China's Regional Economies and Domestic Trade in Value Added: An Interregional Input-Output Analysis

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Abstract

China has registered a high level of economic growth in the last 30 years or so, since the launch of the Reform and Open-Door Policy in 1978. Especially, China's accession to the WTO in 2001 has brought a dramatic change to the global trade structure. In an attempt to understand China's role in global value chains, the case study of Apple's iPhone production has been widely quoted. Namely, China's value added gain in iPhone's supply chain is no more than 4%. However, when considering the Chinese economy as a whole in global value chains, the domestic value added embodied in China's exports is larger than 70% (2005). This fact attracts us to investigating how Chinese value added is created and distributed not only internationally but also domestically. Given the increasing complexity of China's domestic production networks, this paper focuses on the measure of domestic value chains across regions and its linkages with global market. Using China's 1997 and 2007 interregional Input-Output tables, the detailed structure change of domestic Trade in Value Added, the position and participation degree of different regions in domestic value chains can be easily measured. In addition, based on our measurements, the regional economic performance and policy orientation are also discussed at detailed industrial level.

Keyword: Trade in value added, input-output, value chain, Chinese regional economy

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1 Introduction

China has registered a high level of economic growth in the last 30 years or so. Its economic scale in real terms doubled respectively between 1987 and 1997, and between 1997 and 2007. In 2010, China's nominal GDP surpassed Japan and became the second-largest economy in the world. The most important forces that enabled China to achieve such high economic growth are considered to be the domestic market-oriented economic reform and its active participation to the Global Value Chains (GVCs). At the same time, the interaction between these two forces provides a powerful engine supporting the so-called "China Miracle".

In order to investigate the role and position of China in the dynamics of deepening globalization, a number of studies has been done using different approaches and from various viewpoints. Recently, the most widely quoted and attractive case studies are about China's gain in Apple's global supply chain (see Linden et al., 2009, Dedrick et al., 2010 and so on). For example, in the case of iPhone trade, China just contributed about 3.6% of US$2.0 billion export to the US (see Xing and Detert, 2010). However, when considering the Chinese economy as a whole in global value chains, the domestic value added embodied in China's exports is larger than 70% in 2005 (see Meng et at., 2011). This clearly reflects the fact that the iPhone's case study just focuses on the supply chain of a specific firm and its products, rather than paying attention to the role of China's domestic production networks (inter-industrial linkages) in the value added creation process. As a response to this issue and its related topics, some national and international Input-Output (I-O) based analyses have been done, such as Koopman et al. (2008, 2010), Uchida and Inoamata (2009), Yang et al. (2009), Timmer (2010), Johnson and Noguera (2011), Meng et al. (2011), Abdul et al. (2011), Sterher (2012) and so on. However, all of them treat China as a whole rather than considering the expansion of GVCs inside China at regional level. Since there is a very large variation of economic scale, industrial structure and overseas interdependency across regions within China, for the purpose of better understanding the value added creation and distribution mechanism in detail, we need much more regional-level perspectives. This paper applies the concept of Vertical Specialization (VS) and Trade in Value Added (TiVA) to Chinese regional economies. This can not only help us capture the feature and evolution of China's Domestic Value Chains (DVCs), but also provide us the way to understand the relationship between China's DVCs and GVCs at regional level.

The rest of the paper proceeds as follows: the next section shows how to apply the conventional trade indicators such as the VS, TiVA and RCA to their domestic dimension. Section 3 gives a brief explanation on the database used. Section 4 shows the analytical results of China domestic value chains and its linkages to the global market. The conclusion remarks are given in Section 5.

2 Input-Output based measurement of value chains

In this section, we propose some new (alternative) Input-Output based indicators for the purpose of measuring domestic value chain and its linkage with overseas. The indicators include the domestic version of conventional vertical specialization indictors, domestic trade in value added related measurement and some indicator of value added linkage concerning the contribution of export in regional economy. Most ideas in the section can trace to the traditional measurement of global value chain.

2.1 Regional vertical specialization indicators

In order to investigate the participation degree of a specific region in both domestic and global production networks, we here first expand the most widely used HIY's[1] vertical specialization (VS) indicator (import contents of export) into its domestic dimension. The conventional type VS indicator can be simply given as follows:

$$VS = \frac{u \cdot M \cdot (I-A)^{-1} \cdot EX}{u \cdot EX} \quad (1)$$

where, u is a $1 \times n$ vector of 1's, M is the matrix ($n \times n$) constructed by import coefficients (the share of imported intermediate goods to total input), A is the domestic input coefficient matrix ($n \times n$), I is an $n \times n$ identity matrix, $(I - A)^{-1}$ is the matrix of domestic Leontief inverse, and EX is the $n \times 1$ column vector of exports. Obviously, the above VS indicator represents the directly and indirectly induced intermediate imports by exports, which can also be explained as the value of imported intermediates embodied in a country's exports. Therefore, this indicator can be used as a proxy representing the participation degree of a country in global supply chain.

If a single regional I-O table with separate import/export and inflow/outflow (domestic trade with the rest of the nation) information is available, the above national VS indicator can be easily expanded to the following four kinds of region-level measures: 1) regional import contents of export (IMCE); 2) regional import contents of outflow (IMCO); 3) regional inflow contents of export (INCE); 4) regional inflow contents of outflow (INCO). In addition, the above indicators of 2) and 4) can further yield four indicators if the inflow/outflow information can be separated into intermediate and final products.

[1] Hummels et al. (2001)

The advantages of the above regional VS indicators includes 1) the participation degree of a region in domestic and international supply chains can be easily evaluated; 2) the economic interdependency or interaction between domestic and international supply chains can be measured at regional level; 3) the relative position of a region in both domestic and international supply chains can be identified by focusing on intermediate and final products separately.

2.2 Measuring domestic trade in value added

In order to investigate the domestic value chains and its evolution in detail, we apply the concept of global TiVA (Johnson and Noguera, 2009) to domestic interregional I-O framework. The domestic TiVA at regional level can be simply defined as "one region's value added induced by the other region's final demand".

For the ease of explanation on the concept of domestic TiVA, we model a closed economy with just two regions (r and s) and n sectors for each region. Based on the traditional regional I-O model, the total value added can be written as the following form:

$$\mathrm{VA} = \mathrm{diag}(\mathrm{V}) \cdot \mathrm{L} \cdot \mathrm{FD} \tag{2}$$

$$\mathrm{VA} = \begin{pmatrix} \mathrm{VA}^{\mathrm{r}} \\ \mathrm{VA}^{\mathrm{s}} \end{pmatrix},\ \mathrm{V} = (\mathrm{V}^{\mathrm{r}}, \mathrm{V}^{\mathrm{s}}),\ \mathrm{L} = \begin{pmatrix} \mathrm{L}^{\mathrm{rr}} & \mathrm{L}^{\mathrm{rs}} \\ \mathrm{L}^{\mathrm{sr}} & \mathrm{L}^{\mathrm{ss}} \end{pmatrix} = \left[\mathrm{I} - \begin{pmatrix} \mathrm{A}^{\mathrm{rr}} & \mathrm{A}^{\mathrm{rs}} \\ \mathrm{A}^{\mathrm{sr}} & \mathrm{A}^{\mathrm{ss}} \end{pmatrix}\right]^{-1},\ \mathrm{FD} = \begin{pmatrix} \mathrm{FD}^{\mathrm{rr}} \\ \mathrm{FD}^{\mathrm{sr}} \end{pmatrix} + \begin{pmatrix} \mathrm{FD}^{\mathrm{rs}} \\ \mathrm{FD}^{\mathrm{ss}} \end{pmatrix}.$$

where, VA^{r} is the (n×1) column vector representing region r's value added by sector, V^{r} is the (1×n) row vector of value added ratio by sector for region r, L is the interregional Leontief inverse constructed by its sub-matrix L^{rs}. A^{rs} represents the (n×n) matrix of interregional input coefficients from region r to region s, $\mathrm{FD}^{\mathrm{rs}}$ is the (n×1) column vector representing region s's final demand on the goods and services produced in region r. Following the definition of global TiVA proposed by Johnson and Noguera (2009), it's easy to formulate region r's value added exported to region s as shown below:

$$\begin{pmatrix} \mathrm{TiVAD}^{\mathrm{rs}} \\ 0 \end{pmatrix} = \begin{pmatrix} \mathrm{V}^{\mathrm{r}} & 0 \\ 0 & 0 \end{pmatrix} \cdot \begin{pmatrix} \mathrm{L}^{\mathrm{rr}} & \mathrm{L}^{\mathrm{rs}} \\ \mathrm{L}^{\mathrm{sr}} & \mathrm{L}^{\mathrm{ss}} \end{pmatrix} \cdot \begin{pmatrix} \mathrm{FD}^{\mathrm{rs}} \\ \mathrm{FD}^{\mathrm{ss}} \end{pmatrix} \tag{3}$$

$$\mathrm{TiVAD}^{\mathrm{rs}} = \mathrm{V}^{\mathrm{r}} \cdot \mathrm{L}^{\mathrm{rr}} \cdot \mathrm{FD}^{\mathrm{rs}} + \mathrm{V}^{\mathrm{r}} \cdot \mathrm{L}^{\mathrm{rs}} \cdot \mathrm{FD}^{\mathrm{ss}} = \mathrm{TiVADF}^{\mathrm{rs}} + \mathrm{TiVADH}^{\mathrm{rs}} \tag{4}$$

Obviously, $\mathrm{TiVAD}^{\mathrm{rs}}$ represents region r's value added induced by region s's final demands on products produced in both outside ($\mathrm{FD}^{\mathrm{rs}}$) and home region ($\mathrm{FD}^{\mathrm{ss}}$). Therefore, this kind of TiVA can be considered "demand-based" trade in value added from region s's (demander's) viewpoint.

TiVAD^{rs} can be further separated into two parts, TiVADF^{rs} and TiVADH^{rs} concerning different type of final demands FD^{rs} and FD^{ss}.

At the product (sector) level, we can regard the induced value added in a specific sector j by a specific trade flow of final product i from region to region s as "an individual TiVA linkage" which is defined as follows:

$$\mathrm{TiVAD}_{ij}^{rs} = V_j^r(L^{rr} \cdot \mathrm{FD}_i^{rs} + L^{rs} \cdot \mathrm{FD}_i^{ss}) \quad (5)$$

Based on the above definition, region r's export of sector j's value added to region s ($\mathrm{TiVAD}_{\cdot j}^{rs}$) can be measured as follows:

$$\mathrm{TiVAD}_{\cdot j}^{rs} = \sum_i \mathrm{TiVAD}_{ij}^{rs} \quad (6)$$

On the other hands, from the viewpoint of region s who is regarded as a supplier of final products, region r's export of value added to region s (the "supply-based" TiVA) can be defined as follows:

$$\begin{pmatrix} \mathrm{TiVAS}^{rs} \\ 0 \end{pmatrix} = \begin{pmatrix} V^r & 0 \\ 0 & 0 \end{pmatrix} \cdot \begin{pmatrix} L^{rr} & L^{rs} \\ L^{sr} & L^{ss} \end{pmatrix} \cdot \begin{pmatrix} 0 \\ \mathrm{FD}^{sr} + \mathrm{FD}^{ss} \end{pmatrix} \quad (7)$$

$$\mathrm{TiVAS}^{rs} = V^r \cdot L^{rs} \cdot \mathrm{FD}^{sr} + V^r \cdot L^{rs} \cdot \mathrm{FD}^{ss} = \mathrm{TiVASF}^{rs} + \mathrm{TiVASH}^{rs} \quad (8)$$

The above TiVAS^{rs} represents the induced value added in region r when region s provides (produces) final products to all over the nation. As shown in equation (8), TiVAS^{rs} can also be separated in to two parts concerning different type of final demand ($\mathrm{TiVASH}^{rs} = \mathrm{TiVADH}^{rs}$). In addition, with the same manner as shown in equation (5) and (6), the individual supply-based TiVA can be written as follows:

$$\mathrm{TiVAS}_{ij}^{rs} = V_j^r \cdot L^{rs}(\mathrm{FD}_i^{sr} + \mathrm{FD}_i^{ss}) \quad (9)$$

$$\mathrm{TiVAS}_{\cdot j}^{rs} = \sum_i \mathrm{TiVAS}_{ij}^{rs} \quad (10)$$

In the framework of interregional trade statistics, a region's products shipped to its partner region may embody a third region's parts and components. In this meaning, when we consider value trade among regions, the conventional interregional trade cannot provide a reasonable measure since it causes a kind of double counting problem. This is why we propose to use the domestic TiVA to investigate the situation of value chains.

