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# CONTAINER PORTS DEVELOPMENT AND REGIONAL ECONOMIC GROWTH: AN EMPIRICAL RESEARCH ON THE PEARL RIVER DELTA REGION OF CHINA

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**Abstract**: With the PRD (Pearl River Delta) economy emerging, the PRD container ports facilities and service-related have been largely intensified and extended since mid-1990s. Container throughputs handled by local ports have skyrocketed for the sake of massive containerized freight resulted from regional economic growth to be driven by FDIs (Foreign Direct Invest) and related inputs. By utilizing a Cobb-Douglass production function, this paper investigates the relationships between local container throughputs, FDIs and gross products value of industry. It has been found that there exists high elasticity and heavy increasing returns to scale for local container ports in terms of FDIs and gross product values of industry; the regional economic growth and FDIs have surprising depended on local container transport development. So further measures should be taken to intensify the logistics system, including upgrading port facilities, reducing the institutional transition costs and highlighting operation efficiency to leverage PRD and regional economic development.

**Key Words**: China, Container port development, Regional economy, Pearl River Delta

## 1. INTRODUCTION

As critical international logistics facilities, container ports have been playing increasingly important roles in regional and national economies in China. As having been seen in the Pearl River Delta (PRD) region, port systems have been heavily intensified in the recent decades.

Just mid-1990s ago, Hong Kong was ever the heavy-relied gateway for South China to export containerized cargo, while the PRD container port systems were in their infants. However, with ports emerging in Shenzhen and Guangzhou, container logistics systems in these areas have been amazingly changed in recent decade (Wang, 1998; Chen, 2002). Shenzhen Port, with its surprising throughput of 10,649,600 TEUs in 2003, ranked No. 2 in China top-ten coastal seaports and No. 4 in world top-ten container seaports as well this year (Xie, 2003). At the same time, Guangzhou Port and other mid-small ports in PRD region have developed to adapt the ever-growing container transport demands and economic growth in these areas. On the other hand, Hong Kong Port, with its best location, highest operation efficiency and free trade environment, has been keeping its leading position in container port industries Southeast Asia-wide as well as worldwide since China's opening door policies. Container ports in the PRD, however, have enjoyed much more rapid development than Hong Kong Port in terms of port container throughput growth, which hence result acute political-economic issues between governments of the Hong Kong SAR and Guangdong province.

Following the development situation of PRD container ports, there have been studies to concentrate on transport geography in the area and analyze the interaction of container ports development between the PRD and Hong Kong. Wang (1998; 2000) investigated the progress of container port systems evolving in South China, particularly on the interplay between Hong Kong and the other ports in the PRD region; Loo (1999) expressed the China's opening-door-policy impact on the transport geography of the PRD and, focusing on significant factors of development initiatives, financing strategies and changing transport geography. Some studies, such as Seabrooke W. *et al* (2003) and PMB (2001), forecasted cargo-handling volumes, investigated ports competitiveness and total market share. In general, these studies aimed to explain how and how much the PRD ports impacted on Hong Kong Port.

There have been hardly papers interested in the interplay between the economic growth and container ports development in the PRD region. Intuitionally container port development and economic growth in this region have been becoming an outstanding dual phenomenon. This paper investigates the relationship between high-speed economic growth and container ports development in the region. Firstly, we give PRD definition and present an overview of container ports development and economic growth in the region; then utilize Cobb-Douglass productive functions to model and interpret the container throughput growth, gross industrial product value and FDI in the region; finally, present conclusions and policy implications.

## 2. AN OVERVIEW OF CONTAINER PORTS DEVELOPMENT IN PRD REGION

### 2.1 Defining the PRD Region

Geographically, the Pear River (Zhujiang) consists of three rivers, the West River, the North River and the East River. Together with the South China Sea, the Pearl River contributes to forming the PRD fluvial plain. Being located in the southern central Guangdong province, the

PRD Economic Region (see figure 2.1), as specified by Guangdong provincial government, includes Guangzhou, Shenzhen, Dongguan, Foshan, Jiangmen, Zhongshan, Zhuhai, and the urban areas of Huizhou and Zhaoqing as well as county-status cities Huiyang, Huidong, Boluo, Gaoyao and Sihui (Enright, M.-J. et al, 2003). PRD has land area of 41,698 km square and registered population of 37.14 million (in 2002). They respectively account for 23.4% total land area and 47.4% total registered population of whole Guangdong province (compiled from Yangtze River Delta & Pearl River Delta and Hong Kong &Macao SAR, 2003). With the strong economic ties, common geography, linguistic and cultural heritage among the member cities, the PRD region has been considered a distinct and independent entity (Seabrooke, W. *et al*, 2003).


