IMPACTS OF REGIONAL AND GLOBAL FINANCIAL CRISES ON EMPLOYMENT CYCLES AND INDUSTRIAL STRUCTURES: A CASE STUDY OF CITIES IN THE PEARL RIVER DELTA

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ABSTRACT

Using the Pearl River Delta in China as a case study, we found the Asian financial crisis in 1997 had more significant impacts on service sectors, whereas the 2008 global financial crisis exerted more influence on export-oriented manufacturing industries. Before the 2008 crisis, cities had been synchronising in manufacturing expansion. After the crisis, manufacturing expansion became unsynchronised, whereas service industries started to keep growing at relatively high and stable growth rates. In addition to expansion phases which are common in China, we found contraction phases of the employment cycles which were caused by the financial crises. Although most cities in the area took off with labour-intensive manufacturing at the beginning of the economic reform, the industrial structures of the area have evolved into an integrated industrial network through industrial specialisation, functional diversity and collaboration. This change is principally due to self-motivated, crisis-motivated and government-motivated industry restructuring. One characteristic of this industrial network is the complementary relationship between the central city and its surrounding areas. The former provides modern service industries for the latter. A panel model regression confirms that tertiary industries, especially high-tech and high-earning sectors, have significantly positive effects on economic growth after the global crisis.

Contribution/ Originality: This study is one of very few studies which have investigated different impacts of regional and global financial crises on economic cycles and industrial structures. A Markov-switching model and other novel approaches were employed to identify contraction/expansion phases and structural changes.

1. INTRODUCTION

China is recognized as the world's factory as it has one of the most prosperous manufacturing industries in the world. The Pearl River Delta, a thriving economic region in south China, is a principal manufacturing area in China and serves as a pioneer in Chinese open-door policy and economic reform. As this area is characterised by its fast expanding economy, it is worth knowing whether contraction stages ever occurred, especially, during the 1997 Asian financial crisis and 2008 global financial crisis, as export-oriented economies are usually vulnerable to these crises. In order to deal with these crises and ensure more sustainable growth, self-motivated and crisis-motivated

733

industrial restructuring not only drove economic structures of the area into more specialised industries but also promoted more advanced industries and cooperation among them. In this paper, we are going to unveil possible contraction phases caused by the financial crises and the restructuring that led to industrial specialisation, upgrade, and cooperation in the region. We also examine the effects of those factors on economic growth. Expansion and contraction in employment cycles are used to represent the economic stages as employment data are more reliable, excluding possible inaccuracy caused by inflation in monetised values.

2. LITERATURE REVIEW

The business cycle is usually characterised as a series of cycles of economic expansion and recession (Owyang *et al.*, 2005). Hamilton (1989) presented a Markov-switching model to identify two regimes of growth rates in a cycle, which not only allows the identification of expansion and contraction phases but also enables the identification of higher and lower growth phases. The latter is more useful for emerging countries where negative growth rates rarely exist. Using this approach, Owyang *et al.* (2005) studied the business cycles of U.S. and found that states differ significantly in growth levels of the two phases and timing of switching. Industrial structure, represented by employment shares of different industries, is shown to have effects on recession growth rates, and the education level of labour is related to expansion growth rates. Wall (2013) found that neighbouring cities in the U.S. interact over employment cycles, with similar employment cycles for the cities in the same state and with different employment cycles for nearby cities. The author attributed the latter to the tendency of cities in the same metropolitan area to be functionally specialised in industries according to their human capital.

When China started its economic reform, it learned from neighbouring countries such as Japan, South Korea and Singapore, absorbed foreign investment and developed manufacturing industries, especially labour-intensive manufacturing as there were abundant migrant workers from rural areas to fill the industry (White, 2009; Hubbard *et al.*, 2012). Therefore, cities in the Pearl River Delta were similar in the initial patterns of economic development, and fast economic expansion became a feature of this area. However, with time passing, it is worth knowing how functional specialisation and industrial integration emerged and evolved and whether contract phases ever occurred, especially during the periods of financial crises. Although existing literature lacks study of business cycles for the area, we found related research in economic development patterns, regional cooperation, industrial restructuring and urbanisation of the region. For example, Lin (2001); Li and Yeh (2004) stated that, at the beginning of the Chinese reform and open-door policy, the area was quickly urbanised by the influx of migrant rural workers, massive infrastructure improvement and upgrade from agricultural sectors to industrial sectors. During the process of urban-rural integration, the urban-rural dichotomy was mitigated. Shenzhen, the first Special Economic Zone in China, is a good representative for such change. It was nearly built up from scratch in the 1980s, by massive investment from foreign companies, self-raised funds, domestic loan and state appropriation. Shenzhen later became the window of Chinese reform and open-door policy which serves as a conduit between the mainland and its direct neighbour, Hong Kong. Those investments in secondary and tertiary sectors, and investments from foreign countries, created high-productivity and high-return industries and attracted high-skilled labour (Ge, 1999). The high growth rates of Shenzhen turned it into the fourth largest city in China in 2015 in respect of annual GDP. After the Pearl River Delta became a relatively advanced area in China, regional integration was under consideration and was carried out under an arrangement called the Closer Economic Partnership Arrangement (CEPA), effective on 1st Jan 2014. In addition, the mainland provincial government initiated a Five Integration Plans in 2010, which includes integration plans of infrastructure, industrial deployment, urban-rural development, environmental protection and public services (Yang and Li, 2013). Yang and Li (2013) also discussed the resistance to the integration. Yang (2012) studied the restructuring of export-oriented industrialization in the Pearl River Delta, and he found that significant upgrade from an entry mode (sanlaiyibu), i.e., processing with materials or given samples, assembling supplied components and compensation trade, to a higher level (sanzi), i.e., joint