In addition, when replacing the final demand item in equation (7) by the figure of regional exports, the regional value added in international trade (regional value added embodied in its export) can be also measured. This kind of indicator helps us understand how much one region's value added is embodied in other region's export (being different from the regional VS indicator).

2.3 New measure of regional comparative advantage

For the purpose of evaluating a region's comparative advantage of value added creation in domestic value chains, we can also apply the concept of domestic TiVA to the measure of regional Revealed Comparative Advantage (RCA) at sector level. The concept of RCA is mainly based on the theory of Ricardian comparative advantage. The most widely used indicator of RCA (see Béla Balassa, 1965) is given as follows:

$$\mathrm{RCA}_{\mathrm{i}}^{\mathrm{R}} = \frac{\mathrm{EX}_{\mathrm{i}}^{\mathrm{R}} / \sum_{\mathrm{i}} \mathrm{EX}_{\mathrm{i}}^{\mathrm{R}}}{\sum_{\mathrm{R}} \mathrm{EX}_{\mathrm{i}}^{\mathrm{R}} / \sum_{\mathrm{R}} \sum_{\mathrm{i}} \mathrm{EX}_{\mathrm{i}}^{\mathrm{R}}} \tag{11}$$

where, $\mathrm{EX}_{\mathrm{i}}^{\mathrm{R}}$ represents country r's exports of product i. This indicator represents the relative advantage or disadvantage of a certain country in international economics for a certain class of goods or services. However, as mentioned before, when much more intermediate imports are embodied in exports, this indicator may lose its original interpretability. Since a region's value added of a specific sector exported to other region can be measured by the above $\mathrm{TiVAD}_{\cdot\mathrm{j}}^{\mathrm{rs}}$ and $\mathrm{TiVAS}_{\cdot\mathrm{j}}^{\mathrm{rs}}$, using these concepts, a certain region's comparative advantage of value added creation in domestic value chains can be measured as the following two ways:

$$\mathrm{RCAD}_{\cdot\mathrm{j}}^{\mathrm{r}} = \frac{\mathrm{TiVAD}_{\cdot\mathrm{j}}^{\mathrm{r}} / \sum_{\mathrm{j}} \mathrm{TiVAD}_{\cdot\mathrm{j}}^{\mathrm{r}}}{\sum_{\mathrm{r}} \mathrm{TiVAD}_{\cdot\mathrm{j}}^{\mathrm{r}} / \sum_{\mathrm{r}} \sum_{\mathrm{j}} \mathrm{TiVAD}_{\cdot\mathrm{j}}^{\mathrm{r}}} \tag{12}$$

$$\mathrm{RCAS}_{\cdot\mathrm{j}}^{\mathrm{r}} = \frac{\mathrm{TiVAS}_{\cdot\mathrm{j}}^{\mathrm{r}} / \sum_{\mathrm{j}} \mathrm{TiVAS}_{\cdot\mathrm{j}}^{\mathrm{r}}}{\sum_{\mathrm{r}} \mathrm{TiVAS}_{\cdot\mathrm{j}}^{\mathrm{r}} / \sum_{\mathrm{r}} \sum_{\mathrm{j}} \mathrm{TiVAS}_{\cdot\mathrm{j}}^{\mathrm{r}}} \tag{13}$$

In addition, in order to investigate the bilateral RCA for a specific product or target region, we further propose the following indicator:

$$\mathrm{RCAD}_{\cdot\mathrm{j}}^{\mathrm{rs}} = \frac{\mathrm{TiVAD}_{\cdot\mathrm{j}}^{\mathrm{rs}} / \sum_{\mathrm{j}} \mathrm{TiVAD}_{\cdot\mathrm{j}}^{\mathrm{rs}}}{\sum_{\mathrm{r}} \mathrm{TiVAD}_{\cdot\mathrm{j}}^{\mathrm{rs}} / \sum_{\mathrm{r}} \sum_{\mathrm{j}} \mathrm{TiVAD}_{\cdot\mathrm{j}}^{\mathrm{rs}}} \tag{12}$$

$$\mathrm{RCAS}_{\cdot\mathrm{j}}^{\mathrm{rs}} = \frac{\mathrm{TiVAS}_{\cdot\mathrm{j}}^{\mathrm{rs}} / \sum_{\mathrm{j}} \mathrm{TiVAS}_{\cdot\mathrm{j}}^{\mathrm{rs}}}{\sum_{\mathrm{r}} \mathrm{TiVAS}_{\cdot\mathrm{j}}^{\mathrm{rs}} / \sum_{\mathrm{r}} \sum_{\mathrm{j}} \mathrm{TiVAS}_{\cdot\mathrm{j}}^{\mathrm{rs}}} \tag{13}$$

Obviously, the bilateral RCA provide us more views for the evaluation of region's comparative advantage.

3 Data sources

The main data source used in the paper for the calculation of domestic trade in value added is from the 1997 and 2007 China's Multi-regional Input-Output Tables (CMRIO). The 1997 CMRIO table is the main product of the international joint research project done by the IDE-JETRE and China State Information Center (SIC) in 2003. The 2007 CMRIO is compiled by the SIC individually in 2012. Both tables have the same region (see Appendix 1) and sector classification (see Table 1). It should be noted that import item is just a stand-along vector in both CMRIO tables rather than a separated matrix. In order to calculate the regional VS as mentioned in the previous section, we use the so-called "same proportion assumption" to transfer the import vector to import matrix. In addition, both tables are constructed by using a kind of hybrid (survey based + non-survey based) methodology. Although, for the non-survey based method, different types of gravity model are applied in the estimation of interregional trade flow, the calibration of parameters and the original data source are very similar.

4 Empirical analyses

In this section, we first show the general situation of China's regional economy by using the regional value added and interregional trade information obtained from 1997 and 2007 CMRIO data. Second, we present the region-level vertical specialization indicator to show the participation degree and position of a certain region in both domestic and international supply chains. Third, we use the calculation results of domestic TiVA and its evolution between 1997 and 2007 to illustrate the Give-out and Gain potentials of value creation and distribution within multi-regions. We also use the sector-level calculation results of TiVA to evaluate the comparative advantage of different sectors across regions. Finally, the regional value added induced by foreign trade is presented.

4.1 China's regional economies and interregional trade

In order to first give an overall view of the evolution of China's regional economies between 1997 and 2007, we simply calculate the regional value added and its real growth rate by sector. Table 1 shows the calculation results. Obviously, the total value added at national level almost doubles (190%) within the ten years. This is no surprise and normally coincides with our intuitive image of China's economic performance since the officially published average annual GDP growth rate is

about 8%[2]. However, when looking at the growth rate of value added at regional and sectoral levels, a very large variation can be easily confirmed. At regional level, North Municipalities as one of the quickly expanding urban agglomerations area shows the highest growth rate (237%) followed by the largest energy-base region, North West (213%) and two developed coastal regions, East Coast (205%), South Coast (202%). The growth rate of Central (193%) and North Coast (186%) is close to the national average. The remote area including North East (155%) and South West (144%) shows relatively low performance in the value added growth. (income differential)

Using the information of "Comparing to regional average" shown in Table 1, it's easy to identify the leading region of value added growth by sector. For example, for the case of Textile sector, the coastal regions (North, East and South Coast) can be considered leading regions since their growth rates are higher than the national average. (North Coast in primary sector, abandoning-primary-sector of North Municipalities) On the other hand, using the information of "Comparing to sectoral average" in Table 1 helps us understand which sector is the important leading force in regional economic growth. Obviously, heavy industries and services sectors play a significant leading role in most regions. This clearly implies that the economic growth pattern across regions has a kind of similarity. However, for the primary sectors and light industrial sectors, a relatively clear specialization or segregation tendency appears. For example, Mining sector in Non-coastal regions, Wooden products sector in Coastal regions, Chemical sector in Central and South West.

The dynamics and diversity of regional and sectoral economic growth depend on not only the change of intra-regional production techniques but also interregional production networks (including the linkages to overseas). Figure 1 shows the share of bilateral trade in total interregional trade for 1997 and 2007 (the size of bubble represents its share). In order to focus on measuring the magnitude of interregional trade, in this figure the intra-regional trade is excluded. In addition, the rest of the world (ROW) is considered as one region. In general, there is not significant structure change in interregional trade pattern within this ten year. Namely, the export and import of coastal region account for relatively large share; the interaction among coastal regions and between coastal region and Central is the most important part in domestic interregional trade. On the other hand, when comparing the figure of 1997 and 2007 carefully, we can still find a number of interesting features or differences. For example, East Coast replaces South Coast, becomes the leading region in export and import markets in 2007; the interaction between North Municipalities and its neighbor region, North coast shows dramatic increasing tendency within the ten years; the magnitude of transaction among

[2] If the annual growth rate is 8% across ten years, the ten-year growth rate can be easily given as $(1+8\%)^{10}=216\%$.

inland regions and between inland and coastal regions shows clear increasing importance. This makes the transaction among regions become much flatter in general.

In order to investigate the degree of dispersion or concentration of interregional trade at sectoral level, we calculate the coefficient of variation (CV) for intermediate and final products by sector respectively. According to the calculation results shown in Table 2, some features of the changing pattern of interregional trade can be summarized as follows: 1) the concentration degree of total trade in intermediate products across regions decreased (CV changes from 1.23 to 0.97). However, at sectoral level, a large diversity of the change in concentration degree can be confirmed. This reflects the increasing complexity and dynamics of interregional production networks in China. 2) For most final products, their concentration degrees of interregional flows increased rapidly. This clear implies that much more regions tend to specialize in production or procurement of final products within the domestic supply chains.

