5. Has the 'Flying Geese' Phenomenon in Industrial Transformation Occurred in China?

Yue Qu, Fang Cai and Xiaobo Zhang

Introduction

In the past three decades, the Chinese economy has experienced phenomenal growth in large part thanks to rapid expansion in the labour-intensive manufacturing sector, mostly concentrated in the coastal areas. In 2009, China's per capita GDP reached \$3774, qualifying it for status as a 'middle-income country'. Along with economic development, wages and other factor prices tend to increase over time. Consequently, labour-intensive industries will eventually lose their traditional comparative advantage, pushing enterprises to move to other regions or countries with lower costs. The existing literature focuses mainly on the patterns of industrial relocation across countries: as factor prices go up in a developed country, labour-intensive industries tend to move to other, less expensive places, while the developed country retains only those capital-intensive high-value-added industries. This pattern has been coined the 'flying geese model' in the literature (Kojima 2000; Okita 1985).

As China opened up to the world beginning in the late 1970s, its coastal regions enjoyed a geographic advantage compared with their interior counterparts because of their proximity to international markets. Chasing the abundant supply of cheap labour, massive foreign investment flew to the coastal regions. Coupled with favourable policy support from the Central Government, the coastal areas have witnessed a three-decade-plus manufacturing boom. Most of the manufacturing industries are clustered in the coastal areas (Long and Zhang 2011; Lu and Tao 2006). China has become a 'world factory' in just a few decades and achieved the level of industrialisation that took European countries more than a century to realise.

The booming manufacturing sector has generated ample employment opportunities, gradually exhausting the seemingly unlimited supply of labour. Since the early 2000s, there have been an increasing number of media reports of labour shortages, in particular in the coastal regions (Cai 2010; Zhang et al. 2011). Since 2004, the average wage has escalated by a double-digit

percentage rate annually. Alongside the knowledge of demographic trends, there is consequently wide debate as to whether China has reached the Lewis turning point. Amidst rising labour costs, the spatial distribution of industrial activities has begun to change.

For a long time, China was a typical dual economy with a large supply of surplus labour in rural areas. As the industrial sector draws millions of workers from farms to factory floors, the number of excess labourers in the rural areas dwindles. Consequently, workers start to find themselves with more leverage when negotiating wages with employers. At this stage, the wage rate is likely to climb at a much faster pace than before. This is the so-called ‘Lewis turning point’. After the turning point, the capital–labour ratio rises rapidly, imposing huge pressure on labour-intensive enterprises. In order to survive in the new paradigm of labour shortage, they have to make a choice: either introduce more capital-intensive technologies to replace labourers or relocate the business to a region with cheaper labour costs.

In the long run, China will have to upgrade its industries by introducing more capital-intensive techniques and producing more high-quality goods. In the short run, however, because of large regional variations in factor prices, there is a possibility for enterprises to move their operations to interior regions to take advantage of the cheaper labour and land. Early empirical studies (Fan 2004; Luo and Cao 2005) have shown that the historical relocation of business was actually from the interior to the coastal areas, which have become increasingly ‘clustered’; however, these findings are now quite dated, covering the periods up to the late 1990s or the early 2000s. By comparing the regional difference in labour costs from 2000 to 2007, Cai et al. (2009) demonstrate that it is economically viable to move labour-intensive industries to the interior regions. Using provincial-level data, Ruan and Zhang (2010) further confirm that, in the textile sector, the pattern of ‘flying geese’ has occurred. Their finding is, however, based on only one sector and aggregated data at the provincial level. In this chapter, we expand the analysis by Ruan and Zhang (2010) to the firm level, while encompassing all the manufacturing industries. Our results show that since the mid-2000s, the share of manufacturing-sector assets located in inland regions has steadily increased, especially in labour-intensive industries.

Descriptive Statistics

Sample Representativeness

Our study is based on the above-scale manufacturing enterprise census data from 1998 to 2008, covering 31 provinces and 30 manufacturing industries

classified according to SITC (Standard International Trade Classification) two-digit codes. All state-owned enterprises (regardless of size) and non-state enterprises with annual sales income exceeding RMB500 million are included in the sample. The number of businesses included in the sample ranges from about 100 000 in 1998 to about 300 000 in 2008. The dataset has some unique features. First, it is a census survey for large-scale enterprises rather than a sample survey. Second, the sample period encompasses the proposed Lewis turning point about 2004 as shown in Cai (2007) and Zhang et al. (2011). Of course, the dataset has a drawback in that it does not cover private enterprises with sales less than RMB500 million. To check for potential bias as a result of excluding these small firms, we compare the summary statistics drawn from our sample with those inferred from the China Economic Census in 2004 and 2008.