ventures, co-production and foreign enterprises took place after the Asian financial crisis. An industrial relocation to "empty the cage for new birds" was designated by the provincial government during 2008 global financial to replace the labour-intensive industries with high value-added industries, and to deal with the increasing costs and decreasing orders. Yang (2012) pointed out that institutional inertia and territorial embeddedness impeded the ongoing restructuring.

As the growth rates of GDPs are often positive and high in this area, we use employment data, which are more reliable, to study business cycles of this area. Alongside the regime switching model, we also utilise proportional changes of industrial employment to identify the cycles when large data are not available. Our purpose is to study the effect of financial crises on industrial structures, to determine the variations of employment cycles during the regional and global financial crises and to find out the impact of employment structures on economic growth. Methodologies used in this paper are presented in the next section, and changes in industrial structures before and after crises are analysed in section IV. Total employment cycles, industrial employment growth rates, and industrial employment cycles are analysed in section V, VI and VII, respectively. Section VIII assesses the impacts of employment structure on economic growth with a regression model and section IX concludes the paper.

3. METHODOLOGY

3.1. Identify Main Employment Cycle with the Markov-Switching Model

The Markov-switching model (Hamilton, 1989; Kim and Nelson, 1999; Owyang *et al.*, 2005) is used to identify employment cycles in the Pearl River Delta. This model is presented in the following equation.

$$y_{it} = \mu_{Sit} + \varepsilon_{it} , \ \varepsilon_{it} \sim N(0, \delta_{\varepsilon i}^2) \tag{1}$$

y_{it}: The employment growth rate in city i and year t.
S_{it}: S_{it} = 1 or 2, indicates the expansion or contraction states of employment cycles.
μ: Mean growth rate, switching between S_{it} = 1 or 2, corresponding to higher or lower growth rates.
ε_{it}: Stochastic disturbance.

Expansion and contraction are relative to each other, and they are determined on the basis of the normal growth rates of cities. Contraction phase in this model is not always corresponding to negative growth rates. Instead, an expansion period has a higher growth rate and a contraction period comes with a lower growth rate. This enables the model to catch the two growth regimes in a fast-growing economy.

3.2. Determination of Expansion and Contraction Cycles Based on Industrial Proportions

Because of the paucity of data, the Markov-switching analysis cannot be applied to industrial data. Changes in industrial proportions are calculated with the following equation:

$$d_{ij,t} = p_{ij,t} - p_{ij,t-1} \tag{2}$$

$p_{ij,t}$: Proportion of industrial employed persons in the total number of employed persons (as for high-tech and high-earning sectors, it is the proportion of IT, financial and technical sectors in the total number of employed persons in service industries). i is an index for cities, j denotes industries and t represents time.
$d_{ij,t}$: Change in proportions.

Chinese cities achieved positive economic growth rates during most periods after the economic reform. Therefore, it is difficult to find contraction phases with negative growth rates. Thus, an alternative approach is to use proportional changes. As the sum of the proportions equals one, this approach enables us to find relative expansion phases or relative contraction phases, as a rise in the portion of one industry will definitely diminish the proportions of other industries.

3.3. Panel Data Model

The panel data model is used to study the effects of industrial employment structure on economic growth. The growth of GDP is usually determined by capital stock K and labour L. In our model, we add the proportions of employed persons in manufacturing industry, service industry, high-tech and high-earning sectors (IT, financial and technical service sectors) into the model, to exam the impacts of industrial employment structure on economic growth.

$$Ln(GDP_{it}) = C + \alpha\, Ln(K_{it}) + \beta\, Ln(L_{it}) + \gamma\, Ln(L2p_{it}) + \zeta\, Ln(L3p_{it}) + \theta\, Ln(Lhp_{it}) + \varepsilon_{it} \qquad (3)$$

K: Capital stock in a prefecture city.

L: Total labour in a prefecture city.

L2p: Percentage of manufacturing sector employed persons in total employed persons.

L3p: Percentage of service sector employed persons in total employed persons.

Lhp: Percentage of IT, financial and technical service employed persons in service sector employed persons.

i and t: i represents cities and t stands for periods.

The model will be fitted three times with different periods of data, i.e., all data, data before the crisis(<2008) and data after the crisis(>=2008).

