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# THE SHIFT IN MANUFACTURING EMPLOYMENT IN CHINA

Background Paper

Jun Hou, Stephen Gelb and Linda Calabrese

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## EXECUTIVE SUMMARY

Chinese manufacturers, in particular in labour-intensive industries, are striving hard for ways to withstand the pressures emerging during the ‘New Normal’ transition<sup>1</sup> – such as slowing economic growth, labour force shortages and rising factor costs. As a result, they are forced either to relocate production to other low-cost destinations or replace workers with machines by upgrading technological capability levels. The relocation of Chinese manufacturing is forecast to open up major employment opportunities for low-cost regions and countries, with some potentially becoming the next global manufacturing centre.

Light manufacturing offers growth solutions for under-developed regions and economies as it is driven by low factor costs and an abundant workforce. Using data from multiple official sources, this background paper aims to identify the pattern of current manufacturing employment shifts within China and focus on regional and industrial disparities – primarily through the study of four manufacturing sub-sectors: textile clothing and footwear, toys, household appliances, and information and communication technology (ICT).<sup>2</sup> The key findings are as follows:

- Chinese manufacturing is undergoing a transition at the end of which products are expected to be upgraded to serve mid- and high-end consumers, and production is expected to become more technology advanced.
- From 2009 to 2014, China’s real manufacturing wages increased by an annual average of 11.4%, even though this was in the aftermath of the worst financial crisis since the Second World War. During the same period, manufacturing employment tended to shift from low-technology industries (e.g. textile clothing) to high-technology industries (e.g. ICT industries).
- The Eastern region clearly leads growth in Chinese manufacturing in terms of scale of production, employment, export and technology development. Owing to its proximity advantage and relatively low factor costs, the Middle region has embraced rapid employment growth over the past decade. Meanwhile, there has been a moderate catch-up in some parts of the West region but the improvement appears to be most pronounced in high-tech manufacturing such as ICT and electrical machinery.
- The spatial mobility of industry is neither automatic nor costless. The relocation process requires motivated and capable investors, as well as qualified hosts especially those with the requisite capability and readiness to take on the transferred industries. Apart from wages, the cost of industry relocation is believed to be associated with a series of factors, such as natural resources, transportation, infrastructure, host region industry capability and economic development levels.

Although preliminary results imply that manufacturing employment may have declined in Eastern regions, robust evidence on the underlying causes remains scarce. It is still unclear whether it was due to the relocation of economic activity, a decline in market demand, or the departure of firms from the market. It is similarly unclear whether the rise in manufacturing activity in inland regions is a result of a transfer from the East or the arrival of new firms. To answer these questions, the next stage of our research will discuss firm-level evidence in selected Chinese labour-intensive manufacturing industries.

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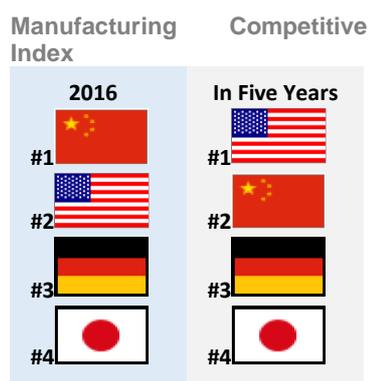
<sup>1</sup> China’s ‘New Normal’ refers to expectations of 7% growth rates in China for the foreseeable future. It was indicative of the Chinese government’s anticipation of moderate but perhaps more stable economic growth in the medium-to-long term. For more details, please see Wikipedia (2016).

<sup>2</sup> Manufacturing sub-sectors include labour-intensive assembly of consumer products for export.

# 1. THE ‘NEW NORMAL’ CHALLENGES

China has embarked on the comprehensive, third-plenum (2013) reform blueprint. Its objective is to move towards more inclusive and sustainable growth through better allocation of credit and resources and improved social welfare. The national People’s Congress 2015 work report noted that as economic reform progresses China has begun moving towards a ‘New Normal’ (State Council of the People’s Republic of China, 2015). The economy has entered a new phase in which structure of the economy needs to be readjusted to support long-term sustainable development. During this transition, the older drivers of the economy – the middle class and the export sector – will be gradually replaced by the New Normal drivers – the upper middle class and the service sector. What is increasingly apparent is that China’s New Normal transformation and the upshifting of its global value chain position are opening up unique opportunities for other developing countries. Investors from labour-intensive productions are seeking other destinations with lower manufacturing costs. Major employment opportunities, 85 million (Lin, 2011), could shift to low-cost regions and countries if labour costs in China continue to rise and labour shortages worsen (Fan, 2014).

Building upon the low wage advantage, the manufacturing sector in China experienced rapid development that helped it achieve unprecedented GDP growth and higher living standards. In 2011, China overtook the United States to become the world’s largest producer of manufactured goods. However, manufacturers must now strive for ways to survive due to slowing economic growth, labour shortages and rising factor costs. It is becoming increasingly difficult to maintain comparative advantages in industries that are most sensitive to labour costs.



The 2016 Global Manufacturing Competitive Index shows that China is still dominant and hanging on to the most competitive manufacturing nation ranking for 2016 (Deloitte, 2016). The USA, ranked second, is expected to regain its lead in five years. However, many scholars argue that rising wages and other factor costs have dampened the competitiveness of Chinese manufacturing in recent years and challenged its leading role as a low-cost centre for labour-intensive products (Ceglowski and Golub, 2007; Chen et al., 2009; Yang et al., 2010). Both multinationals and local manufacturers that engaged in labour-intensive production are actively seeking relocation opportunities to retain the benefit from low-input costs production. Others argue that rising labour costs do not necessarily undermine Chinese producers’ advantages because the possibility of shifting productions to inland areas

and technological upgrading may generate additional spaces for productivity enhancement (Lett and Banister, 2006; Ge and Yang, 2009).

It appears that not only Chinese manufacturers are seeking relocation opportunities. With the additional pressure imposed by the appreciation of China’s RMB currency, many international investors are also inland shifting or re-shoring their operations. For example, Foxconn, the world’s largest contract electronics manufacturer, shifted several main production plant from eastern coast to inner China (*Sina News*, 2013). Adidas’ Suzhou factory decided to terminate its operation in China because of the rising production costs and currency pressures (*China Daily*, 2012). Eventually they chose South-East Asia as the relocation destination, although China still holds the competitive advantage because of relatively higher productivity and better material suppliers. Similar trends are appearing among Japanese cross-border investors; Panasonic have decided to move back their home appliance manufacturing from China (*China Daily*, 2015).

Although manufacturing may have started shifting away from eastern regions, it is unclear whether the slowing down of manufacturing in the East is due to the relocation of economic activity by firms (either to other parts of China or outside the country), to a decline in market demand, or to the departure of firms from the market. It is similarly unclear whether the rise in manufacturing activity in inland regions is a result of transfer from the East or entry of new firms. This paper will not attempt to address these issues but simply to identify the trends geographically and over time in more detail, regarding the sectors of interest.

From the early 1990s to the late 2000s, industrial employment in China was associated with widening regional imbalances. A reversal has been under way with regional inequality peaking in the mid-2000s (Lemoine et al., 2014). The rapid catch-up in inland China has led to substantial industrial employment and the centre of gravity has begun to move from the advanced Eastern region to the inland areas. One possible reason for the shift is rising labour costs. However, labour costs only reflect one aspect of the production factor costs. Many other elements must be taken into account such as infrastructure (Andrews and Swanson, 1995; Vijverberg et al., 1997; Ithori and Kondo, 2001), natural resources (Sachs and Warner, 1995), information and communication technology (ICT) (Bhagwat and Sharma, 2007; Lee et al., 2009; Ollo-López and Aramendía-Muneta, 2012), industrial capability (White and Liu, 1998) and complementary policy instruments (Liu and Buck, 2007).

The rising labour cost and potential shift of manufacturing employment have attracted much attention among scholars and policy-makers, but the potential of the shift and its spatial heterogeneity within China has remained poorly investigated (Tao et al., 2010; *China Daily*, 2015). In this background paper, we present official Chinese data to show the trends in the number of enterprises, employment levels and capital invested, both in the aggregate for China, as well as the regional distribution of these variables. We aim to describe the pattern of the current manufacturing employment shifts and focus on the regional and industrial disparities. We focus primarily on four manufacturing sub-sectors – textile clothing and footwear, toys, household appliances and ICT – which include labour-intensive assembly of consumer products for export. They have been selected for focus in the primary research for which this paper provides some background. The choice of sectors is based on the combination of employment/labour issues and exports/insertion into global value chains. We intend to investigate the manufacturing relocation potentials in industries where employment changes have been more dynamic over the past decade, including both the fastest-expanding industries and those that are contracting in terms of employment.

A note on data: the analysis is based on data from multiple official sources, mainly collected from the National Bureau of Statistics China (NBSC). Numbers for manufacturing jobs and wages are obtained from various statistical yearbooks.<sup>3</sup> Sector data, such as industry performance, export and investment and so on, are obtained from the industrial economic series at provincial level published in the Industry Economic Statistic Yearbook (IESY) (2006–2014). We have also acquired data from high technology statistical yearbooks and regional economic statistical yearbooks (see Appendix B for the detailed data sources). Several issues are worth noting here. First, for some specific industries data were not available from the IESY; for example, regarding ‘Articles for Culture, Education, Sport Activities, and Entertainment products’, we have collected the information from provincial statistic yearbooks from 27 provinces and four directly controlled municipalities except for Guangdong where all the manufacturing details were reported separately in the ‘Guangdong Industrial Economic Statistic Yearbook’.<sup>4</sup> Second, the sales value, exports and average salaries were computed by taking into account the inflation rates throughout the reviewing period.<sup>5</sup> Third, there were some changes in the statistic scope and industry classifications during the reviewing period, specifically firms with outputs of less than RMB20 million have been excluded from the statistics since 2011 and prior to this, only firms with outputs of less than RMB5 million were excluded. Such change may bring inconsistency to our results – for example, it could lead to significant drops in the number of firms, employment scales and sales value from 2010 to 2011.

The following section will discuss the sector employment shift and the rise in salaries over the past decade. By using the regional and provincial-level evidence, Section 3 will describe the uneven distribution of manufacturing employment across regions and industries. Section 4 selects four labour-intensive light manufacturing industries and describe their employment shifts. Section 5 compares the regional productivities, as well as the cost structures. The final section presents the conclusion.

<sup>3</sup> For detailed manufacturing employment and wage data, please see Section 3.1 and Appendix B.

<sup>4</sup> China has 32 provincial-level administrative units: 23 provinces, four municipalities (Beijing, Tianjin, Shanghai, Chongqing), five autonomous regions (Guangxi, Inner Mongolia, Tibet, Ningxia, Xinjiang). Two special administrative regions, Hong Kong and Macau, are not in the scope of the current study. Taiwan is excluded from the current study.

<sup>5</sup> Since most of the data in the current study were obtained from the NBSC, we have used the consumer price index (inflation rates) published by NBSC.

## 2. EMPLOYMENT AND WAGES IN MANUFACTURING

### 2.1 The shift of sector employment

As the Chinese economy has shifted from rapid to moderate growth, its economic structure as reflected in the proportions and inter-relationships between employment and output of its main sectors has changed. Income per capita rose from RMB7,942 in 2000 to RMB47,203 in 2014, and during this period the secondary industry share of output fell below that of the services sector (Figure 1). People's needs become less material while service-based demands – health, education and entertainment – expanded rapidly. In 2014, China's primary industry accounted for only 9.2% of GDP while its secondary industry made up 43.1% of GDP. The service industry has become increasingly important as a driver of the economy. It has taken the lead, making up 47.8% of the whole economy in 2014, up by 1.1 percentage points compared with 2013. This contribution has been rising steadily over the last 10 years and is expected to continue on an upward trajectory.

Figure 1: Sector composition as a share of GDP (%).

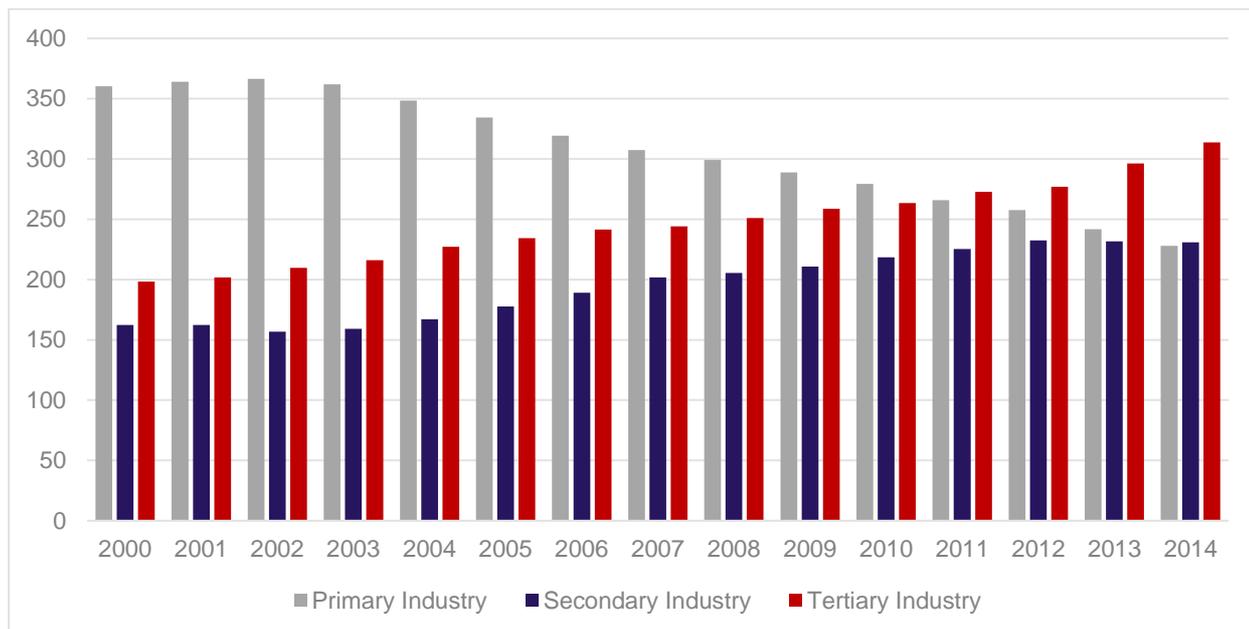


Source: National Statistical Yearbook, 2006–2015 from the NBSC. See Appendix A for the detailed explanation of the strata of industry.

The development of agriculture and improved primary industry productivity helped the country to release an abundant supply of labour onto the labour-intensive, low-skilled manufacturing sector (Hu and Khan, 1997). Agricultural employment as a share of the labour force fell from more than 70% in 1978 (Sachs and Woo, 2001) to only 30% in 2014. In 2007, migrant workers, with an average age of 32 and formal schooling of 10.4 years, were estimated to number around 120 million, making up 64.4% of all workers in industry (Friedman and Lee, 2010). This highly flexible workforce with the required level of schooling offered manufacturers much-needed labour for industrial growth.

In response to these changes in the main sectors of the economy, employment composition per sector is evolving. The working-age population in China peaked in 2013 and the migration of surplus labour from rural to urban areas has also slowed (*Financial Times*, 2015). This trend draws attention to the debate over China's Lewisian turning point, where the transition of surplus labour from the agriculture sector to the modern sector cannot be achieved without increasing wages (Cai, 2008; Golley and Meng, 2011; Zhang et al., 2011). The shrinking pool of surplus labourers in rural China (Cai and Wang, 2008) and the rising trend in wages (Zhang et al., 2011) suggest to many analysts that the country is getting closer to its Lewisian turning point, which is determined by several factors such as volume of surplus labour, wage increases, demand and supply of the labour market, unemployment rate, income gap and inequality (Lewis, 1972; Ranis and Fei, 1961; Minami, 1968).

Figure 2: Employment by sector, in million people.



Source: National Statistical Yearbook, 1990 to 2000, obtained from the NBSC.

Note: The total number of employed persons was estimated according to the labour force survey and population census. It is not comparable to employment from industry economic statistics and high-tech industry statistics in the following sections that only take into account firms in urban areas and those with outputs above RMB20 million. See Appendix A for the detailed explanation of the strata of industry. See Appendix A for the definition of 'employed person'.

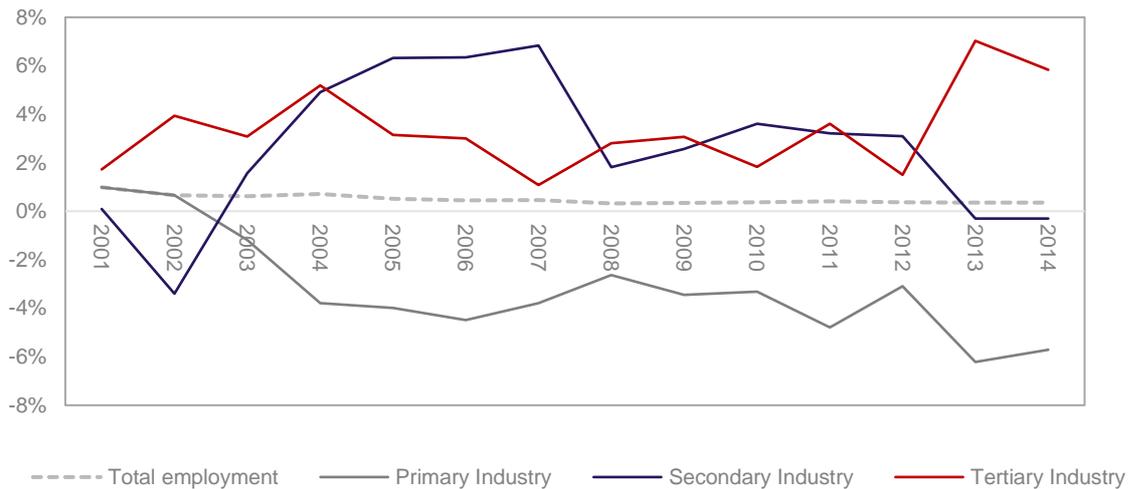
Although consensus on this topic has not yet been reached, there are clear signs that the labour dynamics are changing after taking advantage of decades of ample cheap labour. In general, total employment in China has continued to rise over the past decade. The total number of employed persons was 720.58 million in 2000, 746.47 million in 2005 and 772.53 million by the end of 2014 – a 51.68 million net increase from 2000. This reflects a 0.4% per annum growth rate over the decade, which is very low. From 2000 to 2014, it was 0.5% per annum. In contrast, employment in secondary industry has grown 2.6% per annum since 2000, and 3.32% per annum since 2005 – that is, faster than throughout the whole period. Tertiary industry has grown the fastest since 2000, at 3.34% per annum, but since 2005 has slowed down relative to the previous five years, at 3.29% growth per annum. During this period, significant migration flow has taken place across sectors. Secondary and tertiary industries have become the dominant economic sectors offering employment opportunities while the primary sector follows a downturn trend (Figure 2). Since 2000, the tertiary sector has consistently yielded more employment than the secondary sector. In 2011, it surpassed the primary sector and became the largest employment supplier in China, contributing 313.64 million jobs by the end of 2014. Employment in the primary sector was falling and overtaken by the secondary sector in 2014, becoming the smallest contributor to the nation's employment. In 2014, total employment in secondary industry was 230.99 million people, of which manufacturing contributed approximately 103 million jobs.

While employment in the primary sector continues to shrink, service-related employment has grown rapidly over the past decade. The contribution of the services sector to total employment is large, above 30% since 2004 and exceeding 40% after 10 years, by 2014. The growth in secondary industrial jobs has slowed but remains positive after the financial crisis in 2008; its share peaked in 2012, accounting for about 31% of the labour force. As Figure 3 displays, both primary and secondary industries have suffered negative growth in terms of job creation since 2013 whereas the service sector still enjoys continuing increases. This transition has been greatly supported by the enforcement of the notice of the development of the services industry during the 12<sup>th</sup> Five-Year Plan launched by the State Council.

The labour market in China has so far appeared resilient, though total employment has not grown rapidly. Over the past decade, new job creation has surpassed annual official targets, with significant margins. The key reason often cited is the expansion of the services sector (Lam et al., 2015). Stronger growth for

service-sector jobs signals that the government’s long-promised transition from an industrial economy focused on exports to one led by domestic demand is under way. In fact, the data show that growth of secondary industry employment was as strong as tertiary industry from 2002 to 2012. Since 2013, tertiary industry has become the strongest of the three major sectors. The uneven manufacturing development across regions generates employment relocation potentials, for example, shifting labour-intensive manufacturing from the East to interior parts of the country (Lam et al., 2015). Such relocation potential may partly help the secondary industry rebalance employment within the sector but its long-term effect is yet to be seen.

Figure 3: Growth rates of employment by sector (%)

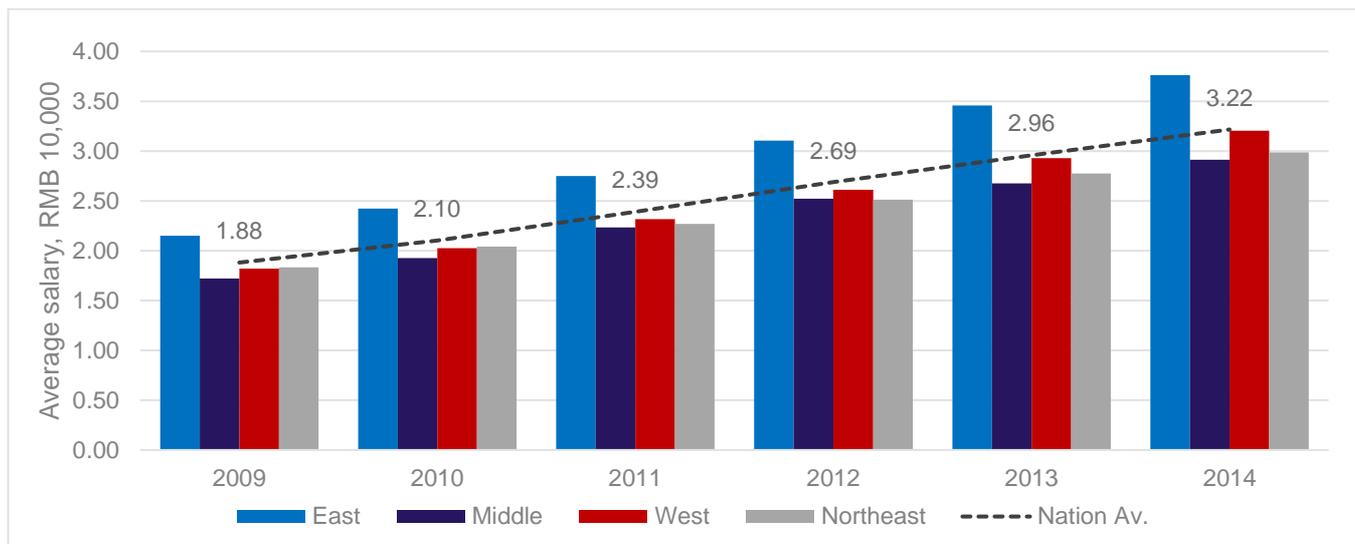


Source: National Statistical Yearbook, 2006-15, obtained from the NBSC. See Appendix A for a detailed explanation of the strata of industry.

## 2.2 Rising manufacturing wages

In an increasingly competitive market, controlling costs is crucial in order for manufacturers to maintain their margin and competitiveness. Undoubtedly, rising wages and other factor costs have put extra pressure on China’s slowing economic growth. The explosion of labour cost is often cited as an important signal that low-cost manufacturing has already reached its competitive limit; and producers have started relocating their operations to new low-cost destinations (Ceglowski and Golub, 2007; Chen et al., 2009; Yang et al., 2010).

Figure 4: Average manufacturing salary by region, 2009-14.