Table 5.1 presents the ratios of average assets, profit and employment calculated from our sample relative to those computed from the full economic census in 2004 and 2006 for major industries. Several features are apparent from the table. First, the difference is more salient for employment than for assets and profit. On average, our sample accounts for about two-thirds of total employment in 2004 compared with about 90 per cent of total assets and profit. Second, the gap in employment between the two data sources narrowed in 2008. The ratio of employment covered in our sample compared with the economic census increased to 73 per cent. Third, the difference in coverage varies greatly across industries. For example, the ratio is as low as 0.45 for the recycling industry in 2004, suggesting that the sector is dominated by small enterprises. In contrast, almost all the tobacco enterprises are in the above-scale category as shown by the greater ratios in assets, profit and employment, which are close to one. Overall, the sample has good coverage in terms of assets and profit, but has less thorough coverage of employment.

Table 5.1 Comparing the National Above-Scale Manufacturing Enterprise Survey with the Economic Census (2004, by industry)

Industry	Ratio						
	Assets		Profit		Employment		Main
	2004	2008	2004	2008	2004	2008	2004
Agriculture food products	0.8349	0.8608	0.7439	0.8380	0.6279	0.6964	0.8867
Food products	0.8433	0.8662	0.8779	0.8659	0.6523	0.7117	0.8836
Beverages	0.8664	0.8896	0.9042	0.8969	0.6577	0.6880	0.8957
Tobacco products	1.0046	0.9989	0.9897	0.9990	0.9846	0.9645	1.0062
Textiles	0.8717	0.8870	0.8577	0.8662	0.7441	0.8104	0.8921
Clothing	0.7913	0.8192	0.8932	0.8378	0.6586	0.7157	0.8558
Dressing and dyeing of furs	0.8268	0.8676	0.8481	0.8750	0.7332	0.8117	0.8854
Lumber	0.7118	0.7354	0.5469	0.6889	0.4559	0.5533	0.6926
Furniture	0.7194	0.7691	0.7092	0.6976	0.5637	0.6629	0.7738
Paper and paper products	0.8573	0.8961	0.8513	0.8610	0.6224	0.6959	0.8546

Industry	Ratio						
	Assets		Profit		Employment		Main
	2004	2008	2004	2008	2004	2008	2004
Publishing, printing	0.7261	0.7490	0.7964	0.7356	0.4818	0.5348	0.6959
Entertainment products	0.7958	0.8329	0.8562	0.7820	0.6987	0.7923	0.8553
Refined petroleum products	0.9693	0.9611	0.9709	1.0138	0.8416	0.9299	0.9877
Chemicals and chemical products	1.1044	0.9243	0.9347	0.9323	0.7132	0.7713	0.9270
Medical products	0.8999	0.9251	1.0404	0.9909	0.8355	0.9005	0.9717
Fibre products	0.9463	0.9536	0.9733	0.9504	0.8888	0.9292	0.9803
Rubber products	0.8812	0.9034	0.8772	0.8644	0.7100	0.7618	0.8881
Plastics products	0.7810	0.8114	0.7988	0.7923	0.5798	0.6593	0.8057
Non-metallic mineral products	0.8144	0.8211	0.6781	0.7449	0.4770	0.5346	0.7527
Basic metals	0.9706	0.9875	0.9834	0.9804	0.8873	0.9509	0.9811
Non-ferrous metals	0.9523		0.9764		0.8399		0.9614
Fabricated metal products	0.7677	0.7926	0.8235	0.7965	0.5866	0.6554	0.8176
General machinery and equipment	0.8348	0.8564	0.8500	0.8582	0.6322	0.6877	0.8318
Special machinery and equipment	0.8513	0.7768	0.9034	0.8491	0.6855	0.6281	0.8743
Transport equipment	0.9355	0.8804	0.9648	0.9180	0.7695	0.7652	0.9503
Electrical machinery and apparatus	0.8958	0.9186	0.9641	0.9492	0.7588	0.8447	0.9355
Computing machinery	0.9471	0.9106	1.0169	0.9381	0.8275	0.9230	0.9868
Precision and optical instruments	0.8526	0.8793	0.9795	0.9472	0.7087	0.7799	0.9150
Crafts	0.7534	0.6291	0.7127	0.6748	0.5987	0.5921	0.7778
Recycling	0.6722	0.7799	0.6492	0.7071	0.4539	0.6069	0.7796
All manufacturing	0.8988	0.8477	0.9062	0.8411	0.6758	0.7275	0.9084