3.4. Data Sources

Data for mainland cities are from National Bureau of Statistics of China and statistical yearbooks of these cities. Data for Hong Kong are drawn from World Bank, International Monetary Fund and Census and Statistics Department of Hong Kong.

4. INDUSTRIAL EMPLOYMENT STRUCTURE EVOLUTION OF CITIES IN THE PEARL RIVER DELTA

The industrial structures of Pearl River Delta cities are shown in Figure 1 (The location of the Pearl River Delta is presented in an embed map). The pie charts in the map depict the employment proportions of the primary (brown), secondary (deep violet) and tertiary industries in 2013 (tertiary industries are split into ordinary tertiary sectors (light violet) and high-tech/high-earning tertiary sectors (light green). Data in 2013 represent the post-crisis period. Proportions of primary industries are close to zero as the area has been substantially urbanised. Among those cities, Hong Kong has the highest ratio (93.3%) in tertiary industries, and Guangzhou, the provincial capital of Guangdong, second to Hong Kong, with a proportion of 61.4%. This indicates that these two cities are the central hubs of the area, offering industrial service, especially modern service to the area. Those cities located in the proximity of central cities are excellent in labour-intensive manufacturing sectors. For example, the employment shares of the manufacturing industries in the total number of employed persons in Dongguan, Zhongshan, and Foshan are 81.3%、74.4% and 71%, respectively, the four highest proportions in the Pearl River Delta. These shares of manufacturing industries are nearly equal to the shares of the whole secondary industry[1]. Large shares of manufacturing employment in these cities and the large share of service sectors in central cities suggest a complementary relationship between central cities and the neighbouring smaller cities.

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[1]Besides manufacturing sectors, the secondary industry also includes construction, production and supply of electric power, heat power and gas.
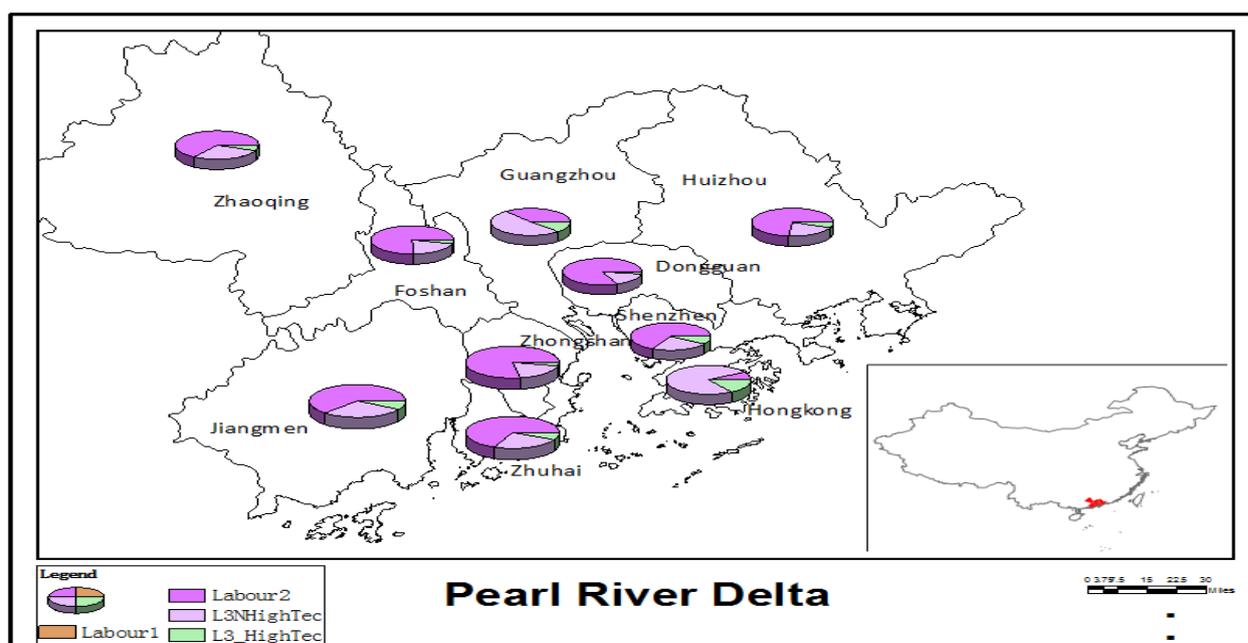
Figure-1. Industrial structures of cities in the Pearl River Delta, 2013

Source: Boundary maps from NGCC and indices calculated by the authors

Notes: Labour1: labour in primary sectors; Labour2: labour in secondary sectors; L3NHighTec: labour in tertiary sectors, excluding high-tech/high-earning tertiary sectors; L3_HighTec: labour in high-tech/high-earning tertiary sectors.

