COST COMPETITIVENESS COMPARISONS AND CONVERGENCE IN CHINA

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We investigate trends in regional cost competitiveness in China's four regions (Coastal, Northeast, Interior and West) over the past thirty-five years. We find that the Coastal region lost its initial cost competitiveness as its higher relative labour productivity (RLP) was offset by rapidly rising relative nominal labour costs (RNLC) due to rising wages. The Northeastern region still has cost advantages in the traditional Manufacturing sector. The Interior and West regions improved their competitiveness in most industries due to low RNLCs. There is convergence of relative unit labour cost (RULC) in all industries before 1995, but only in Finance after 1995. However there is convergence in RLP in five industries in 1978–95 and 1995–2009, offering prospects for robust growth for China into the future.

Keywords: Unit labour cost; regional development planning; China

JEL Classifications: J30; R58

1. Introduction

Unit labour costs (ULCs) are widely used as a metric for international competitiveness comparisons (van Ark *et al.*, 2005). Notable studies between China and other economies include UNCTAD (2002), which compared ULCs in manufacturing for China relative to the US, Sweden and some non-EU countries in 1998. Cox and Koo (2003) calculate China's labour productivity relative to the US and Mexico in 2001. Banister (2005) reports labour costs for Chinese manufacturing in 2002, but does not include productivity or unit labour costs analysis. Szirmai *et al.* (2005) provide a long-run series of labour productivity relative to the US for 21 manufacturing subsectors in China from 1980 to 2002.[1] However, there are huge regional disparities in Chinese economic development which are often overlooked when making international comparisons. For China to maintain its growth trajectory as a nation, it is arguable that it must facilitate convergence across regions in productivity and labour costs. Failure to do so may create frictions within the Chinese economy (wage inflation, labour unrest, resource underutilisation) which may threaten its long-term growth path.

This paper analyses China's regions' cost competitiveness over the period 1978–2009 for nine major industrial sectors.[2] Despite policy interest in the factors driving disparities in unit labour costs in China (Peneder, 2009), empirical work on the issue is sparse. Ceglowski and Golub (2007) analyse China's labour productivity and unit labour costs in Manufacturing over the period 1980–2002, but provide no information for the service industries and regional disparities. Chen *et al.* (2009) focus on comparisons of relative levels of productivity, labour compensation, unit labour costs and convergence trends for 28 manufacturing subsectors and 30 provinces for only two years (1995 and 2004). They argue that unit labour costs have been falling because labour productivity growth is faster than the labour compensation growth. They find convergence in competitiveness in labour-intensive industries, but divergence among capital/skill intensive industries.[3] However, they do not consider the fast developing service industries in China, which is our contribution in this paper.

We investigate trends in unit labour costs for China's regions across nine one-digit sectors from 1978 to 2009. We consider regions' competitiveness based on RULCs to identify which regions rely most heavily on relatively high labour productivity to be cost competitive and which rely more on relatively low nominal labour costs. Sectoral

competitive advantage shifts with relative nominal wages and productivity growth across regions. We focus on the drivers of unit labour costs and decompose regions' cost competitiveness into its productivity and cost components. This paper is structured as follows: section 2 introduces the measure method and discusses the construction of the dataset; section 3 outlines findings and examines competitive differences by industry and region; section 4 provides a decomposition of unit labour costs growth into relative changes of productivity and nominal labour costs; section 5 shows the convergence or divergence trends which have taken place across regions by industry. The final section comments on the implications of the findings.

2. Measurement and Data

In order to calculate unit labour costs, we need information on value added, price deflators of value added, labour compensation, annual hours worked of staff and workers.[4] For cross-regional comparisons, the formula for relative unit labour costs in sector j and region r (or province p) (baseline is Chinese national level b), i.e. $RULC_j^{rb}$, can be calculated by:

$$RULC_j^{rb} = \frac{ULC_j^r}{ULC_j^b} = \frac{LC_j^r / Y_j^r}{LC_j^b / Y_j^b} \qquad (1)$$

where LC_j^r and Y_j^r are labour compensation and value added in sector j and region r. Similarly, LC_j^b and Y_j^b are labour compensation and value added in sector j of the average national level and then relative labour productivity in sector j and region r, i.e. RLP_j^{rb}, can be calculated by:

$$RLP_j^{rb} = \frac{LP_j^r}{LP_j^b} = \frac{Y_j^r / H_j^r}{Y_j^b / H_j^b} \qquad (2)$$

where H_j^r is the annual hours worked by staff and workers in sector j in region r. H_j^b is the annual hours worked by staff and workers in sector j at national level. Finally, relative nominal labour costs in sector j and region r, i.e. $RNLC_j^{rb}$, can be calculated by:

$$RNLC_j^{rb} = \frac{NLC_j^r}{NLC_j^b} = \frac{LC_j^r / H_j^r}{LC_j^b / H_j^b} \qquad (3)$$

Since unit labour costs are all relative to China's average national level, figures greater (lower) than one indicate a labour cost disadvantage (advantage) for the region relative to the national average level.

Our dataset is constructed from two sources: Hsueh and Li (1999) and Chinese Statistics Yearbooks (CSYs). Hsueh and Li (1999) provide information for twelve sectors for the period 1978–95.[5] The CSYs have information for six sectors in two years, 1996 and 1997, twelve sectors for the period 1997–2003, and nine sectors during the period 2004–9.[6] There are many missing values in the consistent nine one-digit tertiary sectors after 1995. We impute missing values using data on the tertiary sector in 1995, such as gross value added, number of staff and workers and labour compensation from Hsueh and Li (1999).[7] We derive the implicit prices of gross value added from the ratios of value added at current prices and constant prices. The price deflators of gross value added for missing tertiary sectors are assumed to be the same as the respective price deflators of the total Tertiary sector.

The year 1994 marks the country-wide spread of 'market based economy' ideas, a change linked to Deng Xiaoping's 'South Trip' in 1992.[8] The year 1994 also marked a shift to the decentralisation of fiscal revenue to promote economic growth. Local governments are better positioned than the central government to locate and monitor fiscal expenditure more efficiently. This, in turn, led to the imposition of hard budget constraints on SOEs and promotion of economic growth through huge lay-offs (Qian and Weingast, 1997; Ma and Norregaard, 1998; Oates, 1972). Following Fleisher et al. (2010) we use the year 1994 as a structural break point for the economic transition process in China and divide the entire time period into two parts (1978–95 and 1995–2009) and also compare results for these two periods.