4.2 Region-level vertical specialization trade

Figure 2 shows the region-level vertical specialization indicators for 1997 and 2007. It's easy to see that at absolute level, North Municipalities, East Coast and South Coast have higher (more than 20% in 2007) import contents of export (IMCE) comparing to all inland regions and North Coast. East Coast and South Coast are the foreign export oriented economies with relatively large scale of export processing zones in which manufacturing production for export is supposed to use more imports of parts and components. This is why these two coastal regions have higher figures. For North Municipalities, given its low economic self-sufficiency rate and high interdependency on outside, it is no surprise that this region's IMCE is high. North Coast is a coastal region, but its main products are concentrated in primary sectors such as agriculture, which originally need less import contents as inputs for production. Therefore, North Coast shows the similar level as the other inland regions. When looking at the evolution of IMCE between 1997 and 2007, North Municipalities and South Coast just show litter increase, but East Coast's figure almost doubles in the ten years. This is mainly because that East Coast has experienced a very rapid economic growth leaded by the Yangtze River Delta Region and Shanghai's Pudong New Area, in which the export processing trade plays a very important role. Another interesting thing is that the IMCE figure for all inland regions shows significant increase. This clear implies that inland regions have been involved in international supply chains with an increasing tendency. The most possible explanations of this phenomenon includes 1) most inland regions come to realize the importance and possibility of export oriented economic growth pattern, which has been successful in coastal regions; 2) the accession to the WTO provides opportunities to not only coastal regions but also inland regions for their access to the world market;

3) the continuous improvement of transportation and logistical system has played a very important role in increasing the accessibility of inland regions to foreign market.

The figures in import contents of outflow (IMCO) for most regions are just litter lower than the figures in IMCE and show similar changing pattern as seen in IMCE. This clearly indicates that the import of intermediate products enhances its importance not only when regions produce exporting products, but also play the similar role when regions produce goods and services for other domestic regions. In addition, it is easy to see that producing intermediate products for outflow needs much more import contents for most regions when comparing to the figure of IMCO in final products. This also provides the evidence that the rapid increase of IMCO for East Coast is mainly due to the contribution of IMCO in intermediate products, and the decline of IMCO for North Municipalities is attributed to the decrease of IMCO in final products.

When looking at the figure in inflow contents of export (INCE), it is easy to confirm that there is not great variation across regions in 1997, but some regions (North Municipalities, North Coast, South Coast, Central and South West) show rapid increasing tendency in 2007. This implies that most regions have expanded their domestic downstream production linkages when they participate in the global supply chains. The similar evolution can be found in the figure of inflow contents of outflow (INCO). Namely, most regions also enhance their participation in domestic supply chains. On the other hand, if we comparing the figures in INCE and INCO with the figures in IMCE and IMCO for North East and East Coast, it is easy to know that these two regions tend to be much involved in global supply chains rather than domestic supply chains through replacing domestic input by much more foreign import. (Russia trade for North East)

In addition, looking at the difference between INCO in intermediate products and in final products, it is easy to see that the increasing participation degree in domestic supply chains for North Municipalities, North Coast and Central is mainly due to their growing presences in intermediate production networks. However, for South Coast, North West and South West, the main contribution is from their increasing presences of the production in final products.

4.3 Domestic trade in value added

In the previous section, we provide the regional vertical specialization indicator of measuring the participation degree of a region in domestic supply chains. This kind of indicator is easy to be estimated if the regional I-O is available. However, it is difficult to show the structure of domestic value chain in detail, since the interregional spillover and feedback effect by the way of production

networks cannot be explicitly captured when we just use regional I-O table. In this section, we applied the concept of domestic TiVA as defined in equation (4) to China's MRIO tables for 1997 and 2007. The calculation results of TiVA related indicators can help us understand how the value added is created and distributed across regions.

Table 3 presents the matrix of cross-regional transfer of value added by origins and destinations induced by regional final demand on its home made products ($\mathrm{TiVASH}^{rs} = \mathrm{TiVADH}^{rs}$). For the ease of comparison between different years, we use China's national GDP deflator to make the 2007 figure be at constant prices (base year: 1997)[3]. For example, in 1997, the value in the cell at the intersection of North Municipalities' row and the North East's column is 3.99, which indicates that North East's final demand on the products produced in its own region has created about 3.99 billion Chinese Yuan (RMB) value added in North municipalities in 1997. Moving down the column, the sum, about 88.77 billion RMB represents the total value added creation effect that North East exerts on the other regions as a whole. We divide the column sum figure of North East by the average of each region's column sum to get an index for North East. We call this index "value added give-out potential" of North East region. Similarly, the row total of North East (54.7) represents the total value added that North East receives from the other regions as a whole. Again, we use the row sum to define the "value added gain potential" of North East from other regions.

In order to illustrate the development of the TiVA structure from 1997 through 2007, the above two potentials of each region are plotted in Figure 3. Even at a quick glance, the position of East Coast catches our immediate attention. East Coast, with its largest economic scale and highest per capital GDP in China, purchases a massive amount of goods and services from its home market, generating a significant value added in other regions, especially in its neighbor, the Central region (see Table 3). In other words, East Coast has relatively strong backward linkage of value added creation with the Central region. The Central region has both higher give-out and gain potentials. This is first because that Central is the second largest economy with relatively large final demand scale, second because of its special geographic location, the central of China with relatively developed transportation system which makes this region have the advantage to provide much more intermediate products to other regions, especially to the most developed coastal regions. In general, the position of region in Figure 3 mainly depends on the economic scale of each region. However, when looking at the movement of each region, the regions with larger economic enhanced their give-out potentials as a value added provider; lost their gain potential. On the contrary, the remote regions with relatively small economic size moved in the opposite direction, but increased their value added gain potentials.

[3] The national GDP deflator is calculated by using IMF's national currency based GDP statistics. We also assume that there is no difference of GDP deflator across regions.

This situation implies that large regions' final demand on their home made products tends to have stronger backward linkages of value added creation, in which, remote and smaller regions locate on the downstream of supply chains by providing much more intermediate products. On the other hand, the movement of North Municipalities is particularly interesting. It enhanced both potentials. This is not so surprising, since North Municipalities is the fastest GDP growth region with large providing power of service products to other regions.

In addition, when looking at the bottom part in Table 3, it's easy to see that for almost all regions, the transfer of TiVA across regions increased. The total growth rate is about 140% which is lower than the growth rate of national value added, 190% (see Table 1). This clearly implies that the regional final demand on home made products is not the leading force in the trans-regional value added creation system (this conclusion can be explained later by Table 4 and 5).

Table 4 shows the trans-regional value added induced by regional final demand of inflow-products for both 1997 and 2007. In other words, the figure in Table 4 represents how much one region's foreign demand creates other region's value added by the way of interregional supply chains. In the same manner as shown in Table 3, we calculate the give-out and gain potentials for each region and plot them in Figure 5. It's easy to see that in 1997 Central is both the largest provider and beneficiary of trans-regional value added caused by the other region's foreign demands. This is easy to be understood since Central is the second biggest economy with the best accessibility to the domestic market. North Coast and East Coast have relatively high gain potentials in 1997. This indeed reflects the fact that these two coastal regions have larger production capacity to match other regions' needs on final products. The gain and give-out potentials in 1997 for North Municipalities and the inland regions (North East, North West and South West) are quiet low. The low figure for North Municipalities is mainly due to its relatively small economic scale (both for foreign demand and production capacity); the low figure for inland regions clearly reflects their low participation degree in domestic value chains. However, this situation changed significantly in 2007. Namely, the variation of gain potential across regions decreased rapidly. This implies that the distribution structure of benefit or value added created by interregional trade in final products has been getting much flatter across regions. On the other hand, there is still large difference in the give-out potential across regions. Central and North Coast enhanced their give-out potentials rapidly between 1997 and 2007. If we look at the detailed trans-regional figures, especially the growth rate shown in Table 4, it's easy to confirm that the main contributor causing this movement is the increasing linkages between Central, North Coast and North Municipalities, inland regions in the trans-regional value added creation system. This also provides the evidence that why the gain potential of North municipalities and inland regions grew up quickly.

In addition, when looking at the bottom sub-table in Table 4, it's easy to see that the national (Row sum or Column sum) growth rate of trans-regional value added between 1997 and 2007 is 524%, which is much larger than the figure shown in Table 3. This exactly supports our previous conclusion that the regional final demand on products produced in other regions can be regarded the main source of the increasing creation of trans-regional value added.

As mentioned in previous section, from the viewpoint of a supplier of final products, we can also estimate the "supply-based" trans-regional value added (see Table 5 and Figure 6). Just focusing on the evolution of gain and give-out potentials as shown in Figure 6, it's clear that the variation of both potentials across regions decreased rapidly between 1997 and 2007. Namely, inland regions enhanced both potentials, while coastal regions excluding South Coast lost both potentials. This also reflects the fact that inland regions increased their participation degree in domestic value chains by both providing much more final products to other regions (the source of give-out potential), but also tends to provide more intermediate products to other regions (the source of gain potential).

4.4 Evolution of regional comparative advantage in terms of domestic trade in value added

Since there is no guarantee that providing much more products equals getting more value added in a highly vertical-specialized supply chain system, e.g. the case of China's iPhone export. This situation becomes much crucial when considering regional comparative advantage from the view of value added creation within the domestic market. This is why we propose to use the TiVA concept to measure the regional comparative advantage.

Table 6 shows the TiVA based domestic RCA indicator and its changing pattern between 1997 and 2007. The main findings can be summarized as follows: 1) there is a large variation of RCA by sector across regions. Namely, coastal regions have relatively more sectors with top ranking RCA, especially in the manufacturing sector; inland regions mainly specialize in primary sectors; 2) the ranking of region in RCA by sector changes significantly between 1997 and 2007. For example, in 1997 for the sector of Transport equipment, North Municipalities ranks first, but in 2007 North East takes over the top position. This is mainly because that North East has experienced rapid development of motor vehicles and car parts production within the ten years; 3) when looking at the Standard Deviation (SD) of RCA by region and sector and its change rate (positive), it's easy to see that for all regions, the increasing tendency of specialization in value added creation across both region and sector becomes much apparent. This clearly implies that most regions tend to enhance their specialization of value added creation characterized by the increasing sectoral RCA when

taking part in the domestic value chains (for detailed bilateral TiVA based RCA, one can refer to Appendix).

4.5 Participation degree of regional economy in global value chains

As shown in the previous section, using the interregional I-O framework, it's easy to estimate how much a region's value added is created by other region's export. This can helps us understand the position of a specific region in other region's supply chains.

Figure 6 shows the give-out potential of induced value added by regional exports. In 1997, the export of South Coast gives the largest impacts on the value added creation of other regions followed by East Coast. When looking at the components of the bars for this two coastal regions' give-out potential, obviously Central and other coastal regions are the main beneficiaries. This fact implies that around the year of 1997, the benefit of the export oriented development strategy applied in coastal regions was limited with relative small spillover effects to the inland regions. However, in 2007, much more inland regions tend to be able to enjoy the benefit from coastal regions' export, and at the same time, inland region themselves also shows an increasing presence in their give-out potential to other regions. On the other hand, when looking at the gain potential of induced value added by regional exports (Figure 7), it's easy to see that Central with its large economic size and good geographic location keeps the position of the largest beneficiary of value added spillover from other regions' export. In addition, similarly as seen in Figure 6, much more inland regions can enjoy benefit from its partner region's export, especially from South Coast and East Coast. All these facts means that the inland regions in China have been increasing their participation degree to the global value chains by not only the way of exporting more products to world market directly, but also by the way of joining the domestic supply chains of some leading coastal regions' global supply chains indirectly.