Compared with the employment structure in 2003 (prior to the 2008 global financial crisis), in 2012[2], positive rises in tertiary industries exist for cities on the north side of the Pearl River, such as Dongguan (8.4%), Hong Kong (2.9%), Shenzhen (1.5%), Huizhou (0.4%) and Guangzhou (0.1%). Significant drops in tertiary proportions are found for cities on the south side of the river, e.g., Jiangmen (-10.8%), Zhaoqing(-9.9%), Foshan (-4.8%), and Zhongshan (-3.8%). The structural shifts between secondary and tertiary industries are partially attributed to the policy known as "emptying cage for new birds", which means moving labour-intensive manufacturing sectors from relatively advanced cities to less developed cities, and thus vacating spaces for more sophisticated and profitable industries. Small increments of the shares of tertiary industries in central cities (Guangzhou, Hong Kong, and Shenzhen) also reveal that, in the short run, there are no significant changes in industrial structures in big cities after the crisis. Considerable loss of manufacturing proportion and increasing of the tertiary industry are found in Dongguan, a manufacturing centre that suffered relatively high impact from the crisis.

To appraise the quality of the expansion in the tertiary industry, three sectors, i.e., IT, financial and technical service, are chosen to represent the high-tech and high-earning sectors[3], and both proportions and increments of proportions of these three sectors are used as quality indicators for the growth. Shenzhen, a young city adjacent to Hong Kong and famous for its high-tech firms, innovations and energetic financial sectors (such as the Shenzhen Stock Exchange), is an outstanding city with the highest proportion (19.4%) and high growth rate (4.5%) for the high-tech and high-earning tertiary sectors. It also has a prominent secondary industry as well, employed persons of which accounts for 55% of total employed persons. GDP and export of Shenzhen surpassed Guangzhou, the provincial capital, in 2012 and became a newly emerging centre in the area. As a new regional centre, Shenzhen differs from other manufacturing-intensive cities. It has a flourishing construction and real estate sectors, which employed 11.4% of total employed persons. The other rapidly growing cities with high proportions of high-tech and high-earning sectors are Huizhou (proportion 17.2%, growth rate 6.2%), Zhuhai (proportion 16.6%, growth rate 3.9%), Guangzhou (proportion 16.3%, growth rate 0.7%) and Hong Kong (proportion 14.2%, growth rate 1.6%).

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[2] Data in 2013 use a statistical approach which is different from previous years. So, 2012 is the latest year that has the data comparable to 2003.

[3] Although several other service sectors, such as health and social work, education, also involve high-skilled workers, these sectors usually have a commingled type of employees and data of detailed categories are not available. Older cities usually have the edge in these traditional sectors.

Generally speaking, industrial structures of central cities, such as Hong Kong and Guangzhou, have shifted to the tertiary industry and serve the area. The new centre, Shenzhen, has a tertiary industry of high quality, but still keeps a large proportion of a highly competitive secondary industry. This makes Shenzhen more resistant to the financial crisis and overtook Guangzhou in recent years. Huizhou and Zhuhai, two neighbouring cities of Shenzhen, demonstrate a growing trend in industrial structures which is similar to Shenzhen. Adjacent cities of Guangzhou, e.g. Dongguan, Zhongshan, and Foshan, have intensive manufacturing industries which are complemental to the headquarter economy in the central cities. With regard to service industries, each central city has its core industries. For example, Guangzhou, the geographical and historical centre, is prosperous in sectors such as commercial trade, logistics, hotel and food service. By contrast, Shenzhen specialises in finance, real estate, and commercial services. The structure of Hong Kong is relatively stable, with higher proportions in Import/export trade, wholesale (30.4%), accommodation and catering services (10.3%) and financial services (7.9%).

5. TOTAL EMPLOYMENT CYCLES OF CITIES IN THE PEARL RIVER DELTA

The Markov-switching model is applied to total employed persons to get the total employment cycles for cities in the Pearl River Delta. The estimation results are shown in Table 1. Additional outputs from the model can be found in Appendix A.1 and A.2 for Guangdong province and Hong Kong. As can be seen in Table 1, contraction periods of total employment were between 1997 and 2001 for cities in the Pearl River Delta, and significant contractions mainly existed in service-intensive cities such as Guangzhou, Hong Kong, Shenzhen, and Zhuhai. Especially, Hong Kong has been in a low growth rate state since 1998. Notice that 1997-2001 is a period immediately after the Asian financial crisis. It is obvious that the crisis affected both mainland cities in the Pearl River Delta and Hong Kong. Furthermore, in1997, the sovereignty over Hong Kong was transferred from the United Kingdom to China, and this added more uncertainty to existing situation. The real estate and stock market prices in Hong Kong declined dramatically during the Asian financial crisis. It caused the bursting of the economic bubble in Hong Kong, and ripple effects that subsequently affected the whole area. Both Hong Kong and mainland investment in Hong Kong suffered a massive loss. The service sectors, especially the financial sector, experienced the most challenging situation. As service sectors are often labour-intensive, contraction in service sectors usually induces a contraction in total employment at the same time. By contrast, those cities with intensive manufacturing sectors, e.g., Foshan, Dongguan, Zhongshan, and Huizhou, were somewhat resistant to the Asian financial crisis, and no significant contractions occurred in those cities.

