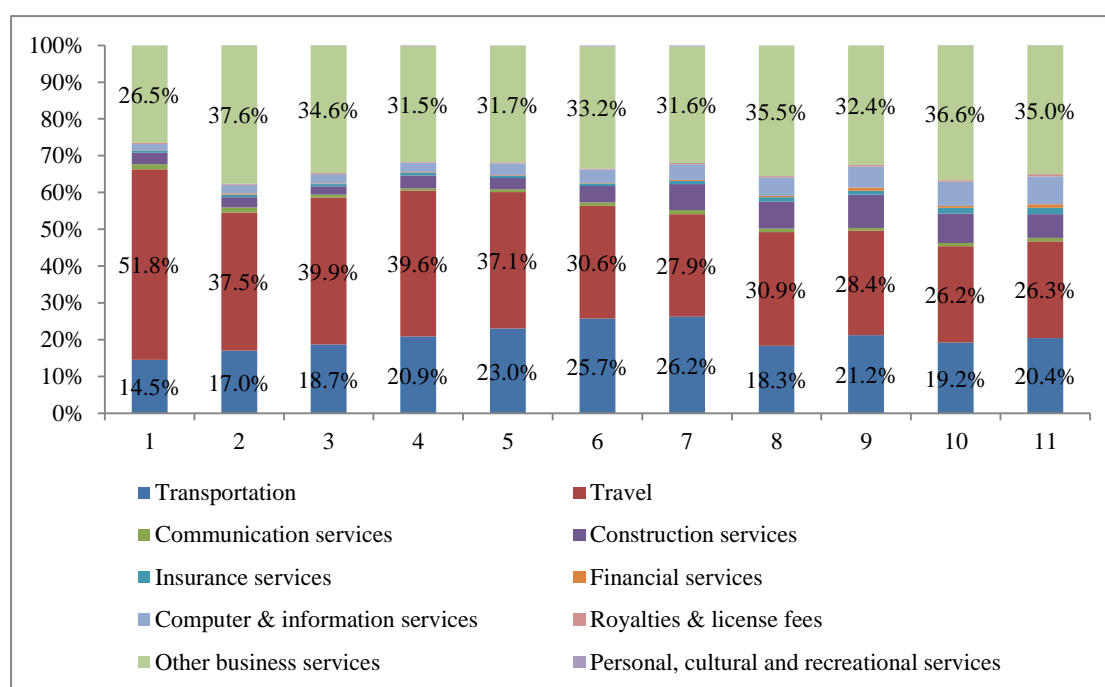
		Intermediate use			Final use					Total output or import	
		D	P	N	Consumption	Gross capital formation	Export	Other capital	Total of final use		
Input	Intermediate input of domestic products	D	$Z^{DD}$	$Z^{DP}$	$Z^{DN}$	$F^{DC}$	$F^{DI}$	0		$F^D$	$X^D$
		P	0	0	0	0	0	$F^{PE}$		$F^P$	$X^P$
		N	$Z^{ND}$	$Z^{NP}$	$Z^{NN}$	$F^{NC}$	$F^{NI}$	$F^{NE}$		$F^N$	$X^N$
	Imported products intermediate input		$Z^{MD}$	$Z^{MP}$	$Z^{MN}$	$F^{MC}$	$F^{MI}$			$F^M$	$X^M$
	Value-added		$V^D$	$V^P$	$V^N$						
	Total input		$X^D$	$X^P$	$X^N$						
Labor		$L^D$	$L^P$	$L^N$							

Figure 1. China's service exports and imports in 2002-2012



Source: International Trade Statistics Database (WTO).

**Figure 2. China's service exports structures in 2002-2012**



Source: International Trade Statistics Database (WTO).

**Table 2. Total DVA of China's US\$ 1000 of Goods and Services Exports (2012)**

	<b>Total Exports</b>	<b>Goods Exports</b>	<b>Services Exports</b>
DVA of US\$ 1000 of China's Exports (in US\$)	640	621	848
Gross Exports (in billion US\$)	2239.2	2048.7	190.4
Proportion (%)		91.5%	8.5%
DVA of China's Exports (in billion US\$)	1433.6	1272.1	161.5
Proportion (%)		88.7%	11.3%

**Table 3. Total DVA of China's US\$ 1000 of Services Exports (2012, units US\$)**

	<b>Total</b>	<b>Compensation of employees</b>	<b>Net taxes on production</b>	<b>Depreciation of fixed assets</b>	<b>Gross operating surplus</b>
<b>Total Service Exports</b>	<b>848</b>	<b>382</b>	<b>116</b>	<b>122</b>	<b>227</b>
Transportation	834	340	113	115	266
Travel	864	421	116	103	224
Communication services	904	364	103	156	280
Construction services	646	283	108	76	178
Insurance & Financial services	949	311	109	66	463
Computer & information services	908	295	97	168	347
Royalties & license fees	783	439	83	96	165
Other business services	860	420	124	144	172
Personal, cultural and recreational services	896	464	111	118	202

\*Notes: In the 2010 national input-output table of China with 65 sectors, Insurance & Finance are aggregated

**Table 4. Total Employment of China's US\$ 1000 of Goods and Services Exports (2012)**

	<b>Total Exports</b>	<b>Goods Exports</b>	<b>Services Exports</b>
Employment by US\$ million exports (in persons)	62.9	59.0	104.8
Non-agricultural employment by US\$ million exports (in persons)	42.1	38.4	81.5
Employment by total exports (in million persons)	141.0	121.0	20.0
Proportion (%)		85.8%	14.2%
Non-agricultural employment by total exports (in million persons)	94.2	78.7	15.5
Proportion (%)		83.5%	16.5%

**Table 5. Total Employment of China's US\$ 1000 of Services Exports (2012)**

	Employment by US\$ million exports (in persons)		Employment by total exports (in thousand persons)	
	Total	Non-agricultural	Total	Non-agricultural
<b>Total Service Exports</b>	<b>104.8</b>	<b>81.5</b>	<b>19967</b>	<b>15519</b>
Transportation	78.2	63.6	3042	2473
Travel	117.3	71.1	5869	3559
Communication services	55.1	47.1	99	84
Construction services	73.7	64.9	902	795
Insurance & Financial services	160.7	152.6	838	796
Computer & information services	41.8	34.1	604	492
Royalties & license fees	198.2	174.7	207	182
Other business services	125.9	106.9	8390	7124
Personal, cultural and recreational services	123.9	100.1	16	13