Sources: National above-scale manufacturing enterprise data from National Bureau of Statistics of China: *The First Economic Census Bulletin* available from <http://www.stats.gov.cn/zgjpc/cgfb/t20051206_402294807.htm>; *The Second Economic Census Bulletin* available from <<http://www.stats.gov.cn/was40/reldetail.jsp?docid=402610156>>

The Spatial Distribution of Manufacturing and Labour-Intensive Industries

Using the above-scale manufacturing enterprise dataset, we examine the distribution of manufacturing industries in assets, profits and output values during the period 1998–2008 in inland and coastal regions. We pay particular attention to labour-intensive industries. By definition, labour-intensive industries use more labour relative to capital input during the production process; however, there is no clear-cut definition of labour-intensive industries. The capital–labour ratio might differ between developed and developing countries. In this chapter, we select a group of industries that displays low

capital–labour ratios in both China and the United States. Based on the above-scale manufacturing dataset, we sort the 30 manufacturing industries according to the value of the capital–labour ratio. The right column in Table 5.2 presents the 15 most labour-intensive industries according to this measure, while the left column exhibits 16 industries with low capital intensity in the United States, obtained from Ciccone and Rapaioannou (2009). There are 12 overlapping industries between the two columns. We categorise these 12 industries as labour-intensive industries: textiles, garments and footwear (18); leather products (19); wood processing (20); furniture (21); sporting goods (24); plastic products (30); fabricated metal products (34); general-purpose equipment (35); special equipment (36); instrumentation (39); communications equipment and computers (40); and electrical machinery and equipment (41).

Table 5.2 The Criteria for Labour-Intensive Industries (International/National)

International criterion		National criterion	
Industry name	CAPINT	Industry name	Capital–labour ratio (RMB1000 per capita)
Footwear, except rubber or plastic	0.443	Dressing and dyeing of furs	31.28
Clothing, except footwear	0.481	Clothing	37.01
Professional and scientific equipment	0.654	Entertainment products	37.23
Leather products	0.663	Crafts	46.18
Tobacco	0.73	Furniture	61.16
Printing and publishing	0.785	Electrical machinery and apparatus	78.64
Furniture, except metal	0.789	Lumber	86.27
Chemicals, other	0.800	Fabricated metal products	91.35
Other manufactured products	0.878	Textiles	91.68
Machinery, electrical	0.924	Plastic products	94.33
Machinery, except electrical	1.017	Precision and optical instruments	94.36
Fabricated metal products	1.173	General machinery and equipment	110.24
Misc. petroleum and coal products	1.199	Recycling	110.51
Transport equipment	1.32	Special machinery and equipment	116.51
Food products	1.366	Computing machinery	116.56
Plastic products	1.416		

Notes: For the international criterion, see Ciccone and Rapaioannou (2009); the national criterion is based on the calculations using the above-scale manufacturing enterprise data for 2008.

Figure 5.1 plots the share of employment, assets and output values in the coastal regions spanning the period 1998–2008 for the manufacturing sector as a whole (the left panel) and for the labour-intensive industries only (right panel).¹ The figure reveals a few interesting features. First, the coastal region plays a dominant role in shaping China's manufacturing sector. It employed more than 55 per cent of workers, accumulated nearly two-thirds of assets and produced more than 70 per cent of output in 1998. By 2008, its shares of employment, asset and output values had all risen to more than 70 per cent. Second, despite the increasing importance of the coastal region in the manufacturing sector during the sample period, the speed of growth has slowed since 2004. In particular, the output share has decreased since then. Third, for the labour-intensive industries, the trend of firms flocking to the coast seems to have dwindled about the mid-2000s. Apart from output, the share of assets in the coastal region showed a declining trend from 2006 to 2008, suggesting a capital outflow from the coastal to interior regions. The share of employment has levelled off since 2004. Because our sample encompasses only the large firms, it might fail to capture the movement in employment from the coastal to interior regions, for vast numbers of small labour-intensive enterprises tend to be more responsive to rising labour costs on the coast.

Figure 5.1 The Share of Manufacturing and Labour-Intensive Industries in Coastal Areas

Source: Computed by authors based on the national above-scale manufacturing enterprises survey.