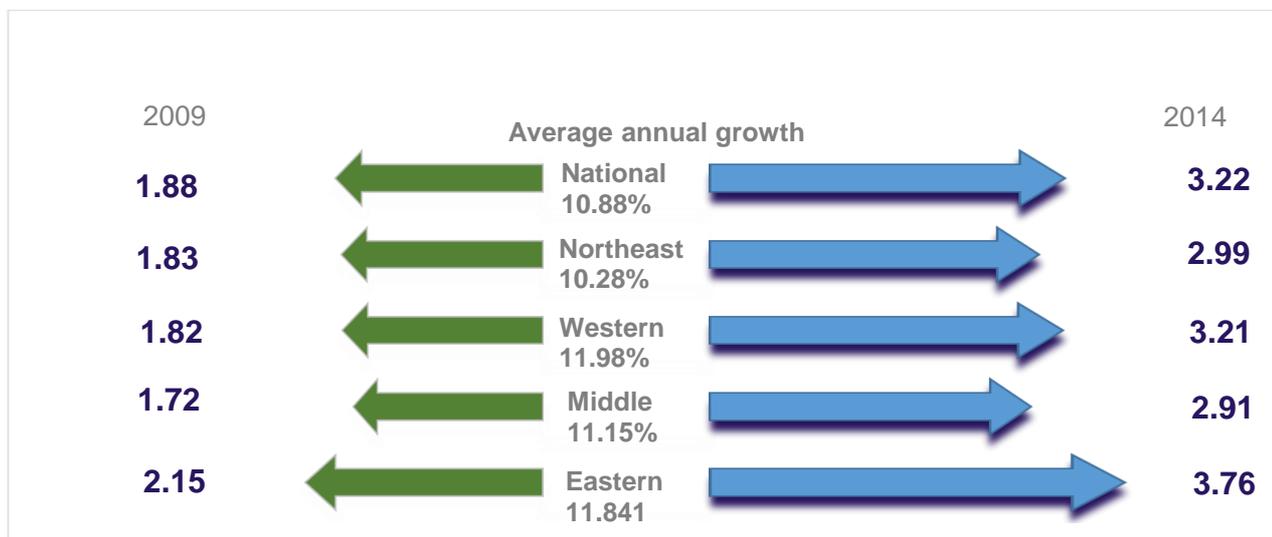


Source: National Statistical Yearbook 2010–15, data obtained from the NBSC. Average salaries in private manufacturing were unavailable before 2009. Statistics before 2009 are therefore not included.

Notes:

- (1) In the National Statistical Yearbook, urban manufacturing employment (average salary) does not include private enterprises. See Appendix for the definition of ‘person employed in private enterprises’.
- (2) Statistics in the above chart are computed as the median values of ‘urban manufacturing average salary’ and ‘private enterprises manufacturing average salary’. As noted in the NBSC statistical yearbook, the level of manufacturing employment was estimated according to the labour force survey and population census. Therefore, average salary was also computed based on the labour force survey and population census.
- (3) Wages are in real terms, adjusted to 2005 prices based on the annual inflation rates published by the NBSC.
- (4) Numbers above the dashed line indicate the real national average salary, in RMB10,000. The end of 2005 Chinese RMB to US Dollar exchange rate was 0.124.
- (5) See Appendix A for the detailed method to compute ‘Average Wage’.
- (6) See Appendix A for the definition of regions: East (blue), Middle/central (purple), West (red) and Northeast (grey).

Figure 5: Average annual salary growth in RMB10,000.

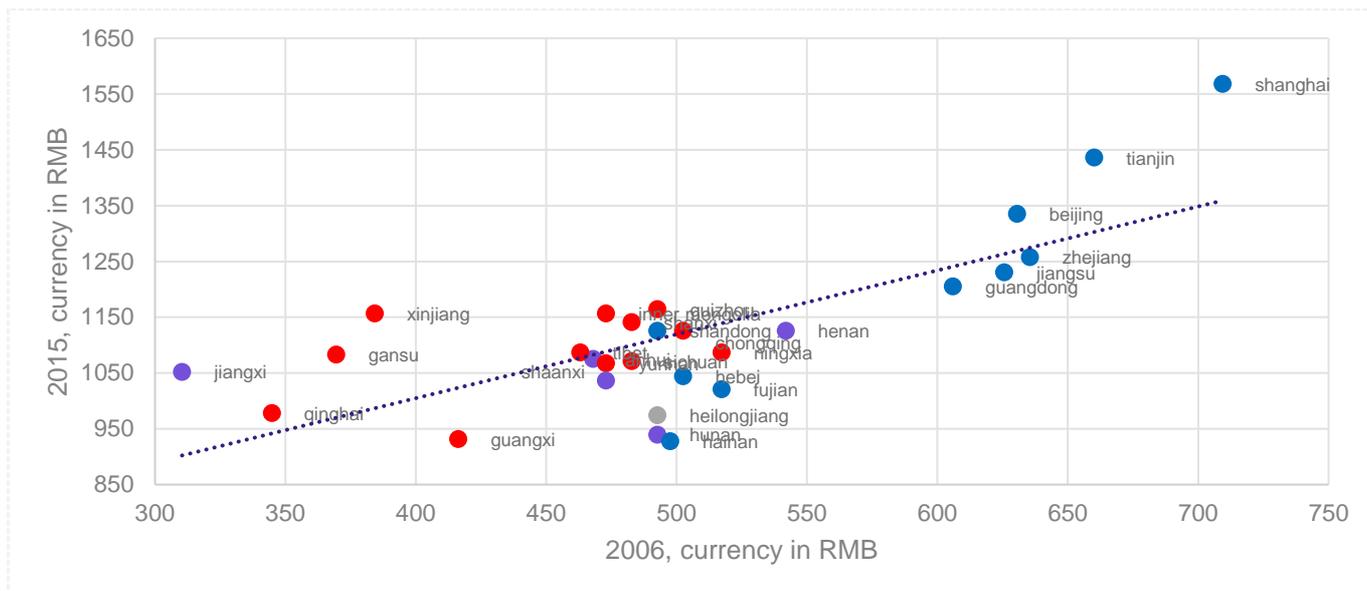


Source: National Statistical Yearbook 2010–15, data obtained from the NBSC. Average salaries in private manufacturing were unavailable before 2009. Statistics before 2009 are therefore not included.

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- (1) In the National Statistical Yearbook, urban manufacturing employment (average salary) does not include private enterprises. See Appendix for the definition of ‘person employed in private enterprises’.
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- (3) Wages are in real term, adjusted to 2005 prices based on the annual inflation rates published by the NBSC.
- (4) See Appendix A for the detailed method to compute ‘Average Wage’.
- (5) See Appendix A for the definition of regions: East, Middle, West and Northeast.

Figure 6: Minimum wages by province, 2006 and 2015.



Source: The minimum salaries are collected across 27 provincial and four directly controlled municipal statistic offices. Wages are adjusted to 2005 prices based on the consumer price index published by the NBSC.

Notes:

(1) The minimum wage was not published on an annual basis. Some provinces report the figure every several years (different cross provinces). The year 2006 was the first time that most of the provinces released the minimum wages within the same statistical year. Therefore, it was chosen to compare with 2015, which was the latest available year. Specifically, 17 provinces and four directly controlled municipalities published minimum wages data in 2006. Data for Anhui, Henan and Ningxia used the figures from 2007. Jiangxi, Tibet, Qinghai and Xinjiang were using the figures from 2004. Liaoning, Jilin and Hubei are not included because the first available data were in 2010. Thus we decided not to include these three provinces in Figure 6.

(2) Due to the missing data, the minimum wages of Jiangsu and Chongqing in 2015 were replaced with the figures from 2016. Hebei and Qinghai used the figures from 2014.

(3) The dashed line depicts the trend of the minimum salary at the national level from 2006 to 2014. Provinces above the trend line were growing faster in terms of the minimum wage compared to the provinces below the trend line.

(4) Regions are represented by different colours: East (blue), Middle/central (purple), West (red) and Northeast (grey).

From 2009 to 2014, China’s real average manufacturing wages increased by an annual average of 11.4% (Figure 4),<sup>6</sup> even though this was in the aftermath of the worst financial crisis since the Second World War. The adverse effect of the financial crisis was mainly seen in the rural sector where unemployed migrant workers returned (Tao et al., 2010). Urban employment was not affected and no reductions in working hours or wages were observed. Figure 5 shows that wages have grown across all regions. Wage gaps between the East and inland are persistent; in fact, they have grown between the East on the one hand and the Northeast and Middle/Central on the other,<sup>7</sup> while remaining constant between East and West. The western provinces have enjoyed the fastest growth and the annual average salary of manufacturing workers grew at 11.98 percentage points. The average salary level of manufacturing employees in Middle China remained the lowest, although its average annual growth was above 11%. The slowest growth of all was the Northeast region – 10.28 percentage points annual growth.

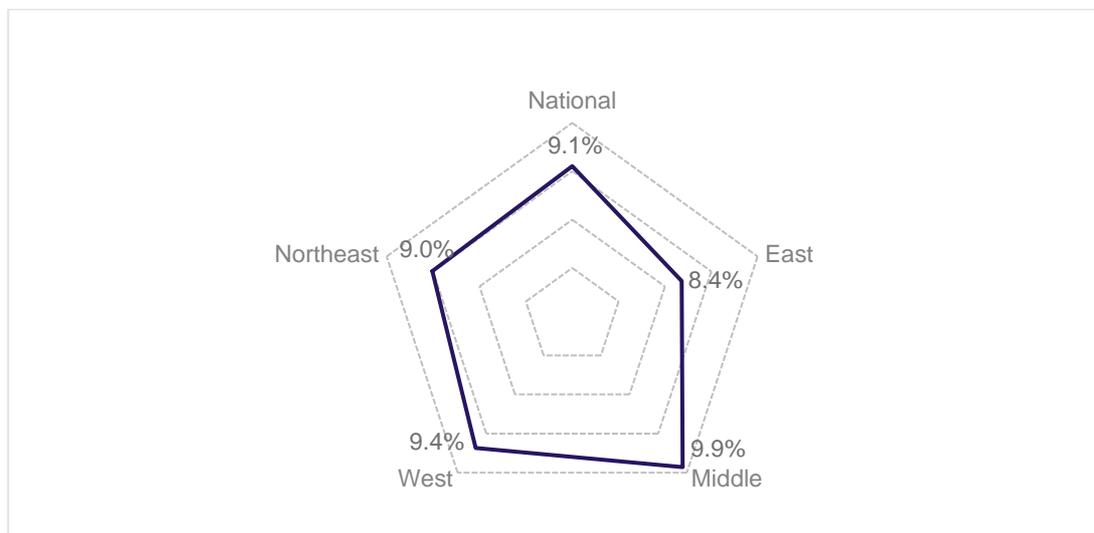
One factor behind rising labour cost is regulation – the minimum wage policy adopted in 2004, which contributes to China’s overall strategy of increasing domestic consumption (Yueh, 2012). This is a different issue from rising wages due to slower supply from rural areas (the Lewis model story). Figure 6 presents the minimum wages by province in China. The wages are in RMB and plotted respectively for 2006 (X axis) and 2015 (Y axis). Further away from the origin indicates higher levels of minimum wage. Located in the top-right corner of Figure 6, Shanghai had the highest minimum wages in China in both statistical years. Minimum wages exhibited regional disparities. East China (in blue) are in general plotted in the high minimum wage area – top right – except for Hainan, Fujian, Hebei and Shandong, which were at a relatively high level in 2006 but falling behind by 2015. The minimum wages across inland China in 2016,

<sup>6</sup> The average salaries include both urban manufacturing (excl. private) and urban private manufacturing. Average growth rates are computed with controlling for the annual inflation. The prices are adjusted to 2005 levels. Therefore, the growth rates are slightly lower compared to figures documented in other studies.

<sup>7</sup> Middle region and Central region are interchangeably throughout the text.

especially the Middle (purple) and West (red) provinces, were generally lower compared to the eastern coast. Most of them increased their minimum wages significantly over the last 10 years – for instance, the real minimum wage of Jiangxi province grew from RMB310 in 2004 to RMB1,052 in 2015 while Gansu's minimum wage tripled, from RMB369 in 2006 to RMB1,083 in 2015. Some of provinces (Hunan, Guangxin and Qinghai) still lag behind.

Figure 7: Compound annual growth of minimum wages by region, 2000-06.



Source: The minimum salaries are collected across 27 provincial and four directly controlled municipal statistic offices. Wages are adjusted to 2005 prices based on the consumer price index published by the NBSC.

Note: The minimum wage was not published on an annual basis. Some provinces report the figure every few years (different for every province). Although the minimum wage policy was launched in 2004, some of the provinces started reporting the data a few years before or after that. The above figure calculated the compound annual growth based on the first available year for each province to the last available year. Specifically, there are eight provinces and two directly controlled municipalities using the data from 2000; seven provinces and one directly controlled municipality were using the data from 2001, and 10 provinces and one municipality were using the data from 2002. For the latest available years of each province, please see Note 2 of Figure 6.

Figure 7 above aggregates the minimum wages at regional level and presents the compound annual growth rates. The top angle of the net chart shows the compound growth rate of the country while other angles refer to the corresponding rates for different regions. The further the purple line deviates from the centre, the higher the compound annual growth rate achieved. Consistent with the provincial results in Figure 6, Middle and West areas experienced relatively faster growth of minimum wages compared to Northeast and East. Taking into account the compound effect, the annual growth rate of minimum wage in the Middle region reached 9.9% while the West was half a percentage point lower. Northeast province had 9 percentage points' annual growth and the eastern coast of China was the lowest, at 8.4%. The fast growth of minimum wages in inland regions suggests that there is a tendency for gaps to narrow between the eastern coast and inland China.

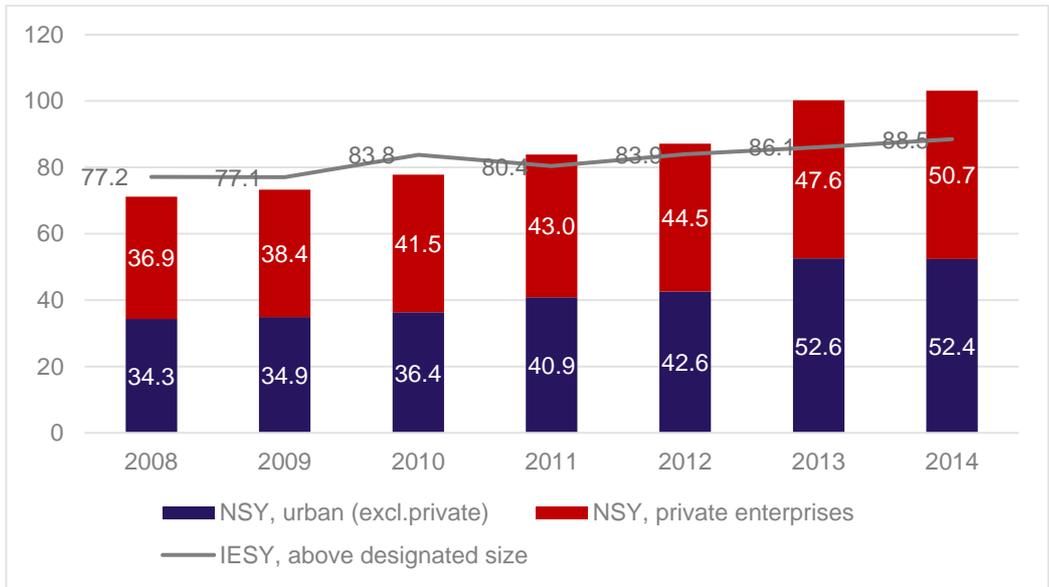
### 3. THE DYNAMICS OF MANUFACTURING EMPLOYMENT

#### 3.1 Manufacturing data

Manufacturing employment data are reported in several statistical yearbooks including the National Statistical Yearbook (NSY), IESY, High-Technology Statistical Yearbook and the Labour Statistical Yearbook. Different statistical ranges were adopted across these and, therefore, inconsistencies exist among the figures. Specifically, the 'employment' section of the NSY and the Labour Statistical Yearbook used the same measurement in which the level of employment and wages are computed from the labour force survey and population census, both published by NBSC. One issue to note about this approach is that the numbers for manufacturing employment are mainly generated from: 1) manufacturing enterprises

in urban areas (excluding private); 2) private enterprises. Non-urban enterprises were not included. Adopting a different sampling approach, statistics of manufacturing industries reported by IESY and the High-Tech Statistical Yearbook are based on enterprises above a designated size (see Appendix A for definition). Excluding firms below the designated size may also lead to bias as small and medium-sized enterprises have become increasingly important for the economy.

Figure 8: Manufacturing employment statistics from IESY and NSY, in million people.



Source: IESY and NSY.

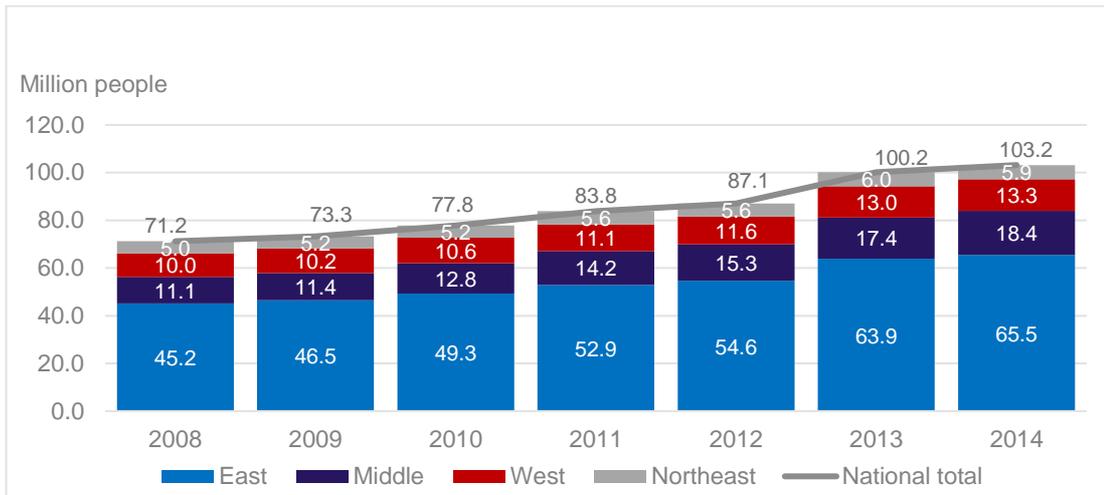
Note: 'above designated size enterprise' in IESY: since 2011, firms with outputs of less than RMB20 million are excluded in the statistics. Prior to this, firms with outputs of less than RMB5 million were excluded. The drop in manufacturing employment in NSY can be explained by this change.

The manufacturing employment sizes from both measurement ranges are given in Figure 8. NSY (based on labour force survey and population census) tended to underestimate the size of manufacturing employment before 2011. After changing the definition of 'designated size' from RMB5 million output to RMB20 million output, the level of manufacturing in the IESY (based on enterprises above a designated size) fell to 80.4 million people, about a 3.4 million drop. Since then, the IESY figure has stayed below the NSY. The rest of Section 3.1 will use the manufacturing statistics from the NSY because the disaggregate-level data allows us to present a more in-depth description of the regional employment trend. As to the employment dynamics for the selected industries in Section 3.2 and Section 4, we will mainly use the IESY data.

### 3.2 Regional disparity

Manufacturing employment in China has grown at a steady pace in the last decade. As Figure 9 shows, the number of jobs created in manufacturing industries increased from 71.2 million in 2008 to 103.2 million in 2014. This is a growth rate of 6.4% p.a.; more than 13 million new jobs (15% of the 2012 total) were created in this sector in 2013 alone. The growth continued in 2014 but slowed down, leading to another 2.2 million new jobs.

Figure 9: Number of manufacturing jobs, 2008-14.



Source: National Statistical Yearbook 2009–15, data obtained from the NBSC. The jobs in private manufacturing were unavailable before 2008. Notes:

- (1) As noted in the NBSC Statistical Yearbook, the number of jobs in manufacturing was estimated according to the labour force survey and population census. It is not comparable to the manufacturing jobs in industry economic statistics or high-tech industry statistics, which take into account firms with at least RMB20 million outputs.
- (2) In the NSY, urban manufacturing employment does not include private enterprises. See Appendix A for the definition of 'person employed in private enterprises', statistics in Figure 9 are the sum of both 'urban employment' and 'private enterprises employment (both urban and non-urban areas)'.
- (3) See Appendix A for the definition of regions: East, Middle, West and Northeast.

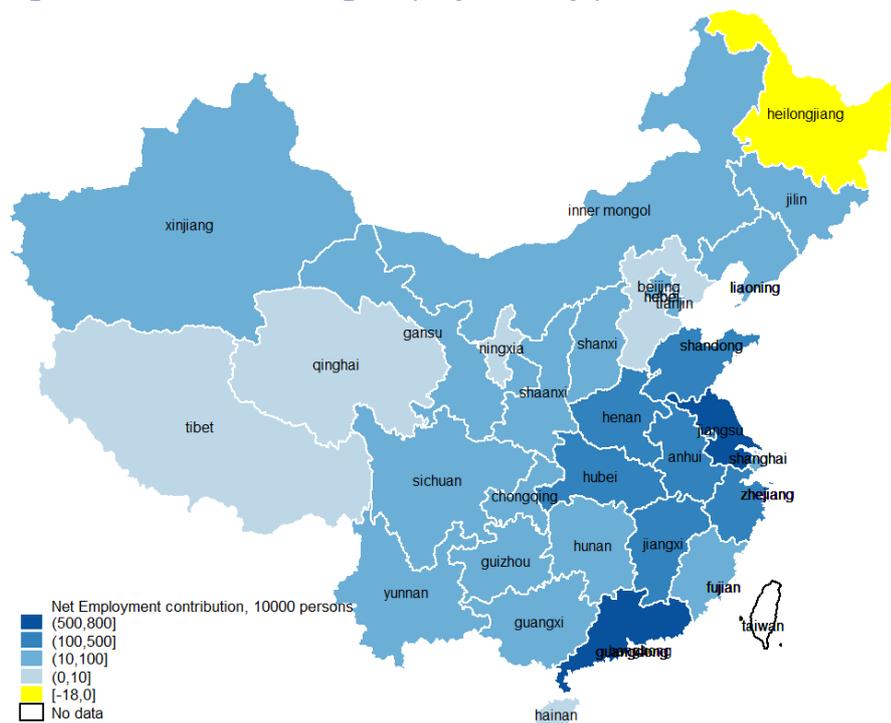
Spatial patterns are revealed when manufacturing employment is broken down by region. Disparities between the East and other areas were evident. With reference to the volume of employment, manufacturers located in the East composite provinces that contribute the most employment amounting to 65.5 million by the end of 2014. From 2008 to 2014, 20.3 million new manufacturing jobs were supplied in the East, of the total 32.1 million new jobs in manufacturing. But the relative annual growth rates for manufacturing employment by region for 2008–14 were 6.48% for East, 8.93% for Middle, 5% for West and 3.01% for Northeast. The national average was 6.45%, the same as for the East region. Employment in the Central region has grown by far the fastest. The employment created in the Middle and Western regions was similar in 2008, 10 million and 11.1 million jobs respectively. The gap between them started opening up after 2010. In 2014, manufacturers in the Middle region supplied more than one third of jobs compared to the Western region. In total, both regions provided 31.7 million jobs by the end of 2014. Owing to the concentration of state-owned heavy industries (Huang, 2008; Szamosszegi and Kyle, 2011), jobs growth in Northeast manufacturing was minimal (see Figure 9).

To reduce the regional disparities, the central government released a series of regional development plans. In 2000, the western development programme was launched to boost domestic demand by allocating resources to stimulate economic growth in the western-located provinces (The Central People’s Government of the People’s Republic of China, 2000). As China’s economy continues to liberalise and privatise, there has been a stagnation in the Northeast heavy-industry-based economy, with little adaptation to structural reforms. The Government began the ‘Revitalise the Northeast’ campaign in 2003 to tackle this problem (Xinhuanet, 2003). Premier Wen Jiabao in 2004 launched the ‘rise of central China’ programme and the central government released the ‘Guiding Opinions of the State Council on Central and Western Regions’ Undertaking of Industrial Transfer’ in 2010 (The Central People’s Government of the People’s Republic of China, 2010).