5 Conclusion remarks

China has experienced a very rapid economic growth since the launch of the Reform and Open-Door Policy in 1978. With the accession to the WTO in 2001, China has been deeply involved in the world economy. China's participation to global supply chains has brought dramatic impacts on not only its domestic economies but also to the global trade structure. Given the increasing complexity of China's domestic production networks, this paper focused on the measure of domestic value chains across regions and their linkages with global market. Using China's 1997 and 2007 interregional Input-Output tables, the detailed structure change of domestic Trade in Value Added, the position

and participation degree of different regions in both domestic and global value chains have been measured. The main conclusions can be summarized as follows: 1) the creation and distribution of value added across regions have become much flatter. This is mainly benefited from the expansion of highly vertical-specialized interregional trade in intermediate products. 2) The regional final demand on goods and services produced in other regions plays a dramatic increasing role in the trans-regional value added trade. 3) Most of inland regions successfully enhanced their gain potentials of value added by increasing the participation degree of domestic value chains. 4) The increase of China's participation in global value chains between 1997 and 2007 is mainly contributed by the increasing presence of inland regions. 5) Inland regions tend to be able to get much more value added by the way of joining the domestic supply chains of some leading coastal regions' global supply chains indirectly. 6) The sectoral TiVA based comparative advantage across regions and the regional TiVA based comparative advantage across sectors shown much apparent concentration tendency. This indirectly reflects the improved efficiency of the whole domestic value chains.

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Table 1 Regional and sectoral value added and its growth rate

		Agriculture	Mining and quarrying	Food products and tobacco	Textile and garment	Wooden products and furniture	Pulp, paper and printing	Chemical	Non-metallic mineral products	Metal products	General mechinary	Transport equipment	Electric apparatus and electronic quipmen	Other manufacturing products	Electricity, gas, and water supply	Construction	Trade and transportation	Other services	Total
1997	North East	143	72	31	14	9	7	57	27	28	22	17	11	12	16	47	88	84	685
	North Municipalities	17	6	9	10	2	6	17	5	13	9	7	16	7	8	24	33	128	317
	North Coast	210	62	57	41	6	21	79	42	43	46	9	22	17	22	67	101	177	1,022
	East Coast	173	14	51	118	9	27	129	43	62	67	31	68	43	35	97	158	253	1,378
	South Coast	182	24	34	74	8	24	60	24	24	10	14	57	35	31	80	117	195	993
	Central	359	82	75	46	15	19	61	65	46	33	17	14	30	35	85	129	216	1,327
	North West	120	37	18	12	2	3	24	14	17	7	3	8	6	15	38	54	89	467
	South West	264	27	74	11	6	9	34	25	24	15	18	15	12	18	61	87	147	847
	Total	1,468	324	349	326	57	116	461	245	257	209	116	211	162	180	499	767	1,289	7,036
2007	North East	219	195	56	21	16	9	143	29	80	63	89	25	34	54	97	229	392	1,750
	North Municipalities	16	42	15	8	2	6	47	7	44	31	26	61	22	31	53	152	506	1,070
	North Coast	328	224	145	112	50	43	210	116	194	127	69	67	47	89	143	314	645	2,922
	East Coast	226	21	103	259	37	64	307	66	265	229	124	311	167	116	206	514	1,194	4,206
	South Coast	237	54	74	162	34	73	172	76	116	69	59	284	91	127	124	364	887	3,002
	Central	590	214	192	92	49	53	220	127	271	118	57	79	75	151	243	451	910	3,891
	North West	189	238	53	13	4	7	65	25	104	18	15	12	5	73	104	182	353	1,461
	South West	390	69	142	19	10	18	88	34	122	44	54	35	25	94	140	240	544	2,069
	Total	2,194	1,057	779	684	201	273	1,252	479	1,196	700	492	874	467	734	1,111	2,447	5,430	20,370
Real growth rate (%)	North East	53	171	80	48	79	31	151	8	184	185	422	130	181	235	107	160	367	155
	North Municipalities	-5	602	62	-23	-23	2	175	38	242	249	272	283	217	292	120	362	295	237
	North Coast	56	262	154	173	729	104	166	175	352	176	666	203	179	304	114	211	265	186
	East Coast	31	48	101	119	308	138	138	53	327	242	300	357	288	230	112	225	372	205
	South Coast	30	126	118	118	321	203	187	216	382	589	321	398	160	310	55	211	355	202
	Central	64	160	156	100	227	178	260	96	489	257	233	463	150	331	186	250	321	193
	North West	58	544	193	8	91	130	171	80	512	162	385	53	-11	385	174	237	297	213
	South West	48	155	91	74	66	96	159	35	407	196	202	135	111	423	130	176	270	144
	Total	49	226	123	110	252	135	172	96	365	235	324	314	188	308	123	219	321	190
Comparing to regional averag	North East	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	-
	North Municipalities	-	+	-	-	-	-	+	-	-	+	-	-	+	-	-	+	-	+
	North Coast	+	+	+	+	+	-	-	+	-	-	+	-	-	-	-	-	-	-
	East Coast	-	-	-	+	+	+	-	-	-	+	-	+	+	-	-	+	+	+
	South Coast	-	-	-	+	+	+	+	+	+	+	-	+	-	+	-	-	+	+
	Central	+	-	+	-	-	+	+	-	+	+	-	+	-	+	+	+	+	+
	North West	+	+	+	-	-	-	-	-	+	-	+	-	-	+	+	+	-	+
	South West	-	-	-	-	-	-	-	-	+	-	-	-	-	+	+	-	-	-
Comparing to sectoral average	North East	-	+	-	-	-	-	-	-	+	+	+	-	+	+	-	+	+	
	North Municipalities	-	+	-	-	-	-	-	-	+	+	+	+	-	+	-	+	+	
	North Coast	-	+	-	-	+	-	-	-	+	-	+	+	-	+	-	+	+	
	East Coast	-	-	-	-	+	-	-	-	+	+	+	+	+	+	-	+	+	
	South Coast	-	-	-	-	+	+	-	+	+	+	+	+	-	+	-	+	+	
	Central	-	-	-	-	+	-	+	-	+	+	+	+	-	+	-	+	+	
	North West	-	+	-	-	-	-	-	-	+	-	+	-	-	+	-	+	+	
	South West	-	+	-	-	-	-	+	-	+	+	+	-	-	+	-	+	+	
	Total	-	+	-	-	+	-	-	-	+	+	+	+	-	+	-	+	+	

Figure 1 Share of bilateral trade in total interregional trade
(without considering intra-regional trade)

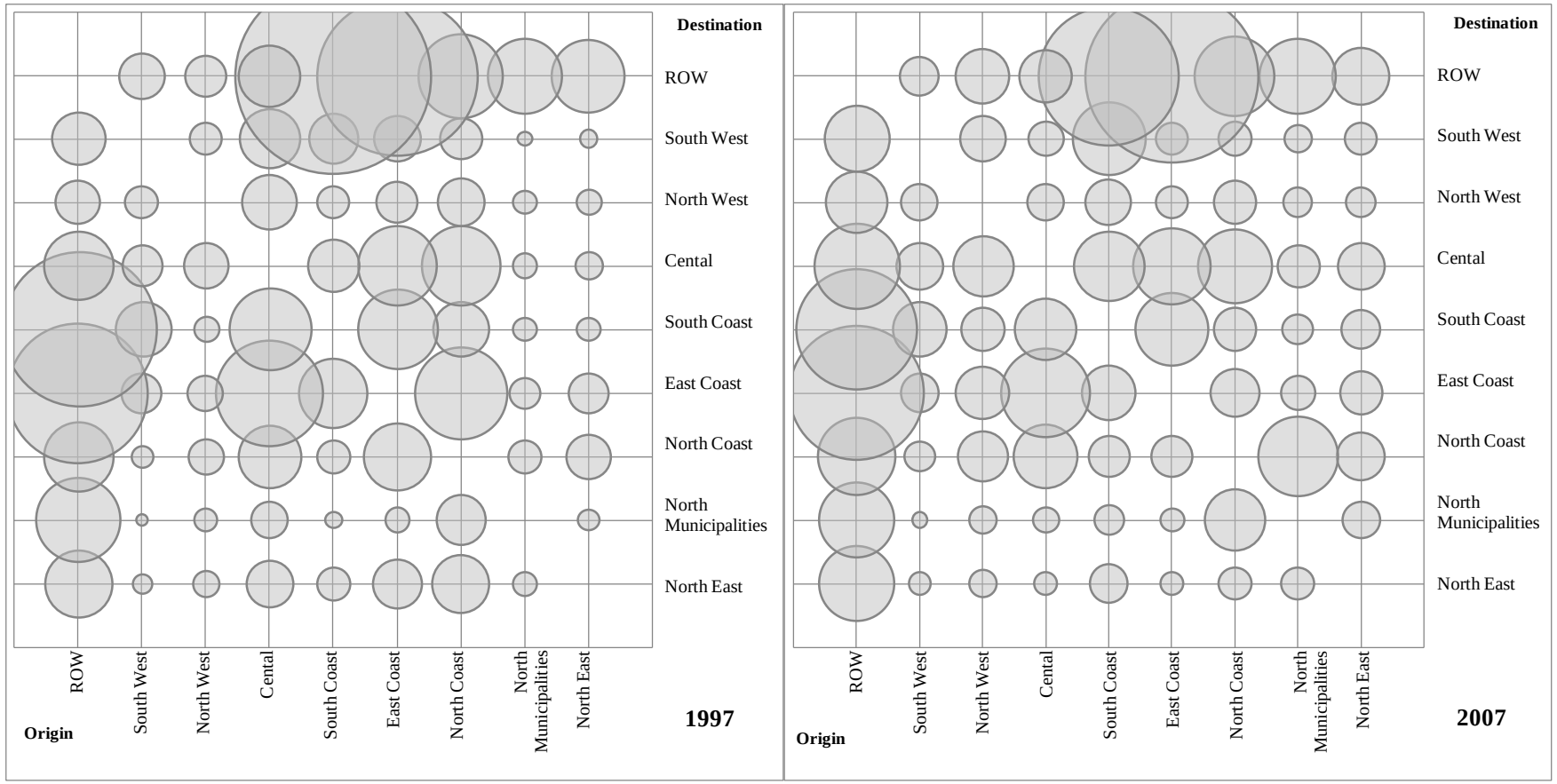
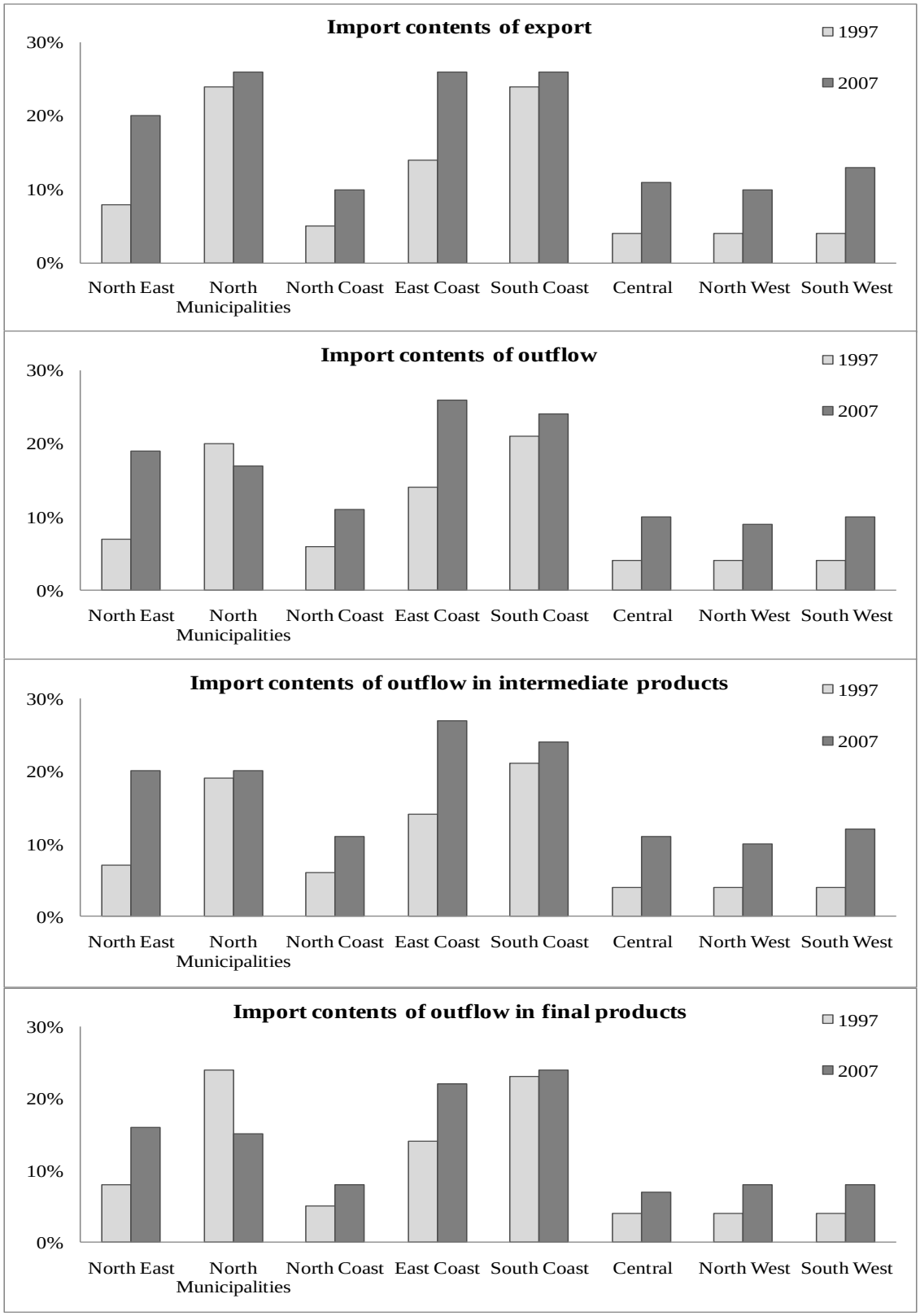
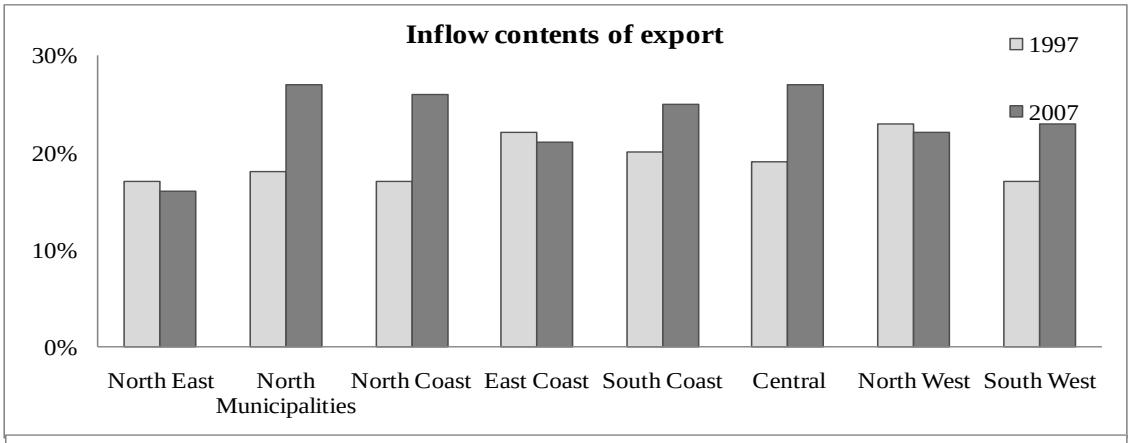