Table-1. Employment cycles of cities in the Pearl River Delta

	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
Guangdong					■	■	■	■	■												
Guangzhou						■															
Shenzhen						■															
Zhuhai					■	■															
Foshan	▨	▨	▨	▨	▨	▨	▨	▨	▨	▩											▩
Huizhou	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Dongguan	▨	▨	▨	▨	▨	▨	▨	▨	▨												▩
Zhongshan	▨	▨	▨	▨																	▩
Jiangmen	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Zhaoqing										■											
Hong Kong				▨	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
PearlDelta					■		■														

Notes: A black colour block represents an employment contraction, a white colour block indicates expansion, a blue colour block means no significant results and a green colour block indicates outliers in the data (probably caused by changes in statistical approaches).

6. INDUSTRIAL EMPLOYMENT CYCLES OF CITIES IN THE PEARL RIVER DELTA

6.1. Changes in Industrial Employment Growth Rates

The downside of the analysis above is that the impact of the 2008 global financial crisis cannot be spotted in the total employment cycles. By limiting employed persons to manufacturing industries, which are more export-oriented and hence are more susceptible to the global crisis, the impacts of the global financial crisis became evident, as shown in Figure 2. In 2008, the employment growth rates of manufacturing industries were nearly all negative. This is a dramatic effect in consideration of the typical positive and high growth rates in China. From the proportional shares shown in the figure, it is apparent that central cities such as Shenzhen and Guangzhou, and rapidly developing cities such as Jiangmen, Foshan, and Huizhou, played a crucial role in the aggregate economic growth of the area post and pre the crisis. In contrast to the Asian financial crisis, which primarily influenced service sectors, the 2008 crisis mainly affected the manufacturing industry. This indicates that influences of global and local financial crises exhibit different patterns. The global crisis reduced the global demand for Chinese products and hence struck the export-oriented manufacturing industries. 1997 Asian financial crisis was a local crisis, and the export-oriented manufacturing firms could diversify their international markets and increased the export to other countries not involved in the crisis.
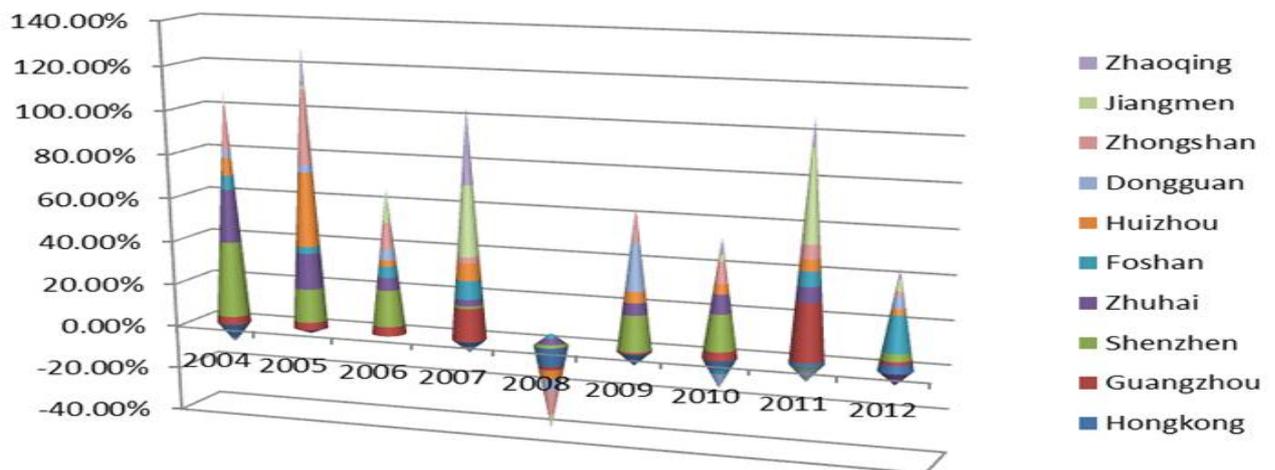
Figure-2. Stacked employment growth rates of manufacturing industries of Pearl River Delta cities

Source: Original data are from sources mentioned in 3.4.