Figure 1. The PRD Region in Guangdong Province

Source: redrawn from Seabrooke W. et al. (2003).

## 2.2 Container Ports Development in the PRD

As southern gateway of China, the PRD has a very advantageous position to develop its maritime trade and port-related industries; however, the container transports systems in the PRD were far more under-developed before China's reform and opening. From 1949 to 1978, except Guangzhou municipality, which increased deep-water berths steadily from 5 to 17, deep-berths in other cities in the PRD hadn't any increase. By the mid-1990s, the South China and the most of Mainland China regions had to rely heavily on transshipment services of container ports in Hong Kong (Loo, 1999). However, China has implemented door-open policies since 1980s, and with Shenzhen and Zhuhai becoming the Special Economic Zones, the construction of PRD container ports has been skyrocketed under highly considering by the local and central government. Particularly in Shenzhen, the construction of Shekou Port was started as early as 1978; afterwards, container ports of Mawan, Chiwan and Yantian were under construction. At the same time, container ports (berths) construction have been spread

across Guangzhou and other mid-small PRD ports, including ports of Huizhou, Zhuihai, Dongguan, Zhongshan, Jiangmen, Fushan and Zhaoqing; they have also begun to boost its container handling facilities and related services. By 2000, the number of container services-related berths totaled 145 in the whole PRD region, of which 16 were deep-water berths specialized for container handling in the Port, 10 belong to Shenzhen Port and 6 Guangzhou; besides deep-water berths, there have been 129 non-specialized berths that spread over mid-small sized ports across the PRD that have been engaged in the container handling services. The characteristics of main container ports in the PRD are listed in appendix table.

Along with ports facilities expanding in the PRD, container throughputs have experienced leapfrog growth in recent decade, as listed in table 1.

Table 1. Container Throughputs of Main Ports in the PRD Region (in 10,000 TEUs)

| Ports | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|
| Shenzhen | 28.4 | 58.9 | 114.7 | 195.9 | 298.6 | 399.4 | 507.6 | 761.8 | 1065.0 |
| Guangzhou | 51.5 | 55.8 | 68.7 | 84.1 | 117.7 | 143.1 | 173.8 | 217.3 | 276.9 |
| Dongguan | N.A. | N.A. | N.A. | 19.5 | 35.4 | 39.7 | 25.6 | 23.1 | N.A. |
| Huizhou | 1.7 | 2.2 | 2.2 | 15 | 6.8 | 5.6 | 7.2 | 20.2 | 26.5 |
| Zhuhai | 27.5 | 27 | 26.4 | 26.2 | 29.2 | 31.4 | 31.4 | 34.7 | 41.1 |
| Jiangmen | 14.2 | 19.9 | 16.4 | 21.9 | 23.5 | 30.2 | 33.3 | 85.2 | 83.4 |
| Zhongshan | 17.8 | 22.2 | 31.9 | 38.4 | 43.3 | 50.6 | 55.2 | 64.2 | 75.5 |
| Foshan | 31.8 | 35.8 | 46.5 | 50.9 | 55.3 | 69.8 | 73.4 | 96.6 | 130.4 |
| Total | 172.9 | 221.8 | 306.8 | 432.4 | 574.4 | 730.1 | 881.9 | 1280 | 1698.8 |
| Proportion (%) | 46 | 52 | 60 | 65 | 72 | 74 | 77 | 76 | 79 |

Note:

(1) N.A. presents not available.

(2) Total throughputs don't include data for Dongguan.

(3) Shenzhen Port includes Shekou, Chiwan, Mawan and Yantian ports.

(4) Proportion data stand for the percentage of Shenzhen Port plus Guangzhou Port in the total container throughputs in the PRD ports listed in the table except for Dongguang Port.

Source: compiled from Jiaotongbu: Quanguo Jiaotong Tongji (Ministry of Communications: National Transport Statistical Yearbook, various years), MOR, Beijing, China. Data for Dongguan and Foshan were complied from the DRCG (2004).