1 The eastern (or coastal) region includes Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan; the interior (central and western) region comprises Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan, Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang.

Next, we further compare the return on assets (ROA) and per capita profit in the two regions over time. As shown in Figure 5.2, initially ROA in the coastal region exceeds that in the interior region. The gap is more evident for labour-intensive industries; however, over time, the regional difference disappears. By the end of the sample, the interior region even slightly outperforms the coastal region in ROA. Per capita profit shows a similar trend. Despite an initially unfavourable business environment, the interior region had become a more lucrative destination for business by 2008. Cai et al. (2009) also show that the total factor productivity in inland areas has increased faster than in coastal areas. The higher and rising returns to assets and profitability might be key factors behind the recent relocation of businesses to the interior regions.

Figure 5.2 Return on Assets and Profit Per Capita (By region)

Note: ROA = return on assets.

Source: Computed by authors based on the national above-scale manufacturing enterprises survey.

Rising labour costs might be another driving force behind the migration. Figure 5.3 shows average labour costs in the two regions over the sample period. Overall, wages have steadily increased. The growth has accelerated since 2003. Moreover, labourers are more expensive in the coastal region than in the inland. In 2007, an average coastal worker earned RMB29 000, which was RMB5000

higher than his inland counterpart. In 1996, coastal workers in the labour-intensive industries earned less than the average of the entire manufacturing sector; however, by 2007, the wage difference across industries had disappeared within the coastal region, while it still exists in the inland regions. This suggests that there is still some room for the labour-intensive industries to move inland to take advantage of the relatively cheaper labour costs.

Figure 5.3 Labour Costs in Coastal and Inland Regions

Source: Computed by authors based on the national above-scale manufacturing enterprises survey.

As more enterprises move into interior regions, they will hire a greater number of local workers, hence pushing up local wages. As a consequence, the regional variation in wage rates is likely to drop as businesses fly from high-wage coastal regions to low-wage inland regions. To check this, we compute a standard measure of inequality—the generalised entropy index (GE(0) index)—using wages at the firm level from the above-scale manufacturing dataset. The index dropped from 0.34 to 0.25 between 2000 and 2007,² suggesting wage convergence over time. To examine how much of the variation is due to coastal–inland difference, we further decomposed the overall GE(0) into two components: the mean difference between the coastal and inland regions and the intra-region variation.³ The share between coastal and inland differences in total wage variation has declined from 0.058 to 0.029, indicating a narrowing wage gap between the inland and coastal regions. The trend in wage inequality seems to support the story that ‘geese’ have flocked to the inland regions.

2 The data for 1998, 1999 and 2008 do not include wage information. Consequently, the sample period used in the calculation of the inequality measure is 2000–07.

3 See Zhang and Kanbur (2001) for the application of the decomposition methodology.

Quantitative Analyses of Flying Geese

Having shown some descriptive evidence in support of the 'flying geese' pattern—industrial relocation to the inland regions since the mid-2000s—we next conduct a quantitative analysis to examine the relative importance of various factors behind the shifting spatial distribution of manufacturing activities. In the literature, the term 'flying geese' often refers to the movement of capital from a developed region to a less developed one. Following the convention, we present the results for assets only.⁴ When firms select a location for investment, they often make agglomeration their top priority. As stated by Krugman (1991) and Marshall (1920), agglomeration offers several key advantages: proximity to the market, the easy flow of information and technology and labour pooling. Holding everything else constant, a region with a higher degree of agglomeration is likely to attract more business investment. So, the first variable of interest is a measure of agglomeration. We use the proximity measure at the county level computed by Long and Zhang (2011) based on firm-level data from China's Industrial Census of 1995 as a measure of agglomeration.

As more firms cluster in a place with high agglomeration, however, the space becomes congested and the demand for land rises. Because the conversion of land from agricultural to non-farm use is strictly controlled by the Government, the supply of land for industrial use can hardly keep pace with the rising demand. The combination of rising demand for and limited supply of land results in higher land prices. This makes it harder for many firms to expand their production in the increasingly congested coastal regions. If they want to expand their production base, they have to seek places endowed with cheaper land—mostly in inland regions. Unfortunately, land price information at the county level is not available. As a compromise, we use local population obtained from China's Population Census of 2000 as a proxy for land price.

