Analysis on Dependence Degree of Production Capacity Cooperation between Guangzhou and Countries along the B&R: Based on the Trade Intensity Index

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Abstract. Guangzhou, a frontier city of reform and opening up, has a pivotal status in the development of the Belt and Road Initiative and it is critical to promote the global production capacity cooperation of B&R Initiative by inspecting the degree of production capacity cooperation between Guangzhou and countries along B&R. As a result, this paper divides the 65 B&R countries into six geographical regions according to the classification of Statistical Bulletin of China’s Outward Foreign Direct Investment to calculate the dependence degree of trade and investment between Guangzhou and the six regions based on the Trade Intensity Index. The result shows that Guangzhou has the strongest trade complementary with Central Asia and Western Asia and faces new opportunities of trade cooperation with ASEAN and South Asia.

1. Introduction

As a leading city for China’s reform and opening up, Guangzhou has obvious outward-oriented economic characteristics and its urban economic development cannot go on without the world’s development. The prominent feature of the new trend of world economic development is economic globalization. The essence of globalization lies in the global division of labour, which will further develop the international production capacity cooperation. In response to the current economic development situation, the Central Government of the CPC has initiated major development paths such as the “B&R Initiative” and “Made in China 2025”. The B&R initiative meets the requirements of the era and the desire of countries to accelerate the development of cooperative governance and provides a huge inclusive development platform. Guangzhou seizes the strategic opportunities of the B&R initiative to positively responses to the central government’s policy. It timely implements the “Guangzhou Manufacturing 2025 Strategic Plan” by actively participating in the B&R initiative to benefit from the international structural cooperative governance. This will enhance in-depth production capacity cooperation between Guangzhou and those countries along the B&R and promotes the transformation and upgrading of Guangzhou's manufacturing industry. This paper uses the Trade Intensity Index Model to analyse the dependence degree of trade and investment
between Guangzhou and countries along B&R to estimate the competitive and complementation of their production capacity cooperation.

The data of trade between Guangzhou and countries alongside the Belt and Road are from the Guangzhou Statistical Yearbook, the Guangdong Statistical Yearbook, the Guangdong Customs Database and the relevant statistical bulletins. The trade data of “B&R” countries are derived from the 1995-2014 World Trade Database and UN Trade database. We select 65 countries and regions involved in the "Silk Road Economic Belt" and "Maritime Silk Road Economic Belt" as research samples (according to table 1). Due to classification of the Statistical Bulletin of China’s Outward Foreign Direct Investment, we divide these countries into six regions which are East Asia, ASEAN, West Asia, Central Asia, South Asia, Commonwealth of Independent States (CIS), and Central and Eastern Europe to analyse their investment and trade.

| Regions | COUNTRIES |
|---------|-----------|
| East Asia(1) | Mongolia |
| ASEAN (10) | Singapore, Malaysia, Indonesia, Myanmar, Thailand, Laos, Cambodia, Vietnam, Brunei, Philippines |
| West Asia(18) | Iran, Iraq, Turkey, Syria, Jordan, Lebanon, Israel, Palestine, Saudi Arabia, Yemen, Oman, UAE, Qatar, Bahrain, Greece, Cyprus, Egypt Sinai Peninsula |
| South Asia(8) | India, Pakistan, Bangladesh, Afghanistan, Sri Lanka, Maldives, Nepal, Bhutan |
| Central Asia(5) | Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan |
| CIS(7) | Russia, Ukraine, Belarus, Georgia, Azerbaijan, Armenia, Moldova |
| Central and Eastern Europe(16) | Poland, Lithuania, Estonia, Latvia, Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Serbia, Albania, Romania, Bulgaria, Macedonia |

2. TII Model Analysis of Degree of Production Capacity Cooperation between Guangzhou and Countries along B&R

2.1. The Construction of Trade Intensity Index Model

The concept of Trade Intensity Index (TII) was apparently first used by A. J. Brown(1949)[1]. Applied and developed by several academics like Kojima (1964)[2] and Kunimoto (1977)[3], the Trade Intensity Index has been used as a convenient approach for describing the geographic distribution of country trade and an effective quantitative indicators to measure the level of trade ties between two countries. Since it is so convenient, many academics adopt it to analyse the relationship of trade and investment between two areas based on specific trade organizations or agreements. Even in recent years, the TII is still widely used. Edmonds et al (2010)[4] used standard trade intensity index to measures China’s trades with different trade organizations and found that China’s trade had been at a very intensive level with countries in East and Southeast Asia (ESA) and at a low level with countries in Europe (EU) and US-Canada (USC). Saini (2012)[5] discusses the significance of South Asia in world GDP, members’ trade openness and the level of intra-regional trade based on the findings from the trade intensity index. Yazicia (2016) [6] explored trend of bilateral trade between Turkey and Israel, with calculating trade intensity index values over the period 2000-2014 while Renjini et al. (2016) [7] used the index to study the status, composition, intensity and competitiveness of agricultural trade between India and the ASEAN for the period 1995 – 2014. This paper follows the Trade Intensity Index method to analyse the level of dependence on trade and investment cooperation between Guangzhou and countries along the B&R.
The mathematical definition of TII is:

$$TII_{ab} = \frac{\sum X_{ab}/\sum X_a}{\sum M_b/\sum M_w}$$

where a and b represent region, w represents world market, $TII_{ab}$ represents trade intensity index between region a and b, $X_a$ represents trade volume from a exports to b, $X_a$ represents gross export volume of a, $M_b$ represents total import volume of b, $M_w$ represents gross import volume of world. If $TII_{ab} > 1$, it means a large degree of integration of trade and stronger complementarity between a and b, otherwise, the complementarity is weaker. Similarly, the formula above can also be used to test the degree of integration of international capacity investment. Under this circumstances, $X_a$ stands for the investment from a to b, $X_a$ stands for the gross investment of region a, $M_b$ stands for the gross attracting investment of region b, $M_w$ stands for the gross investment of world. If $TII_{ab} > 1$, it means a large degree of integration of investment between a and b.

### 2.2. Analysis of The Results of Trade Intensity Index Model

#### 2.2.1. The Complementarity of Trade

The calculation results of the trade intensity index of the production capacity between Guangzhou and countries along the B&R are presented in Table 2-1. As it shows, the TII of Guangzhou and countries along the B&R ranges from 0.462 to 1.203 for the period from 1995 to 2014 and the TII has reached the critical value of 1 after 2011. A steady upward trend has appeared after then which reflects that the trade links between Guangzhou and countries along the B&R has developed rapidly and strengthened gradually. The trend also indicates that there exists strong complementarity between Guangzhou and these countries. In fact, with the rise of Guangdong's industries, Guangdong Province has surpassed South Korea, Singapore, Hong Kong, and Taiwan to become ASEAN’s third largest export trade region. As a leading city of reform and opening up, Guangzhou’s economic and trade relations with countries along the B&R are getting closer. In 2012, Guangzhou’s import and export volume along the B&R was $10.33 billion which increased by 0.5%; in 2013, the figure was $11.74 billion which increased by 13.7%; in 2014, the number reached $14.06 billion which increased by 19.7%; in 2015, the amount was 214.27 billion Yuan which increased by 12.7%.

In 2014, Central Asia got the highest TII with Guangzhou among countries along the B&R, which was only 0.471 in 1995 and increased rapidly later. The rapid increase of TII of Central Asia is due to its geographical advantage: Central Asia and Guangzhou have convenient sea transportation conditions. With the steady advancement of China and Central Asia’s free trade zone construction, the economic development in Guangzhou and Central Asia grow rapidly, and the construction of cooperation networks of oil and gas promotes stably. West Asia is also the region with a higher average of TII in 2014, which rose from a low 0.417 in 1995 to 1.380 in 2014. In recent years, the cooperation between Guangzhou and West Asia in the field of energy and infrastructure becomes closer. The TII of Guangzhou to South Asia is relatively low, followed by Central and Eastern Europe and the ASEAN region, and its TII fluctuated around 1.100 in 2014. These figures imply that Guangzhou has weak trade links with South Asia, Central and Eastern Europe and ASEAN while trade potentials among them are enormous. The solution is to optimize trade structures of these countries and expand the trade areas constantly. Therefore, Guangzhou has the strongest trade complementarity with Central Asia and West Asia.

### Table 2-1. TII of Production Capacity between Guangzhou and Countries along The B&R

| All Countries | ASEAN | West Asia | Central Asia | South Asia | CIS Central Asia | & Eastern Europe |
|---------------|-------|-----------|--------------|------------|-----------------|-----------------|
|               |       |           |              |            |                 |                 |


2.2.2. The Complementarity of Investment

The calculation results of the investment intensity index of the production capacity between countries along the B&R and Guangzhou are presented in Table 2-2. As it shows, the investment intensity index of Guangzhou and countries along the B&R ranges from 0.486 to 1.198 for the period from 1995 to 2014 and the value cannot exceed 1 until 2010. A steady upward trend has appeared after 2010, which reflects that the investment complementarity of the production capacity between countries along the B&R and Guangzhou strengthens increasingly, so as the investment links. In fact, the results also indicate that enterprises of Guangzhou have 104 overseas investment projects in the “Maritime Silk Road” countries, with a total investment of 1.254 billion dollars. Moreover, 9 state-level investment projects carried by Guangzhou’s enterprises to B&R countries, which cover trade, production, logistics, R&D, etc., have been approved.