As can be seen in table 1, total annual throughput was about 1.73 million TEUs when Shenzhen Port and Guangzhou Port were in their start-up stage in container handling services in 1995; in 2003, however, total throughput touched 16.99 million TEUs, of which 79 percent accounted for Shenzhen Port and Guangzhou Port. During the period from 1995 to 2003, container throughput average growth rate of Shenzhen Port reached 57.33%, and Guangzhou Port 23.4%. The emergence of container ports in the PRD region has become a famous story in the history of container ports development in the world. The container throughput growth situation of PRD ports is shown in figure 2.

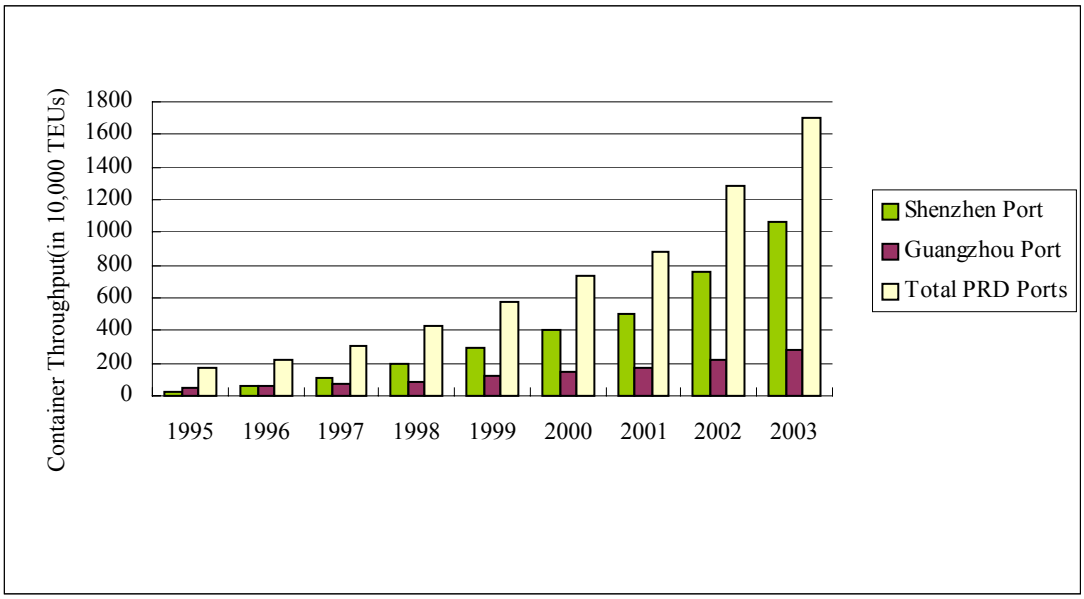


Figure 2. Annual Throughputs Handled by PRD Ports

Source: draw according data in table 1.

As shown in figure 2, the container throughputs handled by Shenzhen Port had increased dramatically while the container throughputs by Guangzhou Port increased moderately from 1995 to 2003. It is shown that the container throughputs of Shenzhen Port and Guangzhou Port accounted for most of the total throughput handled by all PRD ports. It is both Shenzhen and Guangzhou Port that drive PRD container throughputs to skyrocket in recent decade.

## 3. THE ECONOMIC DEVELOPMENT OF GUANGDONG PROVINCE AND PRD

### 3.1 The Economic Development of Guangdong Province

Guangdong province has been experienced rapid economic growth. The main economic indicators are shown in table 2 and table 3. With annual growth rate of 13.4%, GDP of Guangdong province increased from 573.4 billion Yuan in the initial reform year 1979 to 1362.6 billion Yuan in 2003; and in the same period annual growth rate of GDP per capita reached 11.4%, the gross product value of industry and total amount of imports and exports were of two-digit growth from 1996 to 2003. Being the gross value growing, the economic structure has been evolved along with the primary industry share decreasing and the tertiary industry increasing continually since 1995. On the other hand, high growths can be seen in the critical economic variables: gross product value of industries (GPVI), total value of imports and exports (TVIEs), foreign capital actually utilized and FDI (foreign direct investment) (see table 2 and table 3).