Figure 10 below gives the spatial employment dynamics in which the growth trend lines exhibit a clear boom in manufacturing employment in the Middle region. The chart shows clearly that employment growth has been faster in the Middle region than in the East, except in 2013, which appears to have been an unusual year. In both 2010 and 2013, manufacturing employment expanded more than 12% compared to the previous statistical year. The number of manufacturing workers in the West region grew at moderate rates before 2012 and surged in 2013, growing about 12.3%. As the hub for manufacturing, job supply in



Figure 12: Manufacturing employment by province, 2008–14.

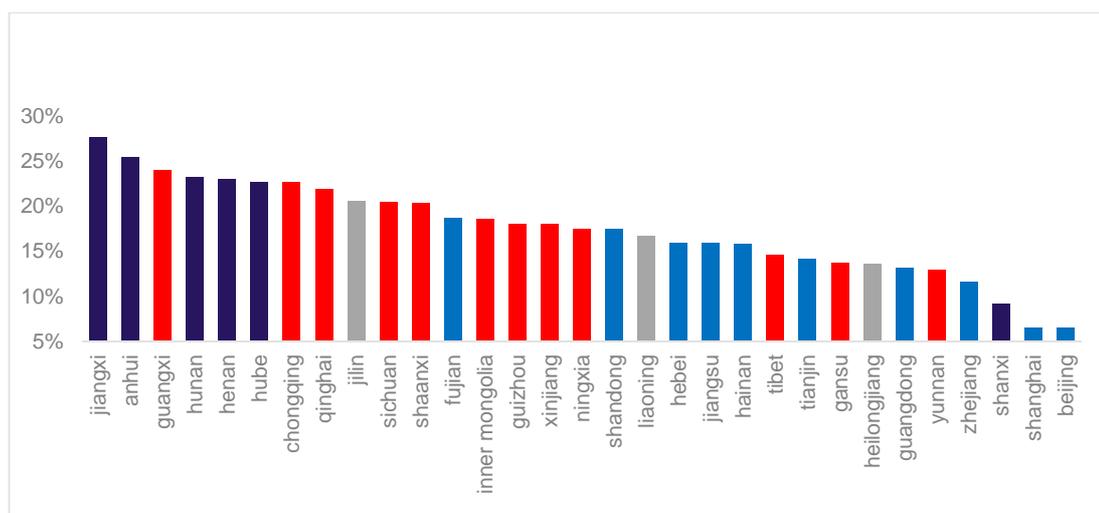


Source: National Statistical Yearbook 2009–15, data obtained from the NBSC. Employment figures in private manufacturing were unavailable before 2009.

Notes:

- (1) As noted in the NBSC Statistical Yearbook, the number of jobs in manufacturing was estimated according to the labour force survey and population census. It is not comparable to manufacturing jobs in industry economic statistics or high-tech industry statistics, which only take into account firms with at least RMB20 million outputs.
- (2) In the National Statistical Yearbook, urban manufacturing employment does not include private enterprises. See Appendix A for the definition of 'person employed in private enterprises'. Statistics in Figure 8 are the sum of both 'urban employment' and 'private enterprises employment'.
- (3) See Appendix A for the definition of regions: East, Middle, West and Northeast.
- (4) The colour density indicates the scale of net employment contribution; dark blue is high contribution while light blue is low contribution. Province(s) in yellow indicate the negative growth of employment during the review period.

Figure 13: Compound annual growth rate of manufacturing sales by province, 2005-14 (% change).



Source: Industrial Economic Statistical Yearbook 2006-2014, data obtained from the NBSC.

Notes:

- (1) Data adopting new classification criteria since 2012. Therefore, figures are not comparable with previous years. Specifically, since 2011, firms with outputs below RMB20 million are excluded in the statistics. Previously, only firms with outputs below RMB5 million were excluded.
- (2) See Appendix A for the definition of regions: East, Middle, West and Northeast.
- (3) Regions are represented by different colours in the above diagrams: East (blue), Middle/central (purple), West (red) and Northeast (grey).
- (4) See Appendix A for the definition of 'industrial sales'.

Breaking down the employment contribution by provinces, Figure 11 uses the annual growth from 2008 to 2014 to signal the rapid development of Middle China. The size of each circle reflects the changes in manufacturing employment size between 2008 and 2014. The horizontal axis gives the manufacturing employment size in 2008 and the vertical axis gives the corresponding numbers for 2014 so that a circle in the top right represents greater employment by province in both 2008 and 2014, and a circle in the lower left close to the origin shows smaller employment in both years. The red dashed line shows the national average of employment change; above the line provinces are experiencing faster annualised growth and below it, those growing at slower rates. The coastal provinces at the top right, for example, Guangdong and Jiangsu, supplied the most manufacturing jobs during the review period. The latecomer provinces in Middle (in purple) and Western (in red) regions gradually rise as popular manufacturing locations for attracting workers, growing at a higher speed compared to East China. Conversely, coastal provinces (in blue) such as Shandong, Zhejiang and Fujian, started at higher points but the sluggish growth rates have pulled them below the national average. With regard to the net employment growth between 2008 and 2014 (Figure 12), there were eight provinces in China contributing more than 1 million new manufacturing jobs. Guangdong, Jiangsu, Shandong and Zhejiang are located on the eastern coast; the other three – Henan, Anhui, Jiangxi and Hubei – are rising stars in Middle China, geographically adjacent to the Yangtze river delta region. As the light blue region indicates, most provinces in Southwest and Middle regions had supplied more than 100,000 new manufacturing jobs during the review period.

Concluding the regional employment shift requires more robust evidence. Using the sales growth from 2005 to 2014, Figure 13 ranks the expansion of manufacturing by province based on their compound annual growth in sales of manufacturing products, with the colour of each bar showing a different region.<sup>8</sup> Manufacturing goods sales have tended to grow in China but magnitude varies across provinces and cities. The Middle region emerged rapidly and took the lead. Five of the top six fastest growth provinces are in this region. For example, the sales value of manufacturing goods in Jiangxi province was RMB231.8 billion in 2005 and surged to RMB2,082 billion (2.1 trillion) in 2014, nearly a nine-times increase. Only one Western province entered the top five; Guangxi province took the third place with compound annual growth rate of 23.9%. Besides the Central region, the majority of the Western provinces have also experienced fast growth as displayed by the red bars in Figure 13. Guizhou, Xinjiang and Ningxia have also accelerated their catch-up, although at moderate paces. Notably, growth in Beijing, Shanghai, Zhejiang and other Eastern provinces and cities was slowing and so they were ranked at the bottom of the list. But the Eastern region still contributed a much bigger share of the total than other regions, amounting to 70.4% of the national total in 2005, and 59.4% in 2014. The shift in the location of output (sales) could be a result of rising costs on the eastern coast. Consequently, manufacturing firms were seeking to reduce costs by relocating to inland China. One factor that may catalyse the relocation process is the improvement of the transportation infrastructure such as the completion of express roads and high-speed train projects connecting West and East, such as the ‘Eight vertical and eight horizontal’.<sup>9</sup> In all, both regional employment and sales have provided us with preliminary evidence that manufacturing may have started shifting away from Eastern regions towards inland areas.

### 3.3 Industrial heterogeneity

There is little doubt that the substantial investments in innovation over the past decades have triggered a rapid upgrading of Chinese high-tech industries, especially after the vigorous implementation of its proactive innovation policy in 2000. Since the start of opening up and reform in the 1980s, China has been implementing an ‘open national innovation system’ approach (Chesbrough, 2003; Fu et al., 2016) to promote technology upgrading in industries. Inward direct investment has been used since the 1980s to source new technology and innovation and to support indigenous innovation capability development. After

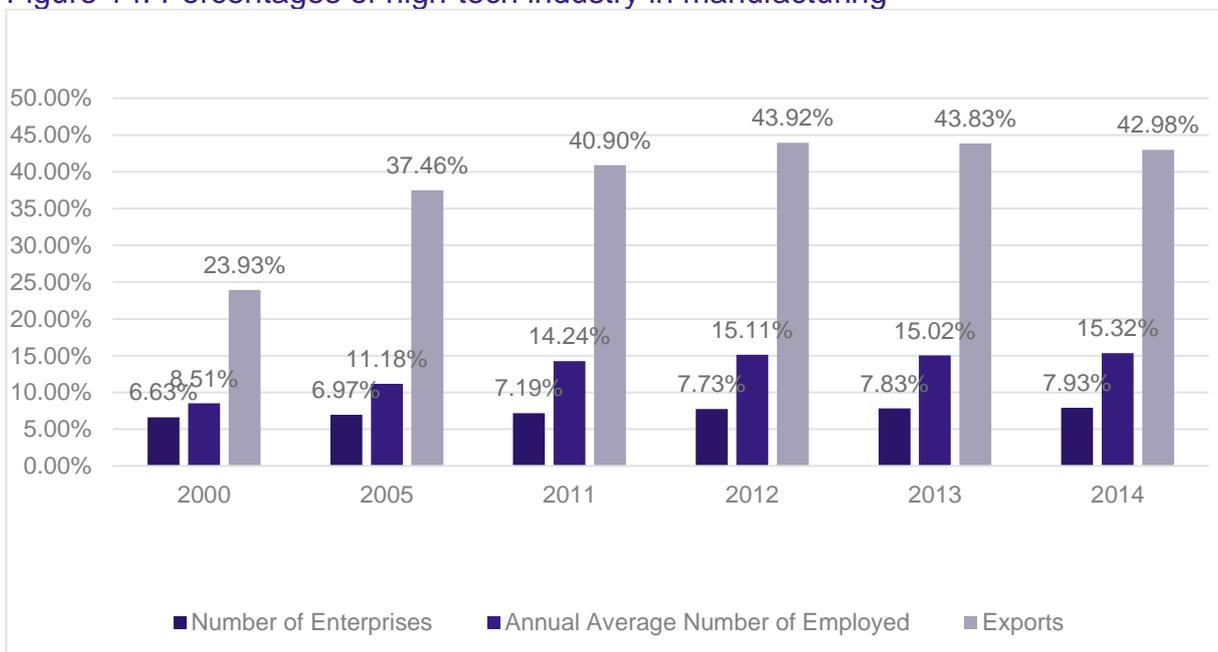
<sup>8</sup> Prices in 2014 are adjusted to the 2005 level based on the inflation rate given by the NBSC. Manufacturing sales measures the total sales value of manufacturing goods produced within the province.

<sup>9</sup> The ‘Eight vertical and eight horizontal’ is a plan to increase in the length of China’s railway network, referring to the eight main vertical lines linking the North and the South and the eight horizontal main lines linking the East and the West. Source: *Baidu Baike* (2017).

2000, the system has become more active in knowledge-sourcing policies by combining unconventional channels that are not often used in developing countries for example, outward direct investment, international innovation collaboration and attracting highly skilled migrants (Fu et al., 2016).

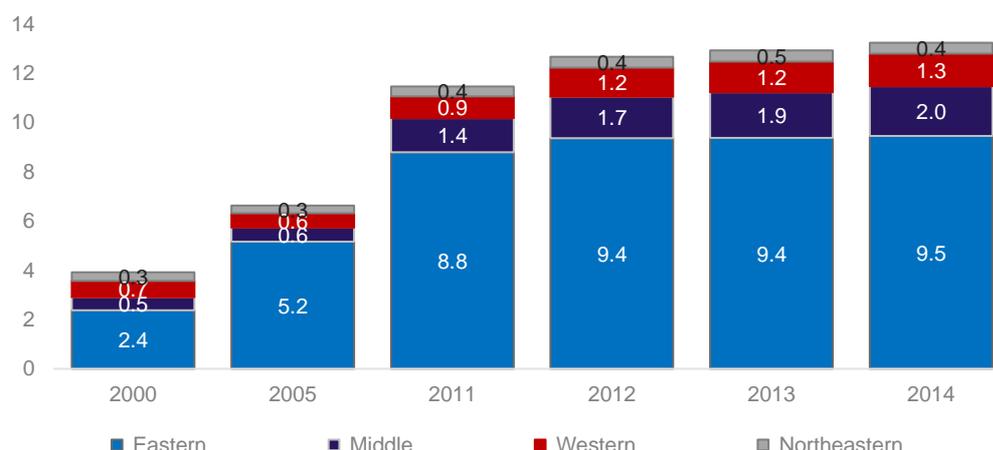
As a consequence, the high-tech<sup>10</sup> industry has expanded rapidly. Figure 14 shows how the number of high-tech companies as a share of total manufacturing firms slightly increased from 6.63% in 2000 to 7.93% in 2014, whereas the expansion of high-tech and skill-intensive products in China’s total manufactured export was more evident, from 23.9% in 2000 to about 43% in 2014. During the same reviewing period, the employment in these industries as a share of total manufacturing employment more than doubled, reaching 15.3%. Nonetheless, the development of high-tech industries remains unbalanced across the regions. Benefiting from the developed infrastructure, large technology pool and highly skilled human capital, the Eastern region takes the lead in high-tech outputs and exports. Significant regional disparity has also emerged in relation to high-tech employment. The Eastern region alone yields 9.5 million workers, about 2.5 times the amount of high-tech employment generated from other regions, as shown by Figure 15. The Middle and Western provinces are catching up in recent years whereas high-tech employment in the three provinces of the Northeast remains stagnated.

Figure 14: Percentages of high-tech industry in manufacturing



<sup>10</sup> See definition in Appendix A.

Figure 15: High-tech employment by region (in millions of people)



Source (Figures 14 and 15): China Statistical Yearbook on High Technology Industry 2015, compiled by the NBSC; National Development and Reform Commission; Ministry of Science and Technology.

Notes (Figures 14 and 15):

(1) Data adopting new classification criteria since 2012. Therefore, figures are not comparable with previous years. Specifically, since 2011, firms with outputs of less than RMB20 million are excluded in the statistics. Previously, only firms with outputs below RMB5 million were excluded.

(2) Employment statistics here are not comparable with those in the 'manufacturing employment' section because the number of jobs there was estimated according to the labour force survey and population census.

(3) See Appendix A for the definition of regions: East, Middle, West and Northeast.

(4) Regions are represented by different colours in the above diagrams, they are East (blue), Middle/central (purple), West (red) and Northeast (grey).

(5) See Appendix A for the definition of 'High technology industry (manufacturing)'.

Light manufacturing offers growth solutions to under-developed regions and economies during the course of industrialisation, driven by low-factor costs competitiveness and an abundant workforce. To understand the detailed structure of the manufacturing employment dynamics, we have broken down the change of employment ratios from 2009 to 2014 by some selected industries in Table 1. Based on the size of employment and the growth rates, four labour-intensive light manufacturing sectors are chosen as our focus in the current research. They are 'Communication Equipment, Computers and Other Electronic Equipment', 'Electrical Machinery', 'Textile Wearing Apparel, Footwear and Hats', and 'Articles for Culture, Education, Sport and Entertainment products'. 'Communication Equipment, Computers and Other Electronic Equipment' makes up the biggest share in total manufacturing employment whereas 'Electrical Machinery' took the second position in 2014. 'Textile Wearing Apparel, Footwear and Hats' experienced a significant drop during the five-year review period and 'Articles for Culture, Education and Sport Activities, including entertainment products' grew significantly from 2009 to 2014.

As China begins to pivot towards a higher value manufacturing paradigm to compete with other innovative economies, high tech-intensive ICT and computer factories have taken the leading role by hiring the most workers in manufacturing industries, reaching 10.28% (9.07 million) of total manufacturing employment in 2014 from 8.76% (6.64 million) in 2009. With the second biggest share in 2014, electrical machinery manufacturers supply about 6.38 million jobs and increased slightly (0.17%) compared to 5.35 million in 2009. Another fast-growing industry of interest is manufacturing of articles for culture, education and sport activities. Although the employment level was relatively low, its share of employment in total manufacturing expanded by 1.05%, from 1.54% in 2009 to 2.58% in 2014. Textiles, on the other hand, scaled back its share in manufacturing employment by 2.58%, the biggest drop among all manufacturing industries. Textile wearing, footwear and hats has also gone through a similar scaling back but at a smaller scale, with a 0.69% drop in the share of manufacturing employment from 2009 to 2014.

Overall, the labour-intensive industries still play an important role in balancing the labour surplus, although their leading role in economic growth has been gradually replaced by the capital-intensive factories that produce high value-added goods. Sixteen manufacturing industries showed growth in their manufacturing employment shares whereas 12 industries experienced decline during the five-year review period. There

has been strong momentum in the capital-intensive industry development including ICT manufacturing, transport equipment, medicine and electrical machinery. A few low-tech industries, such as leather products, food processing, foods and furniture, also expanded but contributed relatively less to total manufacturing employment.<sup>11</sup>

Table 1: Employment sizes (million people) of selected industries and their shares (percentages) in total manufacturing employment, 2009 and 2014

Select industries	2009		2014		Change of Shares
	Size	Share	Size	Share	
Communication equipment, computers and other electronic equipment	6.64	8.76%	9.07	10.28%	1.52%
Articles for culture, education and sport activities, including entertainment products	1.16	1.54%	2.28	2.58%	1.05%
Leather, fur, feather and related products	2.06	2.71%	3.04	3.45%	0.73%
Electrical machinery	5.35	7.06%	6.38	7.23%	0.17%
Textile wearing apparel, footwear and hats	4.49	5.93%	4.62	5.24%	-0.69%
Textiles	6.17	8.14%	4.90	5.56%	-2.58%

Source: IESY 2010 and 2015, data obtained from the NBSC. The 2014 IESY includes 'leather, fur products' and 'articles for culture, education and sport activities, including entertainment products', which were not included in the statistics in 2009. Data in 2009 were collected from the Provincial Statistics Yearbook of 27 provinces and four directly controlled municipalities. Meanwhile, 'rubber and plastics products' were integrated in one category before 2013; we have summed up the two groups into one for 2014.

Notes:

(1) Manufacturing statistics in Industrial Economic Statistical Yearbook apply different sampling standards compared to the 'employment section' of the National Statistical Yearbook.

(2) Data have adopted new classification criteria since 2012. Therefore, figures are not comparable with previous years. Specifically, since 2011, firms with outputs below RMB20 million are excluded in the statistics. Previously, only firms with outputs below RMB5 million were excluded.

(3) Rows are arranged in descending order of changing shares.

## 4. THE EMPLOYMENT DYNAMICS IN SELECTED MANUFACTURING INDUSTRIES

### 4.1 Consumer electronics

ICT manufacturing refers to the manufacturing of communication equipment, computers and other electronic equipment.<sup>12</sup> Our research will focus on the manufacturing of consumer electronics including computers, mobile phones and their peripheral products such as keyboards, mouse, headsets and so on, as well as television and radio. Given that disaggregate-level data are unavailable, the statistics in this section will use the ICT manufacturing industry aggregated level data obtained from the Industrial Economic Statistical Yearbooks and Labour Statistical Yearbooks.

ICT development in China was guided by a series of development policies and plans especially the Science and Technology (S&T) policies. Following Deng Xiaoping's principle to use S&T as the primary driving force for productive growth, the ninth and tenth five-year plans (1996–2005) dedicated great effort to long-term S&T development (Pecht, 2006). The ICT industry was considered the main focus and it led to a dramatic growth of ICT enterprises from 2000 to 2004, with five times as many start-ups as there had been in the 1990s (Wang and Lin, 2008). By the end of 2014, the total number of communication equipment, computer and other electronic equipment enterprises surged to 13,722 from 8,868 in 2005, an increase of 54.7 percentage points.<sup>13</sup>

<sup>11</sup> A table with full statistics of manufacturing employment share for all manufacturing industries is available upon request.

<sup>12</sup> In the industry classification given in the NBSC, 'communication equipment, computers and other electronic equipment' (computer and ICT manufacturing) includes the following subcategories: communication, computer matching, computer parts, computer peripheral equipment, other computer, telecommunications equipment only in radar and ancillary equipment, audio-visual equipment, electronics, electronic components and assembly.

<sup>13</sup> The number of firms is obtained from the NBSC and firms with less than RMB20 million outputs were not included.

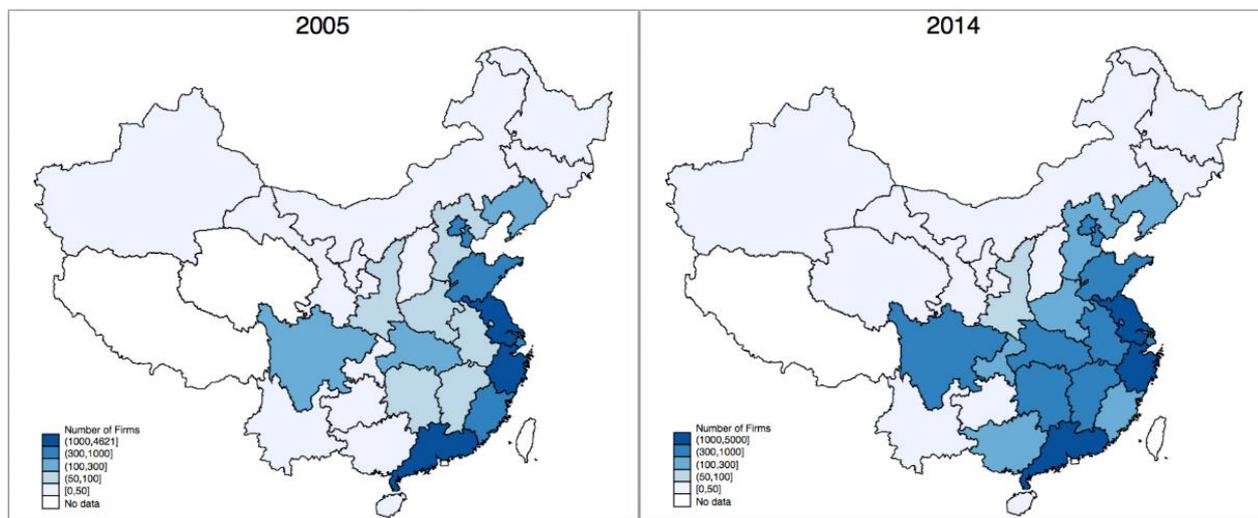
As one of the most profitable industries in the world economy, the Chinese government has given ICT high priority since the 1990s. The rapid development of China’s ICT has made it the world’s largest producer and consumer of electronic products (Pecht, 2006). Yet, as technology-intensive industry normally requires higher levels of technological capabilities than the low-tech industries, its development has inevitably been unevenly distributed geographically and tended to be more successful in technologically advanced areas (Wang and Lin, 2008).

Owing to the largely unbalanced distribution of resources, the development of ICT manufacturing is geographically asymmetric across the nation. The eastern coastal region is in general in an advantageous location, with well-stocked highly qualified human capital, as well as high levels of technological capability. These factors may explain why ICT manufacturing firms are clustered in this region, with the highest concentration in Guangdong province. Figure 16 displays the concentration of ICT manufacturing firms across China in 2005 (left chart) and 2014 (right chart). The provinces with more than 1,000 ICT manufacturing firms were Guangdong, Jiangsu and Zhejiang, all located on the eastern coast (dark blue). Spatial heterogeneity has been improved as a large number of ICT manufacturers have emerged across the Middle and part of the West. By the end of 2014 as shown in Figure 16, most of the Middle provinces had at least 300 ICT manufacturing enterprises. Yet, Western, except for Sichuan, and Northern regions were still significantly behind.

Over the past decade, the acceleration of the technology upgrading has enabled some ICT and computer manufacturers to achieve technological advancement as well as to expand their scope of activities. The intensified supply chain integration may offer the potential to incubate a group of leading brands that possess core technologies, such as Lenovo, Huawei, ZTE and Mi.

After 2011, firms with outputs below RMB20 million were excluded in the statistics provided by the NBSC. Previously only firms with outputs below RMB5 million were excluded. In order to present a robust and clear picture of the employment dynamics, we have divided the 10-year period into two parts. Figure 17 exhibits the changes of employment during these two periods. From 2005 to 2010, ICT goods manufacturing in China created about 3.33 million new jobs in which more than 1 million new jobs were in Guangdong and Jiangsu provinces.

Figure 16: Distribution of ICT manufacturing enterprises in 2005 and 2014



Source: Industrial Economic Statistical Yearbook 2006 and 2015, data obtained from the NBSC.