The National Bureau of Statistics of China records the number of staff and workers in post in the CSYs after 1998. Our data for the number of staff and workers during 1978 and 1997 include the laid-off workers. By assuming the ratio of redundant workers to on-post workers before 1998 is the same as the ratio in 1998 we obtain a consistent number of staff and workers from 1978 to 2009.

Annual working hours are not available in Chinese official statistics. So we follow the calculation of Jefferson et al. (2000). They derive working hours from labour regulation which changed three times during 1978–2009. Until 1994, a 6-day and 48-hour week was the norm for workers throughout Chinese industry. Then, from 1 March, 1994, staff and workers worked 8 hours a day and 44 hours a week, and from 1 May, 1995 they have worked 8 hours a day and 40 hours a week. Hence, during the period between 1978 and 1993, the standard annual

working time was 2400 hours a year (= 48 hours/week *50 weeks). In 1994 the standard annual working time was 2233 hours (= 2400*(2/12) + 2200*(10/12)), and in 1995 it was 2067 hours (= 2200*(4/12) + 2000*(8/12)). The standard annual working time declined to 2000 hours (= 40 hours/week*50 weeks) subsequently. By assuming that individual annual working hours do not vary across industries, total working hours are imputed using the number of staff and workers.

3. Results

First we present the findings of average relative unit labour costs (RULC). Figure 1 shows the RULCs of the Total Economy by region from 1978 to 2009. We find that RULCs in the Coastal, Interior and West regions are fairly stable prior to 1995. This may be due to the imposition of strict wage control by the state. The Northeastern region had a particularly high concentration of loss-incurring SOEs, so the RULCs in the industrial Northeast kept rising. After 1995, RULCs in the Coastal and West regions increase a little, while the Interior and Northeastern regions experience sharply decreased labour costs following huge lay-offs in loss-making SOEs.

Next, we investigate the RULCs by industry and region, and then the extent to which competitiveness, defined by relative unit labour costs (RULC), is determined by a

Figure 1. RULCs of the total economy by region (1978–2009)

nominal labour cost advantage or a relative productivity advantage (RLP). A relative unit labour cost lower than one with respect to the average national level indicates a relatively competitive situation for a region. It means that its labour costs are lower, or its labour productivity is higher. Each of these outcomes is likely to have different policy implications and, from this perspective, it is useful to have a better understanding of which component of relative unit labour costs measurement is driving the level. Thus, the most interesting sectors are those where there is the greatest gap between nominal labour costs and labour productivity.

Table 1 presents the average RULC, RNLC and RLP in the nine one-digit sectors by industry and region, compared with the average national level over 1978–95 and 1995–2009. Before 1995, the Coastal region – known as the "land with fish and rice" – was cost competitive in most industries due to its higher RLPs. This may be because it was the region that was exposed to the economic reforms early on. After 1995, however, the Coastal region experienced rapidly rising wages which offset its continuing labour productivity advantage. In contrast, the Interior and the West regions maintained cost competitiveness in most industries, benefiting from their relatively low labour costs.

In Agriculture cost competitiveness prevailed in the Coastal (0.96) and the Northeast (0.97) regions before 1995, but the Interior (0.89) and the West (0.86) regions became the most cost competitive after 1995. The cost competitiveness of the Coastal and Interior regions comes from the high RLPs (1.73 and 1.35); in contrast, the Northeast and West regions benefit from low RNLCs (0.37 and 0.60). The industrial Northeastern region has the highest cost competitiveness in the manufacturing (D) industry, across the two periods (0.91 and 0.90) with the lowest nominal labour costs across regions (0.80 and 0.85). The average RLPs in the Coastal region are highest (1.21 before 1995 and 1.13 afterwards), but they are offset by the high RNLCs. For the Construction (F) industry, cost competitiveness was in the Coastal region (0.91) before 1995 due to high RLP (1.22), and moved to the Northeast (0.90), the Interior (0.83) and the West (0.82) regions, which all benefit from their low labour costs. For both the Trade (G) and Transportation (I) industries across the four regions, the lowest RULCs (both 0.94) are in the Coastal regions before 1995 because of the highest RLP, and the lowest RULCs (0.83 and 0.93) are in the West region after 1995 from the lowest RNLCs.
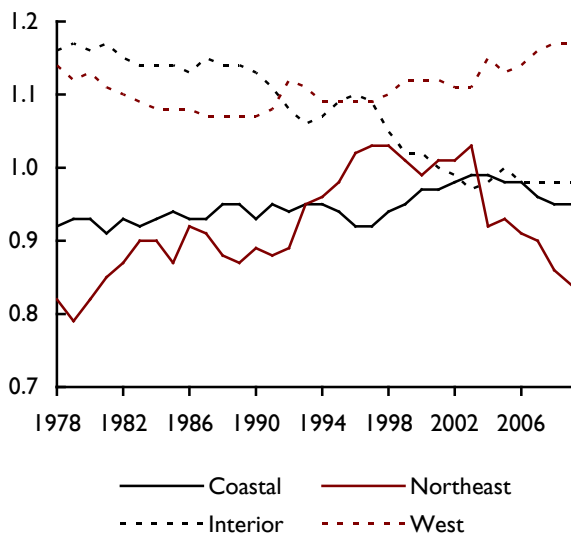
The Coastal regions have cost competitiveness in the Finance (J) industry across the two periods (0.61 and

Table 1. RULC, RNLC and RLP by industry and region (1978–95 and 1995–2009)