Table 2. Main Economic Indices of Guangdong Province

| | 1995 | 2000 | 2002 | 2003 | Average annual growth rate (%) |
|---|---|---|---|---|---|
| GDP (100 million Yuan) | 5734 | 9662 | 11736 | 13626 | 13.4 (1979-2003)<br>10.9 (1996-2003) |
| Industrial structure of GDP | | | | | |
| Primary industry (%) | 15.1 | 10.3 | 8.8 | 8.0 | |
| Secondary industry (%) | 50.2 | 50.4 | 50.4 | 53.6 | |
| Tertiary industry (%) | 34.7 | 39.3 | 40.8 | 38.4 | |
| GDP per capita (Yuan) | 6999 | 12885 | 15030 | 17213 | 11.4 (1979-2003) |
| Gross product value of industry (100 million Yuan) | 7459 | 16510 | 22896 | 29195 | 20.8 (1979-2003)<br>18.6 (1996-2003) |
| Total value of imports and exports (100 million USD) | 1140 | 1701 | 2211 | 2835 | 12.1 (1996-2003) |
| Foreign capital actually utilized (100 million USD) | 121 | 146 | 166 | 189 | 5.7 (1996-2003)<br>14.2 (2002-2003) |
| FDI proportions of foreign capital actually utilized (%) | 84.1 | 84.0 | 79.0 | 82.2 | ---- |

Note:

(1) GDP calculated at current year prices. Gross product value of industry calculated at 1990 constant prices.

(2) Growth rates compiled are calculated at comparative prices.

Source: complied and calculated from Guangdong Statistical Yearbook, various related years.

Table 3. Annual Growth of Indices of Guangdong Province

| | Growth Rates (%) | | | |
|---|---|---|---|---|
| | throughputs [a] | GPVIs | FDIs | TVIEs |
| 1996 | 43.6 | 18.2 | 14.2 | 5.8 |
| 1997 | 59.9 | 18.7 | 0.8 | 18.3 |
| 1998 | 52.7 | 16.5 | 2.6 | -0.2 |
| 1999 | 48.7 | 14.4 | 1.5 | 8.1 |
| 2000 | 30.3 | 18.4 | 0.3 | 21.2 |
| 2001 | 25.6 | 16.5 | 6.0 | 3.8 |
| 2002 | 43.7 | 19.1 | 1.1 | 25.3 |
| 2003 | 37.1 | 27.5 | 18.8 | 28.2 |

Notes:

a. Throughputs only included Guangzhou Port plus Shenzhen Port.

Sources: compiled from Guangdong Provincial Statistical Yearbooks, related years, China Statistical Publishing House, Beijing, China.

Container throughputs handled by Shenzhen Port and Guangzhou Port have been of high growth trend since 1996, and there are strong relative relationships between throughputs and gross product values of industries as well as foreign direct investment in Guandong province

that is shown in figure 3 (GPVI stands for gross product value of industries, TVIE total value of imports and exports, FDI foreign direct investment.)

Growth rate relationships are presented in figure 4（draw according to the data in table 3）. The figure also shows the elasticity of growth rate of port container throughputs to GPVIs, FDIs and TVIEs. Obviously, the elastic values are more than 1 that explains volumes of container throughputs handled by Shenzhen and Guangzhou Ports are very sensitive to the regional economic growth and investment, especially the gross product values of industries and foreign direct investments.