Notes:

- (1) Manufacturing statistics in the Industrial Economic Statistical Yearbook apply different sampling standards compared to the ‘employment section’ of the National Statistical Yearbook.
- (2) Data have adopted new classification criteria since 2012. Therefore, figures are not comparable with the previous years. Specifically, since 2011, firms with outputs below RMB20 million are excluded in the statistics. Previously, only firms with outputs below RMB5 million were excluded.

The eastern coastal region yielded the majority of ICT manufacturing employment while provinces in Middle China gradually became popular. As shown in Figure 18, the ICT manufacturing enterprises in total provided more than 9.17 million jobs at the end of 2014, of which 78.1% were in Eastern provinces. The East dominated the industry especially the large-sized enterprises and joint venture enterprises (Simon, 2012). Eastern employment in ICT has grown by 7.8 percentage points per annum from 2005 to 2014. Other regions were clearly much smaller in scale, although there was a catch-up tendency in the Middle and the West. The Middle has grown at 30.5% per annum on average, a much faster rate than the East. Since 2013, the total number of workers employed in ICT manufacturing factories in the Central region has exceeded 1 million. Figure 19 shows the tendency for growth rates to catch up. Before 2010, ICT employment growth was in general below 30 percentage points per annum except for the 35% increase in Middle China in 2008. Nonetheless, the inflow of ICT manufacturing workers to the eastern coast has slowed down significantly. At the provincial level (right chart of Figure 17), the expansion of dark blue areas indicated the strengthening of manufacturers in the Middle region, and greater concentration of the industry. Shanghai and Jiangsu, the fastest growing areas from 2005 to 2010, went into reverse, with their numbers of ICT employees contracting by 3.51 and 2.1 percentage points respectively between 2011 and 2014.

The export-driven nature of China’s ICT manufacturing sector has made it the world’s most important supplier of many major electronic products (Eugster et al., 2008). China’s ICT export trebled from 2005 to 2014, and is characterised by regional concentration. Consistent with the pattern of employment, the export volumes of ICT products from Middle and Western regions had grown rapidly as shown in Figure 20, but the East still provides 81.9% (RMB2.97 trillion) of total ICT manufacturing exports in 2014 (RMB3.62 trillion) which in total had grown 8.9% per annum on average between 2005 and 2014.

The unbalanced development of ICT manufacturing in China is also associated with the heterogeneous productivity performance across regions. Labour productivity, defined as the sales value generated per worker, are depicted in Figure 21. Although evidence has shown that the sales value per worker in the Eastern region was falling, it was still standing above the national average until 2011. The productivity of ICT manufacturing was holding steady. Even the growth of employment slowed down quickly after 2011. One possible explanation is that heavy investment in costly advanced equipment and high-standard production helped to mitigate the pressure caused by increasing labour costs in the long run (Wang and Lin, 2008). The improvement of the technological capability will subsequently drive the growth in productivity. Following the expansion of the ICT industry in Middle and Western China, productivity increased rapidly. Average sales of ICT products per worker in the Western region exceeded the national average in 2011 and reached nearly RMB100,000 per annum per worker.

Figure 17: Changes in ICT manufacturing employment, 2005–10 (left) and 2011–14 (right)

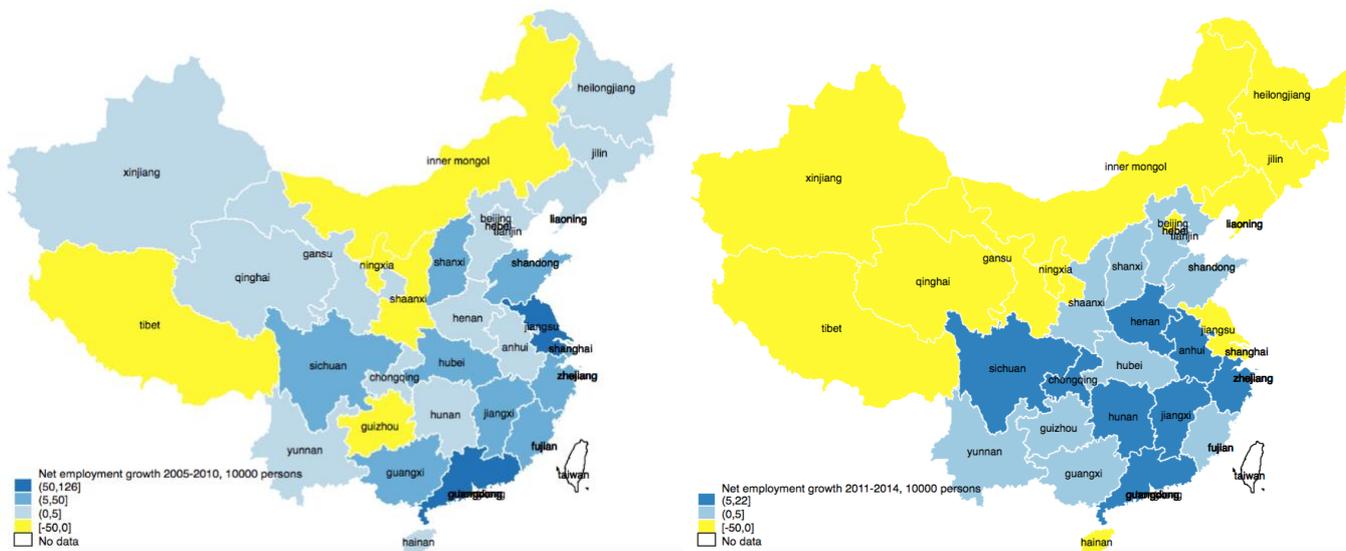


Figure 18: Number of jobs in computer and IT manufacturing industry by region

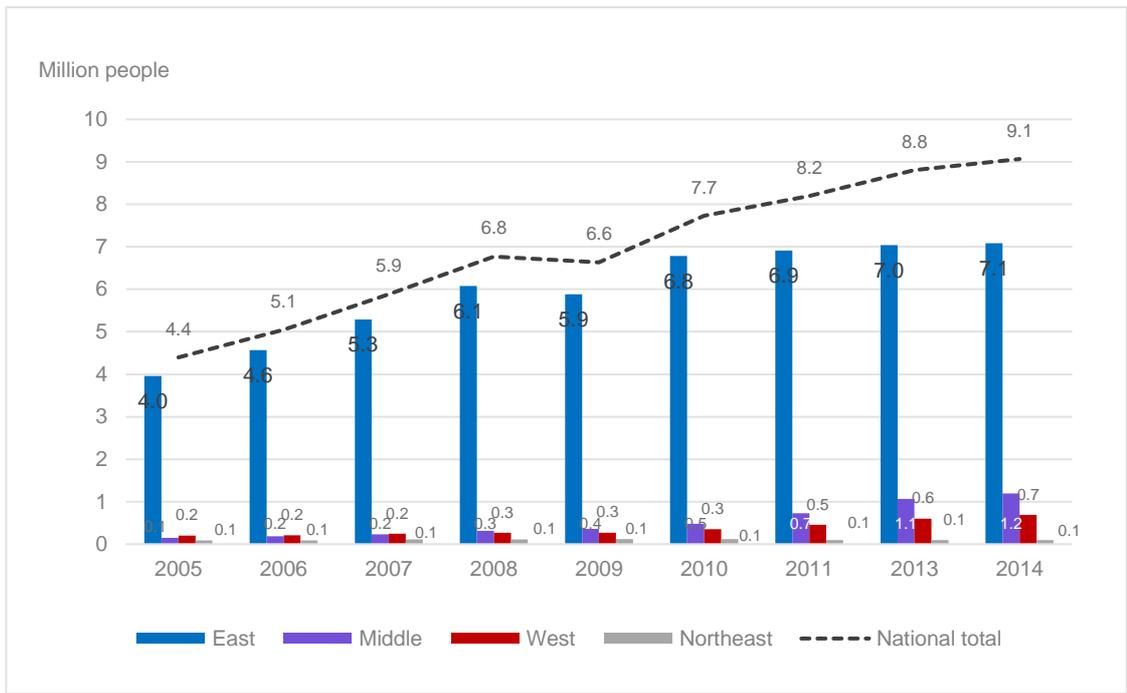


Figure 19: Employment growth of ICT manufacturing by region

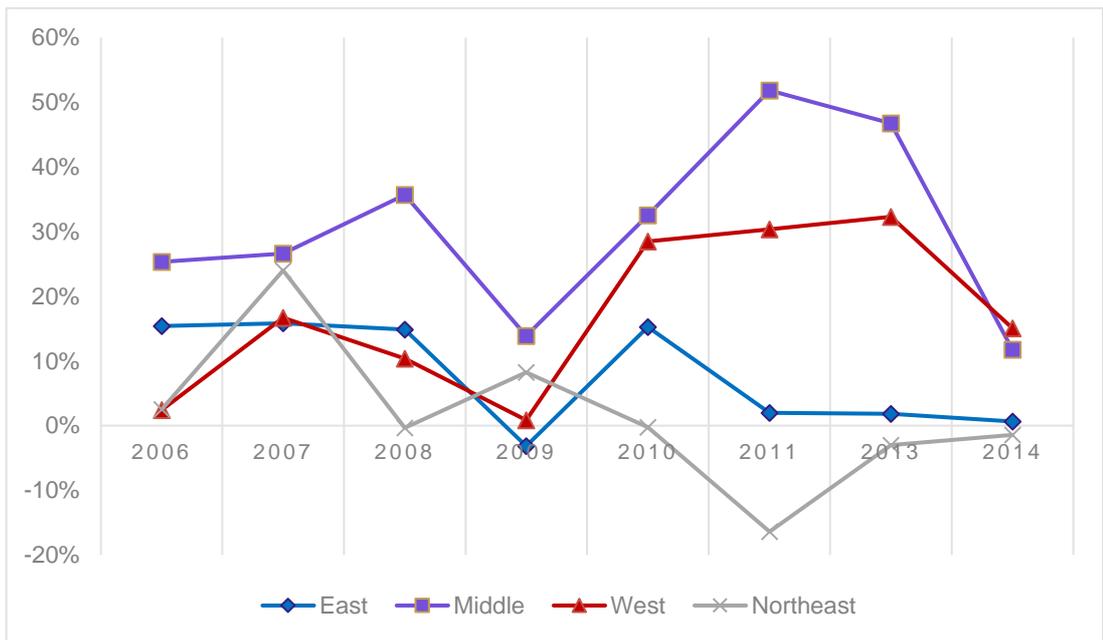


Figure 20: Computer and IT manufacturing exports across regions

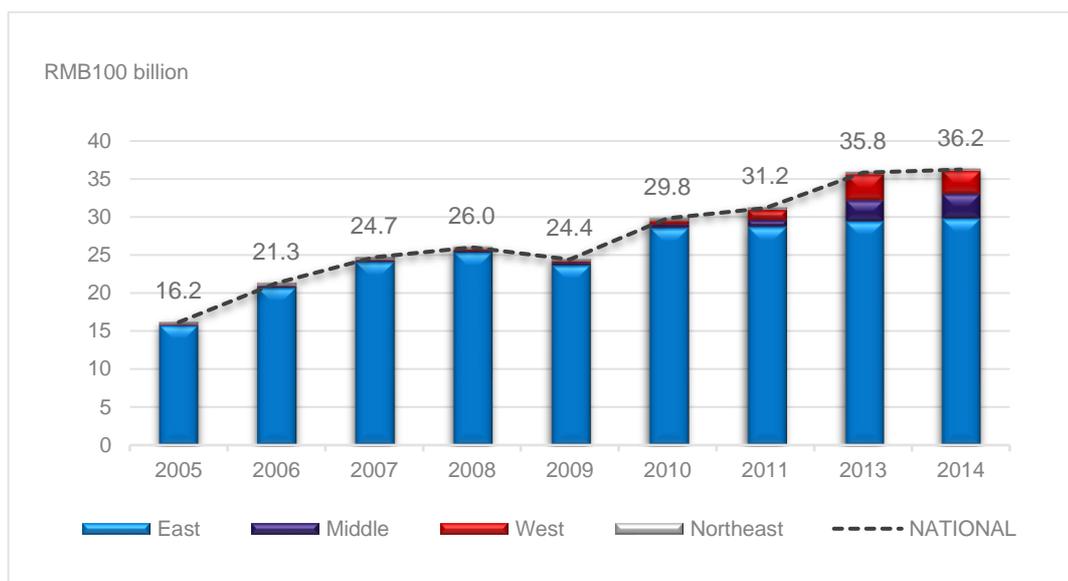
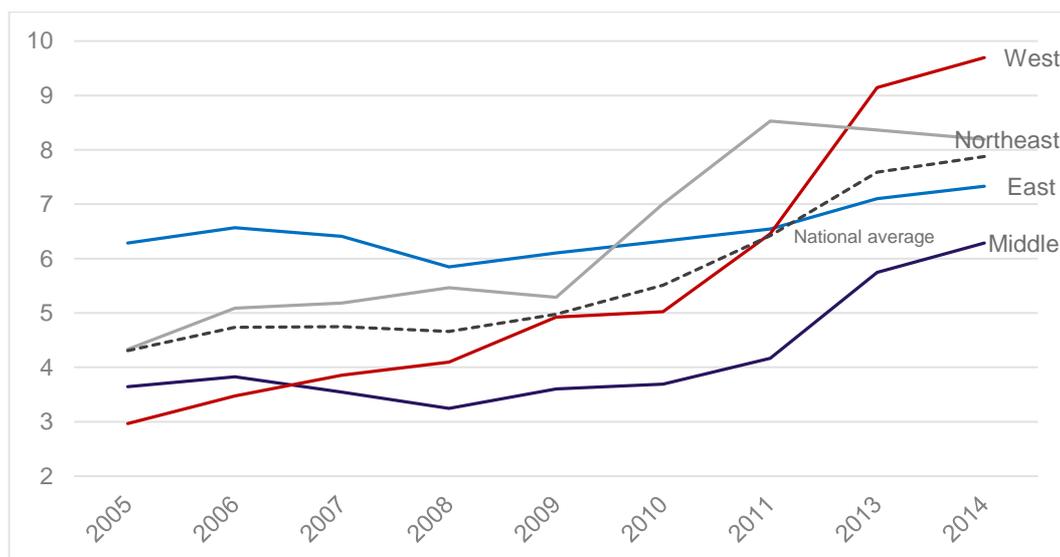


Figure 21: Sales per capita of ICT manufacturing by region (annually RMB10,000/per capita)

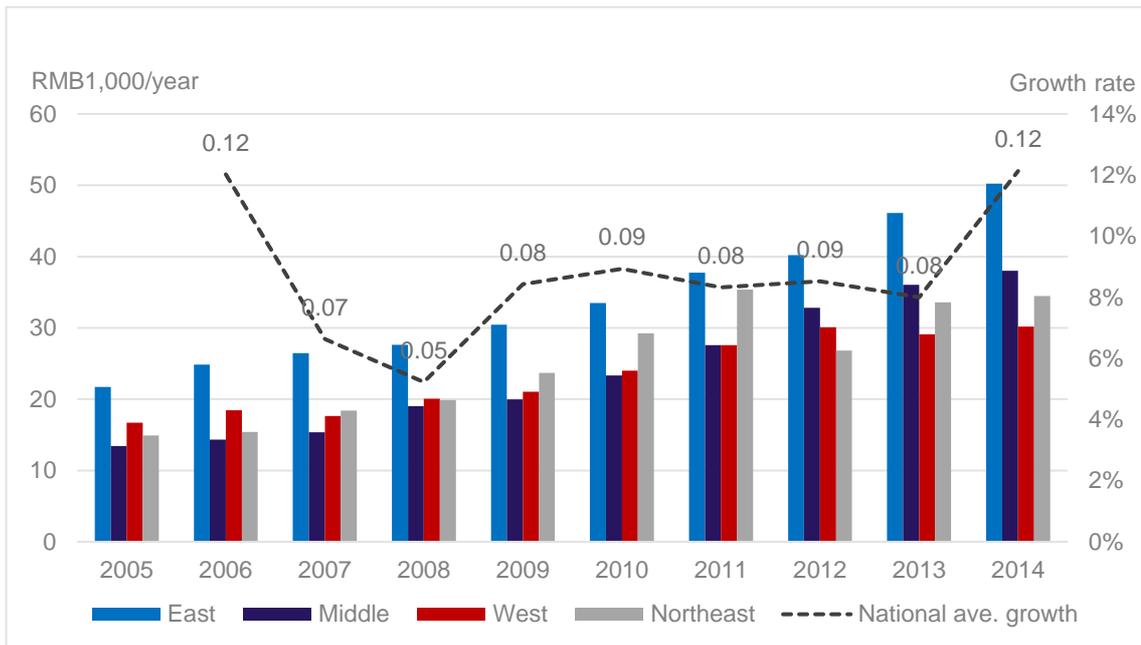


Source (Figures 17 to 21): Industrial Economic Statistical Yearbook 2006–2015, data obtained from the NBSC.

Notes (Figures 17 to 21):

- (1) Manufacturing statistics in the Industrial Economic Statistical Yearbook apply different sampling standards compared to the 'employment section' of the National Statistical Yearbook.
- (2) Data have adopted new classification criteria since 2012. Therefore, figures are not comparable with the previous years. Specifically, since 2011, firms with outputs below RMB20 million are excluded in the statistics. Previously, only firms with outputs below RMB5 million were excluded.
- (3) See Appendix A for the definition of regions: East, Middle, West and Northeast.
- (4) In Figure 17, the colour density indicates the scale of net employment contribution, dark blue is high contribution while light blue is low contribution. Province(s) in yellow indicate negative growth of employment during the review period.
- (5) Exports and sales value are adjusted to 2005 prices based on the annual inflation rates published by the NBSC.
- (6) See Appendix A for the definition of 'industrial sales'.

Figure 22: Wages in urban ICT manufacturing by region, 2005-14



Source: Labour Statistical Yearbook 2006–15, NBSC.

Notes:

- (1) As noted in the Labour Statistical Yearbook, average wages were estimated according to the labour force survey and population census. It is not comparable to the manufacturing wages in industry economic statistics or high-tech industry statistics, which include only enterprises above a designated size.
- (2) Urban manufacturing employment does not include private enterprises. It is different from the manufacturing wages presented in Section 2.1 where the manufacturing wage is the median of urban and private enterprises.
- (3) Wages are adjusted to 2005 prices based on the consumer price index published by the NBSC.
- (4) See Appendix A for the definition of regions: East, Middle, West and Northeast.

Due to the shortage of data, the average wages in Figure 22 represent only the urban ICT manufacturing enterprises, which is different from enterprises that cover the above designated size in the Industrial Economic Statistical Yearbooks.<sup>14</sup> The bars in different colours stand for the average wages across different regions in China while the black dashed line depicts the annual growth rate of ICT manufacturing wages at national level. In the past decade, the average earnings for workers in urban ICT manufacturing firms grew at 8.7% per annum, from RMB21,213 in 2005 to RMB44,837 in 2014. The rise in average wages in ICT manufacturing was in general persistent across regions with the exception of the Northeast in 2012 and the West in 2013. Average annual growth rates were: 9.8% for the East, 12.5% for Central, 7.0% for the West and 10.9% for the Northeast. The fastest growing area was Central China, from RMB13,412 in 2005 to RMB38,021 in 2014. Western China started as the second highest with an average salary of RMB16,717 in 2005, but was the lowest in 2014 with RMB30,171 per annum.

The rapid development of ICT manufacturing in the Middle and West regions suggested industry relocation, but it remains to be seen whether these newly emerged firms were transferred from the East or are newly started businesses. Local governments have used policies including tax incentives and supporting infrastructures to encourage investments from manufacturers. For example, following the tax breaks and other beneficiary policies offered by provincial governments, Foxconn, the world’s largest contract electronics manufacturer, transferred its major production plants from Guangdong to provinces in inner China such as Henan, Yunnan and Guizhou (*Sina News*, 2013).

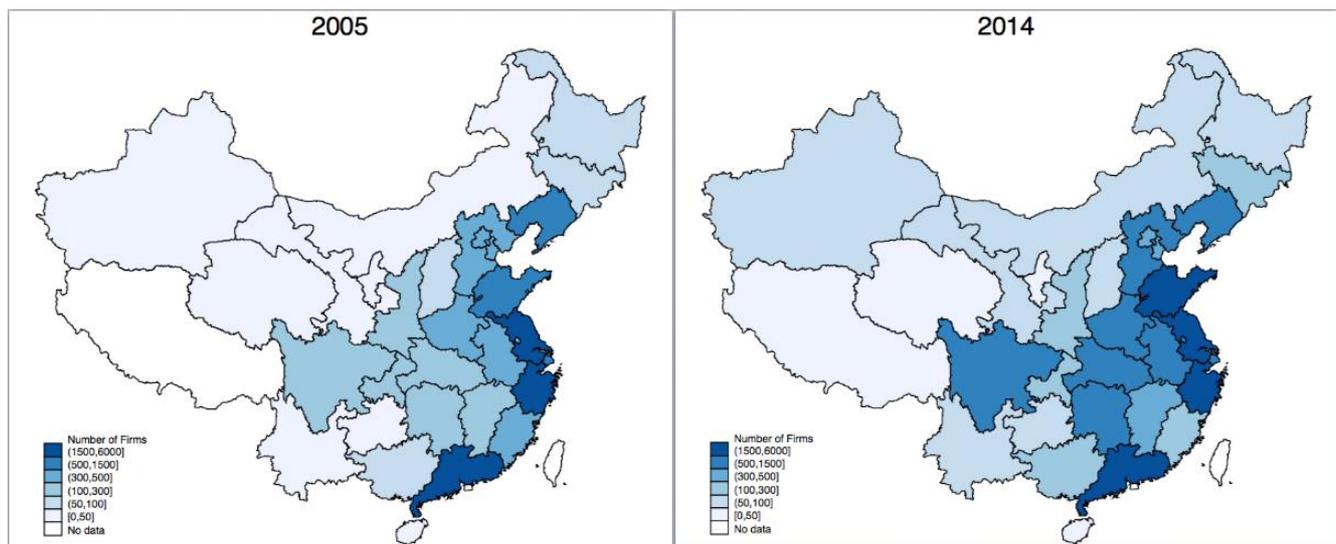
<sup>14</sup> Please see Section 3.1 for detailed description of these two data sources.

## 4.2 CONSUMER HOUSEHOLD APPLIANCES

Another chosen industry in our study is consumer household appliances, which is included as a subcategory of ‘electrical equipment and machinery’ (EEM).<sup>15</sup> Again, the following evidence is based on statistics for EEM as a whole. The EEM industry was the third largest employment contributor in manufacturing in both 2009 and 2014 (see Table 1). EEM manufacturers produce lighting equipment and household electrical appliances, such as washing machines, fridges and stoves, as well as many intermediate electrical items that are used by a wide range of downstream industries. In the five years to 2015, EEM industry revenue increased 10.1% annually to \$8.7 billion in China (IBIS World report, 2015).

In 1990s, the EEM industry began development in China by establishing assembly lines (Wang, 2004). Owing to its specific characteristics – that is, production and distribution processes coordinated in a vertical value chain – many of the components were supplied by foreign subcontractors or foreign producers and imported into China. Since 2000, the shift of their manufacturers’ market strategy from export-oriented to domestic focus has prompted the emergence of local producers in the upstream production chain and subsequently led to a significant growth of the number of electrical machinery firms in China (Wang, 2004; Kiyota et al., 2005). The total number of EEM manufacturing firms reached 27,537 in 2010, up from 15,366 in 2005. Nevertheless, a quarter of firms were omitted from the statistics in 2011 when the government changed the statistic measurement, omitting 7,453 firms. The number then grew from 20,084 in 2011 to 22,782 firms in 2014. As indicated by the intensified colours across provinces in Figure 23, there has been an increase in the number of EEM manufacturers especially in the Central region.

Figure 23: Distribution of EEM manufacturing enterprises in 2005 (left) and 2014 (right).



Source: Industrial Economic Statistical Yearbook 2006 and 2015, data obtained from the NBSC.