The cost of living is generally higher in places with more expensive land. To attract workers, the coastal regions have to offer better wages. Labour-intensive industries are particularly sensitive to labour costs. As labour costs increase, these firms are more likely to move elsewhere to chase cheaper labourers (Duranton and Puga 2000; Puga and Venables 1996). Therefore, wage levels can be a major factor contributing to the relocation decisions of labour-intensive industries.

Although China has a unified tax code on paper, the effective tax rate differs greatly across regions (Zhang 2006). This is largely due to China's centralised political system and decentralised economic system. In China, the size of local government is largely proportional to the registered population; however, under

4 The results for output and employment are similar and available upon request.

fiscal decentralisation, local governments have had to raise most of the revenue to cover their operational costs and provide local public goods and services. Naturally, regions with a larger tax base can afford to collect less tax revenue from individual enterprises than their less fortunate counterparts. In view of this, we also include the effective tax rate, the ratio of taxes collected to gross industrial output, computed from *China Local Public Finance Yearbooks* in the regression analyses.

To test the relative importance of the above four factors to the spatial asset distribution over time, we run the following regressions year by year (Equation 5.1).

Equation 5.1

$$\ln(K_i) = \beta_1 * approx_i + \beta_2 * \ln(taxrate_i) + \beta_3 * \ln(wage_{i-1}) + \beta_4 * \ln(popu_i) + \beta_5 * dummy_{province} + \epsilon_i$$

In Equation 5.1, i represents county; K is total assets aggregated at the county level; $approx$ is a measure of local agglomeration; $taxrate$ represents the effective tax rate; and $wage_{i-1}$ refers to the average wage at the county level in the previous year. We use lagged wage data to primarily reduce the potential reserve causality. We also include a set of provincial fixed effects ($dummy_{province}$) in the regressions.

Because wage information is not available for 1998, 1999 and 2008, in the first set of regressions, we exclude the wage variable in the equation. Thus, the sample period ranges from 1998 to 2008. The upper part of Table 5.3 presents the estimations for the entire manufacturing sector, while the lower panel restricts the sample to labour-intensive industries.

The coefficient for the agglomeration variable is consistently positive and significant throughout the years, suggesting that a county with a higher degree of agglomeration attracts more business investment; however, the importance of agglomeration in the whole manufacturing sector peaked at 10.34 in 2001 and has declined since then (Figure 5.4, left-hand panel). Agglomeration commands a less important role in spurring asset accumulation for the labour-intensive industries than for the manufacturing sector as a whole. Interestingly, the significance of clustering in influencing spatial distribution of capital in the labour-intensive industries has declined more rapidly than the overall manufacturing industries as shown by the coefficient falling from 6.21 in 1998 to 3.32 in 2008.

Table 5.3 Industrial Assets Formation (Cross-section method)

All manufacturing											
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Approx.	8.88** (-1.66)	8.46** (-1.68)	9.80** (-1.61)	10.34** (-1.64)	9.73** (-1.6)	8.96** (-1.68)	9.32** (-1.43)	8.82** (-1.55)	8.99** (-1.43)	8.94** (-1.48)	9.16** (-1.51)
Population (ln)	1.25** (-0.06)	1.27** (-0.06)	1.28** (-0.06)	1.28** (-0.07)	1.21** (-0.07)	1.22** (-0.07)	1.15** (-0.06)	1.12** (-0.06)	1.08** (-0.06)	1.05** (-0.06)	1.04** (-0.06)
Taxrate (ln)	0.01 (-0.05)	0.01 (-0.05)	0.01 (-0.05)	0.03 (-0.05)	-0.03 (-0.04)	-0.03 (-0.04)	-0.03 (-0.04)	-0.04 (-0.04)	-0.06 (-0.04)	-0.08* (-0.04)	-0.12** (-0.04)
r² a	0.47	0.47	0.5	0.49	0.49	0.48	0.49	0.49	0.49	0.47	0.51
aic	5845	5902	5858	5913	6065	6121	6042	5979	5897	5850	5872
N	1660	1651	1682	1671	1706	1718	1728	1711	1702	1670	1716
Labour-intensive industries											
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Approx.	6.21** (-1.93)	6.10** (-1.99)	5.45** (-1.98)	5.21** (-2.03)	5.81** (-1.9)	2.86 (-1.94)	3.93** (-1.92)	4.06** (-1.95)	4.86** (-1.84)	4.07** (-1.92)	3.32* (-1.85)
Population (ln)	1.14** (-0.08)	1.11** (-0.08)	1.16** (-0.08)	1.05** (-0.09)	1.00** (-0.09)	0.95** (-0.09)	1.05** (-0.09)	0.97** (-0.09)	0.93** (-0.09)	0.88** (-0.09)	0.92** (-0.08)
Taxrate (ln)	-0.05 (-0.06)	-0.01 (-0.06)	-0.03 (-0.06)	-0.01 (-0.06)	-0.04 (-0.05)	-0.02 (-0.05)	-0.01 (-0.05)	-0.03 (-0.05)	-0.06 (-0.06)	-0.05 (-0.06)	-0.09* (-0.05)
r² a	0.38	0.4	0.41	0.39	0.4	0.38	0.39	0.41	0.42	0.42	0.45
aic	5824	5583	5690	5517	5572	5493	5626	5561	5409	5263	5481
N	1482	1434	1468	1418	1431	1409	1431	1434	1422	1386	1470