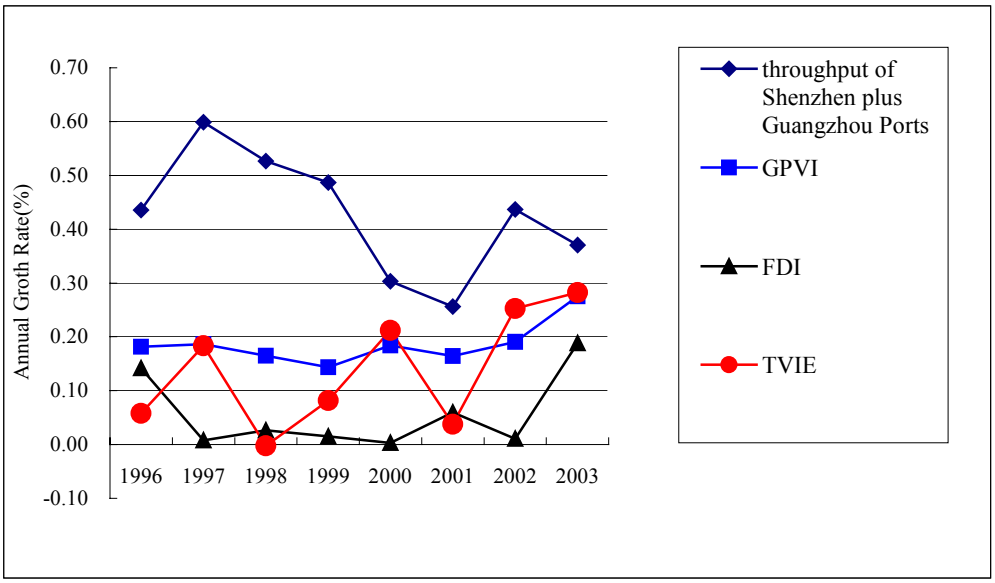


Figure 3. Growth Rates of Container Throughput and Economic Indices in the PRD

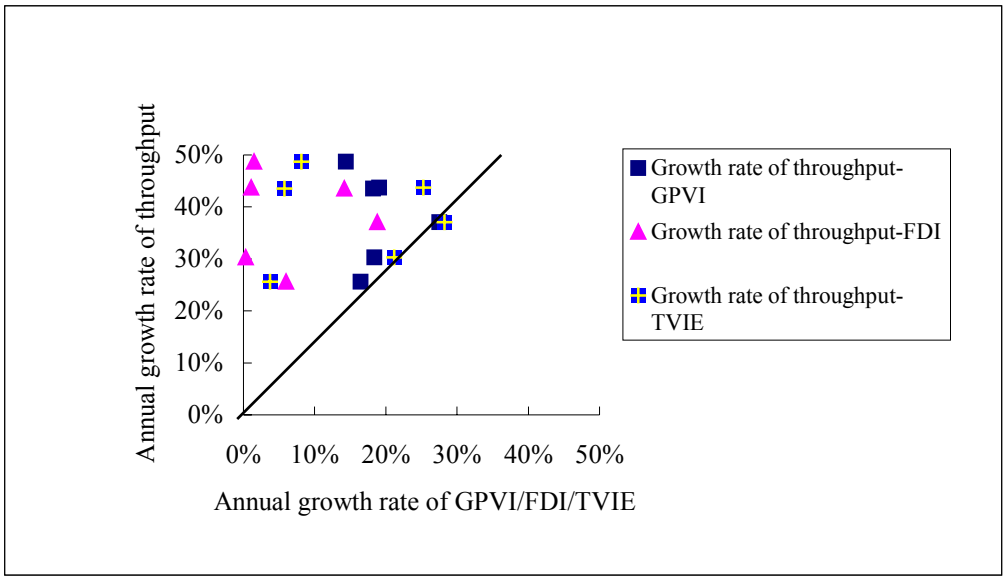


Figure 4. Growth Rates Comparisons

### 3.2 The Economic Development of PRD Region

PRD region has been considered a significant manufacturing base in China as well as in the Southern East Asia (Ng and Tuan, 2003; Enright, et al, 2003). In 2003, the GDP of PRD reached RMB 1134.1 billion Yuan and grew by16.6% over last year and; at the same time, the gross product value of industry totaled RMB 2919.5 billion Yuan; the foreign capital actually utilized and total amount of imports and exports went up to USD 18.9 billion and USD 283.5 billion respectively. The main economic indicators of PRD are shown in table 4.

Table 4. Main Economic Indicators of PRD

| | 1995 | 2000 | 2002 | 2003 | average growth rate (%) |
|---|---|---|---|---|---|
| GDP (100 millions Yuan) | 3900 | 7379 | 9419 | 11341 | 16.6 (2002-2003) |
| GDP per capita (Yuan) | 18242 | 27863 | 34295 | 39782 | 13.9 (2002-2003) |
| GPVI (100 million Yuan) | 5878 | 12866 | 15702 | 21100 | 17.3 (1995-2003) |
| TVIE (100 million USD) | 694 | 1591 | 2119 | 2712 | 18.6 (1995-2003) |
| Foreign capital actually utilized (100 million USD) | 85.79 | 125.41 | 150.21 | 170.27 | 8.9 (1995-2003) |

Notes:

(1) GPVI stands for gross product value of industries, TVIE total value of imports and exports, FDI foreign direct investment.