Note: Data have adopted new classification criteria since 2012. Therefore, figures are not comparable with previous years. Specifically, since 2011, firms with outputs below RMB20 million are excluded in the statistics. Previously, only firms with outputs below RMB5 million were not included.

In a similar way to ICT manufacturing, the EEM industry is greatly concentrated on the eastern coast where the technology pool is large and human capital is abundant. From 2005 to 2010, 2.37 million new jobs in EEM factories were created in which the main suppliers were from the eastern coast of China including Guangdong, Jiangsu, Zhejiang (see Figures 24 and 25). Anhui, located adjacent to both Jiangsu and Zhejiang, also contributed significantly to generating new employment in the same industry. Except for Sichuan province, employment scales of Western provinces stayed low. Guizhou and Gansu grew negatively as highlighted in yellow in Figure 24. From 2011 to 2014, the total new employment created

<sup>15</sup> As defined by the NBSC, ‘electrical equipment and machinery’ includes the manufacturing of electric motors; generators; transformers; electricity distribution equipment; insulated wires and cables; optical fibres for coded data transmission; batteries; lighting equipment; household electrical appliances manufacturing and other electrical equipment.

was 0.38 million, significantly smaller compared to the previous five-year period (see Figure 25). The Central region has strengthened the presence of EEM manufacturers, as reflected by the dark blue colours in the right panel of Figure 24. Regarding the employment change, four out of the five fastest growing provinces were located in this region from 2011 to 2014, providing at least 50,000 jobs apiece. Notably, some East provinces, including Guangdong and Zhejiang, started shrinking their employment scales from 2011 to 2014, as reflected by the yellow in Figure 24.

Although East China still dominates in terms of employment in the EEM industry, the scale has been rebalanced by accelerated development in Middle and Western provinces (Figure 25). Middle China has always been the fastest growth region, except in 2010, and West China followed on with impressive growth rates after 2008 (Figure 26). As a traditionally competitive region for manufacturing EEM goods, East China has taken a step back, seeing employment stagnate after 2011.

The export value of EEM manufacturing more than doubled with 9.8% per annum growth between 2005 and 2014, from RMB372.8 billion in 2005 to RMB775.7 billion in 2014. The East region’s share of exports in the total export volume has remained above 90% for the reviewing period – from 94% in 2005 to 91% in 2014 – suggesting again its dominance in the EEM industry. The Middle region had been slowly catching up with an average growth rate of 31% per annum, from RMB7.2 billion in 2005 to RMB48.6 billion in 2014. Yet, its share in total exports only accounted for about 6.2 percentage points.

Rising labour costs have also been observed in EEM manufacturing (see Figure 29). With annual growth at 10.7 percentage points, average wages increased from RMB16,438 in 2006 to RMB41,049 in 2014 for workers in EEM manufacturing firms. Wage growth across regions was consistent and at similar levels of average growth rates, although Middle and West regions were slightly higher than the East and Northeast – 13.0% and 11.8% respectively versus 11.1% and 10.5%.

China’s fast industrialisation and development as a global production centre for electronics and household appliances in the last decades have been among the main drivers for technology development. EEM is poised to upshift its value chain position from low-end production to mid-/high-end, indicated by a surge in patent filing (NOST China, 2013). In parallel with the technology upgrading in power, energy and equipment manufacturing, the EEM industry has gone through rapid development and has maintained its position as the third largest manufacturing sector for absorbing employment (see Section 3, Table 1).

Figure 24: Growth of EEM employment, 2005–10 (left) and 2011–14 (right); yellow regions show negative growth and blue regions show positive growth.

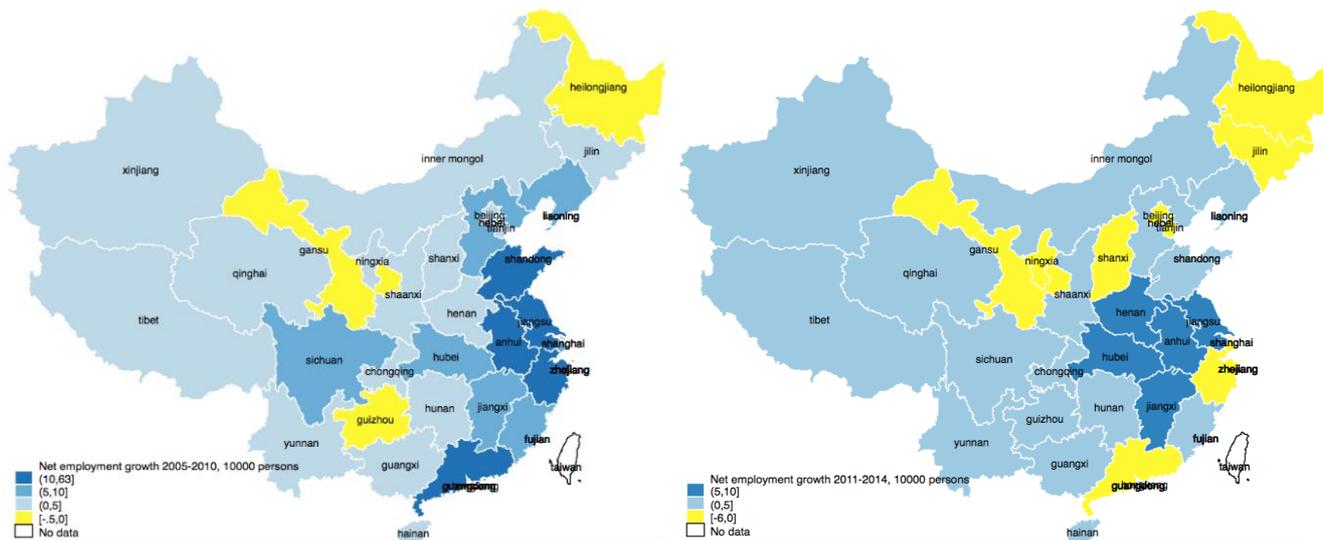


Figure 25: Employment in EEM industry, 2005-14

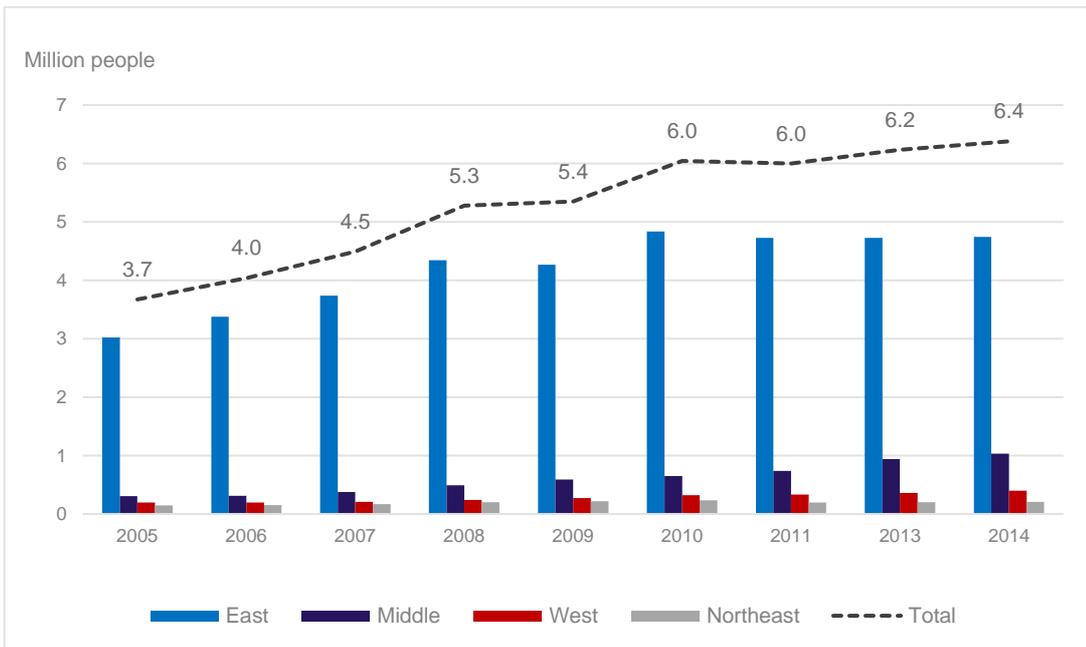


Figure 26: Employment growth in EEM industry by region

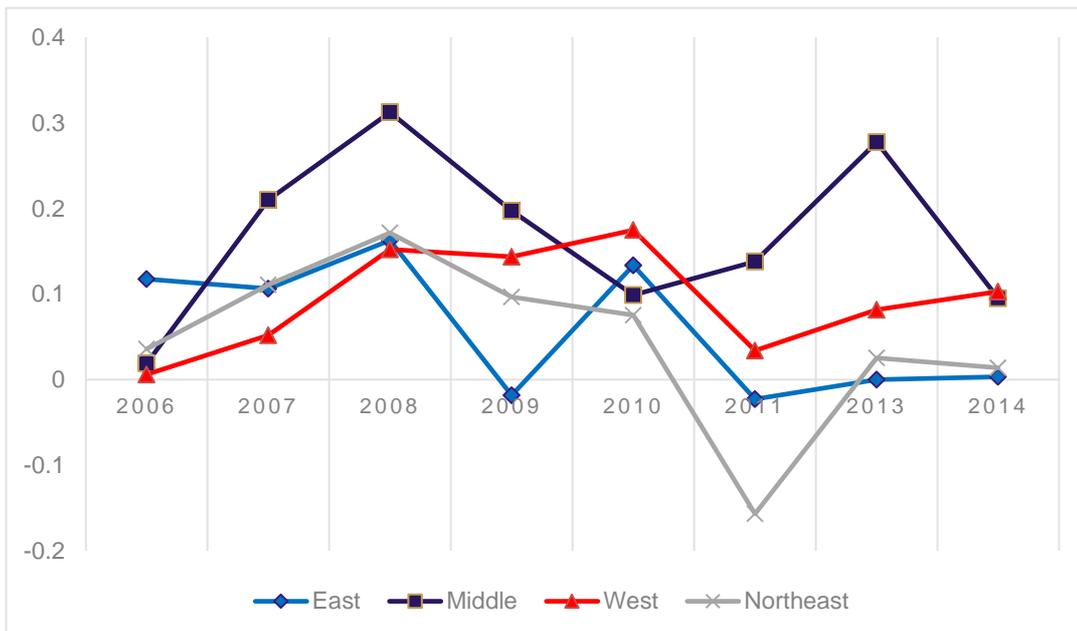


Figure 27: EEM exports

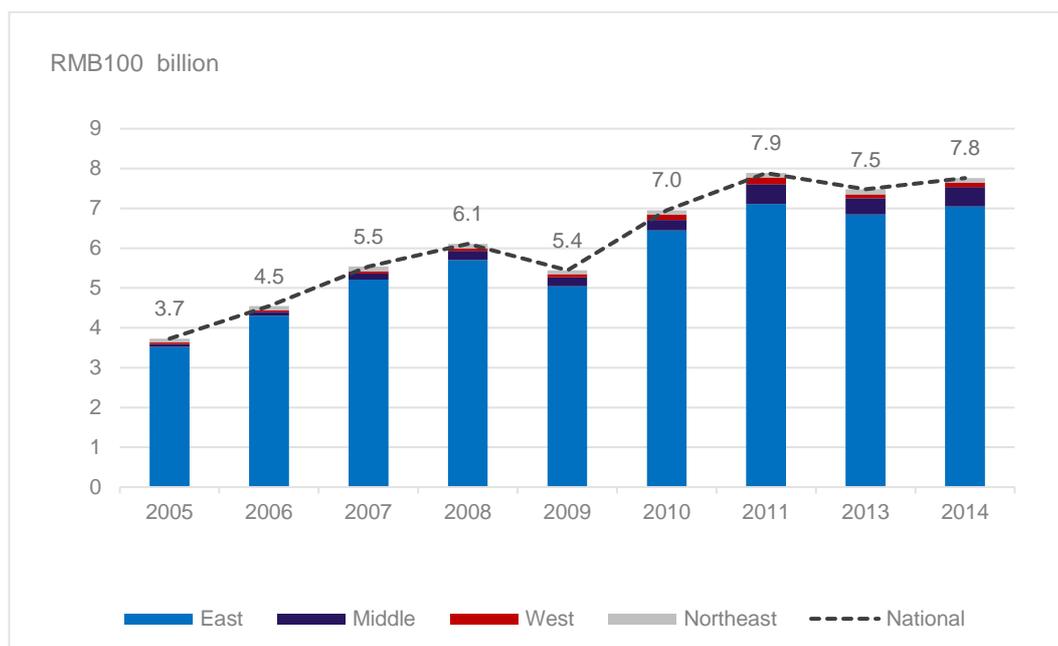
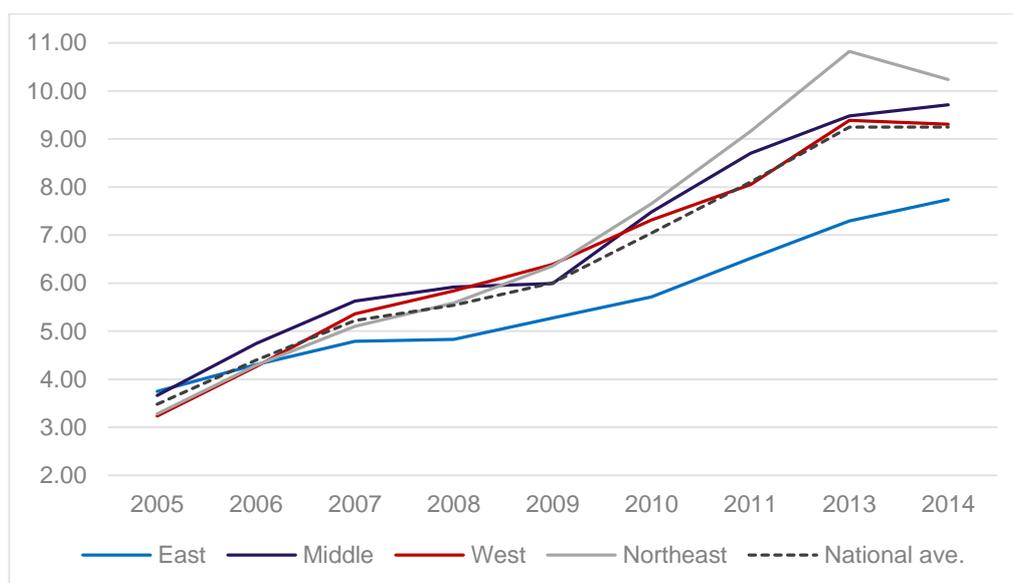


Figure 28: Sales per capita by regions (10,000RMB/per capita)

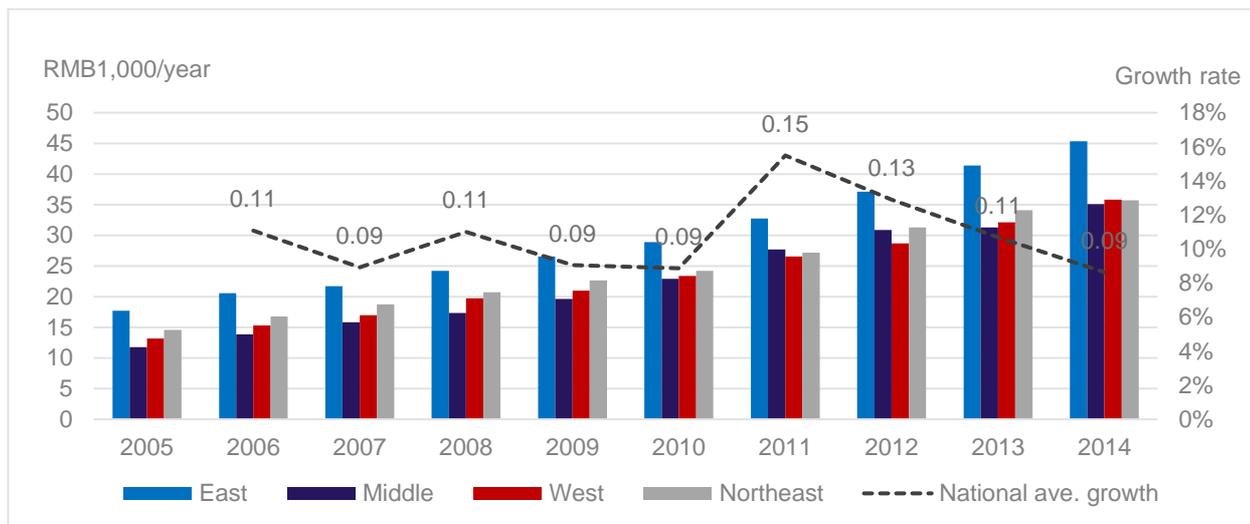


Source (Figures 24 to 28): Industrial Economic Statistical Yearbook 2006–2015, data obtained from the NBSC.

Notes (Figures 24 to 28):

- (1) Data have adopting new classification criteria since 2012. Therefore, figures are not comparable with previous years. Specifically, since 2011, firms with outputs below RMB20 million are excluded in the statistics. Previously, only firms with outputs below RMB5 million were excluded.
- (2) See Appendix A for the definition of regions: East, Middle, West and Northeast.
- (3) In Figure 24, the colour density indicates the scale of net employment contribution: dark blue is high contribution while light blue is low contribution. Province(s) in yellow indicate negative growth of employment during the review period.
- (4) Exports and sales value are adjusted to 2005 prices based on the annual inflation rates published by the NBSC.
- (5) See Appendix A for the definition of 'industrial sales'.

Figure 29: Wages of urban EEM by region, 2005-14



Source: Labour Statistical Yearbook 2006–2015, the NBSC.

Notes:

(1) As noted in the Labour Statistical Yearbook, average wages were estimated according to the labour force survey and population census. It is not comparable to manufacturing wages in industry economic statistics or high-tech industry statistics, which include only enterprises above a designated size.

(2) Urban manufacturing employment does not include private enterprises. It is different from the manufacturing wages presented in Section 2.1 in which the manufacturing wage is the median of urban and private enterprises.

(3) See Appendix A for the definition of regions: East, Middle, West and Northeast.

## 4.3 Textile clothing and footwear

Two industries included among ‘textile wearing, footwear, and hats’ manufacturing are of our concern: garments and footwear.<sup>16</sup> The descriptive statistics in this industry will be based on the grouped data from ‘textile clothing, footwear, hats and leather products’, published in the Industrial Economic Statistical Yearbooks from 2005 to 2014.

As a basic consumer product sector, ‘textile clothing, footwear, hats and leather manufacturing’ (TFCL) is one of the industries in China that enjoy the most international competitiveness. It has benefited greatly from global shifts in production locations since the reform and opening up of the 1970s (ILO, 2014). Not only the industry’s value-added increased significantly in all TFCL subcategories, but domestic demand has also surged due to substantial improvements in standards of living. According to statistics from the Chinese Garment Association (2012), there are more than 100,000 garment manufacturers employing more than 10 million people and sales value amounted to RMB1.7 trillion in the domestic market. China has become the world’s largest manufacturer, exporter and consumer of garment products.

Taking advantage of skilled labour forces, favourable investment environments and a well-integrated industry chain, the majority of China’s TFCL industries are located in the eastern coastal region. Similar to ICT and EEM manufacturing, clustering of TFCL industries is a common phenomenon because it helps to achieve a low-cost-and-high-efficiency regional scale effect through optimal allocation of resources. Taking textile clothing as an example, there were more than 50 textile clothing manufacturing clusters categorised by product type in 2012 across the country (Chinese Garment Association, 2012). With footwear manufacturing, a clear cluster pattern has also formed. Guangdong specialised in medium and high-quality goods whereas Zhejiang concentrated in matching the demand from the low-end market. The West region such as Sichuan and Chongqing focused on producing female footwear and Fujian province has been producing the biggest share of sports footwear.

<sup>16</sup> The manufacturing of ‘textile clothing, footwear, hats and leather products’ includes the following subcategories: garment, footwear, hats and hats, leather, fur, feather and the relevant products.

The total employment of the eastern coastal region including Beijing, Shanghai, Shandong, Hebei, Jiangsu, Zhejiang, Fujian, Guangdong and Hainan, took more than 88.8% of the total employment in the TFCL industry as a whole in 2005 (3.07 million of a total 3.4 million workers). The corresponding share declined by 12.9 percentage points over the past decade, accounting for 75.9% by the end of 2014 (5.81 million of a total 7.66 million workers) as shown in Figure 31. The employment shares of the Central and Western regions both nearly trebled from 2005 to 2014, growing from 6.65% to 18.15% and from 1.22% to 3.85% respectively. With an average growth rate of 17.4% per annum from 2005 to 2011 (Figure 31), the Middle region yielded 0.36 million new jobs in TFCL and contributed a total number of 0.59 million jobs (excluding leather and fur products) in 2010. The 2013–2014 period (including leather and fur products) grew at a relatively slower speed, at 11.8% per annum; it was still counted as the fastest growing region in China followed by the West (8.4%). The East and Northeast experienced declines in TFCL employment from 2013 to 2014, falling 0.3% and 8.9% per annum respectively. The expansion of TFCL employment in Central China between 2005 and 2011 implied that the labour-intensive manufacturing had gradually shifted to inland areas. However, such rapid growth appeared only in regions with proximity advantages to the eastern coastal region, as well as good transportation links. At the provincial level, scaling back of employment was seen not only in the North and West of China from 2005 to 2010 (Figure 30), but some provinces in the East that were traditionally strong in the sector also saw TFCL job numbers decline, including Shandong, Hebei and Zhejiang.

The TFCL industry in China is undergoing a new wave of upgrading, gaining pace in structural re-adjustment, deepening collaboration between upstream and downstream players and building a modern industrial network. The trend of falling employment in the TFCL industry became even clearer after 2011. Between 2011 and 2014, there was a general drop in numbers of TFCL workers across the coastal region except in Fujian – and Fujian’s growth was much slower than previously. The far Western region such as Tibet, Xinjiang and Sichuan also followed the downward trend as marked in yellow in Figure 30. It is commonly acknowledged that the TFCL industry has low entry barriers and therefore relocation would not be difficult to achieve (ILO, 2014). Due to high labour-intensiveness, it is traditionally among the industries that move first to lower-cost locations. The sharp drop of employment (Figure 32) in the East region may be explained by the rising factor cost – for instance, labour, infrastructure and operational costs. Although employment size in the East has in general scaled down as shown by the negative growth since 2009, the competitiveness of the TFCL industry has not been considerably weakened. Sales per capita of TFCL (see Figure 33) were in general increasing except in the Northeast from 2013 to 2014, which may also explain the decline of national average sales in the same period. East China may have gradually moved towards becoming capital-intensive, as its positive productivity measured by sales per capita would suggest. If this argument holds, then rising labour costs may not weaken the competitiveness of TFCL manufacturing as long as there are appropriate strategies in response.

Another indicator that captures the competitiveness of the industry is export performance. From 2005 to 2011, the value of TFCL exports grew incrementally from RMB232.3 billion in 2005 to RMB267.7 billion in 2011, at 2.7% per annum average growth (Figure 34). The share of exports from the East region comprised 92.2% in 2005 and dropped about 9 percentage points from 2005 to 2011, accounting for 86.3% of total TFCL exports. With leather and fur products included in the TFCL category from 2013 to 2014, the share of East region exports remained at a similar level, at around 85%. The growth of total exports grew slightly faster compared to 2005–2011, at 4% per annum.

Average wages in TFCL manufacturing grew from RMB12,512 to RMB31,297, an average rate of 10.3% per annum. Since 2007, the average earnings of TFCL workers started increasing rapidly and the growth rate peaked at 17% in 2011 before slowing. Similar to ICT and EEM, wage gaps existed between the eastern coast and inland areas but these began to narrow in recent years, especially 2013 and 2014 (Figure 35). With respect to wage levels, average salaries of TFCL in inland regions at least trebled over past decades while the East also increased significantly, more than doubling.

Figure 30: Growth of TFCL employment, 2005–10 (left) and 2011–14 (right); yellow regions show negative growth and blue regions show positive growth.