From the regional respects, West Asia gets the highest investment intensity index with Guangzhou among countries along the B&R from 0.383 in 1995 to 1.303 in 2014, with an annual growth rate of 6.31%. In recent years, China has actively promoted the establishment of an agreement with the GCC to establish a free trade zone. The proposal of "Belt and Road" Initiative is providing new development opportunities for this. The co-construction of B&R between Guangzhou and the West Asia region is conducive to make better use of their own advantages and deepen mutual trade and investment cooperation. Central Asia is followed by West Asia, which is also a region with a high investment intensity index ranged from 0.458 in 1995 to 1.271 in 2014. It implies that the investment potential and complementarity between Guangzhou and Central Asia are huge. The index of Guangzhou with ASEAN is lowest, which ranges from 0.410 to 1.059 and the critical value cannot exceed 1 until 2012. This implies that the complementarity of production capacity investment needs to
be strengthened. In South Asia, the index change slightly, ranges from 0.482 to 1.138, which shows that there exists great complementary potential for investment in production capacity and Guangzhou faces new development opportunities of investment cooperation with both ASEAN and South Asia. In conclusion, Guangzhou has the largest complementarity of investment index with Central Asia and West Asia.

Table 2-2. Investment Intensity Index of Production Capacity between Guangzhou and Countries along The B&R

| Year | All Countries | ASEAN | West Asia | Central Asia | South Asia | CIS | Central & Eastern Europe |
|------|---------------|-------|-----------|-------------|------------|-----|-------------------------|
| 1995 | 0.486         | 0.485 | 0.383     | 0.458       | 0.482      | 0.594 | 0.516                   |
| 1996 | 0.539         | 0.411 | 0.358     | 0.543       | 0.485      | 0.747 | 0.687                   |
| 1997 | 0.511         | 0.410 | 0.531     | 0.499       | 0.384      | 0.740 | 0.499                   |
| 1998 | 0.525         | 0.472 | 0.590     | 0.518       | 0.461      | 0.741 | 0.368                   |
| 1999 | 0.578         | 0.559 | 0.509     | 0.656       | 0.620      | 0.756 | 0.368                   |
| 2000 | 0.590         | 0.524 | 0.506     | 0.602       | 0.640      | 0.777 | 0.492                   |
| 2001 | 0.598         | 0.659 | 0.642     | 0.659       | 0.488      | 0.669 | 0.468                   |
| 2002 | 0.666         | 0.545 | 0.588     | 0.852       | 0.689      | 0.740 | 0.580                   |
| 2003 | 0.666         | 0.423 | 0.656     | 0.915       | 0.574      | 0.795 | 0.632                   |
| 2004 | 0.724         | 0.642 | 0.632     | 1.034       | 0.685      | 0.870 | 0.478                   |
| 2005 | 0.789         | 0.693 | 0.660     | 1.243       | 0.727      | 0.789 | 0.623                   |
| 2006 | 0.752         | 0.705 | 0.603     | 0.985       | 0.725      | 0.833 | 0.660                   |
| 2007 | 0.854         | 0.693 | 0.868     | 1.133       | 0.827      | 0.850 | 0.750                   |
| 2008 | 0.869         | 0.681 | 1.043     | 1.114       | 0.617      | 0.860 | 0.898                   |
| 2009 | 0.959         | 0.816 | 1.136     | 1.114       | 0.905      | 0.874 | 0.910                   |
| 2010 | 1.028         | 0.847 | 1.311     | 1.080       | 0.947      | 0.976 | 1.005                   |
| 2011 | 1.021         | 0.949 | 1.165     | 1.035       | 0.984      | 1.096 | 0.899                   |
| 2012 | 1.123         | 1.029 | 1.200     | 1.289       | 1.053      | 1.060 | 1.106                   |
| 2013 | 1.134         | 0.915 | 1.293     | 1.269       | 1.136      | 1.049 | 1.142                   |
| 2014 | 1.198         | 1.059 | 1.303     | 1.271       | 1.138      | 1.167 | 1.247                   |

Source: Calculated the data from the World Bank Database, the UNComrade Database, the Guangzhou Statistical Yearbook and the relevant statistical bulletins from 1995-2014.

3. Conclusions and Suggestions
According to the Trade Intensity Index for the competitiveness analysis of trade and investment between Guangzhou and countries along the B&R, we find that: (1) In terms of production capacity trade, Guangzhou has the strongest trade complementarity with Central Asia and West Asia, while has weak trade links with South Asia, Central and Eastern Europe, and the ASEAN region, which reflects the great potential of trade development between Guangzhou and the named regions. (2) In terms of production capacity investment, Guangzhou also has the greatest complementarity with Central Asia and West Asia, and has broad prospects for cooperation with ASEAN and South Asia.

Based on the above conclusions, Guangzhou shall accumulate its trade and investment advantages in Central Asia and West Asia to realize and expand its complementary strategic cooperation with Central Asia and West Asia by collaboration in realm of personnel construction and innovation-driven
development. At the same time, Guangzhou shall speed up the transition of intelligent manufacturing, green manufacturing, information manufacturing and high-end manufacturing industry. Guangzhou shall also explore opportunities for cooperation with South Asia, Central and Eastern Europe, and the ASEAN region to actively develop the cooperation space by taking advantages of the strategy of “going out” and “bringing in”. Guangzhou also shall strengthen the linking of manufacturing between Guangzhou and B&R countries to promote the transformation, upgrade of its manufacturing industry to improve its manufacturing industry.

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