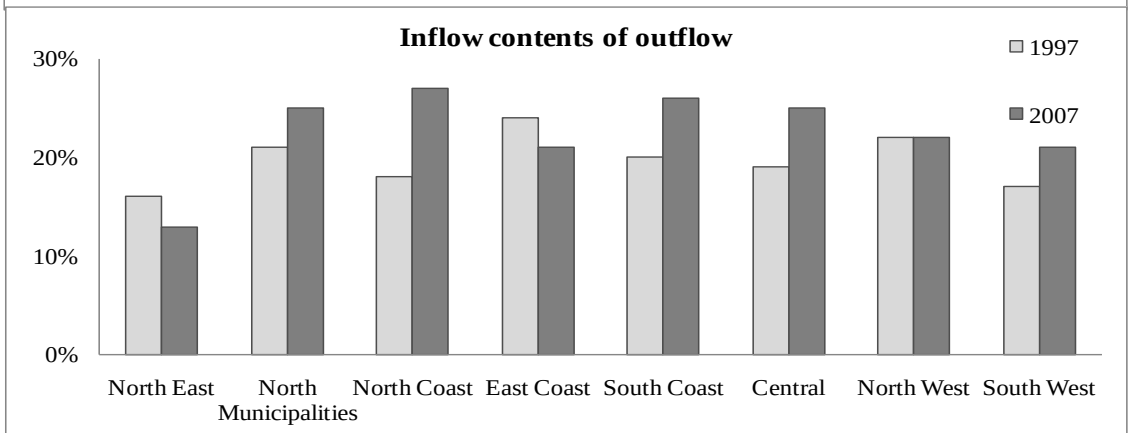
Table 2 Concentration degree of interregional trade in intermediate and final products

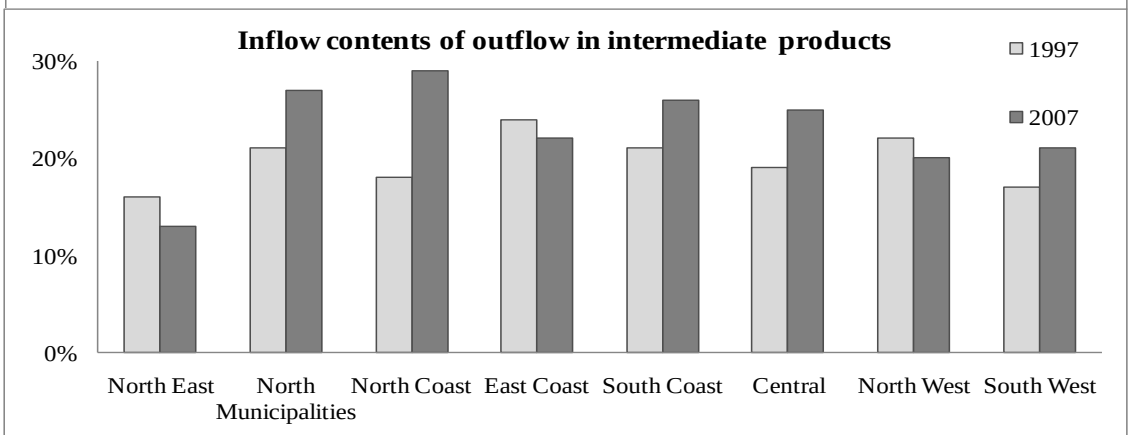
Sector	Intermediate products			Final products		
	1997	2007	Change rate	1997	2007	Change rate
Agriculture	1.26	1.81	44.1%	1.41	1.77	25.9%
Mining and quarrying	1.82	1.65	-9.2%	1.78	2.43	36.4%
Food products and tobacco	1.16	1.29	10.6%	1.11	1.45	29.9%
Textile and garment	1.66	1.56	-5.9%	1.44	3.40	136.2%
Wooden products and furniture	1.91	1.78	-6.9%	1.51	1.76	16.4%
Pulp, paper and printing	1.18	1.78	51.4%	1.22	3.46	183.0%
Chemical	1.31	1.18	-9.7%	1.49	1.32	-11.3%
Non-metallic mineral products	1.76	1.79	1.6%	1.48	2.06	39.5%
Metal products	1.56	1.42	-8.8%	1.31	1.76	34.1%
General mechinary	1.67	1.67	-0.1%	1.81	2.07	14.0%
Transport equipment	1.25	1.37	10.0%	1.52	1.61	5.5%
Electric apparatus and electronic quipment	1.41	2.43	72.1%	1.58	2.19	38.2%
Other manufacturing products	1.35	1.66	23.2%	1.44	2.05	41.9%
Electricity, gas, and water supply	1.96	1.90	-3.0%	2.27	2.45	8.2%
Construction		2.00			1.77	
Trade and transportation	1.10	1.36	23.5%	1.00	1.65	64.5%
Other services		2.15			2.42	
Total products	1.23	0.97	-20.7%	1.09	1.11	2.0%

Figure 2 Vertical specialization indicator at regional level (1997-2007; unit: %)




Inflow contents of export
1997
2007
30%
20%
10%
0%
North East
North Municipalities
North Coast
East Coast
South Coast
Central
North West
South West


Inflow contents of outflow
1997
2007
30%
20%
10%
0%
North East
North Municipalities
North Coast
East Coast
South Coast
Central
North West
South West


Inflow contents of outflow in intermediate products
1997
2007
30%
20%
10%
0%
North East
North Municipalities
North Coast
East Coast
South Coast
Central
North West
South West

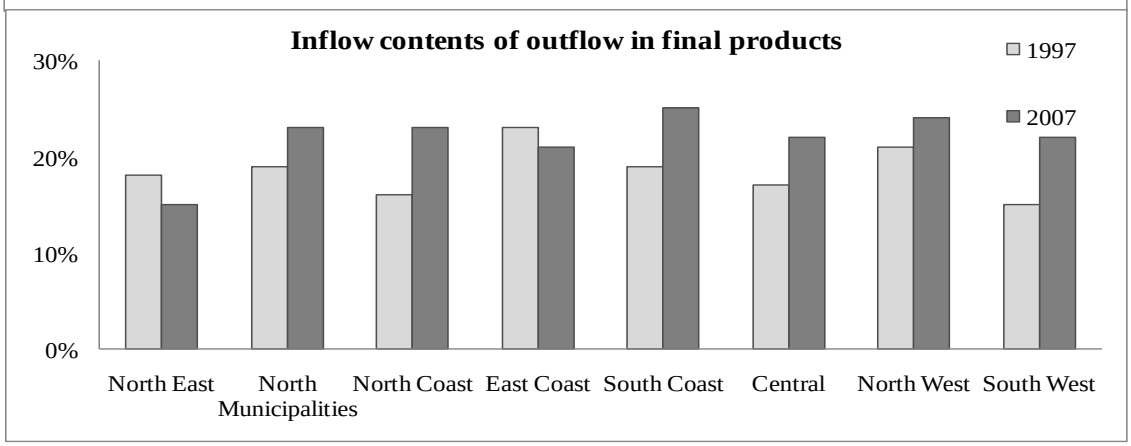

Inflow contents of outflow in final products
1997
2007
30%
20%
10%
0%
North East
North Municipalities
North Coast
East Coast
South Coast
Central
North West
South West