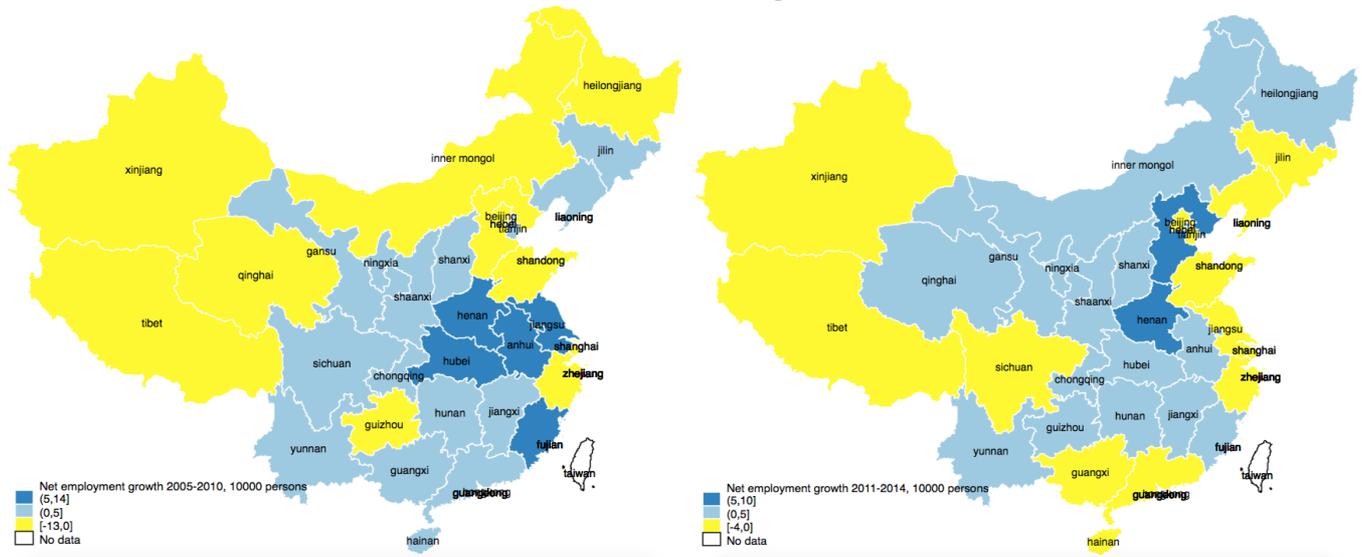


Figure 31: Number of jobs in textile wearing, footwear and cap manufacturing industry across regions (in millions of people).

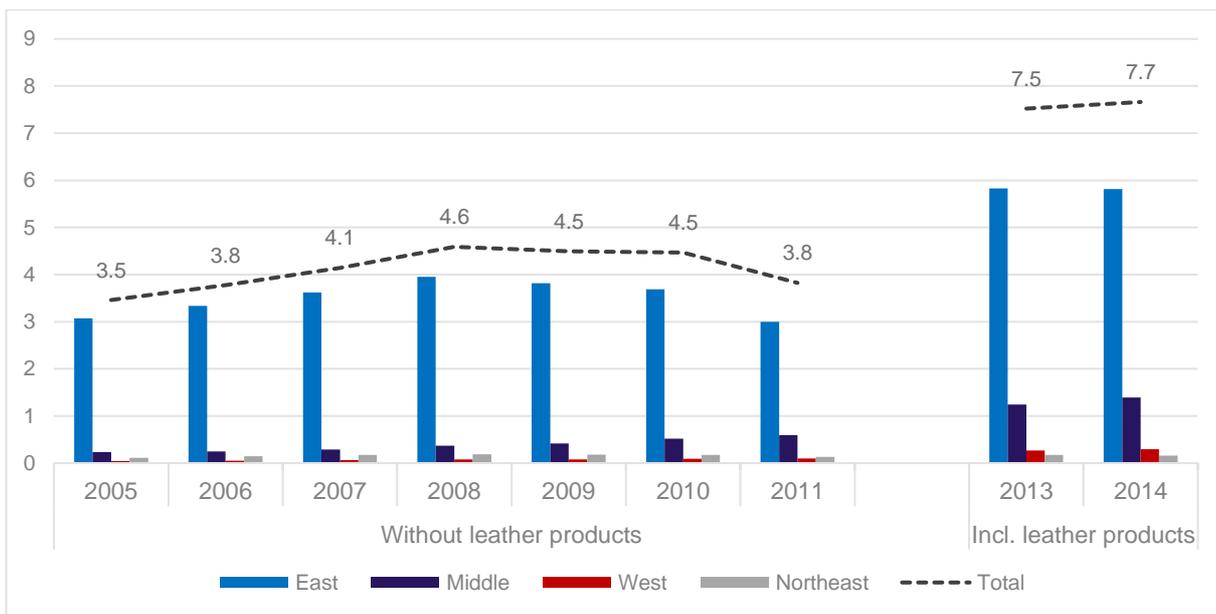


Figure 32: Employment growth of TFCL manufacturing industry by region.

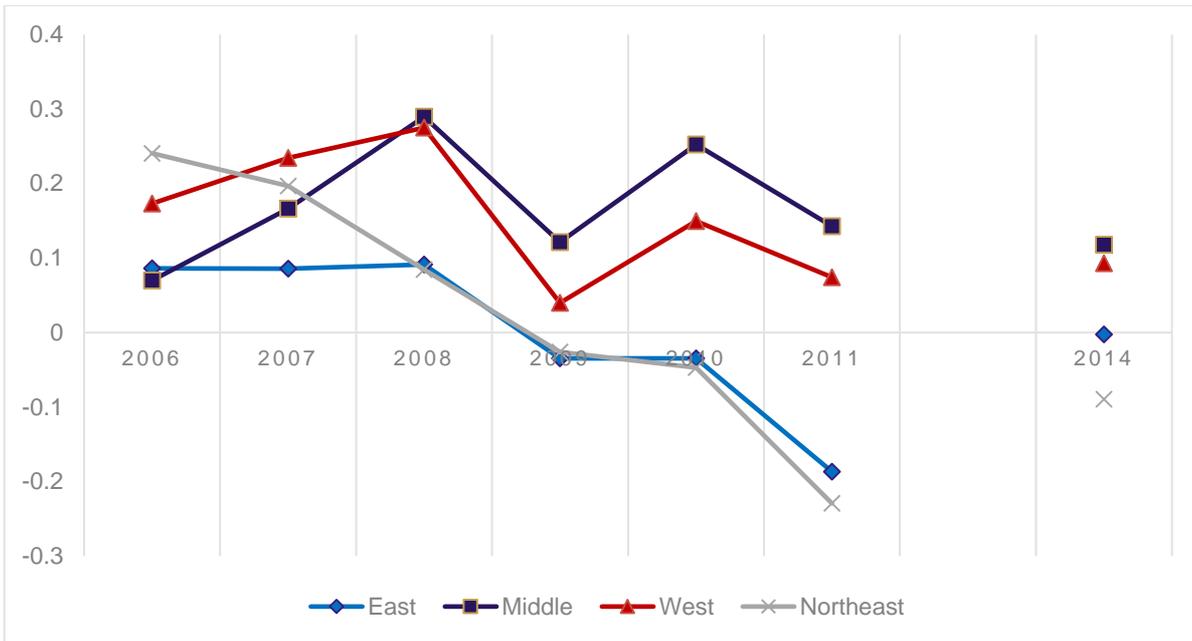


Figure 33: Sales per capita by region (RMB10,000/per capita).

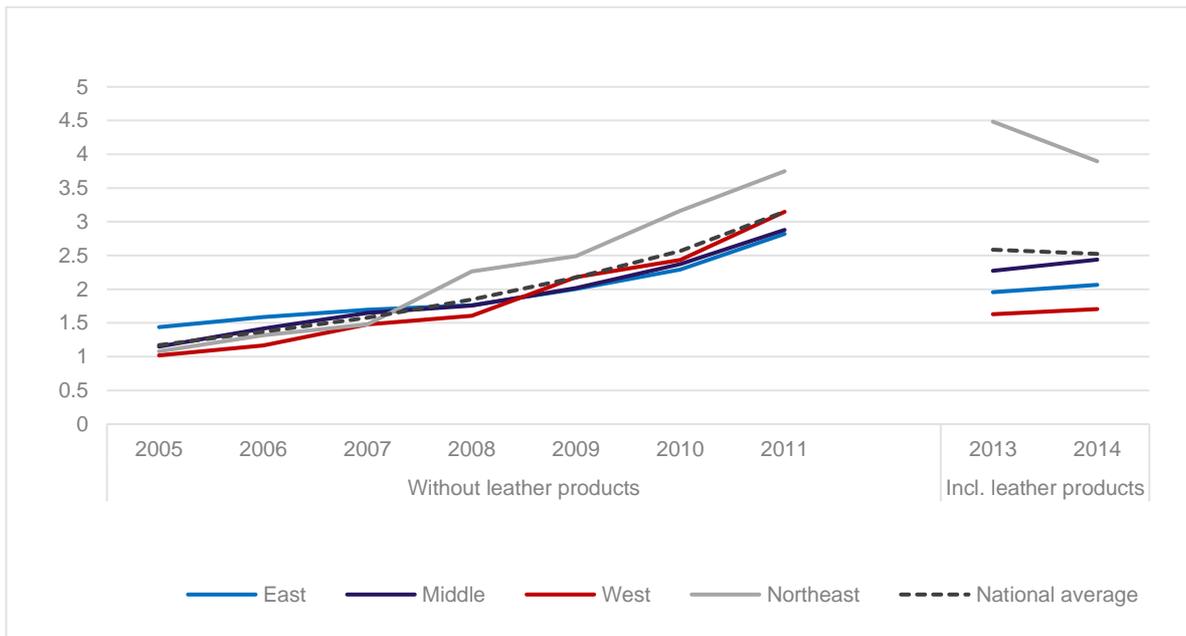
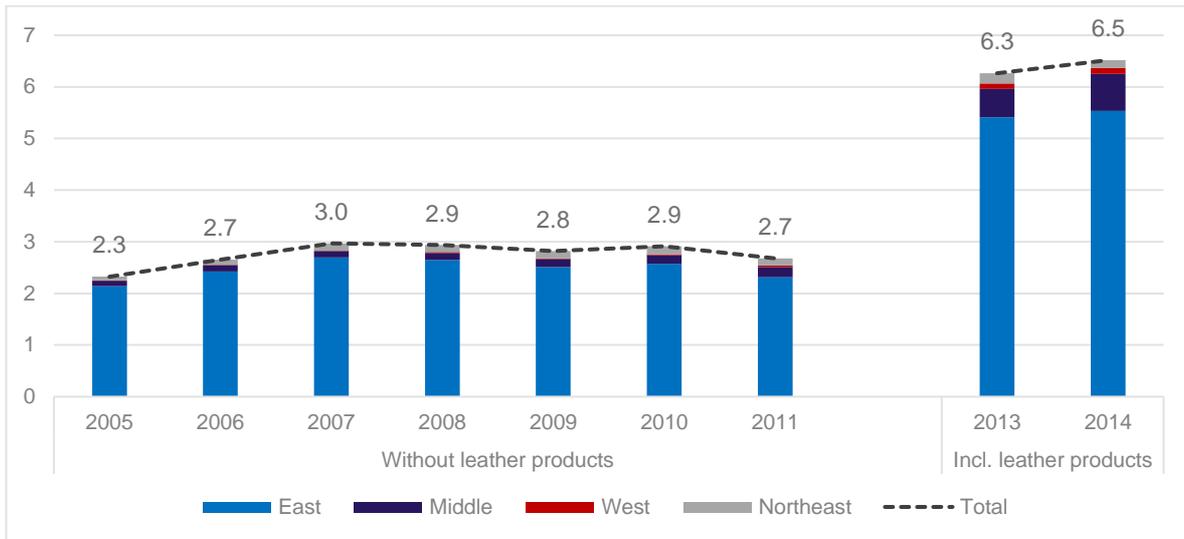


Figure 34: Textile clothing, footwear hats and leather product exports (RMB100 bn)

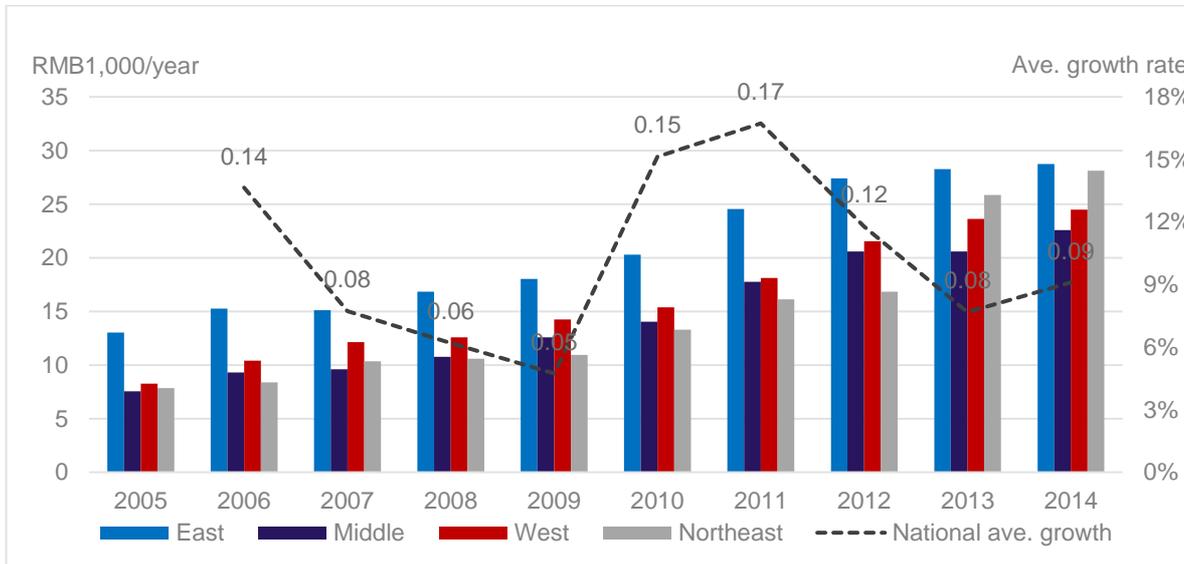


Source (Figures 30 to 34): Industrial Economic Statistical Yearbook 2006–2015, data obtained from the NBSC. Statistics for 2013 and 2014 include 'leather, fur products', which were not included in the statistics in previous years.

Notes (Figures 30 to 34):

- (1) Data have adopted new classification criteria since 2012. Therefore, figures are not comparable with previous years. Specifically, since 2011, firms with outputs below RMB20 million are excluded in the statistics. Previously, only firms with outputs below RMB5 million were excluded.
- (2) See Appendix A for the definition of regions: East, Middle, West and Northeast.
- (3) In Figure 30, the colour density indicates the scale of net employment contribution, dark blue is high contribution while light blue is low contribution. Province(s) in yellow indicate negative growth of employment during the review period.
- (4) Sales value in Figure 33 are adjusted to 2005 prices based on the annual inflation rates published by the NBSC.
- (5) See Appendix A for the definition of 'industrial sales'.

Figure 35: Wages of urban TCLF by region, 2005-14



Source: Labour Statistical Yearbook 2006-2015, NBSC.

Notes:

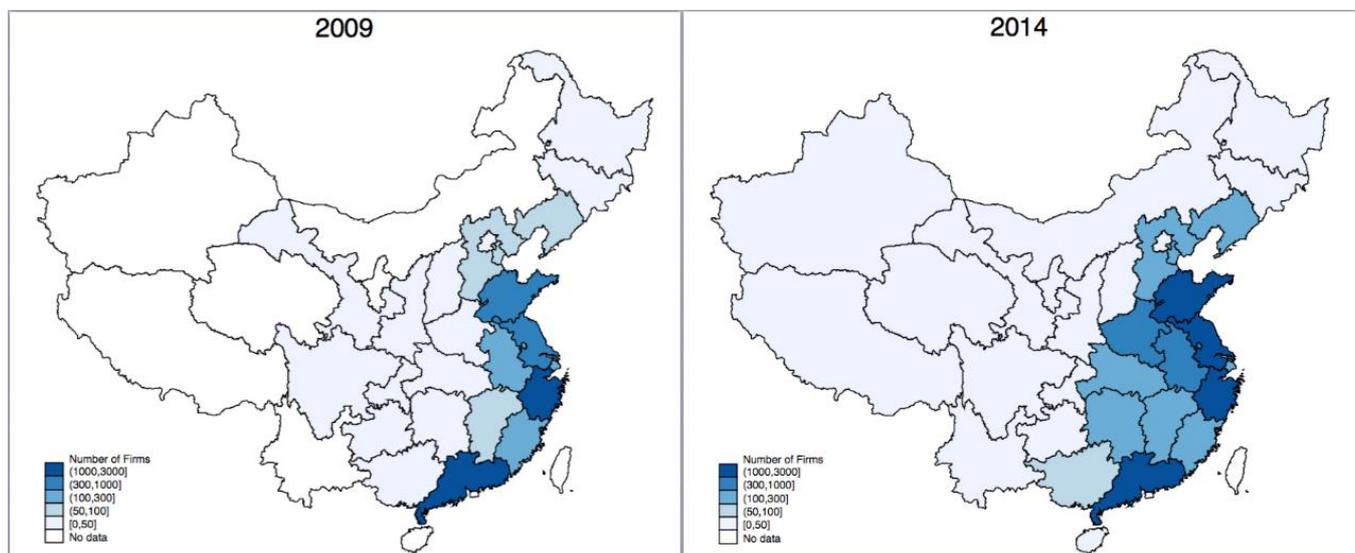
- (1) As noted in the Labour Statistical Yearbook, average wages were estimated according to the labour force survey and population census. It is not comparable to manufacturing wages in industry economic statistics or high-tech industry statistics, which include only enterprises above a designated size.
- (2) Urban manufacturing employment does not include private enterprises. It is different from the manufacturing wages presented in Section 2.1 in which the manufacturing wage is the median of urban and private enterprises.
- (3) See Appendix A for the definition of regions: East, Middle, West and Northeast.

## 4.4 Toys

The other low-tech labour-intensive manufacturing sector selected in this study is ‘culture, education, sport activities and entertainment products’ (CESE), which was the second fastest-growing manufacturing sector in terms of employment growth ratio from 2009 to 2014. As an important manufacturing centre for CESE, China’s total CESE exports reached RMB481.1 billion in 2014 and CESE employment accounted for 2.58% of total manufacturing employment, reaching its highest level at 2.28 million workers. In particular, toy manufacturing took the lead while office supplies experienced rapid development in the past decade. From 2006 to 2014, the outputs of stationery and office supplies, handicraft manufacturing, and toy manufacturing grew 24%, by 1.3% and 16.6% respectively (NBSC, 2014). Guangdong’s export of CESE goods accounted for the biggest share, with RMB209.7 billion and annual growth of 42.14 percentage points in 2014. Guangdong has become the largest toy manufacturing and export base in the world since the start of 21<sup>st</sup> century (China Daily, 2016). Yet, production is characterised as low value-added and, in general, lacks innovation capability, reflected by the absence of established brands.

Given the constraints of data, our study of CESE will use only two waves of provincial-level data, 2009 and 2014.<sup>17</sup> As displayed in Figure 36, development of CESE was uneven and regional disparity consistently appears. New CESE manufacturing enterprises mainly emerged from the eastern coast. Although the number of enterprises rose between 2009 and 2014, the increase remained incremental especially in western and north-eastern regions. More than 2,200 CESE enterprises with more than RMB200 million in output were located in both Guangdong and Zhejiang in 2009. By the end of 2014, that number in Guangdong and Zhejiang combined reached 2,877 while Western provinces of China were hardly changed. CESE concentration on the eastern coast was further strengthened when Jiangsu and Shandong joined those provinces with 1,000 or more enterprises in 2014. The acceleration of CESE businesses was also observed in the Middle region including in Anhui, Henan, Hubei and Hunan.

Figure 36: The distribution of CESE manufacturing in China, 2009 and 2014



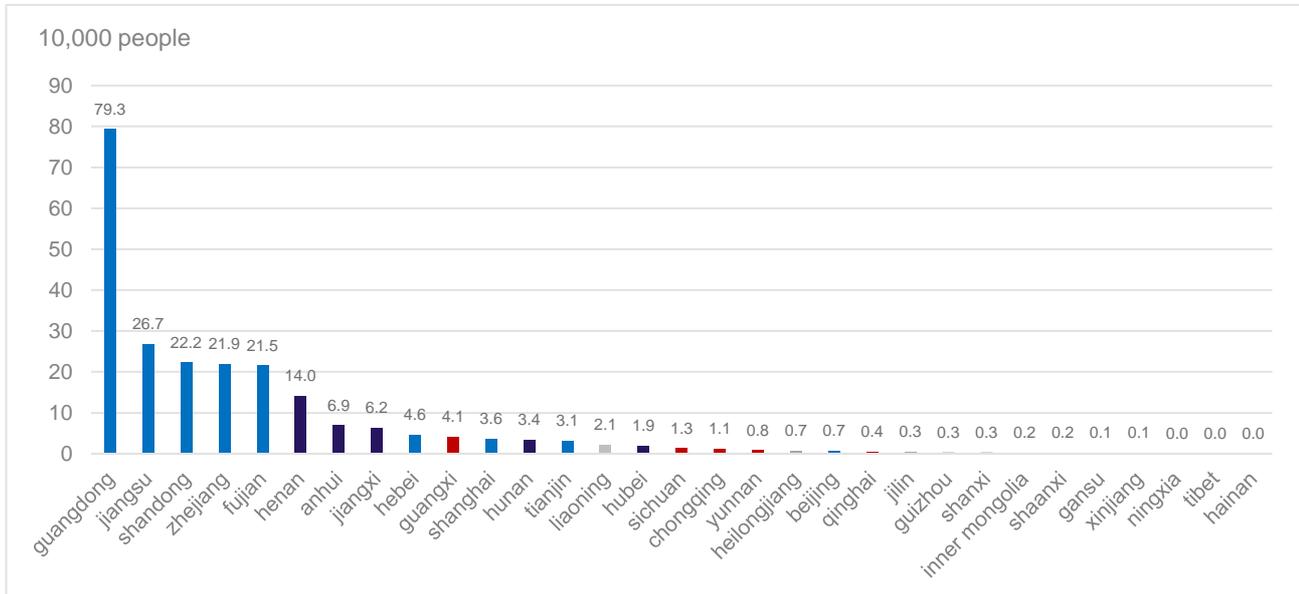
Source: Industrial Economic Statistical Yearbook 2010 and 2015, data obtained from the NBSC. The 2009 Industrial Economy Statistic Yearbook did not include CESE. Data in 2009 were collected from Provincial Statistics Yearbooks of 27 provinces and four directly controlled municipalities. Note: Data have adopted new classification criteria since 2012. Therefore, figures are not comparable with previous years. Specifically, since 2011, firms with outputs below RMB20 million are excluded in the statistics. Previously, only firms with outputs below RMB5 million were excluded.

In line with its dominant role in CESE manufacturing, Guangdong province alone employed nearly 800,000 workers in 2014 (see Figure 37) – three times more than Jiangsu which yields the second highest level of CESE employment – and is about one third of the sector total of 2.28 million. All top five largest

<sup>17</sup> The values in 2009 were computed by aggregating provincial statistics from 27 provincial-level administrative units and four directly controlled municipalities.

employment contributors were located in East China. The Middle region was rising in terms of the growth rates but its CESE employment remains small in scale. Guangxi, located on the southwest coast, had in total 41,000 CESE workers and was at 10<sup>th</sup> place. The rest of the country was left behind.