In contrast to the manufacturing industries, we find that during the 2008 global crisis, service sectors in most cities maintained positive growth rates during the crisis and recovered rapidly after the crisis, as shown in Figure 3.
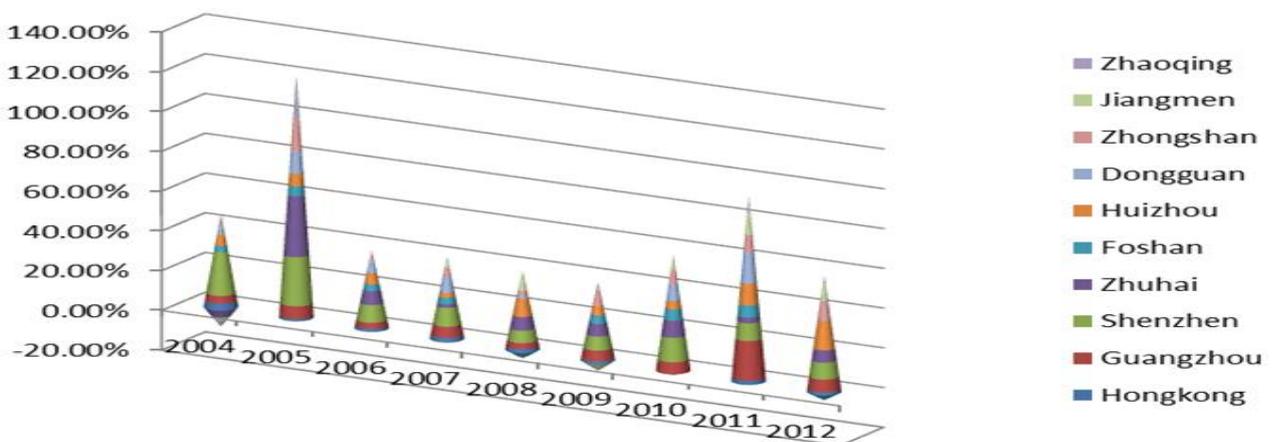
Figure-3. Stacked employment growth rates of service industries of Pearl River Delta cities

Source: Original data are from sources mentioned in 3.4.

The reason for the distinct effects between local and global financial crises is that transfer paths of the crises are different :

(1) 1997 Asian financial crisis transferred through the financial sector. As one of the principal financial centres in Asia, Hong Kong served as an intermediary between neighbouring mainland cities and the Asian financial crisis. Guangdong's foreign investors from Hong Kong and Guangdong's investments in Hong Kong suffered substantial losses during the crisis, and this caused contagious effects in the area. During this process, the financial sector was directly and severely affected.

(2) By contrast, the 2008 global crisis started with the recession of financial and real estate sectors in U.S. and Europe, to which China is mainly linked by international trade. Therefore, it was the reduction in consumption caused by the recession that finally hindered Chinese export-oriented manufacturing industries. The service sectors in China, however, were basically domestic-oriented and hence more robust during the global crisis.

The growth rates of high-tech and high-earning services (IT, financial and technical service industries) exhibited a similar pattern as the aggregate trend of service sectors, illustrated in Figure 3, with higher stacked growth rates in a range of 60%-100% after the crisis. This suggests that the affected industries relied on technological innovation to deal with the crisis, such as replacing workers with robots due to increasing labour cost, turning to E-business to reduce transaction cost and switching to domestic or new markets with more competitive products. All these changes increased the demand for IT service, technical service and investment loan from the financial sector.

6.2. Changes in Industrial Employment Shares

As growth rates used above were usually positive in this area, to distinguish the relatively slower/ faster-growing sectors from other sectors, the changes of employment shares of manufacturing sectors are calculated and shown in Figure 4, based on equation (2). Changes in employment shares of service sectors are not presented as an independent figure because in the absence of the primary sector, share of which is close to zero, the share of tertiary sectors is a complement to that of the secondary sector. Namely, an increase in the secondary sector equals to a decrease in the tertiary sector and vice versa. Figure 4 indicates that, in the Pearl River Delta, before 2008, the manufacturing industries in the Pearl River Delta cities had grown faster than tertiary industries (as shown in part A in the figure, positive changes in manufacturing shares mean adverse changes of service shares). Specifically, in 2004, nearly all cities were expanding their manufacturing sectors. This trend inverted dramatically in 2008 when the financial crisis hit the world. In that year, shares of the manufacturing sectors suddenly declined, and tertiary industries started to grow quicker than secondary industries. After the crisis, as can be seen in part C, employment cycles of different cities are not as synchronised as previous periods. Some cities expanded their manufacturing industries, other cities grew their service industries, and this varied over time. Generally, more expansion phases are found in service sectors after the crisis.
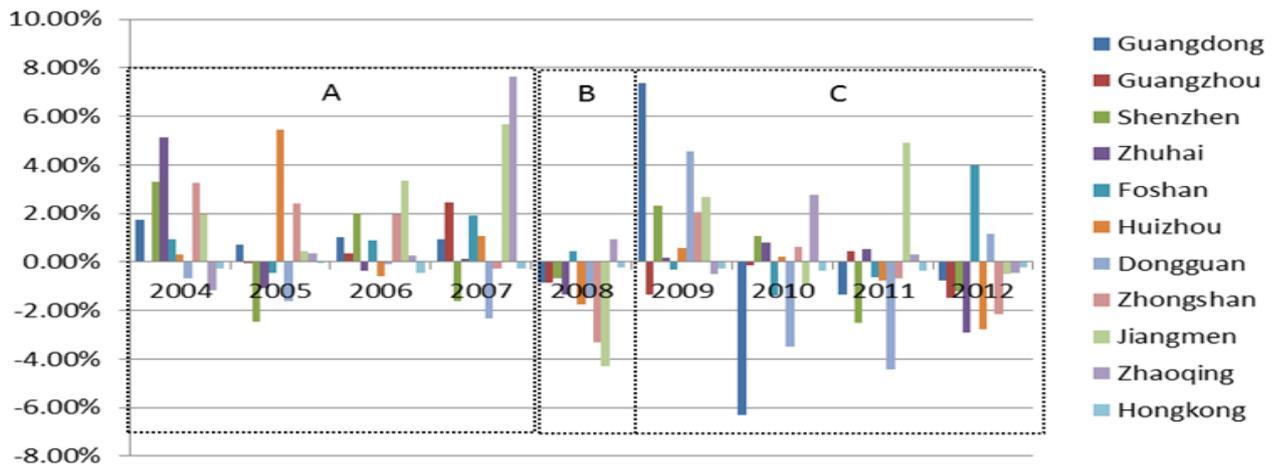
Figure-4. Changes in employment shares of the manufacturing industry of cities in the Pearl River Delta