** represents significance level at 5 per cent

* represents significance level at 10 per cent

Note: The *t* values are in parentheses.

Source: Authors' own estimates.

The coefficient for the effective tax rate is generally insignificant for most of the years except for the last two (Figure 5.4, right-hand panel). The significant and negative coefficient in the last two years of the sample indicates that places with lower effective tax rates have become increasingly popular for business investment.

In the next set of regressions, we include the wage variable. Due to missing values for wage data in 1998 and 1999, the sample period is reduced to 2001–08. The estimated results are similar to those in Table 5.3 and are not reported here. Figure 5.5 plots only the coefficient for the wage variable from this new set of regressions. It is apparent from the figure that the coefficient first increased up to 2005 and has steadily declined since then. Prior to the 2000s, capital flocked to the coastal regions to take advantage of the agglomeration despite a higher labour cost. The rising coefficient for the wage variable in the first half of the 2000s suggests the positive agglomeration effect likely offset the rising labour cost; however, since 2005, counties' wage levels have become less correlated with local asset accumulation, suggesting that some firms have moved away from places with a higher degree of clustering—where workers often command higher wages—to lower-wage regions.

Figure 5.4 The Effect of Agglomeration and Tax Rate on Industrial Formation

Note: The figure is depicted based on the estimated results included in Table 5.3.

Figure 5.5 The Effect of Labour Costs on Asset Formation

Note: The figure is depicted based on the estimated results included in Table 5.3.

The above regressions run year by year offer some suggestive evidence that capital first flowed from inland to coastal regions up to the mid-2000s and subsequently reversed this trend. This approach entails a drawback in that it is not statistically efficient to estimate the regressions year by year. In addition, it does not directly test whether the share of assets possessed by the coastal region has first gone up before coming down after controlling for the major determinants. To overcome the problems, we run further regressions on the pooled sample as follows (Equation 5.2).

Equation 5.2

$$\begin{aligned}
 \ln(K)_{it} = & \beta_1 * D + \beta_2 * T * D + \beta_3 * T^2 * D \\
 & + \beta_4 * approx_i + \beta_4 * T * approx_i + \beta_6 * T^2 * approx_i \\
 & + \beta_7 * \ln(taxrate_i) + \beta_8 * T * taxrate_i + \beta_9 * T^2 * taxrate_i \\
 & + \beta_{10} * wage_{it-1} + \beta_{11} * T * wage_{it-1} + \beta_{12} * T^2 * wage_{it-1} \\
 & + year\ effect + \epsilon_{it}
 \end{aligned}$$

In Equation 5.2, i and t represent county and year, respectively; T is year-1998; D is a dummy variable for the coastal region; K is total assets aggregated at the county level; $approx$ is a measure of local agglomeration; $taxrate$ represents the effective tax rate; and $wage_{it-1}$ refers to the average wage at the county level in the previous year. Year fixed effects are also included. We interact the above variables with T and T^2 to capture the inverted-U shaped relationship between asset accumulation and several key determinant factors as identified in Figures 5.4 and 5.5.

Table 5.4 reports separate regression results for the entire sample, labour-intensive industries and other industries. For each sample, we present three specifications. The first regression (R1), excluding the wage variable, is based on the complete sample from 1998 to 2008. The third regression (R3) includes the wage variable. Due to missing values for the wage variable, the sample period is restricted to 2000–08. To check if any difference in the results between R1 and R3 is due to the additional wage variable or difference in the sample period, we repeat regression R1 on a smaller sample with reduced period 2000–08. The results for the coastal dummy variable and its interactions with T and T^2 are robust across all the specifications no matter which sample is used. Its interaction with the time variable is significant and positive across all nine regressions, while its interaction with T^2 is consistently statistically negative in all the specifications. This implies that after controlling for clustering, wage level and effective tax rate, the share of assets in the coastal region exhibits a clear trend: first rising and then declining. The results are consistent with the descriptive supporting evidence as shown in the previous section.