Figure 37: Number of CESE jobs by province, 2014



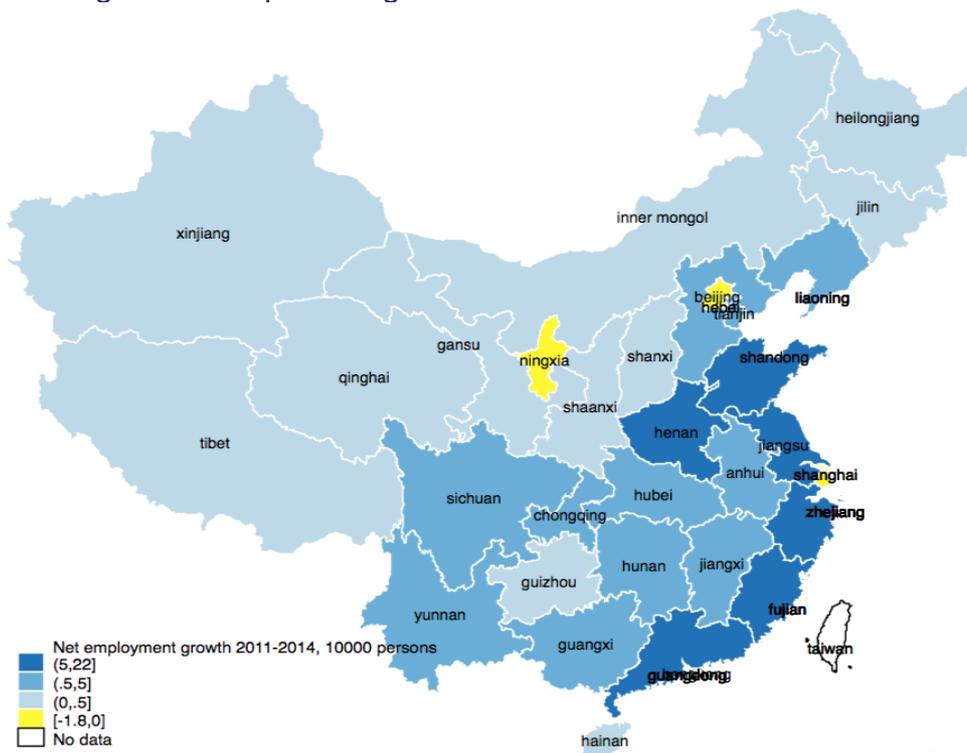
Source: Industrial Economic Statistical Yearbook 2015, data obtained from the NBSC.

Notes:

- (1) Regions are represented by different colours: East (blue), Middle/central (purple), West (red) and Northeast (grey).
- (2) See Appendix A for the definition of regions: East, Middle, West and Northeast.

CESE manufacturing is still expanding as a result of steady growth in domestic demand. Although levels vary, the development of CESE accelerated in most regions across China. Only three provinces and cities suffered a drop in employment between 2009 and 2014 (Figure 38). Some footwear and clothing factories have started moving to South-East Asian countries on account of their low labour costs, while most CESE manufacturing factories have opted to stay because of the well-established industry chain.

Figure 38: Growth of CESE employment, 2009–14; yellow regions show negative growth and blue regions show positive growth



Source: IESY 2010–2015, data obtained from the NBSC. The 2009 IESY did not include CESE. Data in 2009 were collected from Provincial Statistics Yearbooks of 27 provinces and four directly controlled municipalities.

Note: The colour density indicates the scale of net employment contribution; dark blue is high contribution while light blue is low contribution. Province(s) in yellow indicated the negative growth of employment during the review period.

Figures 39 and 40 summarise the employment dynamics across our selected industries. CESE (toy) manufacturing is only partly included due to missing longitude data. As the charts show, dynamics of employment across the three industries exhibited similar patterns. All three were seriously affected by the financial crisis in 2008 and employment growth stagnated or even dropped (ICT and TFCL). Both EEM and ICT manufacturing recovered quickly in the next statistical year while TFCL manufacturing saw further declines in employment. Figure 40 shows how ICT has consistently yielded the most employment throughout the last decade and is still expanding, reaching 9.1 million jobs in 2014. Gaps between ICT manufacturing and the other three industries were persistent and widened in recent years. The surge of TFCL employment in 2013 was most likely influenced by the changing statistical scope that year.

Similar charts were created for capital stocks across the selected industries (Figures 41 and 42). The labour-intensive nature of textile clothing and footwear manufacturing was reflected by their low capital stock level, which increased from RMB86.8 billion in 2005 to RMB138.4 billion in 2011. From 2013 to 2014, the corresponding value reduced by RMB23.1 billion, signalling a contraction of the TFCL industry. Meanwhile, the rapid increase of capital investment in EEM and its relatively moderate growth in employment may imply the transition towards to more capital-intensive production. As the technology-intensive industry with the biggest share of manufacturing employment, ICT manufacturing has accumulated relatively higher levels of capital stock, from RMB426.8 billion in 2005 to RMB969 billion in 2014. The gap between ICT and EEM began to narrow especially after 2013, falling by more than half from RMB179.3 billion in 2005 to RMB80.6 billion by the end of 2014. In terms of the regional shift of capital stock in labour-intensive light manufacturing, Figure 41 shows that the sum of capital stock of our three selected industries were highly concentrated in Eastern China while capital inflow to the Central region has accelerated in the past decade. Eastern coast provinces' dominance of labour-intensive light manufacturing was reflected in the large share of its capital stock, 72% (RMB1.56 trillion) in 2014 and 85% (RMB659.4 billion) in 2005. The Central and West regions accounted for 5.9% and 4.6% respectively in 2005, and were expanding at 31.3% and 28.3% per annum. By the end of 2014, the Middle region share reached 15.2% (RMB329.6 billion) while that of the West reached 10.2% (RMB221 billion).

Figure 39: Summary of employment growth across selected industries (%)

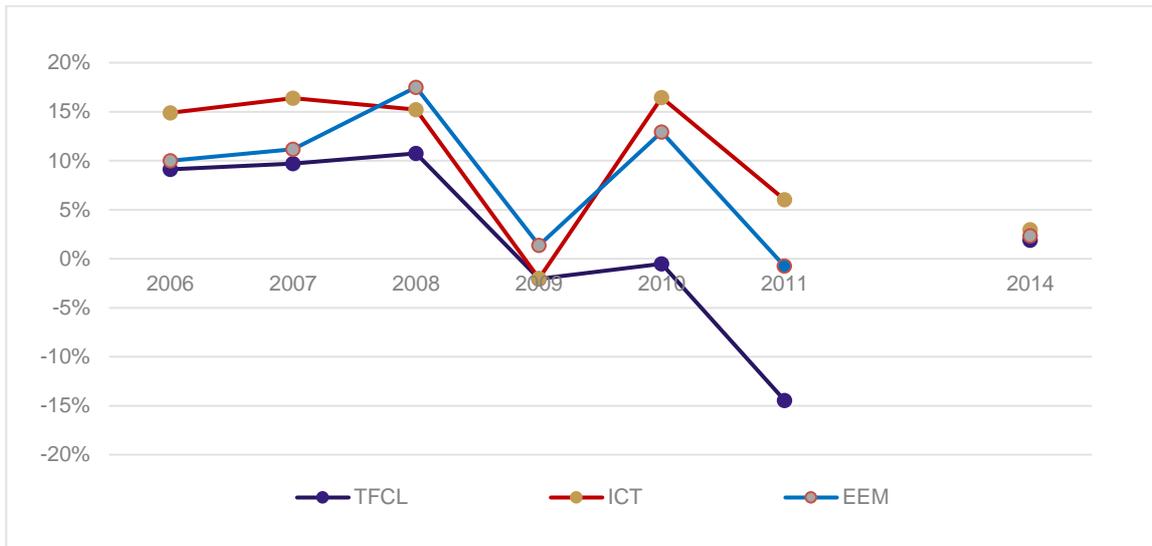


Figure 40: Employment sizes by selected industries

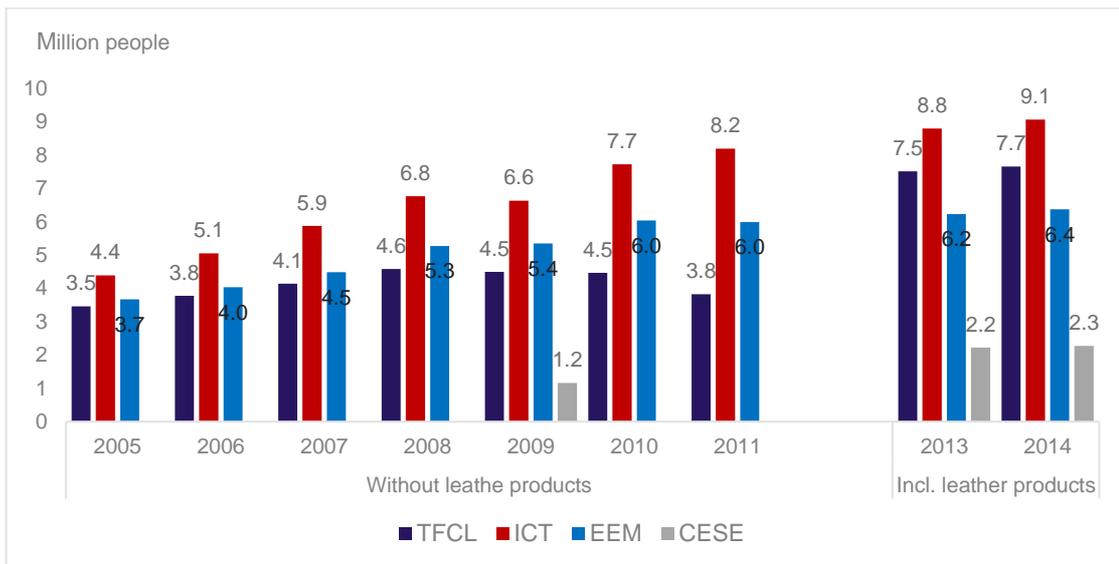


Figure 41: Capital stocks of selected industries

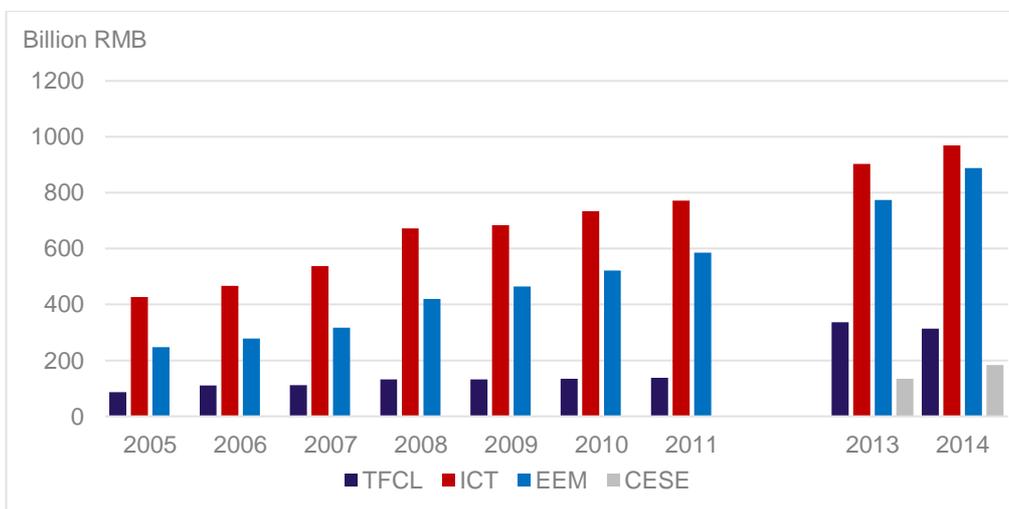
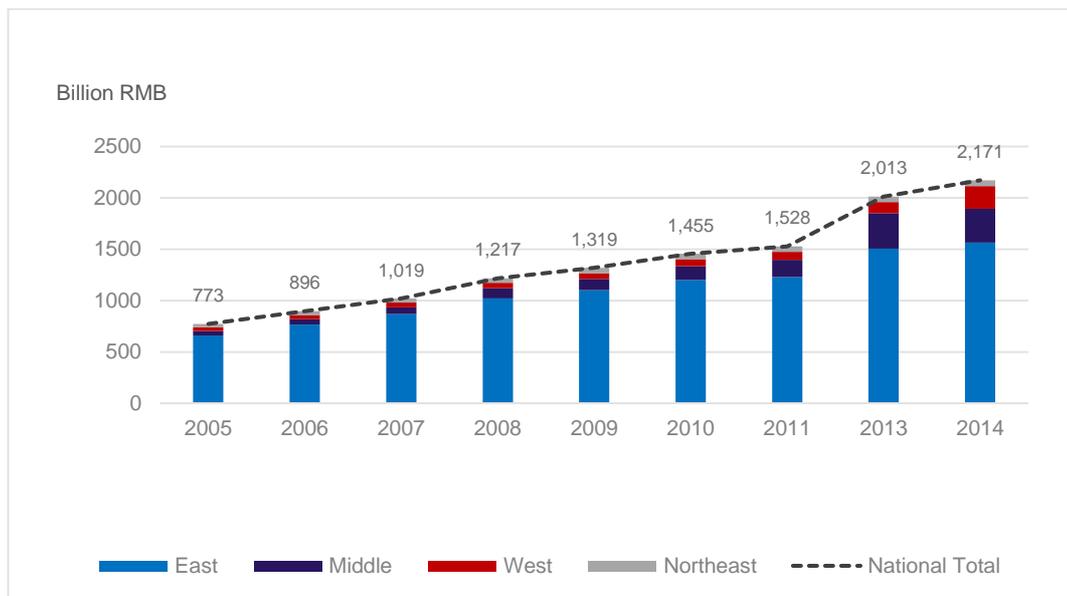


Figure 42: Regional distribution of capital stock, selected industries (TFCL, ICT and Elec.Mac)



Source (Figures 39 to 42): Industrial Economic Statistical Yearbook 2006–2015, data obtained from the NBSC. Statistics of 2013 and 2014 includes 'leather, fur products', including entertainment products, which were not included in the statistics in previous years.

Notes (Figures 39 to 42):

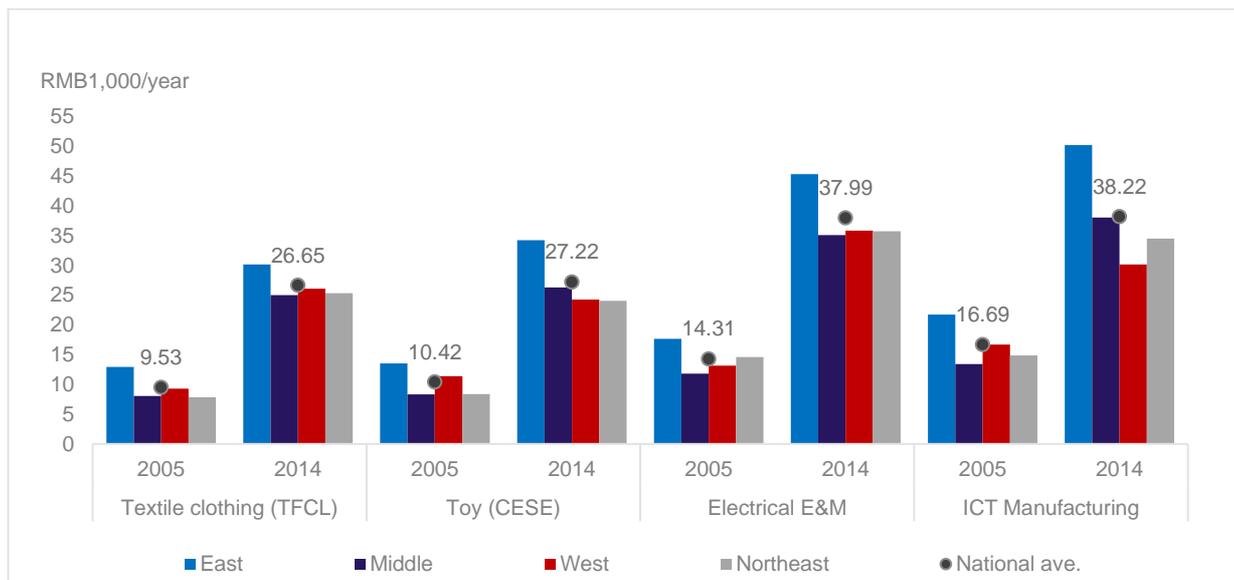
(1) Data have adopted new classification criteria since 2012. Therefore, figures are not comparable with previous years. Specifically, since 2011, firms with outputs below RMB20 million are excluded in the statistics. Previously, only firms with outputs below RMB5 million were excluded.

(2) See Appendix A for the definition of regions: East, Middle, West and Northeast.

(3) Sales value in Figure 41 are adjusted to 2005 prices based on the annual inflation rates published by the NBSC. 4) See Appendix for the definition of 'industrial sales'.

The comparison of wages for the four selected sectors is presented in Chart 4.28. The bars in different colours present the regional average wages of four industries respectively in 2005 and 2014. The dots stand for the aggregated (national-level) industrial average. Although rising salaries were a general phenomenon, wage disparities remained among regions, as well as industries. High technology manufacturing, that is, ICT and EEM, offers relatively higher salaries compared to low-technology manufacturing such as TFCL and CESE. The average salary in ICT manufacturing reached RMB38,223 per annum in 2014, 43.4% higher than the average salary in TFCL (RMB26,651 in 2014) in the same statistical year. The gap between them in 2005 was more profound. ICT workers on average earned RMB16,685 per annum, 75% (RMB7,152) more than the average earnings of shoe-making or garment factory workers.

Figure 43: Comparison of wages by region in selected industries, 2005 and 2014



Source: Labour Statistical Yearbook 2006–2015, NBSC.

Notes:

- (1) As noted in the Labour Statistical Yearbook, average wages were estimated according to the labour force survey and population census. It is not comparable to manufacturing wages in industry economic statistics or high-tech industry statistics, which include only enterprises above a designated size.
- (2) Urban manufacturing employment does not include private enterprises. It is different from manufacturing wages presented in Section 2.1 in which the manufacturing wage is the median of urban and private enterprises.
- (3) See Appendix A for the definition of regions: East, Middle, West and Northeast.

## 5. PRODUCTIVITY DYNAMICS AND COST STRUCTURE ANALYSIS

### 5.1 Regional manufacturing productivity performance

Productivity is the measure of production efficiency. It captures the economy’s ability to harness its physical and human resources to generate output and income. A key concern for the competitiveness of Chinese manufacturing would be whether the increase in manufacturing labour earnings is matched by parallel gains in productivity. If rising labour earnings are not compensated by a proportional improvement of productivity, it will then curtail industry competitiveness. The reforms undertaken across state-owned enterprises in the late 1990s played an important role in driving productivity growth. When rural labour surplus migrated to cities and was absorbed by manufacturing factories in the 2000s, productivity surged again with the rapid improvement of output per person (EIU, 2014).

Using the input and output indicators at provincial level across the four selected industries discussed in the previous section, we regressed the logarithm sales on both capital (in logarithm) and labour (in logarithm), controlling for industry and province specifics. The samples were divided into subgroups by region and the corresponding results of each subgroup are given in Table 2. We firstly pooled the sample and estimated it with an ordinary least square (OLS) approach. Attempting to control for time-invariant heterogeneity, a Fixed Effect (F.Eff.) approach is also used and estimates were given to compare with the OLS results.<sup>18</sup> The interpretation below will be based on estimates of fixed effect while estimated coefficients capture sales elasticities.

<sup>18</sup> A detailed introduction of Fixed Effect can be found in Wooldridge (2013).

Sales elasticity measures the responsiveness of sales to a change in levels of either labour or capital used in the production, *ceteris paribus*. The labour estimator in ‘All samples’ shows that a 1% increase in labour usage would lead to approximately a 0.47% increase in sales. In general, sales elasticity to labour input is much higher in inland China than in the East subgroup. The highest return to labour is found in the Middle region, where 1% of labour input would increase the sales by 0.64% sales growth. The estimates of labour input are not significant for the Northeast region, possibly biased by the few observation numbers because only three provinces are covered in this region. The sales return to physical capital investment appears to be higher in East China compared to West and Middle China, indicating larger returns of sales to physical capital investment – and also that this region may be in transition to capital-intensive productions. Consistent with previous total factor productivity (TFP) studies (Van Beveren, 2012), OLS is inclined to underestimate the output elasticity and produces lower estimators. Coefficients of both physical and labour capital are greater in the fixed effect results across all subgroups.

Table 2: Sales elasticity by regions, Cobb-Douglas production function results of four selected industries

Sales	All Samples		Eastern region		Middle region		West region		Northeast region	
	OLS	F. Eff.								
Capital, log	0.676*** (-0.034)	0.702*** (-0.032)	0.717*** (-0.05)	0.724*** (-0.056)	0.758*** (-0.069)	0.654*** (-0.057)	0.546*** (-0.057)	0.652*** (-0.052)	0.870*** (-0.143)	1.075*** (-0.161)
Labour, log	0.434*** (-0.041)	0.474*** (-0.037)	0.602*** (-0.064)	0.491*** (-0.061)	0.323*** (-0.08)	0.637*** (-0.074)	0.482*** (-0.067)	0.581*** (-0.066)	0.176 (-0.179)	-0.158 (-0.236)
Constant	1.895*** (-0.191)	2.201*** (-0.087)	3.161*** (-0.177)	1.872*** (-0.161)	1.833*** (-0.119)	1.970*** (-0.15)	1.902*** (-0.367)	2.534*** (-0.147)	1.560*** (-0.495)	1.899*** (-0.412)
Observations	890	890	288	288	174	174	312	312	87	87
R-squared	0.965		0.976		0.925		0.932		0.919	
Number of id		125		40		24		45		12

Note: Data obtained from Industrial Economy Statistic Yearbook 2005–2014 for textile clothing manufacturing, communication equipment manufacturing and electrical machinery manufacturing. Cultural, sport and entertainment products manufacturing only available 2013–2014, therefore only two waves of this industry are included in our analysis. F.Eff. presents the Fixed Effect (within estimator) results. Industry and province dummies are included in the OLS estimation. Standard errors are presented in parentheses.

Labour productivity, measured in sales per worker, is only a partial measurement as it does not take account of the contribution of other factors of production. As such, it needs to be interpreted carefully as changes in labour productivity may reflect factors that are outside workers’ influence. Figure 44 below depicts the manufacturing sales per capita from 2008 to 2014. The dashed line draws the average national level. Manufacturing labour productivity<sup>19</sup> has followed an upward trend with an average annual increase of 9.61%, suggesting that the productivity gains have so far been able to (partially) offset the rising labour cost challenges. The exceptionally high value of sales per capita in the Northeast may be attributed to its unique industrial structure. Although reforms have been undertaken, heavy industries still occupy a large share of this region within which state-owned enterprises play a dominant role. Large-scale redundancies among employees may effectively increase industrial efficiency and lead to productivity improvement in the short term. Long-term sustainable development will inevitably require industry transformation and technological advancement.

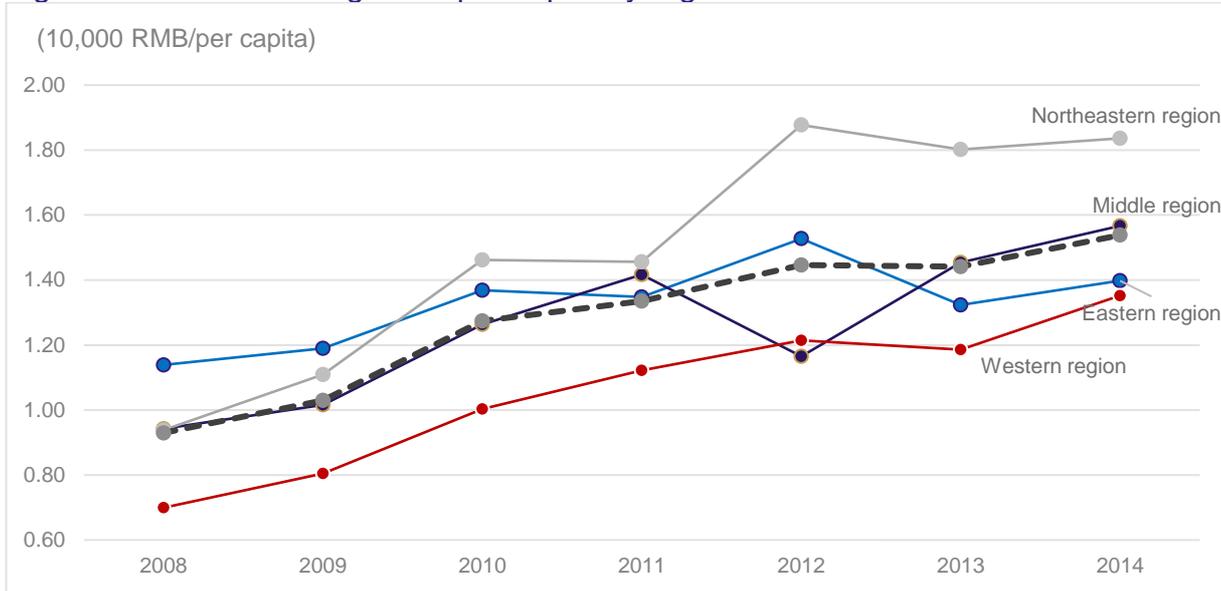
In line with the existing literature, our main theoretical approach to compute productivity is based on growth theory, where output growth is expressed as a function of growth in inputs and growth in efficiency where inputs are transformed into outputs. TFP is the portion of output not explained by the amount of inputs used in production. As such, its level is determined by how efficiently and intensely the inputs are utilised in production. TFP here is calculated by the Solow residual.<sup>20</sup> As Figure 45 shows, manufacturing TFP in the four selected industries grew steadily with an average annual growth at 8.2%. After 2011, it experienced a moderate fluctuation over the next two years. Clearly manufacturing TFP in Eastern

<sup>19</sup> Due to limited access to data, manufacturing sales are used to replace output to compute labour productivity.