(2) GDP calculated at current year prices. Gross product value of industry calculated at 1990 constant prices.

(3) Growth rates are calculated at comparative prices.

Sources: complied and calculated from China Statistics Press: Guangdong Province Statistical Yearbook, various years.

In terms of shares of main economic indices in Guangdong province, the GDP of PRD accounted for 68% and 83% that of total Guangdong province in 1995 and 2003 respectively; gross product value of industry 79% and 72%; total value of import and export 61% and 96%; foreign capital actually utilized 71% and 90% (see table 5).

Table 5. PRD Proportions of the Guangdong Total (%)

| | 1995 | 2000 | 2002 | 2003 |
|---|---|---|---|---|
| GDP | 68 | 76 | 80 | 83 |
| Gross product value of industry | 79 | 78 | 69 | 72 |
| Total value of imports and exports | 61 | 94 | 96 | 96 |
| Foreign capital actually utilized | 71 | 86 | 90 | 90 |

Source: calculated from table 3 and table 4.

From the analysis above, it has been seen that PRD has shared most of the whole economy of

Guangdong province. Virtually as an economic growth engine, PRD owned more than 90% foreign capital utilized and became a fascinated region for foreign investors in the past two decades. Obviously, it was the PRD that led Guangdong province stepping to high-speed economic growth, brought intensive containerized freight, and boosted container ports development in this area.

## 4. METHODOLOGIES AND DATA

### 4.1 Variables Selection and Modeling

Many factors drive the container transport services of ports. The factors can be national or international, political or economical, and transport system itself, including strategies and operations of ports, shipping companies as well as competitive situations (Luo, 2002). This study, however, aims to understand how much the regional economic growth contributes to container throughput booming in the PRD region.

As analyzed in section 3, we have known that there are highly close relationships between the regional economic growth and container throughputs handled by the PRD ports in the nearly past decade. The most significant economic characteristic in the development last decade was that economies have heavily relied on the foreign export in both PRD and Guangdong province. It was the foreign investments especially foreign direct investments (FDIs) that resulted to the boosts of industries, foreign imports and exports, and related services in this area, contributing to the GDP rapid growing and making the economies more and more freight-transport-intensive, especially focusing on the containerized freight-transport. Based on these reasons, we select the gross product of industries (GPVIs) and FDIs to interpret ports container throughput (THPs).

We utilize Cobb-Douglas production function to build following model:

$$THP = \beta_0 \left( GPVI - GPVI^* \right)^{\beta_1} \left( FDI \right)^{\beta_2} \tag{1}$$

Where $\beta_0$ is a positive constant and stands for comprehensive efficiency of port performance; $\beta_1$>0, $\beta_2$>0; $GPVI$ is the aggregate gross product value of industry; $FDI$ is foreign direct investment; $GPVI^*$ is part of aggregate gross product value of industry correlated to $FDI$; $THP$ is aggregate container throughputs handled by regional ports.

We use ($GPVI$ - $GPVI^*$) rather than $GPVI$ to solve the intercorrelation issues possibly due to the following regression, because there exists high correlation between aggregate variables $GPVI$ and $FDI$. We define:

$$GPVI^* = \alpha_0 + \alpha_1 \left( FDI \right) + \varepsilon^* \tag{2}$$

Where, $\alpha_i$ is a coefficient to be estimated (for $i$ = 0 or 1); $FDI$ is foreign direct investment and $\varepsilon^*$ is a normal distribution disturbance term.

To make logarithm conversions to equation 1, we have the equation 3:

$$Ln(THP) = Ln\beta_0 + \beta_1 Ln\left(GPVI - GPVI^*\right) + \beta_2 Ln\left(FDI\right) + \varepsilon \qquad (3)$$

Where, all variables are defined as previously. $\varepsilon$ is a normal distribution disturbance term.

### 4.2 Data Description

Just as analyzed in the section 2, being of extremely critical functions served the PRD and whole Guangdong province economic development, Shenzhen and Guangzhou Ports are only two containers ports that have their direct calls; other mid-small ports in this region have served as their feeder ports for consolidate containers. Hence we define: *THPs* for annual container throughputs handled by Shenzhen Port and Guangzhou Port, rather than container throughputs by all PRD ports, *GPVIs* for annual gross product value of industry and *FDIs* for annual foreign direct investments of Guangdong province.