The relationship between local wages and asset accumulation also follows an inverted-U shape. The coefficient for the interaction term of wages with T is statistically positive, while the interaction terms with the squared term are negative and significant. This implies that, as time goes by, higher wages in the coastal region will eventually push capital away. The results hold no matter whether we use the whole sample, the restricted sample composed of only labour-intensive industries or the sample excluding the labour-intensive industries.

For the whole sample, the interaction term of the effective tax rate with the squared term of T is significantly negative. This suggests that, over time, effective tax rates become progressively more important in influencing asset accumulation in a location. When entrepreneurs select the destination of their investment, they have increasingly taken the ‘friendliness’ of the policy environment (lower taxes) into account; however, for labour-intensive industries, the results are not so robust. The coefficient for the interaction term of the effective tax rate with T^2 is significantly negative only in the first regression on the sample for the period 1998–2008. It loses significance when the sample period is cut to 2000–08.

Table 5.4 Industrial Asset Formation (Panel Regressions)

	All manufacturing			Labour-intensive industries			Others		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
east	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
T*east	0.043** (-0.011)	0.085** (-0.03)	0.078** (-0.029)	0.140** (-0.013)	0.284** (-0.036)	0.258** (-0.036)	0.029** (-0.011)	0.068** (-0.031)	0.060** (-0.03)
T²*east	-0.003** (-0.001)	-0.006** (-0.002)	-0.005** (-0.002)	-0.009** (-0.001)	-0.020** (-0.003)	-0.017** (-0.003)	-0.002** (-0.001)	-0.005** (-0.002)	-0.004** (-0.002)
approx	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
T*approx	0.532** (-0.183)	0.236 (-0.481)	0.241 (-0.469)	-0.173 (-0.246)	0.561 (-0.668)	0.434 (-0.662)	0.338* (-0.191)	0.464 (-0.508)	0.324 (-0.498)
T²*approx	-0.044** (-0.018)	-0.023 (-0.037)	-0.019 (-0.036)	-0.023 (-0.024)	-0.075 (-0.051)	-0.061 (-0.05)	-0.012 (-0.018)	-0.022 (-0.039)	-0.007 (-0.038)
Taxrate (ln)	-0.262 (-0.482)	-0.415 (-0.532)	-0.466 (-0.532)	-1.023* (-0.547)	-1.393** (-0.61)	-1.634** (-0.616)	0.002 (-0.495)	-0.032 (-0.55)	-0.17 (-0.552)
T*taxrate (ln)	-0.010** (-0.005)	0.007 (-0.012)	0.005 (-0.012)	0.003 (-0.006)	0.001 (-0.016)	-0.001 (-0.016)	-0.007 (-0.005)	0.003 (-0.013)	0 (-0.013)
T²*taxrate (ln)	-0.001* (0)	-0.002** (-0.001)	-0.002** (-0.001)	-0.002** (-0.001)	-0.002 (-0.001)	-0.002 (-0.001)	-0.001** (0)	-0.002* (-0.001)	-0.002 (-0.001)
Wage (ln)		0.190** (-0.092)				-0.076 (-0.102)			0.235** (-0.092)
T*wage (ln)		0.059* (-0.03)				0.111** (-0.034)			0.053* (-0.03)
T²*wage (ln)		-0.006** (-0.002)				-0.010** (-0.003)			-0.006** (-0.002)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
r² a	0.274	0.216	0.236	0.238	0.194	0.205	0.248	0.19	0.211
aic	44 980	29 991	28 489	41 467	27 775	26 464	46 014	31 002	29 640
N	24 131	17 648	17 495	19 733	14 227	13 892	23 988	17 567	17 410

** represents significance level at 5 per cent

* represents significance level at 10 per cent

Notes: The t values are in parentheses; Model 1 uses the sample 1998–2008; Model 2 and Model 3 use the sample 2001–08. Variables of *east* and *approx* are dropped in the function because of multi-collinearity with the year fixed effects.

Source: Authors' own estimates.