Table 3 Trans-regional value added induced by regional consumption (production) of home made products (1997 – 2007)

Trans-regional value added induced by regional consumption (production) of home made final products for 1997 (unit: billion Chinese Yuan)										
	North East	North Municipalities	North Coast	East Coast	South Coast	Central	North West	South West	Row sum	Gain potential
North East		3.57	15.03	12.53	4.56	9.64	5.50	3.86	54.70	0.4
North Municipalities	3.99		5.99	5.50	2.79	4.80	3.40	1.89	28.37	0.2
North Coast	28.22	16.36		59.25	21.60	55.07	18.09	17.82	216.41	1.9
East Coast	16.97	4.09	25.23		26.67	41.99	11.21	15.85	142.01	1.4
South Coast	6.96	1.69	6.75	23.39		17.00	5.73	13.51	75.04	0.7
Central	22.02	10.46	31.75	79.12	42.51		23.54	30.95	240.35	2.1
North West	6.52	3.63	9.97	11.19	5.28	19.22		9.28	65.11	0.5
South West	4.09	1.32	4.56	13.54	19.17	15.27	8.58		66.51	0.6
Column sum	88.77	41.13	99.29	204.53	122.58	162.99	76.06	93.16	888.50	
Give-out potential	0.8	0.4	0.9	1.6	1.1	1.5	0.8	0.9		
Trans-regional value added induced by regional consumption (production) of home made final products for 2007 (unit: billion Chinese Yuan)										
	North East	North Municipalities	North Coast	East Coast	South Coast	Central	North West	South West	Row sum	Gain potential
North East		22.22	53.43	53.15	26.19	44.44	12.90	23.40	235.74	0.8
North Municipalities	13.91		70.02	25.64	9.28	20.39	9.43	9.08	157.73	0.9
North Coast	26.88	65.56		69.56	29.63	87.15	27.88	23.93	330.58	1.2
East Coast	11.81	9.88	34.56		52.14	88.64	13.88	21.80	232.72	0.9
South Coast	22.31	12.36	33.80	61.90		63.35	21.20	68.02	282.94	1.1
Central	17.80	17.81	92.03	183.24	58.01		22.68	32.51	424.08	1.2
North West	19.26	15.30	52.95	77.69	32.29	60.83		37.46	295.79	1.1
South West	11.63	5.33	23.09	44.38	41.00	34.53	14.79		174.74	0.7
Column sum	123.58	148.46	359.88	515.56	248.54	399.34	122.76	216.21	2,134.33	
Give-out potential	0.4	0.4	1.3	1.3	1.0	2.0	0.6	1.0		
Growth rate of trans-regional value added between 1997 and 2007 (unit: %)										
	North East	North Municipalities	North Coast	East Coast	South Coast	Central	North West	South West	Row sum	Gain potential
North East		522	256	324	474	361	134	507	331	79
North Municipalities	248		1,068	366	233	325	177	380	456	131
North Coast	-5	301		17	37	58	54	34	53	-36
East Coast	-30	141	37		96	111	24	38	64	-32
South Coast	221	629	401	165		273	270	403	277	57
Central	-19	70	190	132	36		-4	5	76	-27
North West	195	321	431	594	512	216		304	354	89
South West	185	305	407	228	114	126	72		163	9
Column sum	39	261	262	152	103	145	61	132	140	
Give-out potential	-42	50	51	5	-16	2	-33	-3		

Table 4 Trans-regional value added induced by regional consumption of final inflow-products (1997 – 2007)

Trans-regional value added induced by regional consumption of final inflow-products for 1997 (unit: billion Chinese Yuan)										
	North East	North Municipalities	North Coast	East Coast	South Coast	Central	North West	South West	Row sum	Gain potential
North East		1.36	2.74	2.68	1.61	3.62	2.79	1.72	16.53	0.4
North Municipalities	1.81		2.77	1.42	1.22	2.27	1.62	0.89	11.99	0.2
North Coast	13.85	7.34		17.77	10.05	27.14	11.71	10.00	97.86	1.9
East Coast	8.53	2.03	13.76		13.98	25.45	7.97	9.60	81.34	1.4
South Coast	4.71	1.01	4.04	9.27		11.62	4.74	10.15	45.54	0.7
Central	10.83	4.07	13.13	22.18	22.10		14.48	17.92	104.70	2.1
North West	2.58	1.36	2.16	2.50	2.37	5.38		3.99	20.35	0.5
South West	2.23	0.62	2.20	4.00	7.80	8.38	5.00		30.22	0.6
Column sum	44.55	17.78	40.81	59.81	59.13	83.86	48.31	54.27	408.53	
Give-out potential	0.8	0.4	0.9	1.6	1.1	1.5	0.8	0.9		
Trans-regional value added induced by regional consumption of final inflow-products for 2007 (unit: billion Chinese Yuan)										
	North East	North Municipalities	North Coast	East Coast	South Coast	Central	North West	South West	Row sum	Gain potential
North East		20.52	43.02	24.55	31.96	69.93	23.52	29.44	242.94	0.8
North Municipalities	25.07		181.33	23.22	23.48	73.77	23.85	35.07	385.80	0.9
North Coast	18.66	24.97		29.57	37.89	153.62	32.62	46.02	343.34	1.2
East Coast	12.45	5.87	29.45		69.85	121.37	23.59	38.69	301.27	0.9
South Coast	27.85	7.28	26.13	20.96		118.77	41.61	119.27	361.87	1.1
Central	13.94	11.22	47.63	108.52	53.21		29.14	42.57	306.21	1.2
North West	14.42	13.18	57.72	41.37	36.71	122.06		69.22	354.68	1.1
South West	15.41	7.11	21.94	18.76	55.08	90.98	42.71		252.00	0.7
Column sum	127.80	90.15	407.23	266.94	308.18	750.50	217.03	380.27	2,548.11	
Give-out potential	0.4	0.4	1.3	1.3	1.0	2.0	0.6	1.0		
Growth rate of trans-regional value added between 1997 and 2007 (unit: %)										
	North East	North Municipalities	North Coast	East Coast	South Coast	Central	North West	South West	Row sum	Gain potential
North East		1,407	1,470	815	1,880	1,830	743	1,610	1,370	136
North Municipalities	1,285		6,441	1,540	1,824	3,153	1,375	3,863	3,118	416
North Coast	35	240		66	277	466	179	360	251	-44
East Coast	46	189	114		400	377	196	303	270	-41
South Coast	491	620	546	126		923	778	1,075	695	27
Central	29	176	263	389	141		101	138	192	-53
North West	459	870	2,570	1,557	1,446	2,169		1,633	1,643	179
South West	590	1,054	897	369	606	986	754		734	34
Column sum	187	407	898	346	421	795	349	601	524	
Give-out potential	-54	-19	60	-28	-16	43	-28	12		

Table 5 Trans-regional value added induced by regional production of final outflow-products (1997-2007)

Trans-regional value added induced by regional production of final outflow-products for 1997 (unit: billion Chinese Yuan)										
	North East	North Municipalities	North Coast	East Coast	South Coast	Central	North West	South West	Row sum	Gain potential
North East		0.24	2.04	1.39	0.42	0.87	0.28	0.16	5.38	0.4
North Municipalities	0.11		0.85	0.63	0.29	0.45	0.19	0.08	2.61	0.2
North Coast	0.76	1.14		6.28	2.06	5.09	0.92	0.73	16.98	1.9
East Coast	0.48	0.31	3.72		2.97	4.00	0.60	0.70	12.79	1.4
South Coast	0.19	0.13	0.99	2.55		1.55	0.28	0.59	6.27	0.7
Central	0.59	0.71	4.46	7.98	3.80		1.15	1.29	19.98	2.1
North West	0.17	0.26	1.49	1.21	0.50	1.79		0.38	5.80	0.5
South West	0.11	0.09	0.66	1.38	1.73	1.41	0.40		5.78	0.6
Column sum	2.43	2.88	14.20	21.42	11.76	15.15	3.82	3.93	75.59	
Give-out potential	0.8	0.4	0.9	1.6	1.1	1.5	0.8	0.9		
Trans-regional value added induced by regional production of final outflow-products for 2007 (unit: billion Chinese Yuan)										
	North East	North Municipalities	North Coast	East Coast	South Coast	Central	North West	South West	Row sum	Gain potential
North East		17.25	9.82	7.20	9.14	6.08	8.90	5.88	64.28	0.8
North Municipalities	3.19		12.07	3.43	3.87	2.67	5.65	1.98	32.88	0.9
North Coast	6.10	42.10		8.63	14.19	11.34	18.83	5.90	107.08	1.2
East Coast	2.59	7.67	5.97		27.57	11.97	8.70	4.99	69.46	0.9
South Coast	4.58	9.63	5.89	8.23		7.84	12.86	15.11	64.13	1.1
Central	4.30	11.90	15.84	23.08	26.56		15.49	7.95	105.12	1.2
North West	4.81	11.10	10.30	10.39	13.85	8.18		8.86	67.49	1.1
South West	2.58	4.25	4.63	5.63	16.01	4.53	10.47		48.09	0.7
Column sum	28.14	103.90	64.52	66.61	111.18	52.62	80.89	50.68	558.53	
Give-out potential	0.4	0.4	1.3	1.3	1.0	2.0	0.6	1.0		
Growth rate of trans-regional value added between 1997 and 2007 (unit: %)										
	North East	North Municipalities	North Coast	East Coast	South Coast	Central	North West	South West	Row sum	Gain potential
North East		7,213	381	419	2,095	602	3,111	3,646	1,094	62
North Municipalities	2,712		1,319	443	1,224	498	2,907	2,333	1,162	71
North Coast	699	3,592		37	590	123	1,936	712	531	-15
East Coast	436	2,353	61		828	199	1,343	608	443	-27
South Coast	2,271	7,397	498	223		406	4,470	2,454	922	38
Central	634	1,571	255	189	599		1,249	516	426	-29
North West	2,664	4,199	590	758	2,694	357		2,248	1,064	58
South West	2,189	4,394	604	308	823	221	2,537		731	13
Column sum	1,060	3,505	354	211	845	247	2,018	1,189	639	
Give-out potential	57	388	-39	-58	28	-53	187	74		