On the other hand, the three kinds of time-series data selected above just cover the period from 1995 to 2003 for the reason that: firstly and most importantly, with Yantian container port being put into initial operation in 1994, Shenzhen Port has being begun to play critical role since 1995; secondly just since the mid-1990s, Guangzhou Port and Shenzhen Port have experienced container throughput booming. Time-series data are listed in table 6.

Table 6 Data Used for Estimation

| years | throughputs (10,000 TEU) | GPVIs | GPVIs -FDI funded enterprises (100 million yuan) | FDIs (million USD) |
|---|---|---|---|---|
| 1995 | 79.9 | 7459 | 2841 | 102 |
| 1996 | 114.7 | 8815 | 3417 | 116 |
| 1997 | 183.4 | 10462 | 4150 | 117 |
| 1998 | 280.0 | 12190 | 5219 | 120 |
| 1999 | 416.3 | 13944 | 6159 | 122 |
| 2000 | 542.5 | 16511 | 7358 | 122 |
| 2001 | 681.4 | 19231 | 9057 | 130 |
| 2002 | 979.1 | 22896 | 11085 | 131 |
| 2003 | 1341.9 | 29195 | 15274 | 156 |

Notes:

(1) Throughputs data cover that of Shenzhen Port and Guangzhou Port.

(2) GPVIs are gross product values of industry of Guangdong province. GPVIs-FDI funded enterprises include those enterprises funded by not only foreign countries but also Hong Kong and Macau enterprises.

(3) All GPVIs are based on 1990 price.

Sources: throughput data complied from table1; economic data complied from National Statistics Bureau: Guangdong Statistical Yearbook, various years, China Statistics Press, Beijing, China.

## 5. ESTIMATIONS AND INTERPRETENTIONS

Firstly, in terms of equation 2, we estimate $GPVI^*$ by using data of *GPVIs*-FDI funded enterprises and FDIs in table 6; hence yields $\left(GPVI - GPVI^*\right)$ that is independent from the FDIs. Secondly, by using $\left(GPVI - GPVI^*\right)$, throughputs and FDI data in table 6, $\beta_1$ and $\beta_2$ are estimated by making regression statistics with respect to equation 3. Summary outputs of regression statistics are presented in table 7.

Table 7. Summary Outputs of Regression Statistics

| | multiple R | R square | Adj.-R Square | standard error | observations |
|---|---|---|---|---|---|
| Equation 2 | 0.95 | 0.90 | 0.89 | 1340 | 9 |
| Equation 3 | 0.97 | 0.94 | 0.93 | 0.26 | 9 |
| | coefficients | standard error | t Stat | p-value | |
| Equation 2 | | | | | 9 |
| Intercept | -25475 | 4048 | -6.31 | 0.0004 | |
| *FDI* | 263 | 32 | 8.13 | 0.00008 | |
| Equation 3 | | | | | 9 |
| Intercept | -25 | 4.17 | -6.07 | 0.0009 | |
| $Ln\left(GPVI - GPVI^*\right)$ | 1.11 | 0.30 | 3.76 | 0.0094 | |
| $Ln\left(FDI\right)$ | 4.41 | 1.17 | 3.76 | 0.0094 | |

Notes:

(1) Equation 2: $GPVI^* = \alpha_0 + \alpha_1\left(FDI\right) + \varepsilon^*$

(2) Equation 3: $Ln(THP) = Ln\beta_0 + \beta_1 Ln\left(GPVI - GPVI^*\right) + \beta_2 Ln\left(FDI\right) + \varepsilon$

(3) Significant at the 5 percent level.

From the spectrum of R square values, R Square for equation 2 is as high as 0.90 that shows there exists high correlations between the gross product values of industry funded by foreign enterprises and FDIs in Guangdong povince; R square for equation 3 reaches 0.94 that presents there is heavy correlations between the container throughputs and the gross product values of industry domestic-funded and FDIs in Guangdong province respectively.