Conclusions

In the past several years, there have been more and more media reports on labour shortages, in particular in the coastal regions. Some have argued that China has passed the Lewis turning point (Cai 2008; Zhang et al. 2011). As labour costs keep rising, the labour-intensive manufacturing industries—most of which are located in coastal regions—will gradually lose their cost advantages in the international market. They have to either upgrade quality to move up the value chain or relocate their business to places with lower labour costs.

Based on the census-type survey for above-scale manufacturing enterprises from 1998 to 2008, this chapter shows that a transfer of capital from the coastal to the inland region has occurred since the mid-2000s—exactly corresponding with the timing of the Lewis turning point. As investment flocked inward, wage rates in the interior regions caught up with those on the coast. Consequently, the regional difference in wages narrowed over time. As China is a large country with huge regional differences, it could take some years for wages to equalise across regions. The geese won't stop flying inward until that date. After that, there are likely to be massive relocations of labour-intensive industries from China to other developing countries with cheaper labour, such as Bangladesh and Ethiopia; however, it is not clear when that day will come.

References

- Cai, F., 2007, 'The Lewisian turning point of China's economic development', in *Reports on China's Population and Labour No. 8*, Social Sciences Academic Press, Beijing, pp. 147–69.
- Cai, F., 2008, 'Chinese economy: how to break through the low middle income trap', *Journal of Graduate School of Chinese Academy of Social Sciences*, vol. 1, pp. 13–18.
- Cai, F., 2010, 'Labour shortage (*mingong huang*): causes and policy implications', *The Opening Herald*, vol. 2, pp. 5–10.
- Cai, F., Dewen, W. and Yue, Q., 2009, 'Flying geese within borders: how does China sustain its labour-intensive industries?', *Economic Research Journal*, vol. 9, pp. 4–14.
- Ciccone, A. and Rapaioannou, E., 2009, 'Human capital, the structure of production and growth', *Review of Economics and Statistics*, vol. 91, no. 1, pp. 66–82.

- Duranton, G. and Puga, D., 2000, 'Nursery cities: urban diversity, process innovation, and the life cycle of products', *American Economic Review*, vol. 91, no. 5, pp. 193–204.
- Fan, J., 2004, 'Yangtze River Delta integration, regional specialization and the manufacturing transfer', *Management World*, no. 11, pp. 77–96
- Kojima, K., 2000, 'The "flying geese" model of Asian economic development: origin, theoretical extensions, and regional policy implications', *Journal of Asian Economics*, vol. 11, pp. 375–401.
- Krugman, P., 1991, 'Increasing returns and economic geography', *Journal of Political Economy*, vol. 99, no. 3, pp. 483–99.
- Long, C. and Zhang, X., 2011, 'Cluster-based industrialization in China: financing and performance', *Journal of International Economics*, vol. 84, pp. 112–23.
- Lu, J. and Tao, Z., 2006, 'Industrial agglomeration and co-agglomeration in China's manufacturing industries: with international comparison', *Economic Research Journal*, no. 3, pp. 103–14.
- Luo, Y. and Cao, L., 2005, 'A positive research on fluctuation trend of China's manufacturing industrial agglomeration degree', *Economic Research Journal*, no. 8, pp. 106–27.
- Marshall, A., 1920, *Principles of Economics*, Macmillan, London.
- Okita, S., 1985, 'Special presentation: prospects of Pacific economies', in Korea Development Institute (ed.), *Pacific Cooperation: Issues and Opportunities, Report of the Fourth Pacific Economic Cooperation Conference, Seoul, Korea, April 29 – May 1*, pp. 18–29.
- Puga, D. and Venables, A. J. 1996, *The spread of industry: spatial agglomeration in economic development*, Discussion Paper No. 279, Centre for Economic Performance.
- Ruan, J. and Zhang, X., 2010, *Do geese migrate domestically? Evidence from the Chinese textile and apparel industry*, IFPRI Discussion Paper 01040.
- Zhang, X., 2006. 'Fiscal Decentralization and political centralization in China: Implications for growth and regional inequality', *Journal of Comparative Economics*, vol. 34, no. 4, pp. 713–26.
- Zhang, X. and Kanbur, R., 2001, 'What difference do polarisation measures make?', *Journal of Development Studies*, vol. 37, no. 3, pp. 85–98.
- Zhang, X., Jin, Y. and Shenglin, W., 2011, 'China has reached the Lewis turning point', *China Economic Review*, vol. 22, pp. 542–54.