<sup>20</sup> Although other popular approaches have been widely used in computing TFP such as Olley and Pakes (1996) and Levinsohn and Petrin (2004), it requires us to use investment level or intermediate inputs or to proxy the productivity shocks. Both inputs values were not available in the IESY, therefore we adopt the CD function residual approach.

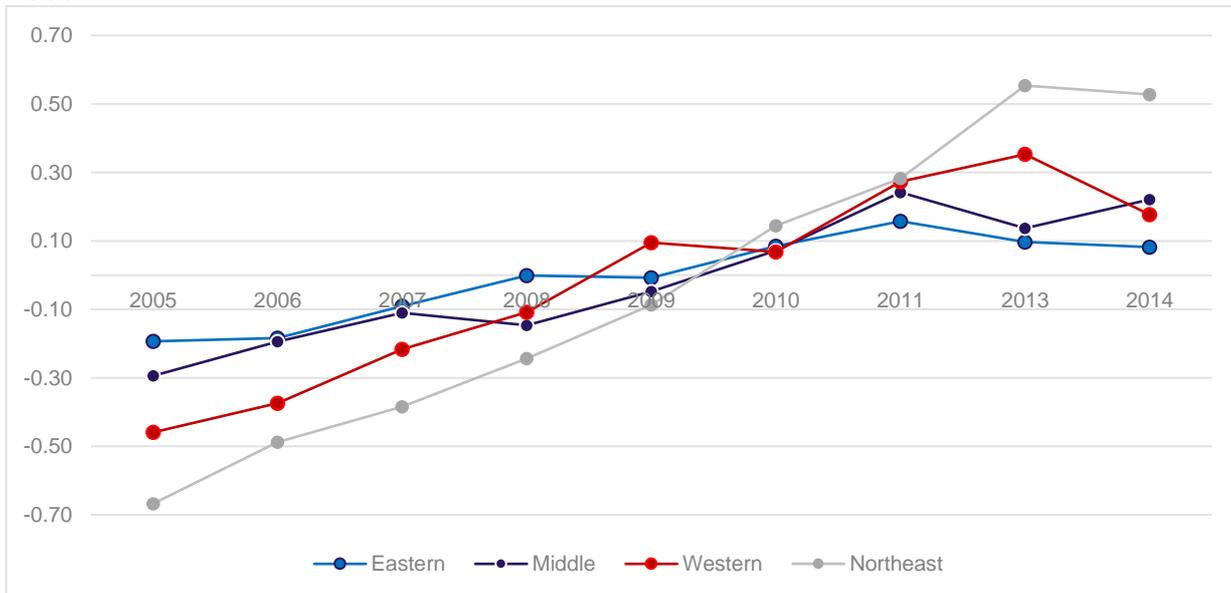
provinces slowed down, particularly after 2010, compared to the rest of China, signalling that manufacturing competitiveness may have started shifting towards inland China.

Figure 44: Manufacturing sales per capita by region



Note: Sales value per capita is calculated with data obtained from the NBSC.

Figure 45: Total factor productivity by regions based on four selected industries (in logarithm), 2005-14



Note: Total factor productivity is based on the author's calculation using Cobb Douglas production function in which output values were replaced by sales due to data availability. The TFP is the residual of OLS estimates in Table 2.

## 5.2 Regional cost structure comparison

Chinese manufacturing is undergoing a transition process after which products are expected to upgrade to serve mid- and high-end consumers and production will become more technology-embedded. Undoubtedly, the Eastern region leads growth in Chinese manufacturing with respect to the scale of production, employment, export and technology development. Owing to its proximity advantage and relatively low factor costs, the Middle region has so far embraced rapid growth over the past decade. The review of four selected industries also showed a moderate catch-up in some parts of the West region but the improvement appears to be more profound in high-tech manufacturing such as ICT manufacturing and

electrical machinery. Coupled with the acceleration of manufacturing development in inland China, employment in labour-intensive light manufacturing has also begun to shift.

The spatial mobility of industry is neither automatic nor costless. The relocation process requires motivated and capable transferors, as well as a qualified host especially one with adequate capability and readiness to undertake the transferred industries. In view of its wage-sensitive nature, labour cost is the most cited factor when labour-intensive manufacturing relocation is undertaken. Nonetheless, production cost covers various aspects aside from workers' earnings. The cost of industry relocation is believed to be associated with a series of factors, among which we would like to highlight the following: natural resources, transportation, infrastructure, host region industry capability and economic development levels.

Table 3: Impact factors of manufacturing relocation

Category	Indicator	Unit
Natural resources	Land	Construction land coverage in total land size of China, in percentage
	Water	Water storage in million cubic metres per 100 land hectares
Transportation	Road	Highway: km/10,000hectares Expressway: km/10,000hectares
	Rail	km/10,000hectares
	Waterway	km/10,000hectares
ICT infrastructure	Base station of mobile telephones	per station/10,000 hectares
	Optical cable lines	km/10,000 hectares
	Internet user	Internet user ratio
Industry capability	Secondary industry	Secondary industry/GDP
	R&D	R&D/GDP
	Technology transfer	Tech. transfer value/GDP
	University graduates	Graduates/provincial population
Host region economic development	GDP	GDP per capita
	Service sector	Service sector/GDP

Source: China Regional Economic Statistic Yearbook (2014) and Statistic Yearbook (2014), data obtained from the NBSC.

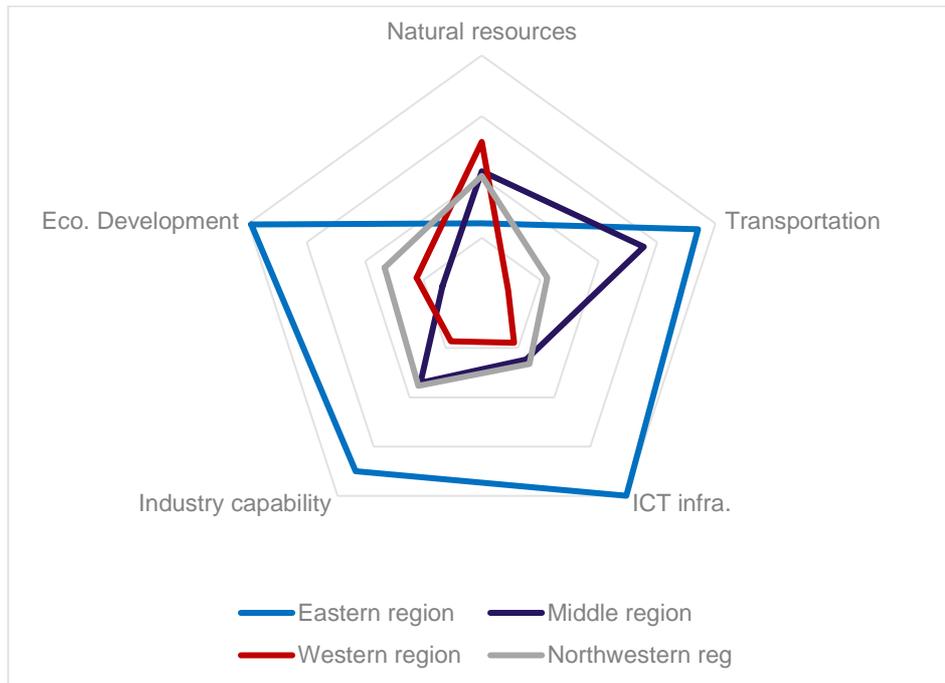
As the indices in Figure 46 show, China's natural resources is concentrated in the West region, which is also one of the least developed areas across the nation. The East ranked as the area least abundant in natural resources while Middle China is ranked as the most resource-insufficient region although it also has the most established transportation system including road, rail and waterways. All three indicators are measured by length normalised by acreage. The West and Northeast regions lag behind. The least accessible places are the far West including Tibet, Xinjiang and Yunan. Road, rail and waterway infrastructure are well developed in Middle region such as Anhui, Henan, Hubei and Hunan. Convenient transportation networks have greatly helped the Middle region to better accommodate labour-intensive manufacturing. Meanwhile, the completion of several high-speed train projects, such as Guiguang, Lanxin and Hukun, are also expected to enhance integration between West and East.<sup>21</sup>

Over the past decade, there has been an explosion in the use of ICTs in China – for example, internet users grew from 1.8% of the whole population in 2000 to 52.2% in 2016, reaching 721.4 million (*Internet Live Stats*, 2016). Three indicators are taken to compute the ICT infrastructure index: number of base stations of mobile telephones (by 10,000 hectares), optical cable lines (in km), and number of internet users. As the right bottom corner of Figure 46 suggests, ICT infrastructure is far superior in the Eastern region compared to inland China. The Middle and Northeast areas have similar levels of ICT development whereas the West is the least advanced region.

<sup>21</sup> Guiguang high-speed railway connects Guizhou with Guangdong; Lanxin railway connects Xinjiang with Lanzhou through which connections can extend to the Eastern and other parts of China; Hukun is the longest horizontal high-speed railway connection in China, connecting the far Western areas such as Yunnan and Guizhou with the Eastern region, reaching Shanghai.

Although the shift of labour-intensive manufacturing does not compel a host region to have advanced technology levels, the absence of basic industrial capability will to some extent inhibit the process of integration and productivity growth (White and Liu, 1998; Liu and Buck, 2007; Hou and Mohnen, 2013). Industry capability in the Eastern region is much further ahead compared to other regions. The Central area is gradually catching up and is ranked as the second most developed place. With regards to both GDP per capita and service to GDP ratio, it is no surprise that the Eastern region is more economically advanced than inland areas. The Northeast and West regions take second and third place respectively, while Middle provinces lag relatively far behind.

Figure 46: Regional cost structure comparison, 2014.



Source: China Regional Economic Statistic Yearbook (2014) and Statistic Yearbook (2014), data obtained from the NBSC.  
Note: Indices of each category are computed by using Principle Component Analysis (PCA).

## 6. FINAL REMARKS

Using data from multiple official sources, this paper tries to identify the geographical employment relocation trends of Chinese labour-intensive light manufacturing. The descriptive evidence revealed that, as tertiary industry has become increasingly important to the nation's economy, the labour market in China has so far appeared to be resilient and employment from other sectors has started moving to the tertiary sector. Due to pressures from rising wages and other factor costs, spatial and industrial distributions of Chinese labour-intensive light manufacturing have experienced dynamic changes over the past few decades.

Focusing on selected manufacturing sub-sectors – garment and footwear, toys, household appliances and ICT, we described the pattern of current manufacturing employment shifts. Findings suggest that manufacturing is unevenly distributed in China with great concentration in the eastern coast region, despite the recent catch-up by the Central region that may imply a shifting trend from East to inland areas.

Evidently, wages are not the only factor to consider when manufacturing begins to migrate. Transportation networks, ICT infrastructure and host region industry capability are critical and are influencing manufacturers' relocation decisions. Although natural resources are not as abundant as other inland areas, provinces in Middle China have so far successfully attracted labour-intensive manufacturing by their well-developed transportation networks and ICT infrastructure. The strong knowledge pool and technological

capability have further strengthened their manufacturing readiness and have enabled provinces such as Anhui, Hubei and Henan to benefit from the fast industrial development and to catch up. Another trend found is that a proportional amount of workers has also started to shift to this region.

Three provinces in the Northeast have retained a certain level of industrial capability, benefiting from the strong concentration of heavy industry operated by large state-owned enterprises. However, the prior claim on the region by the traditional heavy industries may mean there is limited readiness to accommodate labour-intensive manufacturing factories since resources and policies were largely targeted at heavy industry – such as the ‘Revitalise the Northeast campaign’ in 2007. Owing to the lack of solid infrastructure and a limited level of industrial capability accumulation, the relocation of manufacturing to the Western region is geographically uneven and incomplete. The improvement of transportation networks and investment-friendly policy instruments initiated by local government could perhaps make it the next destination for potential manufacturers.

Although preliminary results imply that manufacturing may have started shifting away from Eastern regions towards interior parts of the country, robust evidence on the underlying causes remains scarce. It is still unclear whether the slowing down of manufacturing in the East was due to relocation of economic activity by firms (to other parts of China or outside China), to a decline in market demand, or to firms leaving the market. It is similarly unclear whether the rise in manufacturing activity in inland regions is a result of a transfer from the East or the arrival of new firms. To answer these unsolved questions, our project will continue by conducting a firm-level survey in selected Chinese labour-intensive manufacturing industries.

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## APPENDICES

### Appendix A: Notations

**Employed person:** This refers to a person above a specified age with the capacity to work and who performed work for compensation or business gains. Specifically, it refers to all people, aged 16 and over, who performed some work for compensation or business gains for one hour or more during the reference period; or who had work units or sites but were temporarily not at work during the reference period.

**Persons employed in various units:** This refers to the total number of employees who work at a unit and who obtain wages or other forms of payment at the end of the reporting period. This indicator is a type of time point index and equals the sum of the number of employed staff and workers, labour dispatch personnel and other employed persons. Employed persons do not include:

- 1) persons who have left their working units while keeping their labour contract (employment relation) unchanged and receiving regular alimony;
- 2) students who do part-time jobs and all kinds of enrolled students who do internships in various units;
- 3) persons employed due to labour outsourcing;
- 4) persons who dissolve labour contracts with their units on the last day of the reporting period or before.

**Persons employed in private enterprises:** This refers to persons employed in private enterprises that have been registered with the departments of industrial and commercial administration for which the business operation is situated in a county town (that is, a town where the county government is located), or in urban areas with an administrative hierarchy higher than a county town.

**Self-employed individuals in urban areas:** These are people who hold certificates of residence in urban areas or have resided in the urban areas for a long time and have been registered at the departments of industrial and commercial administration and approved to be engaged in individual industrial or commercial business, including as a self-employed person as well as helpers and hired labourers who work in individual households.

**Average wage:** This refers to the average per capita wage during a certain period of time for employed persons. It shows the general level of wage income during a certain period of time, and is one major indicator to reflect the wage level. It is calculated as follows:

Average wage = total wage bill of employed persons at reference time/average number of persons employed at reference time.

**Three strata of industry:** In China, economic activities are categorised into the following three strata of industry:

- **Primary industry** refers to agriculture, forestry, animal husbandry and fishery industries;
- **Secondary industry** refers to mining and quarrying, manufacturing, production and supply of electricity, water and gas, and construction;
- **Tertiary industry** refers to all other economic activities not included in the primary or secondary industries.

**Industrial sales value:** This refers to the monetary terms of the total industrial products and services sales value during the reporting period. It includes: 1) sales value of finished goods; 2) income from external processing.

**Enterprise above designated size:** This definition is provided by the NBSC. Only the enterprises above a designated size will be included in the industrial statistics such as industrial economic statistics and high-technology industry statistics. Since 2011, enterprise above designated size refers to firms with outputs above RMB20 million. Previously, firms with more than RMB5 million were included as enterprise above designated size.

**High-technology industry (manufacturing):** The high-tech industry (manufacturing) classification specified the sectors that invested in relatively high intensity of R&D (research and development), including six categories: ‘pharmaceutical manufacturing’, ‘aviation, spacecraft and equipment manufacturing’, ‘electronic and communications equipment manufacturing’, ‘computer and office equipment manufacturing’, ‘medical equipment and instrument manufacturing’, ‘information chemicals manufacturing’.

**Electrical machinery:** electric motors; generators; transformers; electricity distribution equipment; insulated wires and cables; optical fibres for coded data transmission; batteries; lighting equipment; household electrical appliances manufacturing and other electrical equipment.

**Communication equipment, computers and other electronic equipment:** communication, computer matching, computer parts, computer peripheral equipment, other computer and telecommunications equipment only in radar and ancillary equipment, audio-visual equipment, electronics, electronic components and assembly.

**Textile clothing, footwear, hats and leather products:** garments, footwear, hats and caps, leather, fur, feather and their products.

**Culture, education, sports and entertainment products manufacturing:** stationery and office supplies, musical instruments, arts and crafts, sporting goods, toys, games equipment.

**East China (in blue):** Eastern China is a geographical and loosely defined cultural region that covers the eastern coastal area of China. For administrative and governmental purposes, the region is defined by the Chinese Central Government to include the provinces of Hebei, Jiangsu, Zhejiang, Fujian, Shandong, Hainan, as well as the municipality of Shanghai, Tianjin, and Beijing.

**Middle China (Central China, in green):** Middle China refers to the middle part of China. In the definition of the Chinese Government, Middle China covers six provinces: Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan.

**Northeast China (in grey):** Northeast China includes three provinces: Heilongjiang, Liaoning, Jilin.

**West China (in red):** Western China refers to the western part of China. In the definition of the Chinese Government, Western China covers one municipality Chongqing; eight provinces: Inner Mongolia, Guangxi, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai and three autonomous regions: Tibet, Xinjiang, and Hainan.



## Appendix B: Data notes

Table A: Data sources

Data sources	Year	Main indicators variables used	Section in the text / notes
Statistical Yearbook China	2000–2015	<ul style="list-style-type: none"> <li>GDP, sector shares in GDP</li> <li>Primary, secondary and tertiary industry employment</li> <li>Urban manufacturing employment, private sector manufacturing employment</li> <li>Urban manufacturing average salary, private sector manufacturing average salary</li> <li>Consumer price index</li> </ul>	2.1; 2.2; 3.1  Note: Employment statistics in the 'employment' section of the Statistical Yearbook China was estimated according to the labour force survey and population census. It includes manufacturing firms across all scales. However, the employment statistics acquired from this source only cover urban (excl. private enterprises) manufacturing and private enterprises. Other enterprises are not covered such as rural non-private enterprises.
Industrial Economic Statistical Yearbook, China	2006–2014	<ul style="list-style-type: none"> <li>Manufacturing sales across provinces</li> <li>Industry-level employment across four selected manufacturing industries</li> <li>Number of enterprises across four selected manufacturing industries</li> <li>Sales across four selected manufacturing industries</li> <li>Capital investment across four selected manufacturing industries</li> </ul>	3.1; 3.2; 4.1-4.4; 5.1  Note: 1) CESE (toy manufacturing) was not included in the Industrial Statistical Yearbook before 2013. 2) Since 2011, firms with outputs below RMB20 million have been excluded in the statistics. Previously, only firms with outputs below RMB5 million were excluded.
High-Technology Industry Statistical Yearbook, China	2000, 2005, 2011–2014	<ul style="list-style-type: none"> <li>High-tech enterprise numbers</li> <li>High-tech average number of employment</li> <li>High-tech exports</li> </ul>	3.2  Note: The scope and measurement of the High-Tech Statistical Yearbook is same as the Industrial Economic Statistic Yearbook.
Labour Statistical Yearbook, China	2006–2014	<ul style="list-style-type: none"> <li>Urban manufacturing average salary, private sector not included</li> </ul>	4.1-4.4  Note: Urban manufacturing does not include private enterprises.
Regional Statistical Yearbook, China	2014	<ul style="list-style-type: none"> <li>Cost structure indicators: land, water, road, rail, waterways, base station of mobile telephones, optical cable lines, internet users, R&amp;D, technology transfer, university graduates etc.</li> </ul>	5.2
Provincial Statistical Yearbook, 27 provincial and four directly controlled municipalities	2000–2014	<ul style="list-style-type: none"> <li>Minimum wages</li> <li>'Article of culture, education, sport activities and entertainment products' manufacturing 2009 data including number of firms, employment</li> <li>Number of enterprises in four selected industries across in 2014</li> </ul>	2.1
Guangdong Industrial Economic Statistical Yearbook	2009, 2014	<ul style="list-style-type: none"> <li>'Article of culture, education, sport activities and entertainment products' manufacturing 2009 data including number of firms, employment</li> <li>Number of enterprises in four selected industries in 2014</li> </ul>	3.2; 4.1-4.4

Regional employment and wages are reported in several different statistical yearbooks with inconsistent measurements.

Table B: The number of manufacturing jobs reported from different sources.

	2008	2009	2010	2011	2012	2013	2014
IESY, above designated size	77.2	77.1	83.8	80.4	83.9	86.1	88.5
NSY, urban (excl. private)	34.3	34.9	36.4	40.9	42.6	52.6	52.4
NSY, private enterprises	36.9	38.4	41.5	43.0	44.5	47.6	50.7
NSY, urban (excl. private) and private enterprises	71.2	73.3	77.8	83.8	87.1	100.2	103.2

Notes:

(1) IESY refers to Industrial Economic Statistical Yearbook, China; NSY – National Statistic Yearbook, China.

(2) IESY only covers the above designated size enterprises: since 2011, firms with outputs below RMB20 million are excluded in the statistics. Previously, only firms with outputs below RMB5 million were excluded.

(3) The last row is the sum of the fourth and fifth rows.

## Appendix C: Elasticities of substitution between capital stock and employment

Applying a nonlinear squares approach to the constant elasticity of substitution production function, we have computed the sales elasticity of substitution between capital inputs and labour inputs with the pooled data for each region. Results are presented in Table C.1. The elasticity of substitution measures how easy it is to substitute capital inputs for labour inputs and reflects the elasticity of the ratio of two inputs to sales function with respect to the ratio of their marginal effects (Solow, 1956; Arrow et al., 1961; Klump et al., 2007). Western China holds the highest elasticity of substitution coefficient, suggesting that this region is more likely to substitute capital inputs with labour inputs considering their marginal return on sales. The elasticity of substitution coefficients for East and Middle regions are similar in size; East is 1.1 percentage points lower, suggesting that the investment in capital is less responsive to labour inputs in the East than other areas.

Table C: Elasticity of substitution across regions

Variables	East	Middle	West	Northeast
	(1)	(2)	(3)	(4)
Constant	1.959*** (0.074)	1.969*** (0.111)	2.065*** (0.126)	3.524*** (0.154)
rho	1.472** (0.678)	1.347* (0.728)	0.563* (0.291)	-5.419 (10.051)
delta	0.991*** (0.016)	0.977*** (0.037)	0.885*** (0.074)	0.000 (0.000)
E. of Substitution	0.405*** (0.111)	0.426*** (0.132)	0.639*** (0.118)	-0.226 (0.514)
Observations	288	174	312	87
R-squared	0.949	0.898	0.888	0.846

Note: Data obtained from Industrial Economy Statistic Yearbook 2005–2014 for textile clothing manufacturing, communication equipment manufacturing and electrical machinery manufacturing. Cultural, sport and entertainment products manufacturing only available for 2013–2014, therefore only two waves of this industry are included in our analysis. Nonlinear least-squares estimation approach was applied and standard errors are presented in parentheses. Delta is the shared parameter measuring the capital intensity in production; elasticity of substitution between capital and labour is calculated as  $1/(1+\rho)$ . Standard errors in parentheses

\*\*\* p&lt;0.01

\*\* p&lt;0.05

\* p&lt;0.