On the other hand, the coefficients, for equation 2, $\alpha_1$ (=263), t-stat = 8.13 and p-value = 0.00008, show estimation for $\alpha_1$ is statistically significant at the 5 percent level; thus say that unit FDI will yield a 263-unit increase in the GPVI funded by foreign enterprises. The same is with equation 3. Parameters estimation for $\beta_1$ and $\beta_2$ equal 1.11 and 4.41 respectively, that is to say, the elasticity of container throughputs (Shenzhen plus Guangzhou Ports) is 1.11 for gross product value of industry non-FDI-funded, and as high as 4.41 for FDIs in Guangdong Province; there existed increasing returns to scale for the sake of

$\beta_1+\beta_2>1$, and hence very heavy reliance between local economic growth and container ports development in the PRD.

So we can infer that FDIs and gross product values of industry including both FDI-funded and non-FDI-funded have contributed to the container throughputs booming of Shenzhen and Guangzhou Ports as well as other mid-small container services-related ports across the PRD. There is considerable correlation between regional economic growth and container throughputs in the PRD and Guangdong province. The high-speed economic growth in the PRD surprisingly depended on the container ports development.

## 6. CONCLUSIONS

Along with its advantageous location adjacent to Hong Kong and Macau and at the gateway of The South China, the PRD has been focused on export-oriented economic development and kept two-digit economic growth since China implemented open-door in 1978. PRD has been becoming one of the most fascinating areas to absorb FDIs in China as well as in the East Asia. Abundant FDIs poured into the PRD in the past two decades. As critical growth engine, FDIs have boosted the local industrialization with resulting in massive import and export trades and containerized freight transport demand.

The PRD container ports, especially Shenzhen and Guangzhou Ports, have been developed rapidly with port facilities extension and container throughputs expanding to meet local economies growth and container-intensived freight since mid-1990s. The most contributive economic factor to the PRD container throughputs has been concentrated on FDIs that have very high elasticity for the sake of their massive import and export transport demand; non-foreign-funded gross industrial products have still marginal but lower contribution. Obviously, there exists complex positive feedback between FDI, regional economic growth, and container ports development in the PRD and all Guangdong province; regional economic high-speed growth has heavily relied on the local container ports development; FDIs, as PRD economic growth engine and with increasing returns to scale to container throughputs, have highly depend on the local container ports development. So the container port facilities, along with their freight consolidation and distribution systems, should be intensified further not only to satisfy but also to promote the future Guangdong provincial economic development.

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## APPENDIX: TABLE

The Characteristics of Main Container Ports in the PRD Region

| City | Container port | Water depth (m) | Major function (TEU) | Annual capacity-designed (TEU) | Annual throughput * (TEU) | Hinterland | Major destinations |
|---|---|---|---|---|---|---|---|
| Shenzhen | Yantian (Phase I & II) | 14-15.5 | Export (90%) Ex. Feeder (10%) | 2,000,000 | 4,180,000 | PRD (95%), including Shenzhen + Dongguan + Huizhou (70%) | North America, West Europe |
| | Chiwan | 14-16.7 | Import (30%) Export (70%) | 850,000 | 1,140,000 | Shenzhen + Dongguan + Huizhou (90%), Shantou, other places in PRD | Asia mainly |
| | Shekou | 13 | Export | 600,000 | 880,000 | | Asia and Europe mainly |
| Dongguan | Humen | 9 | Import feeder | 600,000 | 231,000 | Dongguan Guangzhou | Mainly Hong Kong |
| Guangzhou | Xinsha | 6 | Import feeder | 400,000 | 251,000 | | Mainly from Hong Kong |
| | New Huangpu | 8.6 | Export feeder | 300,000 | 767,000 | | Mainly Hong Kong |
| Zhuhai | Jiuzhou | 6 | Export feeder | 200,000 | Total 347,000 | Panyu, Guangzhou | Mainly Hong Kong |
| | Gaolan | 12 | Export feeder | 30,000 | | Zhuhai, Zhongshan | Mainly Hong Kong |
| Zhongshan | Zhongshan | 4-5 | Export feeder | Total 1000,000 | 642,300 | Zhongshan | Mainly Hong Kong |
| Jiangmen | Jiangmen | 6 | Export feeder | Total 805000 | 851600 | Jiangmen | Mainly Hong Kong |
| Foshan | New Foshan | 6 | Mixed feeder | Total 1903,400 | 966,006 | Shunde | Mainly Hong Kong |

Note:

except for stated, all data are for 2000.

*: data for 2002

Sources: replied from table 3 in Wang (2000) and DRCG (2004).



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