Source: Original data are from sources mentioned in 3.4.

Changes in employment shares of high-tech and high-earning sectors are presented in Figure 5. Before the crisis (part A), high-tech and high-earning sectors showed similar patterns as other service sectors. After the crisis (part B), more cities were shifting to high-tech and high-earning sectors which were deemed to be more profitable, to achieve a long-term and sustainable growth. All these changes imply that there was an on-going restructuring in the area.
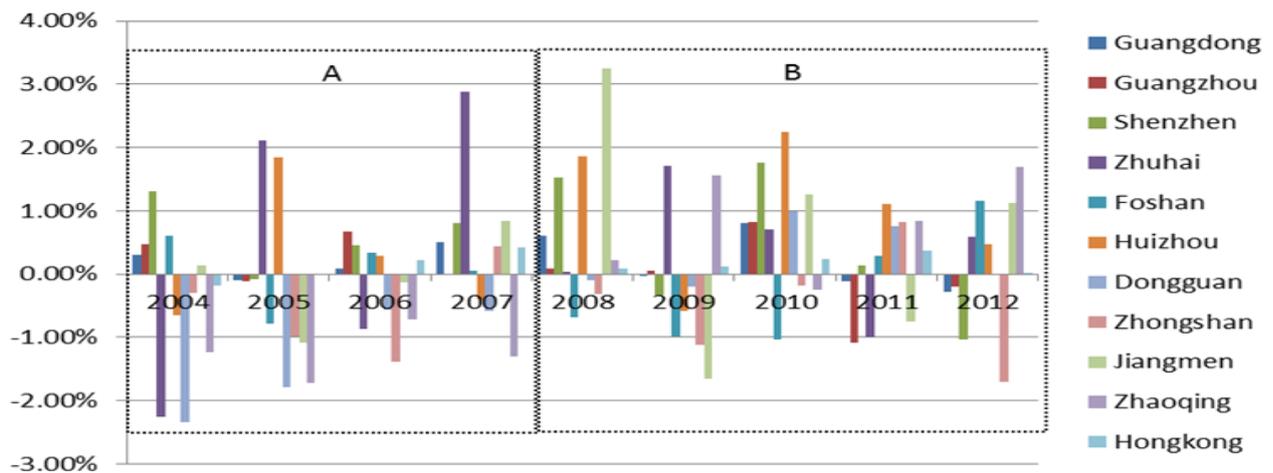
Figure-5. Changes of employment shares of the IT, financial and technical services of cities in the Pearl River Delta

Source: Original data are from sources mentioned in 3.4.

7. IMPACTS OF INDUSTRIAL EMPLOYMENT STRUCTURES ON ECONOMIC GROWTH

In previous sections, the effects of the crises are shown to affect industrial employment structures and cycles. The changes of industrial structures also influenced the economic growth of the area. Empirical evidence based on a panel data model is presented in Table 2. Fixed effects are chosen by Hausman test and F test. In model I (with all data), elasticities of capital K and labour L are consistent with existing studies (Fu and Li, 2010; Li et al., 2013). Employment proportions (L2p) of manufacturing do not have significant effects on economic growth in all models (I, II and III), which implies that previous labour-intensive manufacturing is not a good option for future growth. Service industries (L3p), however, have positive and significant impacts on the economic growth. This suggests that the Pearl River Delta area should expand its tertiary sectors. The high-tech and high-earning sectors (Lhp) did not have positive effects before the crisis (Model II, <2008). This explains why high-tech and high-earning sectors did not expand as quickly as manufacturing industries did before the crisis. The reason is that if firms could make profits with low-cost and less-effort products with which they were familiar, they did not have an incentive to

switch to uncertain areas. The advent of the crisis reduced the demand, and thus forced the firms to expand their capacity and produce more advanced and competitive products. Model III (>=2008) points out the fact that after the crisis, the coefficient of high-tech and high-earning sectors becomes positive and significant at 1% level.