		RULC		RNLC		RLP	
	Region	1978–95	1995–2009	1978–95	1995–2009	1978–95	1995–2009
Agriculture (A to B)	Coastal	**0.96**	1.14	1.66	2.30	**1.73**	**2.02**
	Northeast	**0.97**	1.01	**0.37**	**0.39**	0.38	0.38
	Interior	1.03	**0.89**	1.33	1.20	**1.29**	**1.35**
	West	1.03	**0.86**	**0.78**	**0.60**	0.76	0.69
Manufacturing (D)	Coastal	**0.99**	1.05	1.19	1.18	**1.21**	**1.13**
	Northeast	**0.91**	**0.90**	**0.80**	**0.85**	0.88	0.95
	Interior	1.07	1.03	**0.89**	**0.93**	0.83	0.91
	West	1.05	**0.91**	**0.90**	**0.75**	0.86	0.82
Construction (F)	Coastal	**0.91**	1.20	1.11	1.44	**1.22**	**1.21**
	Northeast	1.01	**0.90**	**0.63**	**0.79**	0.62	0.90
	Interior	1.09	**0.83**	1.18	**0.73**	**1.08**	0.89
	West	1.05	**0.82**	**0.96**	**0.69**	0.92	0.85
Trade (G)	Coastal	**0.94**	1.11	1.20	1.38	**1.27**	**1.25**
	Northeast	1.14	**0.91**	**0.72**	**0.94**	0.64	1.04
	Interior	1.09	1.03	**0.87**	**0.68**	0.80	0.66
	West	**0.95**	**0.83**	1.01	**0.67**	**1.06**	0.82
Transportation (I)	Coastal	**0.94**	1.08	1.19	1.40	**1.27**	**1.31**
	Northeast	**0.99**	1.00	**0.84**	**0.66**	0.85	0.66
	Interior	1.13	**0.98**	**0.97**	**0.84**	0.86	0.86
	West	1.00	**0.93**	**0.82**	**0.70**	0.82	0.77
Finance (J)	Coastal	**0.61**	**0.88**	**0.80**	1.20	**1.30**	**1.37**
	Northeast	1.21	1.39	**0.98**	**0.79**	0.83	0.58
	Interior	1.29	**0.94**	1.04	**0.61**	0.81	0.65
	West	1.70	1.50	1.33	1.13	0.78	0.76
Real estate (K)	Coastal	**0.88**	1.07	1.02	1.25	**1.15**	**1.16**
	Northeast	1.24	1.12	**0.71**	**0.83**	0.58	0.75
	Interior	**0.85**	**0.83**	**0.99**	**0.76**	**1.17**	0.92
	West	1.21	1.00	1.24	**0.74**	**1.04**	0.74
Education (M)	Coastal	**0.99**	1.14	**0.99**	1.39	1.00	**1.23**
	Northeast	1.02	1.04	1.05	**0.98**	**1.04**	0.95
	Interior	1.00	**0.86**	1.01	**0.71**	1.00	0.83
	West	1.02	**0.91**	**0.99**	**0.74**	0.97	0.81
Health (N)	Coastal	**0.93**	1.08	1.02	1.21	**1.10**	**1.13**
	Northeast	1.03	1.37	1.04	1.32	**1.02**	0.97
	Interior	1.03	**0.87**	**0.95**	**0.77**	0.92	0.89
	West	1.08	**0.86**	**0.99**	**0.74**	0.92	0.87

Sources: Hsueh and Li (1999), and Chinese Statistics Yearbooks (CSYs), own calculations, average figures over 1978–95 and 1995–2009.
Notes: The bold values represent the regions' advantage relative to the national level. The red bold values are those we discuss in this paper.

0.88) with highest RLPs (1.30 and 1.37), and the Interior region has cost advantage (0.94) after 1995 with the lowest RNLC (0.61). The Real Estate (K) industry has the lowest RULCs in the Interior region during two periods (0.85 and 0.83), both due to their low RNLCs (0.99 and 0.76). In the Education (M) and the Health (N) industries, the Interior (0.86 and 0.87) and the West (0.91 and 0.86) regions have cost competitiveness after 1995 with their low RNLCs. This is consistent with the hypothesis that provinces in the Interior and West

regions accumulated human capital that helped them to catch up with the provinces in the Coastal region.[9]

Within each region, which provinces then contribute most to the regional cost competitiveness shown in table 1? Table 2 shows that in the Coastal region, Beijing has the lowest RULCs in the Agriculture (0.71), Trade (0.60) and Transportation (0.60) industries before 1995, and Shanghai has the lowest RULCs (0.26 and 0.34) in the Finance industry for both periods. Shanghai is

Table 2. RULC by industry and province (1978–95 and 1995–2009)