Figure 3 Give-out & Gain potential of trans-regional trade in value added based

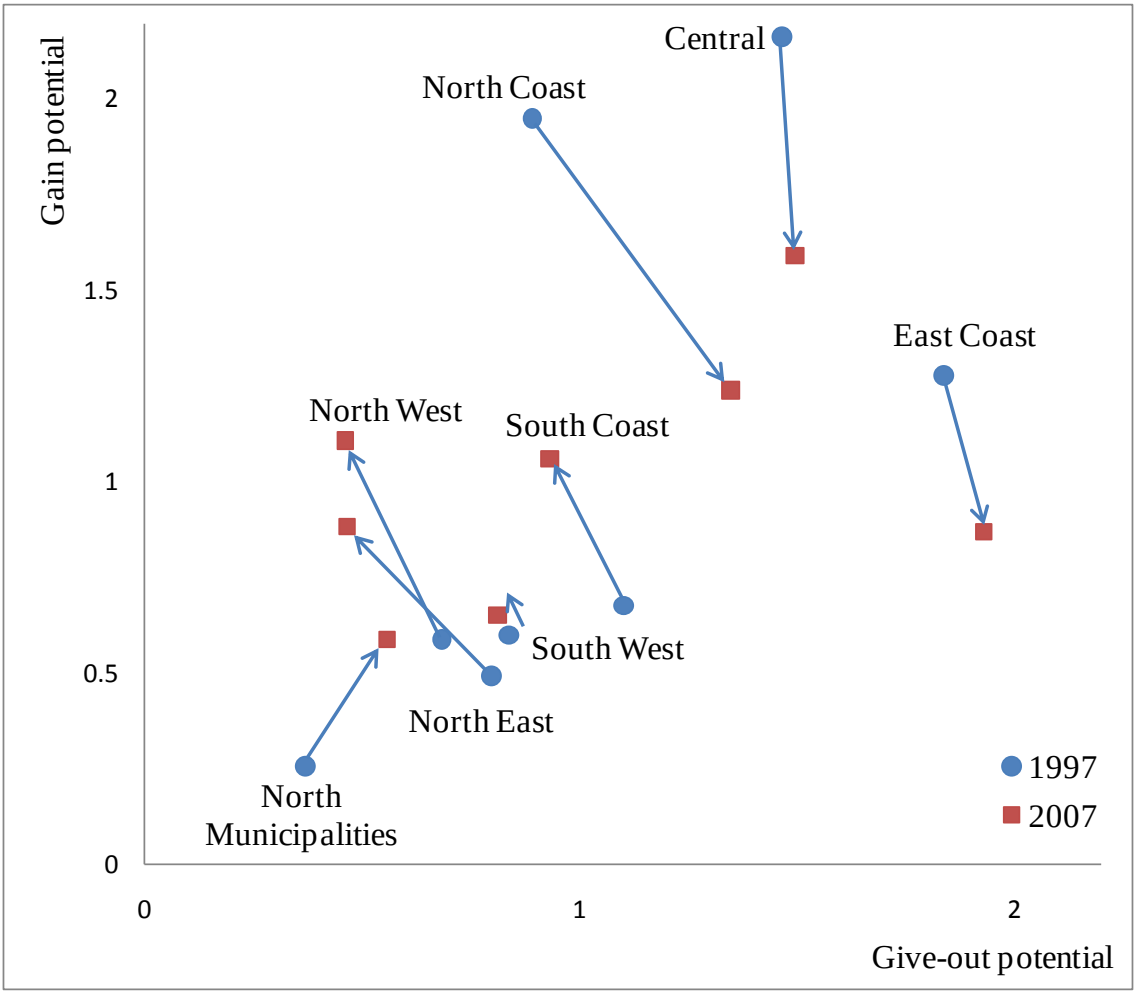


Figure 4 Give-out and Gain potential of trans-regional trade in value added

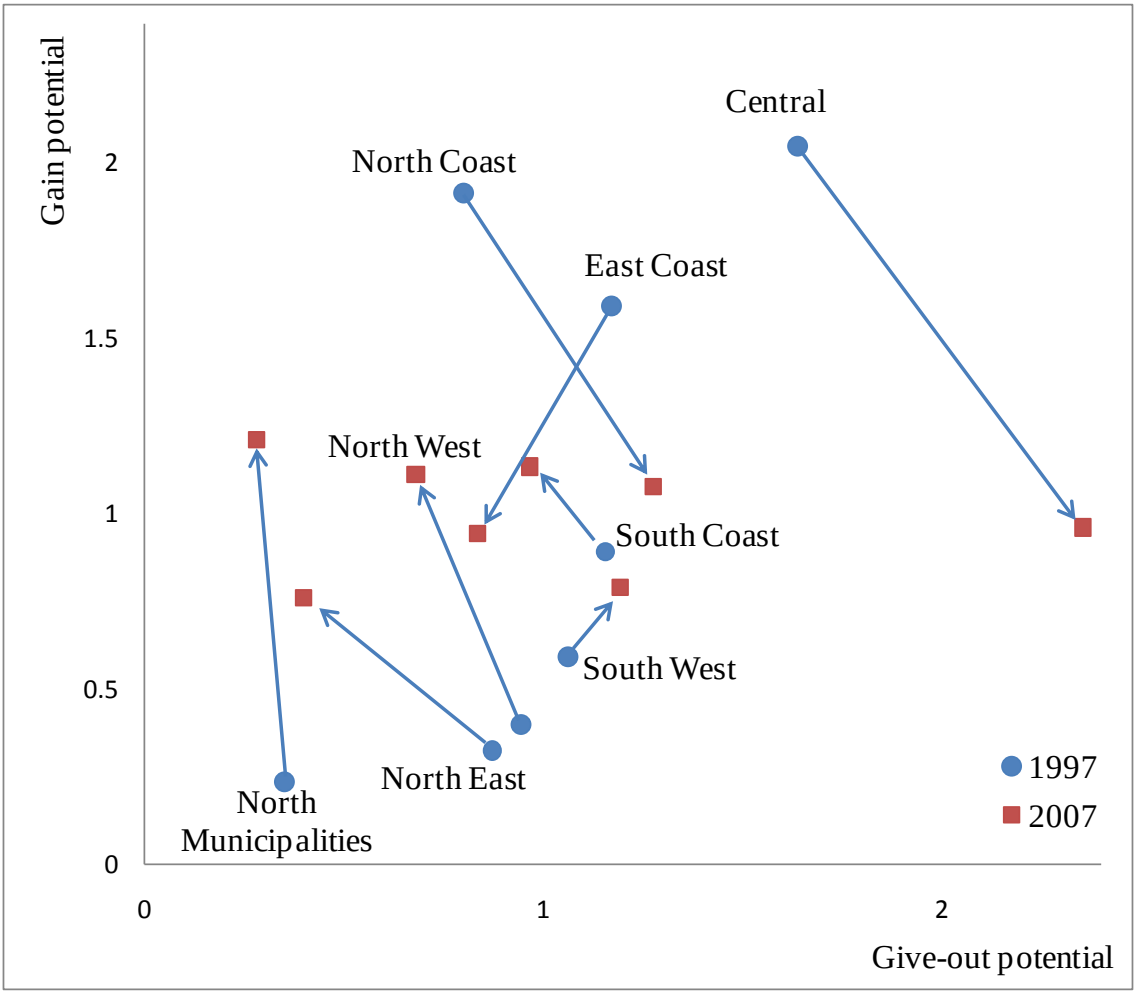


Figure 5 Give-out and Gain potential of trans-regional trade in value added

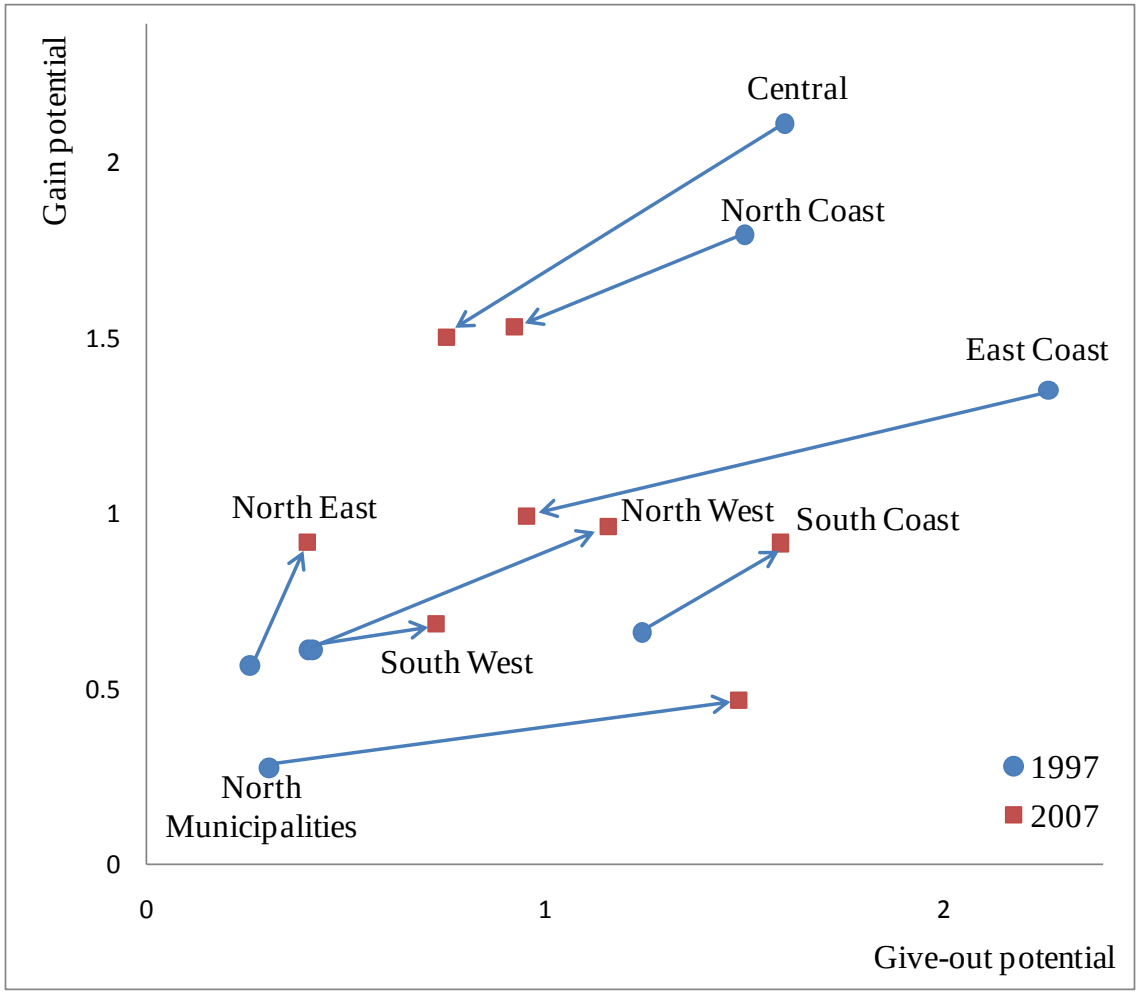


Table 6 TiVA based domestic Revealed Comparative Advantage (RCA) indicator and its changing pattern between 1997 and 2007