Table-2. Regression results

Variable	Model I	Model II (<2008)	Model III (>=2008)
Ln K	0.640*** (0.0315)	0.588*** (0.0642)	0.542*** (0.0546))
Ln L	0.383*** (0 .0811)	0.967*** (0.1601)	0.282*** (0.0915)
Ln L2p	-0.026 (0.1411)	-0.262 (0.3975)	0.0562 (0.1238)
Ln L3p	0.651*** (0.1867)	1.078*** (0.3924)	0.367** (0.1711)
Ln Lhp	-0.180* (0.1030)	-0.524*** (0.1736)	0.386*** (0.1098)
C	4.500*** (0.4815)	2.437** (0.9292)	7.546*** (0.8069)
F	352.68	101.05	146.76
R square	0.9571	0.9410	0.9179

Notes: * Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level.
Sources: 1990-2013 statistical data from data sources mentioned in 3.4

8. CONCLUSION

By analysing employment structures and cycles of cities in the Pearl River Delta before and after the financial crises, central and neighbouring cities are found to have a complemental relationship, i.e., central cities offer services to the area and neighbouring cities manufacture goods. There are three central cities in the delta area, and each central city has its own relatively advanced service sectors. Hong Kong acts as a global city, specialises in financial sectors and provides international trade service between mainland China and the rest of the world. Guangzhou, the provincial capital, mainly offers traditional service to the region. Shenzhen benefited from special economic zone policies and spillover effects from Hong Kong. It has attracted investment and human resources of high quality, and has become a growing innovation and production centre. The Asian financial crisis in 1997 had more significant effects on service sectors and caused employment contraction. Financial and real estate sectors in Hong Kong served as an intermediary to pass the Asian crisis to mainland cities. The manufacturing industry was more resistant to the 1997 Asian crisis as it could divert its exports to other areas. However, during 2008 global financial crisis, global consumption declined, and this induced a contraction of export-oriented manufacturing sectors in the Pearl River Delta. Locally oriented service sectors seem less affected by the 2008 global financial crisis, partially because of the relatively loose linkage of financial sectors between the socialist economy in China and the capitalist economies in western countries. Before the 2008 crisis, cities had been synchronising in the expansion of manufacturing industries. After the global crisis, service industries, high-tech and high-earning service sectors kept growing at relatively stable rates and contributed significantly to economic recovery. As Shenzhen had a prominent portion of high-tech and high-earning service sectors, the global crisis presented a chance to Shenzhen and let it become outstanding in the region.

The contraction phases in the area due to the global and regional crises suggest that China is not a stand-alone economy. The integration of the global economy, either by direct investment or by indirect linkages through international trade, makes China susceptible to regional or global crises. This study also reveals the flexibility of Chinese industries. The area could adjust its industries to better competitive positions according to its local resources. Restructuring of the industries, either motivated by the government, or by firms, made them not only adaptable to the change of the global market but also suitable for the local industrial network.

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Appendix

A.1 Regime switching model regression output for Guangdong

1-21 corresponding to 1993-2013

State 1 mean: 0.1195***(0.0417)

State 2 mean: -0.2572***(0.0814)
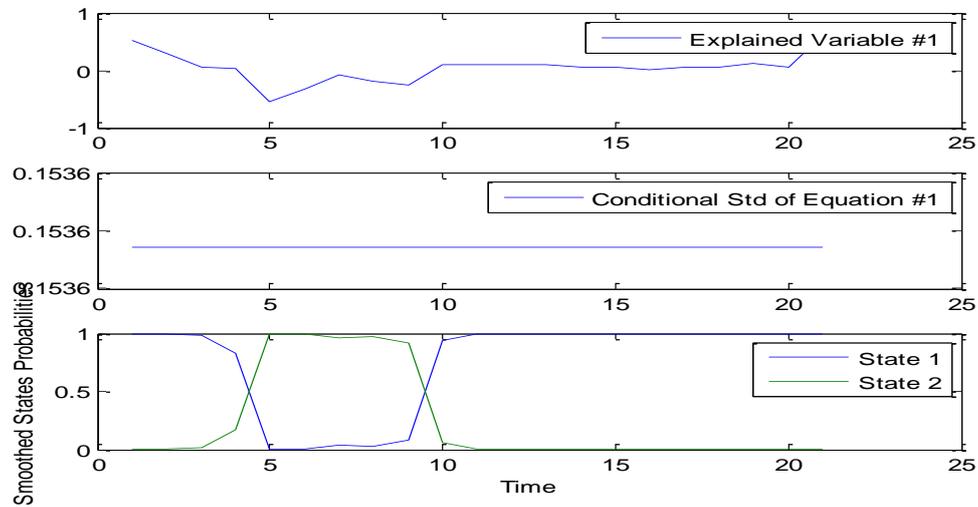
A.2 Regime switching model regression output for Hong Kong

1-21 corresponding to 1993-2013

State 1 mean: 0.0110***(0.0022)

State 2 mean: 0.0314***(0.0044)