	1978–1995									1995–2009								
	AtoB	D	F	G	I	J	K	M	N	AtoB	D	F	G	I	J	K	M	N
Coastal	0.96	0.99	0.91	0.94	0.94	0.61	0.88	0.99	0.93	1.14	1.05	1.20	1.11	1.08	0.88	1.07	1.14	1.08
Beijing	0.71	0.79	0.88	0.60	0.60	1.03	0.88	1.04	0.86	0.94	1.43	1.37	1.40	0.80	0.39	1.56	0.95	1.43
Tianjin	0.89	0.79	0.99	0.85	0.82	0.71	1.23	1.11	1.06	1.44	1.21	1.49	1.31	1.48	0.79	1.80	1.02	1.10
Hebei	0.98	1.02	0.92	0.98	1.00	0.59	1.35	1.02	1.18	0.93	0.92	0.86	1.64	1.07	1.21	0.97	1.03	1.07
Shanghai	0.86	0.75	0.91	0.64	0.79	0.26	0.55	1.07	1.07	1.26	1.35	1.35	1.25	0.79	0.34	1.43	1.29	1.36
Jiangsu	1.01	0.91	0.88	0.86	1.14	0.37	0.69	0.93	1.01	1.21	1.11	0.90	1.04	1.39	0.70	0.97	1.15	1.20
Zhejiang	0.91	1.11	1.03	0.72	1.32	0.52	0.52	1.09	0.91	1.26	1.01	1.34	1.27	1.44	0.55	0.85	0.95	0.76
Fujian	1.05	1.35	1.04	1.46	1.19	0.74	1.15	0.98	1.00	1.13	1.08	1.29	0.87	0.92	0.71	0.81	1.07	1.05
Shandong	0.95	1.06	0.89	0.97	0.84	0.87	0.60	0.88	0.81	1.22	0.87	0.94	0.88	1.12	2.28	0.75	1.13	0.88
Guangdong*	0.88	1.37	0.84	1.55	0.92	0.87	1.09	0.81	0.84	1.20	1.04	1.74	0.96	0.87	1.16	0.97	1.59	1.21
Northeast	0.97	0.91	1.01	1.14	0.99	1.21	1.24	1.02	1.03	1.01	0.90	0.90	0.91	1.00	1.39	1.12	1.04	1.37
Liaoning	0.99	0.84	1.00	0.76	0.86	0.53	1.26	0.95	0.96	0.97	0.96	1.09	0.88	0.80	1.59	1.12	1.07	1.44
Jilin	0.95	1.15	1.07	1.88	1.29	1.72	1.02	1.02	1.08	0.93	1.02	0.67	0.96	1.00	1.32	0.92	1.02	1.03
Heilongjiang	0.96	0.93	1.02	1.59	1.09	1.77	1.42	1.09	1.12	1.15	0.76	0.79	0.87	1.31	1.10	1.15	0.95	1.37
Interior	1.03	1.07	1.09	1.09	1.13	1.29	0.85	1.00	1.03	0.89	1.03	0.83	1.03	0.98	0.94	0.83	0.86	0.87
Shanxi	0.94	1.18	1.09	1.03	1.08	0.68	1.28	1.08	1.12	0.84	1.20	1.02	0.78	0.91	0.91	1.11	0.93	0.77
Anhui	1.02	1.11	1.13	1.04	1.06	2.00	0.71	1.13	1.18	1.02	0.93	0.83	0.93	0.42	0.94	0.67	0.70	0.60
Jiangxi	1.02	1.11	1.11	1.42	1.62	1.60	0.75	0.65	0.64	0.95	1.01	0.67	1.04	0.79	1.33	0.64	1.15	1.28
Henan	1.02	1.12	1.01	1.11	0.90	0.89	0.72	1.00	1.06	0.90	1.18	0.69	1.05	0.97	1.06	0.81	0.87	1.09
Hubei	0.98	0.95	1.01	1.15	1.30	1.55	0.98	1.08	1.07	0.96	0.73	1.01	1.27	1.35	0.73	1.21	0.96	1.01
Hunan	1.09	1.04	1.17	0.98	1.23	1.53	0.73	1.12	1.12	0.81	1.09	0.90	1.01	1.27	1.11	0.61	0.76	0.70
West	1.03	1.05	1.05	0.95	1.00	1.70	1.21	1.02	1.08	0.86	0.91	0.82	0.83	0.93	1.50	1.00	0.91	0.86
Inner Mongolia	0.83	1.09	1.04	1.26	1.08	1.46	1.19	1.07	1.12	0.96	1.15	1.12	1.11	0.86	1.11	1.16	1.18	1.04
Guangxi	1.02	0.98	1.18	1.16	0.98	2.59	1.06	0.93	1.05	0.74	1.13	0.66	0.67	1.06	3.37	0.97	0.74	0.81
Sichuan*	1.02	1.07	1.06	0.75	0.84	1.36	0.98	1.00	1.06	0.89	0.97	0.98	0.71	0.75	1.15	0.74	0.91	0.81
Guizhou	1.03	1.06	1.05	1.12	0.90	1.32	1.31	1.17	1.15	0.78	0.95	0.66	0.78	1.07	1.20	0.76	0.80	0.67
Yunnan	1.08	0.62	0.95	1.23	0.86	1.17	1.36	0.82	0.88	0.97	0.58	0.85	0.79	1.13	2.19	0.97	1.06	0.65
Shaanxi	1.02	1.21	1.08	1.27	1.04	3.39	1.47	1.15	1.20	0.89	0.93	0.49	1.30	0.95	1.44	1.37	0.84	1.03
Gansu	0.97	1.27	0.94	0.80	1.38	1.65	1.65	0.99	0.97	0.67	1.10	0.64	1.09	1.02	1.54	1.59	0.96	1.29
Qinghai	1.05	1.35	1.11	0.71	1.59	1.76	1.68	0.94	1.11	0.82	1.01	0.95	0.74	1.17	1.40	1.70	1.01	1.07
Ningxia	1.14	1.08	1.07	0.76	0.94	0.69	1.09	0.96	1.00	1.07	1.04	0.75	0.75	0.86	1.29	1.14	0.81	0.82
Xinjiang	1.02	1.04	1.13	0.70	1.05	1.27	2.14	1.24	1.28	0.84	0.60	0.99	0.84	1.12	1.11	1.65	0.97	1.01

Sources: Hsueh and Li (1999) and Chinese Statistics Yearbooks (CSYs), own calculations, average figures over 1978–95 and 1995–2009. Notes: The bold values represent the provinces' advantage relative to the national level. The red bold values are those we discuss in this paper. The industry names are Agriculture (A to B), Manufacturing (D), Construction (F), Trade (G), Transportation (I), Finance (J), Real estate (K), Education (M) and Health (N). Guangdong* is the combination of Guangdong and Hainan provinces, and Sichuan* is the combination of Sichuan and Chongqing provinces.

China's finance centre and attracts funds worldwide. In addition to huge foreign investments and advanced banking systems, Zhejiang, Jiangsu and Fujian also have traditional informal finance from citizens and foreign remittances.

In the Northeastern region, Jilin has the lowest RULCs in the Agriculture (0.95) and Construction (0.67) industries, due in large part to its vast land and low population densities. The lowest RULCs in the Manufacturing industry are in Liaoning (0.84) before 1995 and Heilongjiang (0.76) afterwards. In the Interior region, Anhui province has the lowest RULCs in the Real Estate (0.71), Education (0.70) and Health (0.60) industries. Within the West region, Guangxi province has the lowest RULCs in the Trade (0.67) and Education (0.74) industries after 1995. Shaanxi province has the biggest cost advantage in the Construction (0.49) industry.

4. Decomposition of relative unit labour costs

Changes in relative unit labour costs (RULC) can be decomposed into two component parts: changes in relative nominal labour costs per hour (RNLC) and relative labour productivity (RLP):

Table 3. Decomposition of RULC by industry and region (1978–95 and 1995–2009)

	Region	dulc		dnlc		dlp	
		1978–95	1995–2009	1978–95	1995–2009	1978–95	1995–2009
Agriculture (A to B)	Coastal	0.003	0.008	0.006	0.026	**0.003**	**0.017**
	Northeast	**–0.005**	**–0.003**	**–0.002**	**–0.020**	**0.003**	–0.017
	Interior	0.003	**–0.013**	–0.008	0.007	–0.011	**0.020**
	West	**–0.004**	**–0.006**	–0.004	**–0.016**	0.000	–0.009
Manufacturing (D)	Coastal	0.000	0.007	0.008	**–0.016**	**0.008**	–0.023
	Northeast	0.003	**–0.001**	**–0.025**	0.031	–0.027	**0.032**
	Interior	0.004	**–0.010**	0.009	0.011	**0.005**	**0.021**
	West	**–0.008**	**–0.015**	**–0.012**	0.005	–0.004	**0.021**
Construction (F)	Coastal	0.004	0.016	0.022	0.000	**0.018**	–0.017
	Northeast	**–0.001**	**–0.013**	0.001	0.042	**0.003**	**0.055**
	Interior	0.000	**–0.027**	–0.028	**–0.021**	–0.029	**0.006**
	West	0.000	**–0.015**	–0.012	**–0.012**	–0.012	**0.003**
Trade (G)	Coastal	0.004	0.008	0.014	**–0.003**	**0.009**	–0.011
	Northeast	**–0.017**	0.008	**–0.018**	0.033	0.000	**0.025**
	Interior	0.008	**–0.010**	–0.009	**–0.012**	–0.017	–0.002
	West	**–0.001**	**–0.003**	–0.011	**–0.009**	–0.010	–0.006
Transportation (I)	Coastal	**–0.005**	0.019	0.010	**–0.001**	**0.015**	–0.020
	Northeast	**–0.001**	**–0.002**	**–0.033**	0.007	–0.032	**0.009**
	Interior	0.003	**–0.016**	0.001	**–0.006**	–0.001	**0.010**
	West	0.008	**–0.024**	–0.003	**–0.006**	–0.011	**0.018**
Finance (J)	Coastal	0.017	0.006	0.019	0.000	**0.003**	–0.006
	Northeast	**–0.013**	0.033	**–0.015**	0.007	–0.003	–0.026
	Interior	**–0.021**	0.011	**–0.035**	**–0.001**	–0.014	–0.012
	West	0.000	**–0.008**	0.006	**–0.006**	**0.006**	**0.001**
Real estate (K)	Coastal	0.003	0.013	0.003	0.005	**0.000**	–0.007
	Northeast	**0.000**	**–0.002**	0.013	0.015	**0.014**	**0.017**
	Interior	0.012	**–0.013**	–0.009	**–0.013**	–0.021	0.000
	West	**–0.002**	**–0.012**	–0.008	**–0.022**	–0.006	–0.010
Education (M)	Coastal	0.002	0.014	0.017	0.007	**0.015**	–0.006
	Northeast	0.005	0.005	**–0.008**	0.006	–0.013	**0.001**
	Interior	0.000	**–0.015**	**–0.016**	**–0.016**	–0.016	–0.001
	West	**–0.002**	**–0.012**	**–0.009**	**–0.006**	–0.007	**0.005**
Health (N)	Coastal	**–0.001**	0.016	0.007	0.006	**0.007**	–0.011
	Northeast	0.013	0.019	0.012	0.006	–0.001	–0.013
	Interior	0.005	**–0.019**	**–0.006**	**–0.011**	–0.011	**0.008**
	West	**–0.005**	**–0.019**	**–0.013**	**–0.006**	–0.008	**0.013**

Sources: Hsueh and Li (1999) and Chinese Statistics Yearbooks (CSYs), own calculations, average figures over 1978–95 and 1995–2009.
Notes: The bold values represent the regions' advantage (dulc<0, dnlc<0 and dlp>0). The red bold values are those we discuss in this paper.

$$\Delta \ln(RULC) = \Delta \ln(RNLC) - \Delta \ln(RLP) \qquad (4)$$

where a negative change in *dulc* (unit labour costs) indicates a gain in region competitiveness, and a negative change in *dnlc* (nominal labour costs) indicates a relative decrease in region nominal labour costs. A positive change in *dlp* (labour productivity) indicates a relative improvement in region labour productivity.

Table 3 decomposes the competitiveness gains or losses of the four regions for the nine one-digit industries. In general, the improving relative competitiveness of the Northeast, Interior and West, as measured by changes in RULCs, are driven by falling nominal labour costs, rather than improving labour productivity, but there is substantial heterogeneity across industries. Since 1995, RULCs have fallen in eight out of nine sectors in the Interior and West regions. In five of these industries this is due to falling RNLCs, with no significant change in RLPs. In the other three industries the fall in RULCs is

due to a combination of falling RNLCs and rising RLP. The one exception, Agriculture, experienced a decline in RULCs in the Interior due to rising labour productivity alone. Turning to the Northeast, it experienced a decline in RULCs in five industries between 1995 and 2009. In four industries this was due solely to improvements in RLP, and in one case it was due to falling RNLCs.

In Agriculture, the highest gain of region competitiveness occurs in the Northeast (–0.005) before 1995, with both a decrease in RNLC by –0.002 and an increase in RLP by 0.003. After 1995, the highest cost gain is in the Interior region (–0.013) and is due to a relative increase in RLP (0.020). In Manufacturing the biggest gain in cost competitiveness is in the West region for both periods (–0.008 and –0.015). In the early period it is due to falling RNLC (–0.012) and, from 1995, increasing RLP (0.021). In Construction the gain in competitiveness for the Northeast (–0.001) before 1995 comes from the increase of RLP (0.003). The gain in the Interior's (–0.027) competitiveness is from both a decreasing RNLC by –0.021 and increasing RLP by 0.006.

In Trade, the largest gain in cost competitiveness is in the Northeast (–0.017) region before 1995 and in the Interior (–0.010) region afterwards; both are from the decrease of RNLC. In Transportation, the gain in cost competitiveness before 1995 in the Coastal region (–0.005) is due to rising RLP (0.015). After 1995, the highest gain across regions is in the West region (–0.024) and comes from both the decrease in labour costs (–0.006) and rising labour productivity (0.018). In Finance, the biggest gain in cost competitiveness before 1995 is in the Interior region (–0.021) with a decrease of RNLC

by –0.035. After 1995, the biggest gain across regions is in the West region (–0.008) with both the decrease of labour costs by –0.006 and the increase of labour productivity by 0.001 contributing. In Real Estate and Education, the highest gain in cost competitiveness before 1995 is in the West region (–0.002 and –0.002) and the highest gain after 1995 is in the Interior region (–0.013 and –0.015). These are due to falling labour costs in the West by –0.008 and –0.009 respectively, and in the Interior (–0.013 and –0.016 respectively). In Health, the highest gain is in the West region (–0.005 before 1995, and –0.019 afterwards) and is due to falling relative labour costs (–0.013 and –0.006 respectively). After 1995, labour productivity also increases by 0.013.

5. Convergence in RULC, RLP and RNLC

To have a better understanding of the degree of convergence that has taken place across provinces, we present the dispersion of the relative levels of ULC, LP and NLC in table 4. It shows the annual growth rate of the coefficients of variation for RULC, RNLC and RLP for the provincial comparisons by nine industries over 1978–95 and 1995–2009.

Three important points emerge. First, convergence in RULC growth rates is apparent for all industries in the period prior to 1995, with the exception of Finance. In the period after 1995, Finance is the only sector in which there is ULC growth convergence across provinces. Second, most of the convergence in RNLC occurs in the earlier period. Third, there are signs of convergence in labour productivity growth rates in both periods, but in only two industries – Manufacturing and Real estate – do we observe labour productivity convergence across provinces in both periods.

Table 4. Annual growth rates of coefficients of variation across provinces

	AtoB	D	F	G	I	J	K	M	N
RULC									
1978–1995	**–0.02**	**–0.01**	**–0.05**	**–0.04**	**–0.01**	0.01	**–0.03**	**–0.06**	**–0.03**
1995–2009	0.07	0.01	0.09	0.00	0.01	**–0.03**	0.02	0.11	0.07
RNLC									
1978–1995	**–0.01**	0.01	**–0.02**	0.00	0.02	0.02	**–0.04**	**–0.04**	**–0.07**
1995–2009	0.02	**–0.02**	0.02	0.01	0.00	**–0.01**	0.02	0.05	0.03
RLP									
1978–1995	**–0.01**	**–0.01**	0.00	0.01	0.01	0.00	**–0.01**	**–0.03**	**–0.06**
1995–2009	0.01	**–0.03**	0.00	**–0.01**	**–0.02**	**–0.01**	**–0.01**	0.04	0.01

Sources: Hsueh and Li (1999) and Chinese Statistics Yearbooks (CSYs), own calculations, average figures over 1978–95 and 1995–2009.
Notes: The bold values represent convergence of coefficients of variation of RULC across provinces. The red bold values are those we discuss in this paper. The industry names are Agriculture (A to B), Manufacturing (D), Construction (F), Trade (G), Transportation (I), Finance (J), Real estate (K), Education (M) and Health (N).

Figure 2. Coefficients of variations of RULC across provinces
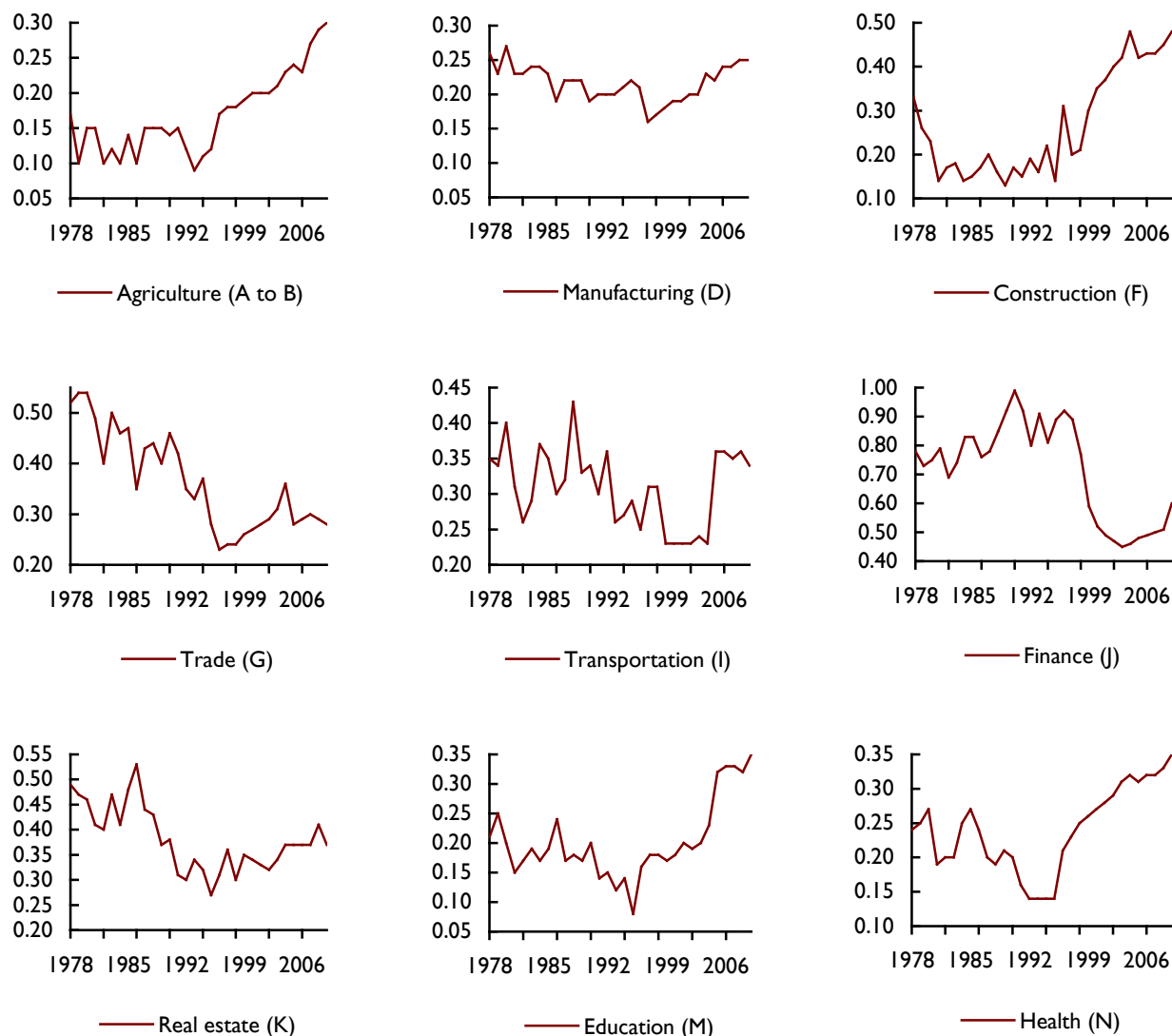
Sources: Hsueh and Li (1999), and Chinese Statistics Yearbooks (CSYs), own calculations.

Figure 2 presents trends in the coefficients of variations of RULC for provincial comparisons from 1978 to 2009. What is striking is the degree of heterogeneity in trends across industries. For example, Agriculture and Construction have divergent trends after 1994. Manufacturing has a convergent trend before 1997 then diverges afterwards. Trade exhibits sharp convergence before 1996, then diverges until 2004, and then converges again. In Transportation, Finance, Real Estate, Education and Health industries have a 'W' curve with sharp convergence and divergence firstly, then converge until the end of 1990s, and diverge afterwards.

6. Conclusions

This paper is the first to examine regional and provincial trends in labour costs and productivity across industries, including the service sector, for over three decades. We establish whether there has been divergence or convergence in relative unit labour costs (RULCs) since the late 1970s, which is often identified as the beginning of market reforms in China. We decompose these trends

into relative convergence or divergence in nominal labour costs (NLCs) and labour productivity (LP).

This exercise is important for three reasons. First, it helps us understand how regions compete with each other. Second, it draws attention to the heterogeneity in China's economy – both geographical and industrial – which is often ignored in international comparisons at whole economy level. This is particularly important in China's case because regional and provincial disparities in labour costs and productivity are substantial. Third, it provides evidence which gives us insights into just how sustainable China's growth trajectory is likely to be.

If we take all sectors together, figure 1 showed a remarkable improvement in the relative competitive position of the Interior as measured by declining RULCs, such that its level of ULCs is now on a par with the Coastal region, which is renowned as the most dynamic region in terms of productivity. There has been relative stability over the whole period in competitiveness of the West and Coastal regions, with the West having by far the highest levels of labour costs.

When drilling down to a more disaggregated level, it is apparent that there is very substantial heterogeneity with respect to trends in both labour costs and labour productivity across industry and region. But, in general, the Interior, the West and the Northeastern regions improved their competitive position relative to the Coastal region, primarily through lower relative labour costs than through productivity growth, though the latter were apparent in a sub-set of industries. One might argue that convergence of this nature is good news for China, since it implies a more efficient economy beyond the Coastal region, one which should, in the long run, be better equipped to generate the goods and services that the burgeoning middle classes will demand.

There is no literature at present on the extent to which lagging regions or provinces in China benefit from productivity catch-up mechanisms such as foreign direct investment, knowledge and technology transfer, imitation and adaptation of production methods and types of work organisation adopted in more advanced regions/provinces. The challenge in future research is for analysts to begin to examine what lies behind the trends we have identified in this paper.

NOTES

1   They use industry of origin unit value ratios for the benchmark year 1995 to convert Chinese value added into US dollars, and find that value added for Chinese manufacturing was 43 per cent of US value added in 2002, against 12 per cent in 1980. After 1992, there was a rapid and accelerating process of catching up for China, the comparative labour productivity increased from 5.3 per cent of the US level in 1995 to 13.7 per cent in 2002.

2   The four regions are defined geographically as the Coastal region (including Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, and Guangdong*), the Northeastern region (including Heilongjiang, Jilin and Liaoning), the Interior region (including Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan) and the West region (including Guangxi, Sichuan*, Guizhou, Yunnan, Inner Mongolia, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang). Because Hainan was separated from Guangdong in 1988, and Chongqing was separated from Sichuan province in 1996, we combine Guangdong with Hainan into Guangdong*, and Sichuan with Chongqing into Sichuan*, to ensure consistency over the entire period of 1978–2009. We do not study Tibet due to data limitations. The geographic graph is shown in Appendix figure A1.

3   The capital/skill-intensive industries have a strong central planning heritage and are still under state monopoly or tight control for national strategic purposes (petroleum, basic chemicals, chemical fibres, and non-ferrous metals) and tax purposes (tobacco) (Chen *et al.*, 2009)

4   The CSYs provide the definition of Staff and workers as persons who signed labour contracts with working units and working units would pay wages, social insurance and housing funds for them. Persons who have their work posts but are temporarily absent from work for reasons of study or on sick, injury or maternal leave and still receive wages from their working units are also included.

5   The twelve sectors are total economy (TOT), primary sector (AtoB), total manufacturing (D), construction (F), wholesale and retail trade (G), transportation, post and telecommunications (I), banking and insurance (J), real estate (K), government agencies, party agencies and social organisation (L), education, culture, arts and television broadcasting (M), health, sports and welfare (N), social service, science research and general technical services (O).

6   The six sectors in 1996 and 1997 are TOT, AtoB, D, F, G and I. The twelve sectors in 1997–2003 are TOT, AtoB, D, E, F, G, I, J, L, M, N and O. The nine sectors in 2004–9 are TOT, AtoB, D, F, G, H, I, J and K.

7   See the technical appendix for details.

8   In the spring of 1992, Deng Xiaoping visited the east region of China (Guangdong and Shanghai). His main idea was 'To Get Rich Is Glorious'. This phrase captures the spirit of his ideas, although he may never have uttered these words.

9   Li (2003) finds that the returns to education are higher in less-developed Gansu province (6 per cent) for an additional year of schooling than the developed Guangdong province (4 per cent) in 1988, because unskilled labour is abundant but educated people are scarce in the less-developed regions. Zhang *et al.* (2005) use fourteen consecutive annual surveys of urban

households conducted by China's National Bureau of Statistics from 1988 through 2001 in six provinces, and also find that in 1988, the returns to education in the west Shaanxi province (6.3 per cent) for an additional year of schooling are more than twice as great as in Beijing (2.8 per cent). This difference declined over time, but the western Sichuan province (12.3 per cent) still has higher returns of education than Beijing (10.5 per cent) in 2001. This suggests that the provinces in the Interior and West regions should take advantage of the cost advantages of the education sector to accumulate human capital for further economic growth and catching-up with the provinces in the Coastal region.

REFERENCES

Banister, J. (2005), 'Manufacturing earnings and compensation in China', *Monthly Labor Review*, August, pp. 22–40.
Ceglowski, J. and Golub, S. (2007), 'Just how low are China's labour costs?', *The World Economy*, 30 (4), pp. 597–617.
Chen, V.W., Wu, H.X. and Van Ark, B. (2009), 'More costly or more productive? Measuring changes in competitiveness in manufacturing across regions in China', *Review of Income and Wealth*, 55 (1), pp. 514–537.
Cox, W.M. and Koo, J. (2003), 'China: awakening giant', *Southwest Economy*, Federal Reserve Bank of Dallas, 5.
Fleisher, B., Li, H. and Zhao, M. (2010), 'Human capital, economic growth, and regional inequality in China', *Journal of Development Economics*, 92 (2), pp. 215–231.

Hsueh, T. and Li, Q. (1999), *China's National Income, 1952–1995*, Boulder, Westview Press.
Jefferson, G.H., Rawski, T.G., Wang, L. and Zheng, Y. (2000), 'Ownership, productivity change, and financial performance in Chinese industry', *Journal of Comparative Economics*, 28 (4), pp. 786–813.
Li, H. (2003), 'Economic transition and returns to education in China', *Economics of Education Review*, 22 (3), pp. 317–328.
Ma, J. and Norregaard, J. (1998), *China's Fiscal Decentralization*, Washington DC, International Monetary Fund.
Oates, W.E. (1972), *Fiscal Federalism*, New York, Harcourt Brace Jovanovich.
Peneder, M. (2009), *Sectoral Growth Drivers and Competitiveness in the European Union*, European Commission.
Qian, Y. and Weingast, B.R. (1997), 'Federalism as a commitment to perserving market incentives', *The Journal of Economic Perspectives*, 11 (4), pp. 83–92.
Szirmai, A., Ren, R. and Bai, M. (2005), 'Chinese manufacturing performance in comparative perspective, 1980–2002', Working paper.
UNCTAD (2002), *China's Accession to WTO: Managing Integration and Industrialization*, Trade and Development Report, pp. 141–174.
Van Ark, B., Stuivenwold, E. and Ypma, G. (2005), *Unit Labour Costs, Productivity and International Competitiveness*, GGDC Research Memorandum GD-80.
Zhang, J., Zhao, Y. , Park, A. and Song, X. (2005), 'Economic returns to schooling in urban China, 1988 to 2001', *Journal of Comparative Economics*, 33 (4), pp. 730–752.

Technical Appendix

Hsueh and Li (1999) and the Chinese Statistics Yearbooks (CSYs) have the same definitions of Gross value added (GVA), Prices of gross value added (PGVA), Number of staff and workers, Annual hours and average wage of staff and workers. But Hsueh and Li (1999) present more information in detailed industries. Hence, we splice two datasets for the two periods using the overlapping year 1995 and produce a consistent series of variables for the entire period.

For missing values, we recode data using reasonable assumptions as follows:

Gross value added (GVA)

Hsueh and Li (1999) provide 1978–95 data for all industries, while the Chinese Statistics Yearbooks (CSYs) provide 1996–7 data except for industries J, K, M and N, 1998–2003 data for all industries, and 2004–9 data except the M and N industries. The CSYs have 1995–2009 data for the aggregated Tertiary sector, which is composed of the tertiary industries G, I, J, K, M, N and others. We impute the missing values in the J, K, M and N industries in 1995–7 by assuming that the ratios of each missing tertiary industry in 1995–7 are the same as the ratio in 1995. For example:

$$GVA_{96} \text{ in J industry} = GVA_{96} \text{ in the Tertiary sector} * (GVA_{95} \text{ in J industry} / GVA_{95} \text{ in the Tertiary sector})$$

We impute the missing values in the M and N industries in 2004–9 by assuming that the ratios for each missing tertiary industry are the same as in 2003. For example:

$$GVA_{04} \text{ in M industry} = GVA_{04} \text{ in the Tertiary sector} * (GVA_{03} \text{ in M industry} / GVA_{03} \text{ in the Tertiary sector})$$

Prices of gross value added (PGVA)

Hsueh and Li (1999) provide 1978–95 data for all industries, and the CSYs provide 1996–7 data except the J, K, M and N industries, 1998–2003 data for all industries, and 2004–9 data except for industries M and N. We imput the missing prices by assuming they are the same as the price of the Tertiary sector for each year. For example:

$PGVA_{96}$ in J industry = $PGVA_{96}$ in K industry = $PGVA_{96}$ in M industry = $PGVA_{96}$ in N industry = $PGVA_{96}$ in the Tertiary sector

Number of staff and workers

For the 'number of staff and workers', the 1978–95 data is from the Hsueh and Li (1999) and the 1996–2008 data from the Chinese Statistics Yearbooks (CSYs). The missing 2009 data need to be imputed with the 'number of employed persons in urban units' at the end of 2008 and 2009, thus:

The number of staff and $workers_{09}$ = the number of staff and $workers_{08}$ * (the number of employed persons in urban $units_{09}$ / the number of employed persons in urban $units_{08}$)

The CSYs record 'number of staff and workers' since 1998 as the number of staff and workers in post, implying that the figures in 1978–1997 include laid-off workers. The 1978–95 data is from Hsueh and Li (1999). Luckily, the CSYs provide two tables of number of staff and workers in 1998, one with the laid-off workers and the another one without the laid-off workers. To make the dataset consistent, we impute the number of staff and workers in 1978–97 by assuming the ratios of on-post workers in 1978–97 are the same as the ratios in 1998. For example:

The imputed number of staff and workers without laid-off $workers_{97}$ = the number of staff and workers with laid-off $workers_{97}$ * (the number of staff and workers without laid-off $workers_{98}$ / the number of staff and workers without laid-off $workers_{98}$)

Annual hours worked of staff and workers

Annual hours worked are not available in Chinese official statistics. So we follow the calculation of Jefferson *et al.* (2000). They derive working hours from labour regulation which changes three times over 1978–2009. Until 1994, a 6-day and 48-hour week is the norm for workers throughout Chinese industry. Then, from 1 March, 1994, staff and workers work 8 hours a day and 44 hours a week, and from 1 May, 1995, they work 8 hours a day and 40 hours a week. Hence, during the period between 1978 and 1993, the standard annual working time is 2400 hours a year (= 48 hours/week*50 weeks). In 1994, the standard annual working time is 2233 hours (=2400*(2/12) + 2200*(10/12)), and in 1995 it is 2067 hours (=2200*(4/12) + 2000*(8/12)). From 1996 the standard annual working time declined to 2000 hours (= 40 hours/week*50 weeks). By assuming that individual annual working hours do not vary across industries, the total working hours are imputed using the number of staff and workers:

Annual hours worked of staff/workers in 1978–1993 = number of staff/workers * 2400 hours per year
Annual hours worked of staff/workers in 1994 = number of staff and workers * 2233 hours per year
Annual hours worked of staff/workers in 1995 = number of staff and workers * 2067 hours per year
Annual hours worked of staff/workers in 1996–2009 = number of staff and workers * 2000 hours per year

Labour compensation

Labour compensation of staff and workers = number of staff and workers * average wage of staff and workers

For the 'average wage of staff and workers', the 1978–95 data is from Hsueh and Li (1999) and the 1996–2008 data from the CSYs. The 2009 data need to be imputed with the 'average wage of employed persons in urban units' at the end of 2008 and 2009:

The average wage of staff and $workers_{09}$ = the average wage of staff and $workers_{08}$ * (the average wage of employed persons in urban $units_{09}$ / the average wage of employed persons in urban $units_{08}$)

Appendix figure A1. Geographic graph of four regions

Note: We do not study Tibet due to data limitation.