		Agriculture	Mining and quarrying	Food products and tobacco	Textile and garment	Wooden products and furniture	Pulp, paper and printing	Chemical	Non-metallic mineral products	Metal products	General mechinary	Transport equipment	Electric apparatus and electronic quipment	Other manufacturing products	Electricity, gas, and water supply	Construction	Trade and transportation	Other services	Standard Deviation (SD)	Change rate of SD (%)
1997	North East	0.63	2.42	0.53	0.34	1.39	0.44	1.28	1.10	1.20	0.99	1.13	0.50	0.82	0.68	0.15	0.91	0.41	0.52	
	North Municipalities	0.38	0.40	0.74	0.52	0.72	1.09	1.53	0.40	1.33	0.52	2.09	1.72	0.97	0.97	1.04	1.12	1.77	0.51	
	North Coast	1.02	1.11	1.04	0.90	0.42	1.03	1.12	1.07	0.99	1.81	0.51	0.76	0.71	0.98	1.34	0.88	0.95	0.30	
	East Coast	0.67	0.18	0.80	1.74	1.07	1.28	1.53	0.57	1.00	1.11	1.62	2.03	1.07	0.85	0.72	1.14	1.11	0.45	
	South Coast	1.03	0.43	1.02	2.31	0.87	1.31	0.63	0.73	0.57	0.29	1.26	1.90	1.49	1.05	1.67	1.23	1.25	0.51	
	Central	1.25	1.23	1.08	0.73	1.41	0.96	0.69	1.55	0.98	0.76	0.86	0.36	1.25	1.16	0.74	0.90	0.89	0.29	
	North West	1.10	1.78	0.72	0.28	0.42	0.39	0.83	0.53	1.41	0.45	0.44	0.86	0.57	1.22	0.75	1.07	0.85	0.39	
	South West	1.19	0.93	1.74	0.27	1.77	0.93	0.65	0.73	1.00	0.52	1.25	0.78	0.80	0.84	1.46	1.10	1.22	0.39	
	Standard Deviation (SD)	0.29	0.71	0.34	0.70	0.46	0.32	0.36	0.36	0.24	0.46	0.52	0.62	0.28	0.17	0.46	0.12	0.37		
2007	North East	1.45	2.19	1.00	0.05	1.00	0.36	1.68	0.71	0.69	0.62	3.07	0.20	0.64	1.20	1.51	0.68	0.39	0.75	44
	North Municipalities	0.12	0.42	0.51	0.09	0.06	0.30	0.57	0.15	0.38	0.63	0.99	0.49	0.80	0.54	0.31	0.96	3.01	0.66	29
	North Coast	1.30	0.97	1.00	0.93	2.24	0.99	1.09	2.03	1.27	0.74	0.68	0.40	0.54	0.71	0.02	0.87	1.04	0.52	72
	East Coast	0.24	0.10	0.43	1.20	0.30	1.06	1.83	0.40	0.96	2.24	1.51	2.75	2.09	0.64	0.66	1.09	1.01	0.75	67
	South Coast	0.32	0.28	0.19	4.35	2.12	2.98	0.66	1.01	1.03	2.61	0.40	2.70	2.18	1.16	0.21	0.92	0.66	1.17	128
	Central	1.44	1.09	1.19	0.47	1.07	1.07	1.03	1.73	1.41	0.59	0.50	0.81	0.90	1.05	0.79	1.19	0.58	0.34	17
	North West	1.43	2.28	1.31	0.22	0.18	0.31	0.65	0.66	0.75	0.17	0.35	0.19	0.16	1.24	2.02	1.09	0.87	0.64	63
	South West	1.71	0.56	2.76	0.10	0.55	0.50	0.58	0.78	1.40	0.28	1.32	0.29	0.67	1.59	3.26	1.16	0.49	0.85	118
	Standard Deviation (SD)	0.61	0.78	0.74	1.35	0.79	0.83	0.47	0.60	0.34	0.86	0.84	1.03	0.69	0.33	1.03	0.16	0.79		
Change rate of SD (%)		111	11	116	92	73	157	31	69	41	86	64	65	144	102	124	31	115		

: first rank : second rank

Figure 6 Give-out potential of induced value added by regional exports

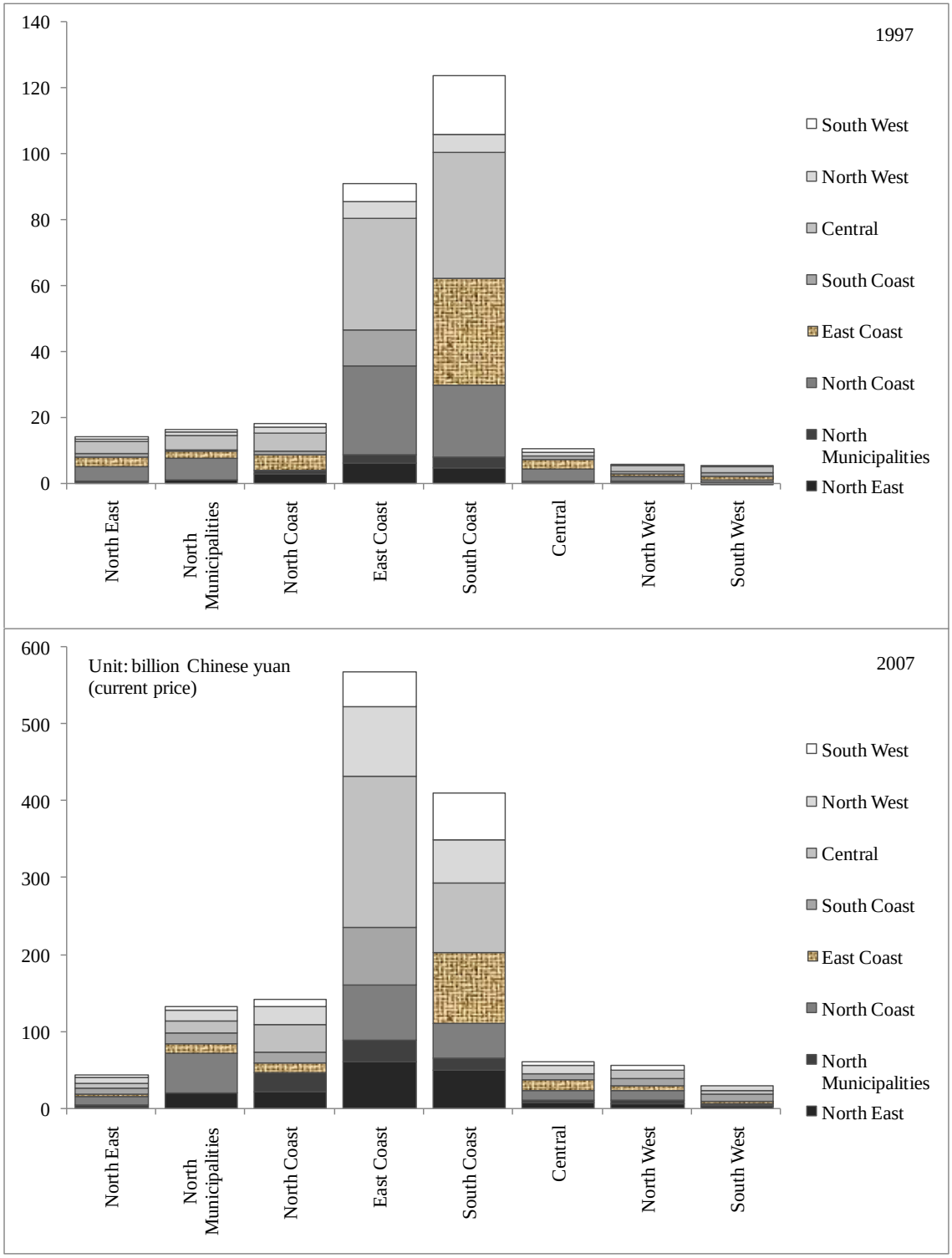
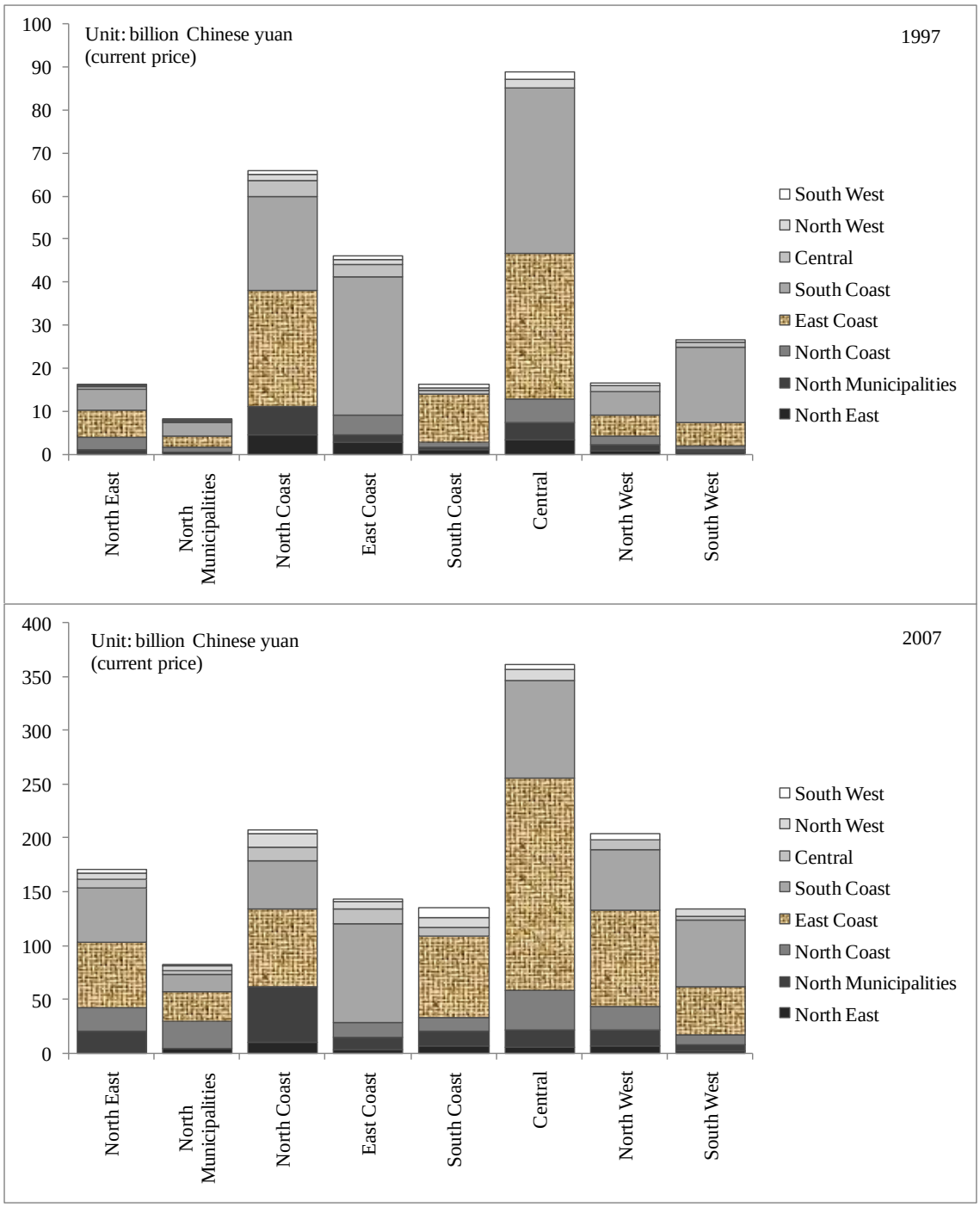


Figure 7 Gain potential of induced value added by regional exports



Appendix 1 Region classification

8 Regions	China's 31 Province-level Regions
North East	Liaoning, Jilin ,Heilongjiang
North Municipalitis	Beijing, Tianjin
North Coast	Hebei, Shandong
East Coast	Shanghai, Jiangsu, Zhejiang
South Coast	Fujian, Guangdong, Hainan
Central	Shanxi, Anhui, Jiangxi, Henan, Hubei, Hunan
North West	Inner Mongolia, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang
South West	Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet