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Spatial rebalancing and industrial convergence in China

Françoise LEMOINE, Sandra PONCET, Deniz ÜNAL *

CEPII, France

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ABSTRACT

Our study documents the recent narrowing of the coast-inland divide in China. We argue that this rebalancing reflects, with a time lag, the catching up process which has been at work in the industry of the inland region since the end of the 1990s. The pattern is in line with the rapid and unconditional convergence observed in China's manufacturing industry over this period. The convergence of labor productivity suggests that advanced coastal regions have transferred capital and technology to the interior.

1. Introduction

In a country as vast as China (the fourth largest country in the world by geographic dimension and the first by size of population) regional differences are huge. They stem from natural and historical conditions.[1] Regional development has also been shaped by political power. In the economic strategies that have been followed since the founding of the People's Republic of China (PRC), spatial imbalances and regional disparities have been a crucial concern. In China, regional inequality and geographic imbalances go hand in hand as the dividing line between advanced and backward provinces roughly coincides with the dichotomy between coast and inland. This dichotomy has structured China's development process since the 19th century as the center of gravity of the economy has been alternately located in the coast and in the interior.

From the early 1990s to the mid-2000s, China's rapid economic growth was associated with widening regional disparities and growing spatial imbalances (OECD, 2010). A reversal has been underway since: regional inequality peaked in the mid-2000s and the center of gravity of the economy has begun to move from the advanced eastern region to the inland (Andersson, Edgerton, & Opper, 2013; Feng, 2009; Wei, 2009). The paper investigates the mechanisms at work behind the ongoing spatial rebalancing in China with a specific focus on contribution productivity convergence in manufacturing across China.

* Corresponding author at: CEPII, 113, rue de Grenelle, 75007, Paris, France. Tel.: +33 1 53 68 55 08; fax: +33 1 53 68 55 03.
E-mail address: deniz.unal@cepii.fr (D. Ünal).

[1] The extreme diversity of the climate and relief, the large variations in population density, in natural resources and in communication facilities create different conditions for economic development.

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Our work combines two complementary approaches. In the first part it puts the changes in the geographic pattern of China's economy in a long term (1950–2012) perspective to properly identify the timing and likely explanations of the recent inland catch-up process. The analysis is complementary to other studies on China's regional convergence (Feng, 2009; Wei, 2009). We differ in that we focus on the great dividing line that runs between "Blue China" i.e. the coastal area, open to the outside world, with seaports and merchant traditions; and "Yellow China" which encompasses the central and western regions and makes up a continental area, less advanced economically. We show that from the early stage of economic modernization until now, the center of gravity has been alternately located in the coastal area ("Blue China") and in the inland area ("Yellow China"). We contribute to the understanding of the recent rebalancing as we highlight striking differences in the regional industrial trajectories, in terms of openness and ownership patterns. Notably the comparison of the inland and coastal industrial performance and specialization at the level of distinctive manufacturing branches over this period suggests that the flying geese model is at work in China. The advanced coastal regions are losing their comparative advantage in labor intensive industries and have now to build up new specialization in high value-added industry and services.

In the second part of our paper we investigate the possibility that the rebalancing simply reflects, with a time lag, the catching up process which has been at work in the industry of the inland region since the end of the 1990s. We test whether the "unconditional convergence" that exists in manufacturing at the international level according to Rodrik (2013) also operates in China. Our contribution is two-fold. First, we propose the first econometric estimation of the "intrinsic" speed at which labor productivities catch-up in the manufacturing sector in China. Second, we exploit the heterogeneity in the convergence coefficients across industries, firm-types and regions to investigate the drivers of convergence. We show that productivity catch-up is greater for private firms and in low-skill industries suggesting that consistency with the local productive structure yields positive spillovers. Our results are in line with other studies (Cai, Harrison, & Lin, 2011; Hale & Long, 2011; Poncet & Starosta de Waldemar, 2015) that argue that policy interventionism should not focus on the players and sectors with limited links with the existing local comparative advantages.

The paper is organized as follows. Section 2 provides an overview of the recent literature on spatial rebalancing and regional convergence. Section 3 sketches out how the center of gravity of China's economy oscillated between the coast and the interior from the early phase of modernization up to now. Section 4 focuses on the regional pattern of industry in the 2000s and highlights the inland catch-up process. Section 5 presents the econometric estimates of the convergence pace in manufacturing from 1998 to 2009. Section 6 concludes.

2. Overview of the recent literature on regional rebalancing and industrial convergence

The studies analyzing regional imbalances and disparities at the macroeconomic level agree on the conclusion that economic reforms since 1978 led to a widening fault line between the coast and the inland, associated with increased regional disparities. They also find a mitigation of provincial divergence in the mid-2000s. Wei (2009) observes that the increase mobility of capital and labor accentuated the trend towards concentration of economic activities (in particular of industry) in the east up to 2004 which marked a turning point, when regional disparities of GDP per capita have ceased to increase. Industrial production is moving to north and to west as a result of government policies and of rising costs of labor and land in the coast. Industrial productivity and profitability provide evidence of the economic take off of the central region. The author considers that regional development has entered a watershed period and that the latecomers may become economic pace setters. In a similar way, Feng (2009) observes that since 2004 the geometric gravity center of economy has moved from east to west, as growth rates has slowed in the East and increased in the West. The OECD (2010) indicates that inter-provincial inequalities peaked around 2004 and have declined in the following years. According to Andersson et al. (2013) a regional divergence corresponding to the east/west divide characterized the initial phase of reforms and the divergence peaked as early as 1994. Since the 2003, the "followers" (mostly inland provinces) have grown faster than the "leaders" (mainly coastal provinces) and productivity levels have begun to converge.

Other studies, using firm-level datasets, put forward a convergence of industrial labor productivity across regions. They find that the catch-up process of backward regions has taken place since the mid-1990s and has been associated with a spatial diffusion of industry. Jefferson, Rawski, and Zhang (2008) analyze the multifactor productivity gap between four regions (the coast, the center, the north-east and the west), using the manufacturing enterprise census database covering the period 1998–2005. They find that in term of multifactor productivity, the center has caught up with the coast as early as 2005 and that this rapid improvement is mainly explained by the restructuring of SOEs, which is taking place in the interior during this period (and had taken place earlier in the coast). They conclude that the center's higher productivity growth may be temporary. However, they also observe that an extensive diffusion of technology and efficiency has contributed to the convergence of labor productivity.

Deng and Jefferson (2010, 2011) carry an analysis based on a large and medium industrial enterprise dataset from 1995 to 2004. They consider labor productivity in reference with the international technology frontier (the US). They find that coastal industry reduced its technology gap with the international frontier at an especially rapid pace from 1995 to 2000, but that this gap-growth advantage disappeared in the mid-2000s. From 1995 to 2004, the labor productivity gap between the coastal and interior regions narrowed significantly as the relatively backward inland regions exploited the advantages of backwardness. The larger the initial gap for a given industry-province, the higher the subsequent growth rate of labor productivity. They underline that the coast and the inland follow different growth trajectories: initially the coast benefited from "the advantage of openness" and later on, the inland grew faster due to the "advantage of backwardness". This growth pattern offers China a rare opportunity simultaneously to reduce income inequality while maintaining a high overall growth rate.

The studies based on firm level data which analyze regional performance in specific manufacturing industries confirm the convergence process and the signs of a westward move. Ruan and Zhang (2010) test whether the flying geese model hypothesis applies to the case of textile industry in China. They refer to the history of US industry when rising labor costs and union density drove manufacturing industries from the mid-west and north-east to the south and west. In the case of China's textile industry, they find that the return on capital and the profit per worker has been higher in the central region than in the eastern region since 2006 and that the extreme concentration of this industry in the east has begun to diminish since 2004. The question is whether the lower price of labor and of land in the central region will be a sufficient condition to counter the agglomeration advantage existing in the east. Qu, Cai, and Zhang (2012) consider China's labor-intensive manufacturing industry from 2004 to 2008 and show that it has become less geographically concentrated in the east. Higher return on assets and profit per capita in inland labor intensive industry might be key factors behind this recent relocation of businesses to the interior regions. With rising labor costs, the labor-intensive manufacturing industry of the eastern region is now facing increasingly significant competitive pressure and is therefore likely to seek new space to grow.

The purpose of this paper is to revisit these issues and to take into account the new developments. As a prerequisite, the next session considers the geographic imbalances and regional disparity in China in an historical perspective.

3. The coast/inland dualism in a long term perspective

The PRC consists of 22 provinces, four municipalities directly linked to the central government and five autonomous regions. Beyond these administrative divisions, there are many geographical, historical or cultural fault lines (North/South, rural/urban, Han/non Han).

One of the great dividing line runs between “Blue China” i.e. the coastal area, open to the outside world, with seaports and merchant traditions; and “Yellow China” which encompasses the central and western regions and makes up a continental area, less advanced economically. Of course this division overlooks the internal heterogeneity of the two areas, which include provinces with different natural, economic, social characteristics. But the economic history of modern China shows that this dichotomy based on geography as well on economy has structured the development process and can usefully shed light on the issues of today's China.

In this study, the coast includes seven provinces (Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang) and three municipalities with provincial level (Beijing, Shanghai, Tianjin). It is home to 38% of the Chinese population on 10% of the territory, and creates about half China's GDP. The inland area includes all other provinces and can be further subdivided into three regions. The central region with 12 provinces (Anhui, Gansu, Guizhou, Henan, Hubei, Hunan, Jiangxi, Qinghai, Shaanxi, Shanxi, Sichuan and Yunnan) and one municipality (Chongqing), is home to 46% of the population on 37% of the territory. The northeast encompasses three provinces (Liaoning, Jilin and Heilongjiang), with 8% of the population on 8% of the territory. The periphery/west includes the five border areas which have the status of autonomous regions (Guangxi, Inner Mongolia, Ningxia, Tibet and Xinjiang) and is home to 8% of the population on 45% of the territory.

For crude as it be, the distinction between coastal and inland China corresponds to a contrast in the level of development and even more in the degree of openness (Figs. 1 and 2). In the coastal area, eight provinces out of ten have a GDP per capita above national

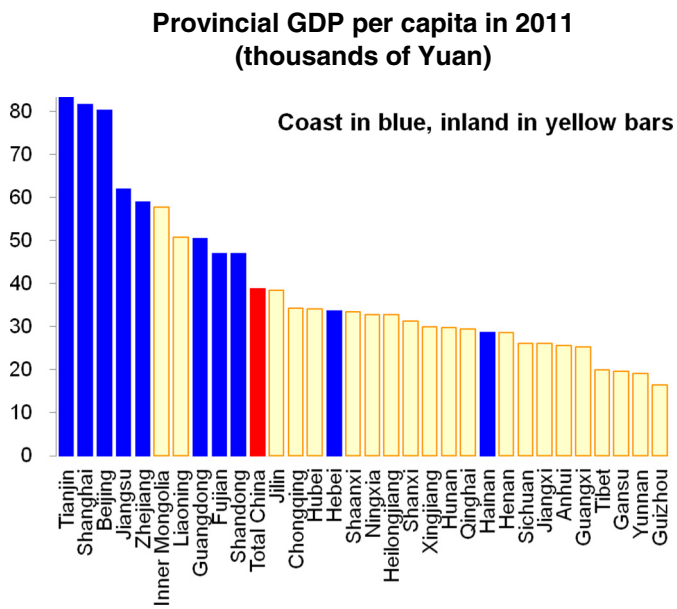

Fig. 1. Provincial GDP per capita in 2011 (thousands of yuan). Source: National bureau of statistics, China statistical yearbook 2012.

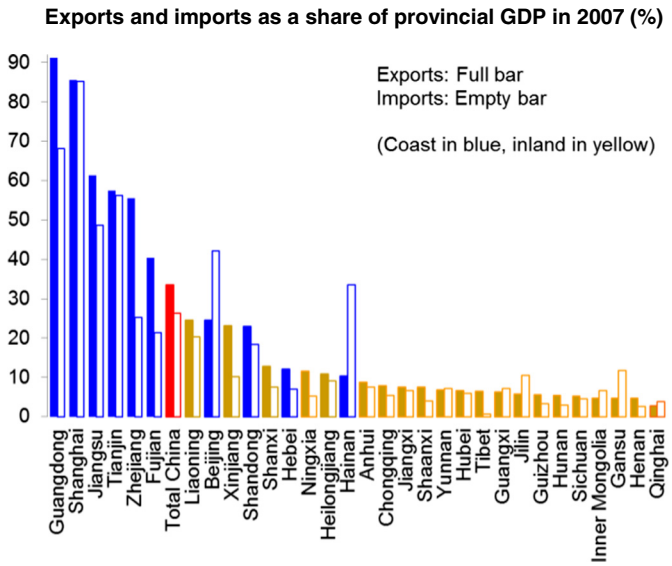

Fig. 2. Exports and imports as a share of provincial GDP in 2007 (%). Source: National bureau of statistics, China statistical yearbook 2012.

average, which is the case for only two inland provinces. Coastal economies are also much more outward-oriented than inland economies. In 2007, when China's export orientation peaked (with total exports reaching 36% of GDP, and imports 26%), eight coastal provinces recorded an above national export or import ratio. This was the case for no inland province.

3.1. Coastal early modernization

China missed the industrial revolution of the 19th century. For China, this century was a period of decline, marked by stagnant economy, social unrest, weakened Manchu dynasty and foreign aggression. However, as amply shown by Bergère (1989), in the mid-19th century, a modern economic activity had begun to emerge in *coastal cities* (Shanghai, Nanjing, Guangzhou, etc.). This modern sector was largely under the control of foreign capitalists who had acquired the right to do business in the open ports after the Unequal Treaties which put an end to the Opium Wars. The activities of these new industrial centers spread in their neighborhood, and especially along the waterways. But their spillover effects remained insufficient to pull the industrialization of the whole country, given the lack of government support to economic modernization. The importance of the modern sector remained marginal, accounting for about 13% the national income in 1933 (Liu & Yeh, 1965).

Modernity was concentrated in coastal cities, with Shanghai as the main landmark. In the 1920s, Shanghai accounted for about half of China's foreign trade and industrial output (Gipouloux, 2009). In Manchuria they invaded in 1931, the Japanese carried an accelerated industrialization drive based on the region's natural resources. Transport infrastructures were developed for routing goods to Japan. The region became one of the most industrialized parts of China (Giroir, 1999).

The eastern part of China had thus initiated an economic modernization which was fundamentally associated with the presence of foreign powers, with colonial or military penetration. This period's legacy was a divide between inland China, characterized as rural, bureaucratic and traditional, and maritime China, seen as cosmopolitan, enterprising and open to innovation (Bergère, Bianco, & Domes, 1990).

3.2. The industrialization of inland provinces under Mao

The development strategy designed by the Communist power in the 1950s imposed a radical break in all dimensions of China's economy. The economic strategy put forward the principle of national self-sufficiency in a world deemed as hostile. Economic and commercial ties with the rest of the world were severed, or kept at minimum.

The central planning of economic development aimed at reducing regional inequality and at rebalancing the distribution of industrial capacities. Ideological, political, and strategic considerations lay under such priorities. In 1963, the government launched a program for the construction of military-industrial plants in inland provinces (the “third front”) out of reach of a possible foreign military aggression.

During this period, the state budget centralized large financial resources (accounting for 30% of China's GDP in 1978) and financed the bulk of capital investment in industry. There were large financial transfers to backward provinces and massive investment in heavy industry and infrastructures. (Démurger et al., 2002). This investment allocation, which favored the poor at the expense of advanced economic regions, was costly in terms of economic growth. Investment in inland areas was less productive and less profitable than in more advanced regions. As Lardy (1980) states “Management has deliberately chosen to sacrifice some economic growth to achieve the improvement of regional economic imbalances”. Following the motto of “self-reliance”,

inter-regional and inter-provincial trade was kept at a minimum level and the fragmentation of the economy and the lack of regional specialization also dampened economic growth.

The distribution of industrial production changed in favor of the central region (its share in the industrial GDP increased from 26% to 30%) while the north-east lost ground (with a share falling from 23% to 17%). The progress of industry was especially rapid in the regions initially the least industrialized, i.e. the center and the periphery, as shown in Table 1.

However, there was no convergence in regional income (Démurger et al., 2002). In 1952, GDP per capita in coastal area was on average 30% higher than in the inner zone and in 1978 it was 50% higher.

3.3. The coastline economic takeoff in the era of globalization

The reforms initiated at the end of 1978 reflected a new mindset. The priority was to maximize growth and accelerate the country's modernization. This required a better use of resources at national level and led to a gradual transition to market mechanisms and to the opening to the outside world. In this new logic, the comparative advantages were to guide regional specializations and the reforms were accompanied by a far-reaching fiscal and economic decentralization up to the mid-1990s.

The coastal provinces were the spearhead of the "open door" policy in the 1980s. The new strategy explicitly set new regional priorities. Coastal province industrial modernization was to be based on their comparative advantages: abundant and cheap labor, geographical proximity to world markets and to foreign financial centers. They had to specialize in modern industries, new technology sectors, in the production of consumer goods and in export-oriented industries. The inland was to provide the necessary inputs. Given the complementarity existing between the two regions, the coastal development was expected to have ripple effects on the inland regions (Andersson et al., 2013).

Imports of goods for processing and re-exports have been exempted from customs duty, which has laid ground to the development of international subcontracting and assembly operations and to the integration of coastal industries into the international division of labor. It has structured Chinese manufacturing industry and exports for the two following decades (Gaulier, Lemoine, & Ünal-Kesenci, 2007).

In the 1990s, the open door policy extended to the whole territory and the accession of China to the WTO, at the end of 2001, gave a new impulse to its integration into the world economy. Multinational companies from all over the world have arrived, attracted by the low production costs and by the potential domestic market (Berthélemy & Démurger, 2000). The internationalization of the coastal industries accelerated. In the mid-2000s, external demand boomed and the export-led growth of the coastal economies further accentuated regional polarization. Foreign trade remained heavily concentrated. In 2007, the coast accounted for 91% of exports and five provinces (Beijing, Shanghai, Jiangsu, Zhejiang and Guangdong) for 72% of exports. The export-driven model of coastal provinces during the 2000s is reflected in the rapid rise of their export to GDP ratios (Table 2).

The share of the coast in national GDP increased from 44% in 1978 to 56% in 2006 (Fig. 3). The fault line between the coast and the rest of China further deepened. In 1978, the GDP per capita was on average 50% higher in the coast than in the interior; in 1998, it was twice higher and in 2006 the ratio reached 2.2 (Fig. 4).

3.4. Pressures for geographic rebalancing

Pressures for changes in the spatial dynamics had begun to be felt since the end of the 1990s.

On the external side, the Asian crisis of 1997–1998 was a first shock which highlighted the vulnerability of the China's economy to the ups and downs of the international environment. Chinese exports stagnated as a result of a weaker demand in Asia and of the devaluation of Asian currencies which threatened the competitiveness of Chinese products.

Ten years later, in 2008, the global crisis interrupted a period of unprecedented expansion of world trade of which China had been a major beneficiary. This second shock was stronger than the first one because the contraction of the international trade was more brutal (world trade went down by 18% in value in 2009) and because the Chinese economy had become more open. To cushion

Table 1
Structure of the regions' GDP by sector, 1952 and 1978 (%).

	Agriculture		Industry		Services		GDP	
	1952	1978	1952	1978	1952	1978	1952	1978
Coast	49	23	25	57	26	20	100	100
Inland	59	34	21	48	20	20	100	100
Center	65	34	16	48	20	20	100	100
North-East	36	38	41	43	23	21	100	100
Periphery	68	18	18	67	14	15	100	100
China	55	29	23	52	23	20	100	100

Source: National bureau of statistics, comprehensive statistical data and materials on 50 years of new China (1999). Notes: Coast includes Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin. Periphery (Western area) includes Guangxi, Inner Mongolia, Ningxia, Tibet and Xinjiang. Center includes Anhui, Gansu, Guizhou, Henan, Hubei, Hunan, Jiangxi, Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan and Chongqing. North-East includes Liaoning, Jilin and Heilongjiang.

Table 2
Coast and inland region openness to foreign trade in the 2000s (% of GDP).

	Exports		Imports	
	2000	2007	2000	2007
Coast	35	54	32	42
Inland	6	9	5	7

Source: National bureau of statistics, China statistical yearbooks 2001 & 2008.
Notes: Coast includes Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin. Inland refers to the rest of China.

the depressive effects, in late 2008 the government launched a vigorous stimulus plan based on massive capital expenditure, most of which was directed to the inland provinces. While the coast was the most directly affected by the crisis, the interior was the main beneficiary of the package (Inomata & Ushida, 2009).

On the domestic side, the polarization of economic development became a political concern in the late 1990s. Regional disparity and the widening income gap between the coastline and the rest of China were recognized as major issues (Lin, Cai, & Li, 2002 and Naugton, 2002). Coastal provinces had developed stronger links with world markets than with the rest of China. Poor transport infrastructure in the interior hampered inter-regional trade and encouraged the outward-oriented bias of the coastline.

In the late 1990s, the government launched the "Go West policy", aimed at enhancing the economic development of 12 central and western provinces. This encompassed fiscal transfers and tax preferences, measures to induce financial institutions and especially policy banks to increase loans to regional development.

The reversal in the demographic situation is another important factor favoring the reversal in regional dynamics. The period of surplus labor has come to an end and this has altered the situation in the labor market. As early as 2005, local shortages had occurred in coastal provinces (Guangdong), where export industries depend heavily on the migrants. The wages of the low skilled workers, which had stagnated for nearly a decade, were too low to attract migrants, all the more as they were excluded from the benefits enjoyed by urban citizens (social security, pensions, housing). Since the late 2000s, the increase in wages has accelerated, reducing the competitiveness of the coastal industries and pushing them to move to central regions where wages are lower (Saw & Wong, 2009). These less industrialized and less urbanized regions have a larger reserve of labor force in rural areas.

4. The catch up of inland industry in the 2000s

Internal factors and external conditions have thus combined to accelerate the inland economic growth. The mid-2000s marked a turning point as the weight of inland in China's GDP ceased to decline (Fig. 3, above) and the gap in per capita income between the coast and the interior ceased to increase (Fig. 4).

The following section focuses on manufacturing industry, providing evidence of the rapid catch up of inland industry.

4.1. Industrialization at the core of regional dynamics

Industry has been the main engine of China's economic development during the Maoist period as well as since 1978. As noted by Naugton (2002), the pace of industrial growth was the most important factor in the evolution of inter-regional disparities.

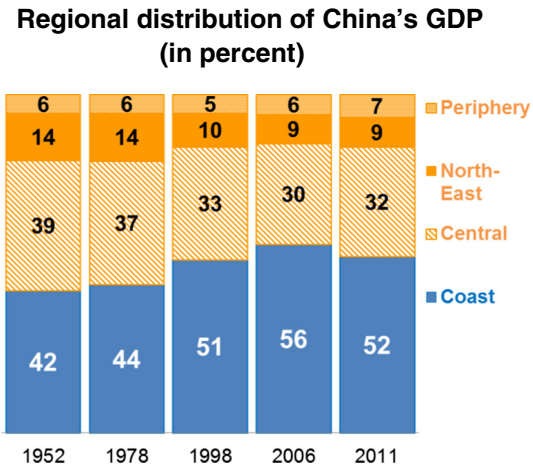

Fig. 3. Regional distribution of China's GDP (in percent). Source: National bureau of statistics, China statistical yearbook, various issues. Notes: Coast includes Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin. Periphery (Western area) includes Guangxi, Inner Mongolia, Ningxia, Tibet and Xinjiang. Central area refers to Anhui, Gansu, Guizhou, Henan, Hubei, Hunan, Jiangxi, Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan and Chongqing. North-East includes Liaoning, Jilin and Heilongjiang.

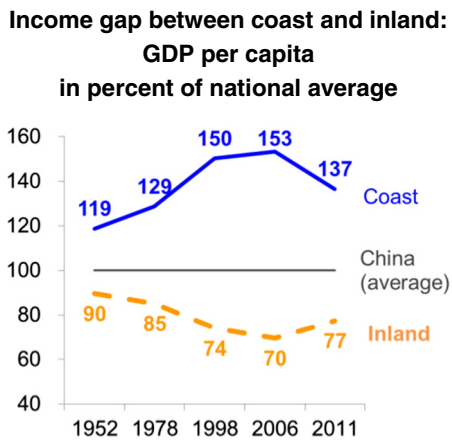

Fig. 4. Income gap between coast and inland: GDP per capita in percent of national average. Source: National bureau of statistics, China statistical yearbook, various issues. Notes: Coast includes Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin. Periphery (Western area) includes Guangxi, Inner Mongolia, Ningxia, Tibet and Xinjiang. Central area refers to Anhui, Gansu, Guizhou, Henan, Hubei, Hunan, Jiangxi, Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan and Chongqing. North-East includes Liaoning, Jilin and Heilongjiang.

The geographical distribution of industrial GDP and output shows that the mid-2000s marked a watershed in the spatial pattern of industry as for the first time since the early 1950s, the share of the inland area has ceased to decrease. (Fig. 5)

In 2011, the respective contributions of inland and the coast to China's industrial value-added have almost come back to their level of 1978 (Fig. 5A). The central region has more than recovered the ground lost and its contribution to the country's industrial added value has never been so high (34%).

The distribution of industrial production, measured by the gross value of industrial output (GVIO) of "above-scale" industrial firms, confirms that the years 2005–2006 marked a turning point in the relative positions of the coast and the inland. It is worth noting that the importance of the coast is greater in the GVIO (which includes the value of intermediate products) that in the added value data, because coastal industries include low value-added activities, namely international subcontracting and assembly operations (Fig. 5B).

4.2. Trends in regional specialization

Using the industrial enterprise census data for years from 1998 to 2009 we analyze the spatial distribution of production at the sectoral level and examine the evolution of regional industrial specialization.

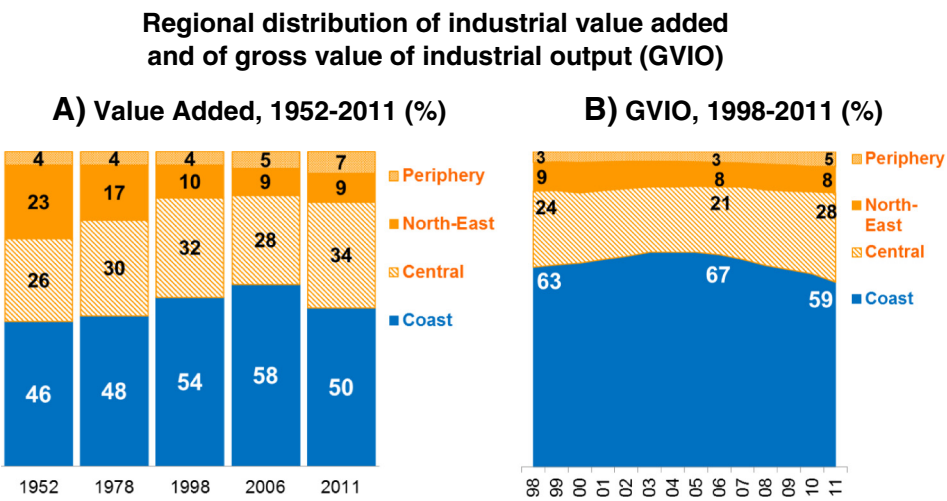

Fig. 5. Regional distribution of industrial value added and of gross value of industrial output (GVIO). Source: National bureau of statistics, China statistical yearbook, various issues. Notes: Coast includes Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin. Periphery (Western area) includes Guangxi, Inner Mongolia, Ningxia, Tibet and Xinjiang. Central area refers to Anhui, Gansu, Guizhou, Henan, Hubei, Hunan, Jiangxi, Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan and Chongqing. North-East includes Liaoning, Jilin and Heilongjiang.

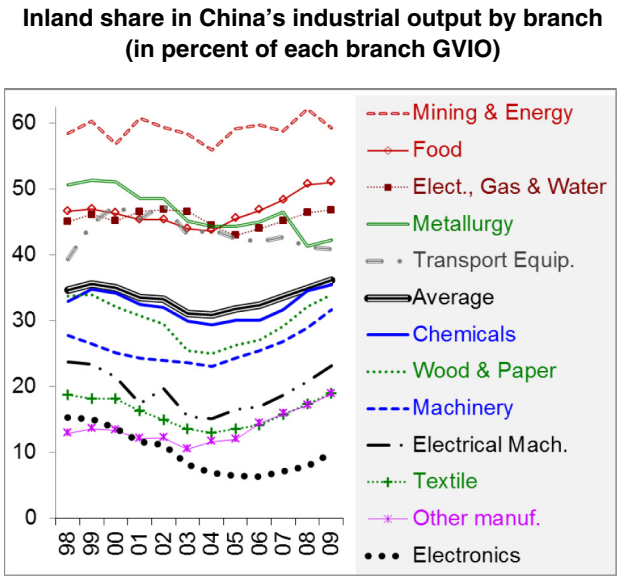

Fig. 6. Inland share in China's industrial output by branch (in percent of each branch GVIO). Source: National bureau of statistics, industrial enterprise census data. Notes: Inland refers to non-coastal provinces with the coast including Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin.

Because of its natural resource endowments, the inland area dominates production in mining and in energy sectors, with 60% of national output. Its contribution to manufacturing output is much lower, but on the rise since the mid-2000s: 35% in 2009 against 31% in 2004.

In most industrial branches the contribution of inland to output followed the same pattern (Fig. 6). It contracted from the end of the 1990s to the mid-2000s and increased in the following years (except in transport equipment and metallurgy). In 2009, the inland contribution to industrial output had caught up or exceeded the level it had in 1998 in all industries but two (metallurgy and electronics).

Regional specialization is measured by an index computed as the weight of a branch in the region's production over the weight of this branch in national production. Inland specialization lies in the energy sector, public utilities (distribution of water, gas and electricity) and in three manufacturing industries, food, metallurgy and transport equipment (Fig. 7). During the first half of the 2000s, specialization tended to increase: the indicator shows an upward trend in the industries in which the inland area was initially specialized and a downward trend in those it was not specialized. Since the mid-2000s, however, the specialization index has tended to decrease (except in food) meaning that regional industrial structures have begun to converge. In textile, electrical equipment and to

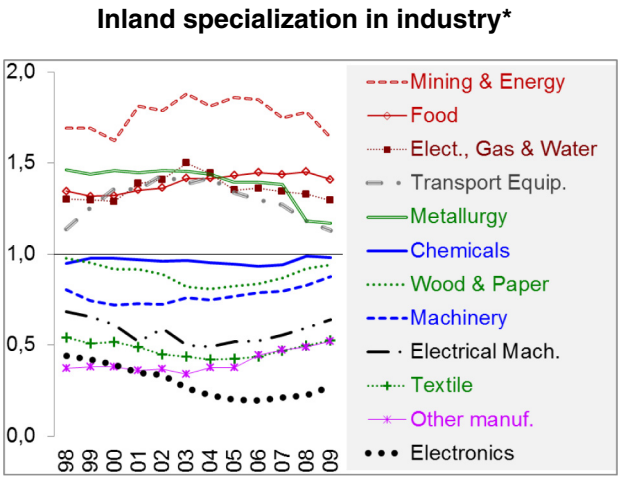

Fig. 7. Inland specialization in industry*. Source: National bureau of statistics, industrial enterprise census data. Notes: *Specialization is measured by the ratio: $\left[\frac{Q_i^k}{Q_i \sum k} \Big/ \frac{Q_{China}^k}{Q_{China} \sum k}\right]$ where i is the inland region, Q the output (*Gross value of industrial output*) and k the branch. Inland refers to non coastal provinces with the coast including Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin.

a lesser extent in electronics, the inland has recently begun to reduce its "disadvantage", presumably reflecting the relocation of coastal industries to the interior.

Recent trends thus suggest that the inland area may be on the way to diversify its manufacturing industry and shift away from its traditional specialization pattern.

4.3. Closing the productivity gap

The following analysis focuses on manufacturing industry. The performance of inland manufacturing enterprises has improved since the late 1990s and this movement has accelerated since the middle of the past decade.

Fig. 8 shows the relative performance of the inland compared to the coast in terms of labor productivity, profitability (profit per employee, profit per unit of fixed assets) and capital intensity. At the level of the whole manufacturing as well as in individual sectors, there is a rapid catch-up. The inland performance, which stood far behind in 1998, has not only caught up but overtaken that of the coast in several industries.

At the beginning of the period, the labor productivity in inland manufacturing was low compared to that of the coast (about 60%) and it has surpassed its level by about 15% at the end of the period (Fig. 8A). In 2009, labor productivity was higher in inland than in

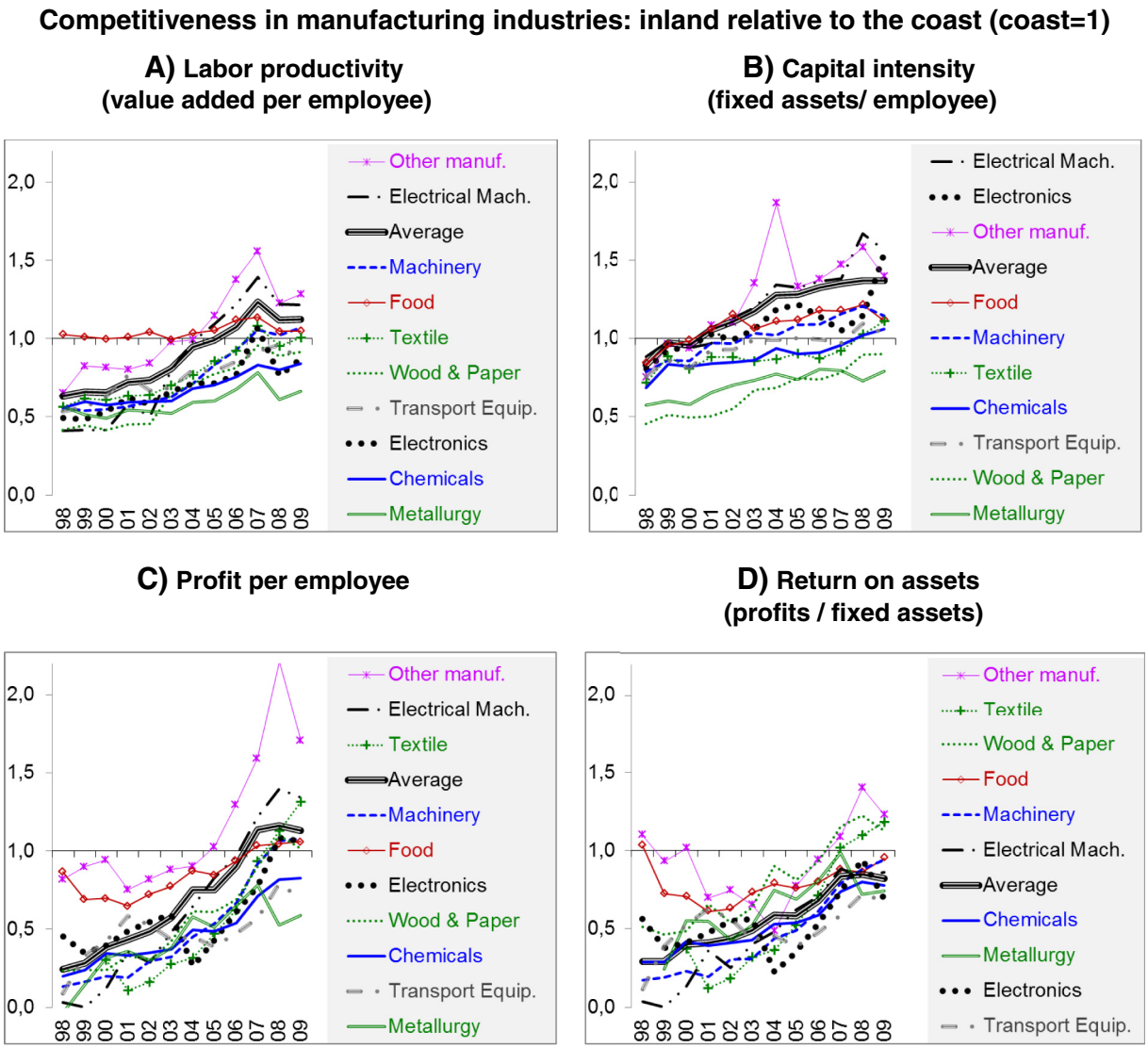

Fig. 8. Competitiveness in manufacturing industries: inland relative to the coast (coast = 1). Source: National bureau of statistics, industrial enterprise census data. Notes: Inland refers to non-coastal provinces with the coast including Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin.

the coast in five industries (textile, machinery, electrical machinery, food and miscellaneous industries). In these five industries and in manufacturing as a whole, the inland had also a higher level of profit per employee than the coast (Fig. 8C).

This progress in labor productivity can be explained by the rapid rise of the capital intensity. In manufacturing as a whole and in eight out of ten industries, capital intensity was higher in inland than in the coast in 2009 (Fig. 8B). The rise has been especially remarkable in electronics and electrical machinery, where the capital per employee was respectively 50% and 60% higher in inland than in the coast in 2009. This suggests that the production of these two industries, which has been up to now heavily concentrated in the coast, will move westward in the years to come. The shift of the center of gravity of Chinese manufacturing in inland area is likely to be a well-entrenched tendency.

The return on assets (profits/fixed assets) also improved fast but still remained, on average, well below that of the coast (excepted in textile, wood-paper and miscellaneous industries, which are not capital intensive, Fig. 8D). This gap does not imply that the investment drive in inland industries has been motivated by political considerations and incentives: the profitability of *new* industrial investment in inland may be above that of the coast.

Fig. 9 shows that the average salary ("wages/employees" ratio) in inland manufacturing which was still far below the coastal level in 1998 has increased much faster since. The most recent data available (2007) indicate that, the wage level in interior provinces was on average still 15% below the coastal level, while the level of labor productivity was already higher. Comparison of labor productivity provides evidence that the coastal area has lost its comparative advantage over the interior in manufacturing. The cost of labor combined with the cost of land will continue to induce manufacturing industries to move from the coastline to inland.

There is clear evidence that the evolution of minimum wages over the 2000s brings about wage convergence. The reform implemented in March 2004, known as the 2004 minimum wage rules, imposed a massive rise in city-level minimum wages, extended minimum wage coverage to migrant workers, and rose penalties in case of non-enforcement. As described in greater detail in Mayneris, Poncet, and Zhang (2014) the annual growth rate of city-level minimum wages, equal to 6.9% on average between 2000 and 2003, rose to 15.5% between 2003 and 2007. The 2004 Rules also expressly promote the convergence of minimum wages across localities, imposing unprecedented large increases in minimum wages where they were initially the lowest. While the dispersion of city-level minimum wages was quite stable before 2004, with a coefficient of variation equal to 0.23, it declined sharply after, to 0.2 in 2005, and to 0.17 in 2007. Fig. 10 shows that the ratio between the highest and the lower minimum wage across Chinese localities declined from 1.9 at the beginning of the 2000s to 1.5 in 2000 as a result.

4.4. The flying geese model

Inland industry has consolidated its progress all over the period, suggesting that the catch-up observed since the end of the 1990s was more than a temporary phenomenon related to the restructuring of SOEs and was the beginning of a sustainable trend reflecting new comparative advantages.

The calculation of labor productivity at the level broad sectors in the National accounts shows clear-cut diverging trajectories between inland and the coast (Fig. 11).

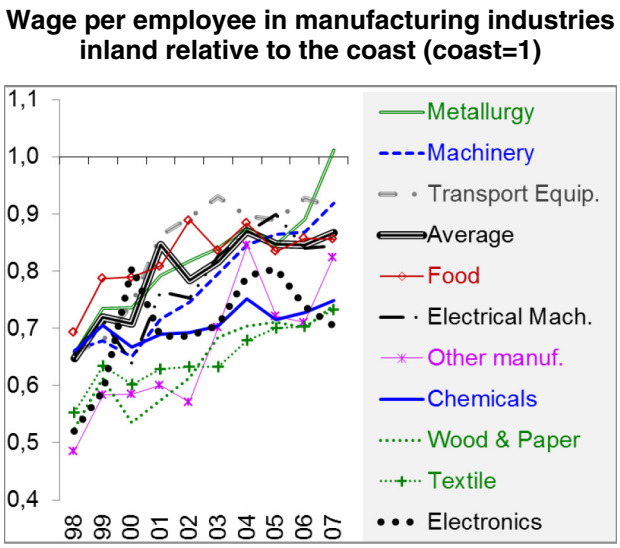

Fig. 9. Wage per employee in manufacturing industries inland relative to the coast (coast = 1). Source: National bureau of statistics, industrial enterprise census data. Notes: Inland refers to non-coastal provinces with the coast including Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin.

Fig. 10. Evolution of the ratio of maximum over minimum of city-level minimum wages across China. Source: Mayneris et al. (2014).

In inland China, the increase in labor productivity in the secondary sector (industry plus construction) has clearly been the determinant of the macroeconomic catch-up (measured by the GDP/labor ratio). In the services sector (secondary), labor productivity gains clearly lagged behind.

In the coast by contrast, labor productivity has increased faster in the services sector than industry since the early 2000s. The gap between productivity in services and industry has closed and the coast has thus kept its advantage over the inland in services.

This suggests that the coastal economy has to enter a new development stage, in which production and allocation of resources shift to services and away from industry. As the inland industry has begun to acquire a competitive edge in many manufacturing sectors, the coastal area has to build up new specialization in high value added industries and in services. The reform in services sector, i.e. its opening up to private Chinese investors as well as to foreign enterprises is thus of crucial importance for coastal economies. The recent project of "Special economic zone" in Shanghai epitomizes the need for the coastal to find new growth opportunity.

4.5. Inland industry: a low dependence on foreign markets and capital

Inland and coastal industries still differ profoundly in their degree of openness to foreign trade and capital.

Inland industrial production is almost entirely sold in the domestic market (Fig. 12A). Only a small share is exported: 6% in 2006 falling to 4% in 2009 following the global crisis. The corresponding figures for the coastal industry stand around 20%–25% in the 2000s, falling to 18% in 2009.

This contrast is not the result of specialization but pertains to all manufacturing industries. In electronics, textile and miscellaneous manufacturing, the inland industry took advantage of the expansion of external demand in the mid-2000s, but even in its heyday, the dependence on world markets was about half that in the coast (Fig. 12B).

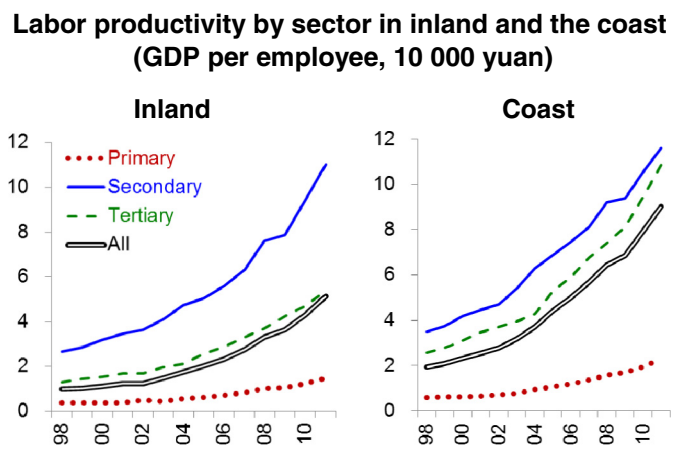

Fig. 11. Labor productivity by sector in inland and the coast (GDP per employee, 10,000 yuan). Source: National bureau of statistics, China statistical yearbook. Notes: Inland refers to non coastal provinces with the coast including Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin.

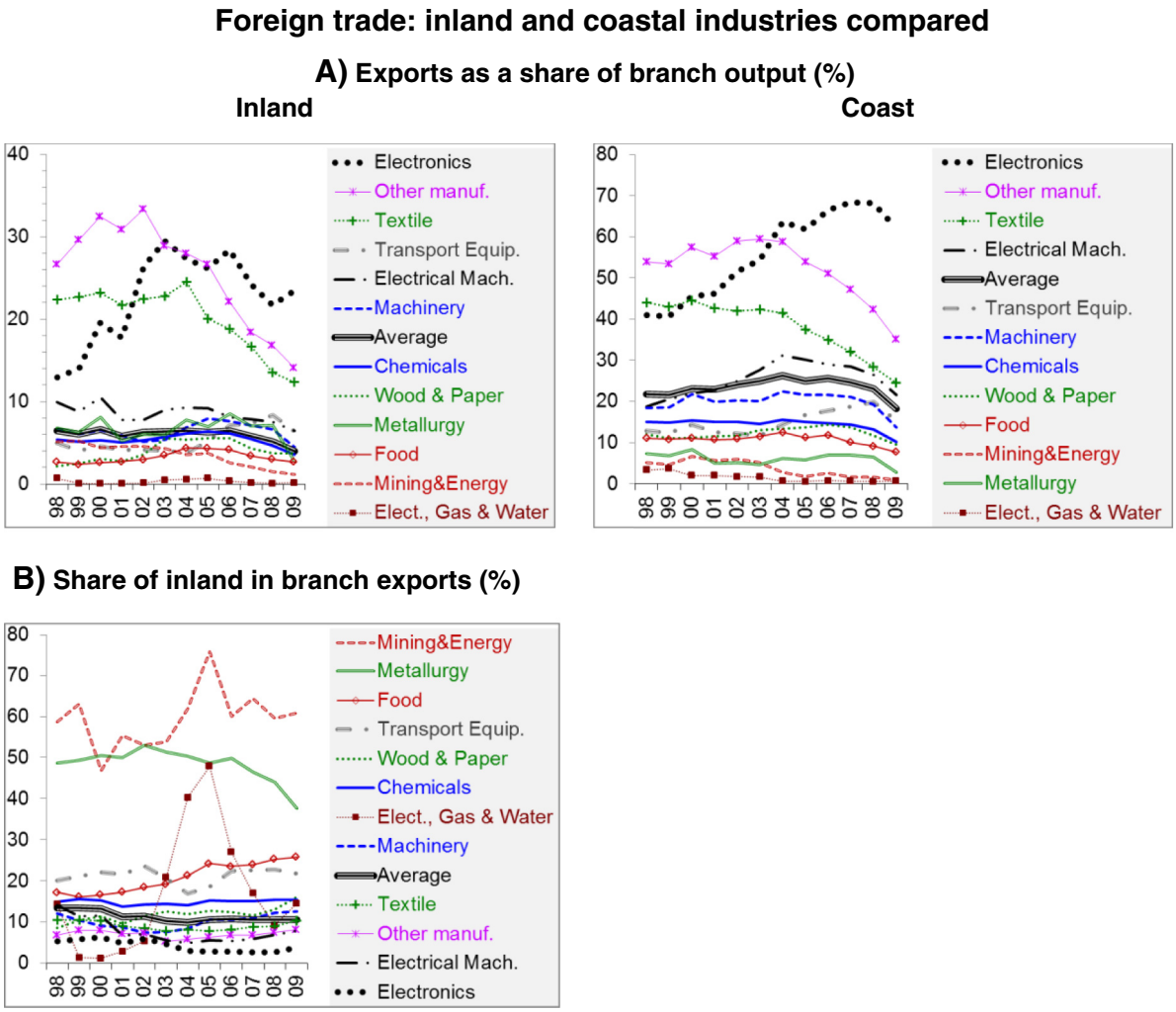

Fig. 12. Foreign trade: inland and coastal industries compared. Source: National bureau of statistics, industrial enterprise census data. Notes: Inland refers to non coastal provinces with the coast including Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin.

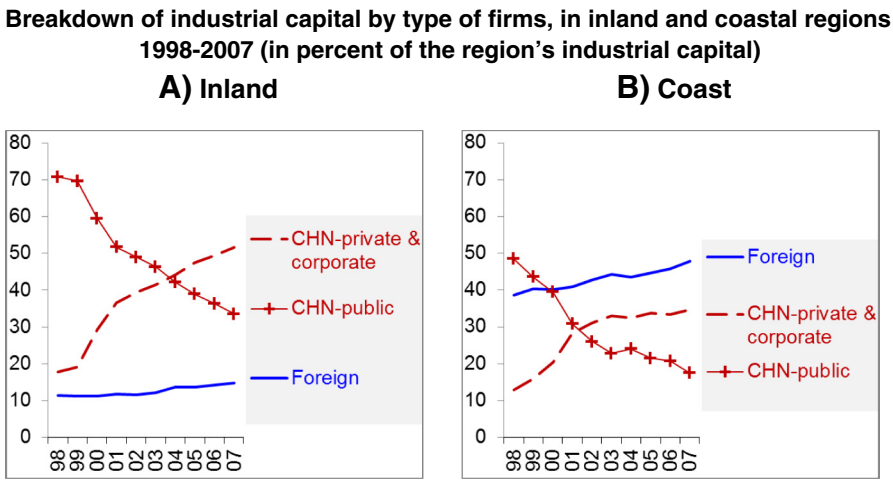

Fig. 13. Breakdown of industrial capital by type of firms, in inland and coastal regions 1998–2007 (in percent of the region's industrial capital). Source: National bureau of statistics, industrial enterprise census data. Notes: Inland refers to non-coastal provinces with the coast including Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin.

Inland region contributes only marginally to China's industrial exports and its contribution decreased between 1998 and 2011 (from 13.5% to 11%). It plays a significant part only in industries related to natural resources such as metallurgy and food (Fig. 12C). However, these ratios measure only "direct" exports to foreign markets and the actual contribution of the interior is somewhat larger as inland industries have an indirect part in Chinese exports through their sales of intermediate products to coastal exporting firms (Meng, Wang, & Koopman, 2013).

The ownership pattern is also different. The far-reaching changes which have taken place in the ownership of industrial capital have led to different regional patterns.

The restructuration and the privatization process since 1997 led to the collapse of state-controlled firms as owners of industrial capital (Fig. 13). In both areas, they now hold a relatively small share of industrial capital, but this share is still twice larger in the interior (34%) than on the coast (17%).

Symmetrically, the importance of industrial capital held by "companies" ("corporations") and private firms has soared. In the late 2000s, the major difference between the coast and the interior stands in the importance of foreign-invested enterprises (i.e. wholly or partly funded by investors from Hongkong and Taiwan and by other foreign investors). They hold 48% of industrial capital in the coast but only 15% in the interior. Local corporate and private investors have by far the most important share of inland industrial capital (52% in 2007), while the first place is held by foreign funded firms in the coastal industry.

4.6. The effect of policies in favor inland catch-up

Despite far-reaching market-oriented reforms, State intervention in the economy has remained strong in China and since the late 1990s, government policy has fostered the economic development of inland area. The effect of these policies can be briefly assessed as follows.

The ninth Five-Year plan (1996–2000) and the tenth Five-Year-plan (2001–2005) emphasized central government commitment to reduce regional inequality through the "Western Development Strategy" or "Campaign to Open the West". This strategy was not planned in detail and there is no single policy document that summarizes it (Goodman, 2004). The intention was to provide additional funds to be invested in the West from government budget, private and foreign sources. In this perspective, numerous fiscal and credit measures were taken to enhance investment in inner provinces, together with policies encouraging their opening up to foreign trade and FDI and cooperation between coastal and inland regions (Golley, 2007). National account data show a very sharp increase in capital expenditure in inland area in the 2000s (Fig. 14).

There is no clear cut evidence that investment policy has been a determinant of regional catch-up. First, as noted by Chen and Groenewold (2013) there is little empirical work assessing the impact of investment allocation on regional disparities. Analyzing this question for the period 1953–2008, the authors find that this effect has been relatively modest: investment had a weak impact on the output, although the impact was somehow stronger in the post-reform period (since 1978).

Second, the western development strategy has incorporated public investment in infrastructure and namely ambitious programs to expand transport networks (road and railways, airports). The aim was to open the regional economies to domestic (and possibly international) trade. However, to our knowledge, there is no research work investigating whether investment in infrastructure had a positive impact on the performance of inland industry, and this may be due to a lack of easily available data. But indeed, the development of the national transport system connecting East and West China, together with the call for developing "mutually beneficial cooperation" between the rich coastal provinces and the poor inland ones is likely to have facilitated relocation of industries from east to west and led to the spread of industrial activity.

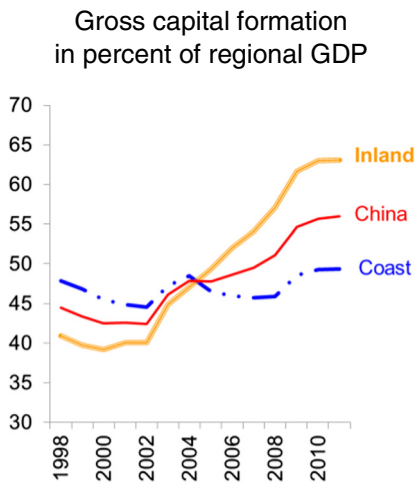

Fig. 14. ross capital formation in percent of regional GDP. Source: National bureau of statistics, China statistical yearbook, various issues. Notes: Inland refers to non-coastal provinces with the coast including Fujian, Guangdong, Hainan, Hebei, Jiangsu, Shandong, Zhejiang, Beijing, Shanghai and Tianjin.

Turning to FDI and trade policy, it stands out from the literature that it favored coastal development and was a crucial factor in explaining growing spatial inequality in China in the 1980s and the 1990s. Henceforth, the new development strategy since the early 2000s has included measures to attract foreign direct investment into inland provinces. As a result, while FDI remained heavily concentrated in the coastal region, the degree of concentration somehow decreased in the 2000s. In 1997–1998, inland provinces received about 20% of the amount of FDI, and this share rose to 27% in the late 2000s. The share held by foreign firms (JV and wholly foreign firms) in the total fixed assets of inland manufacturing industry doubled (from 8% to 17%). Since foreign-capital firms have generally a better performance than the Chinese ones, this change was favorable to inland catch up. However FDI in inland industry failed to stimulate exports. Inland region accounted for only 6% of China's exports by foreign capital firms, a share that remained stable over the period.

As mentioned above, the government has promoted wage convergence since 2004, but there is no evidence that the evolution of minimum wages has fostered convergence across localities in terms of aggregate labor productivity. Minimum wage growth will favor this convergence if minimum wages increase faster in initially less productive localities. However Mayneris et al. (2014) do not observe such a pattern for the 2004 reform. While the growth of real minimum wage between 2003 and 2005 correlates negatively and significantly with its initial level, its correlation with initial labor productivity is null. This can be explained by the fact that even though labor productivity and minimum wage in 2003 are positively correlated, the magnitude is moderate (at 0.38) and other city characteristics are also at play in the dynamics of local minimum wages. Mayneris et al. (2014) show that cities with initially identical labor productivities exhibit very different growth rates of their minimum wage. Hence, even though higher minimum wages foster aggregate productivity, the 2004 reform has not favored convergence in terms of productivity across Chinese cities.

Finally, the Chinese government interventions in economic activity also take the form of industry-specific policies. For instance, subsidization and administrative interference are used to support strategic industries (WU, 2014). However, as convergence appears to be a general trend that takes place across all industries, it can hardly be attributed to any sectoral policy.

Ultimately, convergence can be ascribed to the combination of several policies which have facilitated a market-based coordination of economic activity. This is the hypothesis of Golley (2007) who talks of a “market-enhancing regional strategy”.

5. Rapid convergence in manufacturing

This section proposes an estimation of productivity growth to analyze the process of convergence in industrial labor productivity across China. Our focus on manufacturing is deliberate. As discussed above, the literature on income disparities across China's provinces suggests that there has been (absolute) divergence in per capita incomes from 1978 up to recently (Chen & Fleisher, 1996; Jian, Sachs, & Warner, 1996; Jones, Li, & Owen, 2003; Li, Liu, & Rebelo, 1998). A recent analysis by Rodrik (2013) however suggests that strong convergence forces may operate in manufacturing industries even when economies as a whole fail to exhibit unconditional convergence, i.e. a systematic propensity of lagging behind countries to catch-up with richer ones irrespective of their characteristics. Rodrik suggests that in manufacturing activities intrinsic forces allow firms with lower than average productivity to catch-up with the most productive ones, hence displaying larger growth rates.

Our empirical approach relies on prefecture level data to estimate the speed at which labor productivities catch-up in the manufacturing sector in China. We are hence able to determine whether convergence coefficients vary between the various geographic regions. We also propose some preliminary examination of what factors appear to facilitate the convergence process. We look notably at the role of firm ownership and qualification.

5.1. Empirical specification

Following Rodrik (2013), we assume labor productivity growth in an industry i in a location j in period t to be a function of both location-specific conditions and a convergence effect. The convergence effect is set to be proportional to the gap between each industry's initial productivity and its frontier technology. The latter is hence specific to the industry i and common to all locations represented by D_{it} in the following expression of the growth of nominal labor productivity:

$$Growth\_y_{ijt} = \beta \ln y_{ijt} + D_j + D_{it} + \varepsilon_{ijt} \tag{1}$$

where $Growth\_yijt$ is measured as the difference in labor productivity for industry i and city j ($\ln yij$) between years $t + k$ and t. We report two sets of results, on a cross section for the period 1999–2009 where k is equal to 10 and a panel specification for three 3-year periods (1998–2002, 2002–2005, and 2005–2008) where $k = 3$. D_j is a dummy variable that stands in for all time- and industry-invariant location-specific factors. The error term ε_{ijt} is assumed uncorrelated with other explanatory variables and captures all other idiosyncratic influences on labor productivity growth.

The empirical strategy is hence to regress the growth of labor productivity in nominal terms on the initial level of labor productivity, a set of industry/time period fixed effects (D_{it}) and prefecture fixed effects (D_j).

The coefficient of interest in Eq. (1) is that on β. Unconditional convergence is tested when estimating the equation without location fixed effects (D_j). Findings of a negative and significant β will suggest unconditional convergence. In turn when local-specific conditions are controlled for by these fixed effects, the estimate of β will be a measure of conditional convergence.

Table 3
Baseline specification: cross-section of Chinese prefectures for the 1999–2009 period.

Explained variable	Annual growth rate of labor productivity (prefecture–industry) 1999–2009 decade		
	(1)	(2)	(3)
	Unconditional convergence	Conditional convergence	With squared productivity
log initial productivity	−0.090***	−0.094***	−0.105***
	(0.001)	(0.001)	(0.002)
Squared log initial productivity			0.002***
			(0.000)
Capital Intensity		0.003***	0.002***
		(0.001)	(0.001)
Size		0.000	0.001
		(0.000)	(0.000)
Export on sales		−0.017***	−0.016***
		(0.003)	(0.003)
Share of public production		0.000	0.000
		(0.002)	(0.002)
Share of foreign production		0.004	0.003
		(0.003)	(0.003)
Prefecture fixed effects	No	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Observations	19,024	18,987	18,987
R-squared	0.619	0.655	0.656
Number of prefectures	336	336	336

Data source: Industrial enterprise surveys (National bureau of statistics) aggregated to the prefecture–industry level.
Notes: Heteroskedasticity-robust standard errors are reported in parentheses. *** and ** respectively denote significance at the 1% and 5% levels.
Productivity is computed as value added per employee. Control variables (capital intensity, size, export on sales, production shares) are measured in the initial year. Capital Intensity is computed as fixed assets per worker and Size corresponds to the number of employees.

5.2. Data

The dependent variable is the (compound annual) growth rate of labor productivity for 3-digit manufacturing industries. Labor productivity is computed dividing nominal value added by employment. The original firm-level dataset (NBS, National bureau of

Table 4
Panel specification of Chinese prefectures: three-year sub-periods (1999–2002, 2002–05, 2005–08).

Explained variable	Annual growth rate of labor productivity (prefecture–industry)		
	(1)	(2)	(3)
	Unconditional	Conditional	Interacting year with initial labor productivity
log initial productivity (common 1999–2008)	−0.182***	−0.219***	−0.187***
	(0.003)	(0.002)	(0.004)
log initial productivity * period 2002–2005			−0.055***
			(0.004)
log initial productivity * period 2005–2008			−0.049***
			(0.004)
Capital Intensity		0.019***	0.021***
		(0.002)	(0.002)
Size		0.005***	0.005***
		(0.001)	(0.001)
Export on sales		−0.049***	−0.052***
		(0.006)	(0.006)
Share of public production		−0.037***	−0.034***
		(0.004)	(0.004)
Share of foreign production		0.013***	0.012**
		(0.005)	(0.005)
Prefecture fixed effects	No	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Observations	59,439	59,361	59,361
R-squared	0.310	0.367	0.373
Number of prefectures	339	339	339

Data source: Industrial enterprise surveys (National bureau of statistics) aggregated to the prefecture–industry level.
Notes: Heteroskedasticity-robust standard errors are reported in parentheses. *** and ** respectively denote significance at the 1% and 5% levels.
Productivity is computed as value added per employee. Control variables (capital intensity, size, export on sales, production shares) are measured in the initial year of the various sub-periods. Capital Intensity is computed as fixed assets per worker and Size corresponds to the number of employees.

statistics) is aggregated up to the 163 3-digit GBT sectors and to the prefecture-level. The regressors are the log of initial labor productivity and a host of fixed effects, depending on the specification. Each regression is run first without and then with prefecture dummies. Then we add controls built in the spirit of those found in the macro literature. We introduce proxies for capital intensity, export outward-orientation, size and the importance of the public and foreign sector. They are computed at the industry–prefecture level from the NBS census. Capital intensity is measured as the ratio of fixed assets per worker. Outward orientation is the ratio of exports over industrial sales. The importance of share ownership is computed dividing the output emanating from state-owned firms by the total output for each prefecture–industry pair. The role of foreign capital is apprehended following the same logic but looking at the output from foreign firms.

5.3. Regression results

5.3.1. Benchmark results

Table 3 reports the results when running over a pure cross-section for the period 1999–2009. In that case "industry × time period" fixed effects are reduced to industry fixed effects. Column 1 is the baseline result in absence of prefecture-level dummies. The coefficient of unconditional convergence ("beta") is very large −9% per year. This figure is three times higher than the value between 2–3% found in a cross-country analysis of Rodrik (2013). This is consistent with the greater economic homogeneity and easier technology diffusion within China than across different countries. Also our estimates are based on a much more disaggregated classification of industries. Rodrik's benchmark results correspond to a breakdown of 23 2-digit industries. He notes that more disaggregated specifications generally yield somewhat higher estimates. A convergence rate of 9% implies that industries that are, say, a fifth of the way to the technology frontier experience a convergence boost in their labor productivity growth of 14 percentage points per annum ($0.09 \times \ln(5)$). It also means that it takes 8 years for the laggards to cut by half their distance to the leaders.

Column 2 adds prefecture fixed effects. The coefficient on the initial productivity remains globally unaffected suggesting that the rate of conditional convergence is roughly similar to that of unconditional convergence.

Column 3 further adds the squared term of the initial productivity to test for non-linearity of β. The squared term turns out to be positive and rather small in magnitude suggesting that the convergence boost in labor productivity growth does not increase indefinitely. It reaches a maximum value of 34 percentage points for industries in which labor productivity is 26 times lower than the technology frontier. Moreover it does not drop rapidly as labor productivity catches-up with the frontier confirming strong convergence forces.

The negative coefficient on export on sales in Table 3 indicates that the growth rate of productivity is on average lower for outward-oriented sectors after accounting for initial productivity and other characteristics. In unreported results available upon request we split the sample in two subsets according to the median rate of exports on sales to investigate whether the speed of convergence depends on outward orientation. We do not find that the convergence speed is significantly different between more

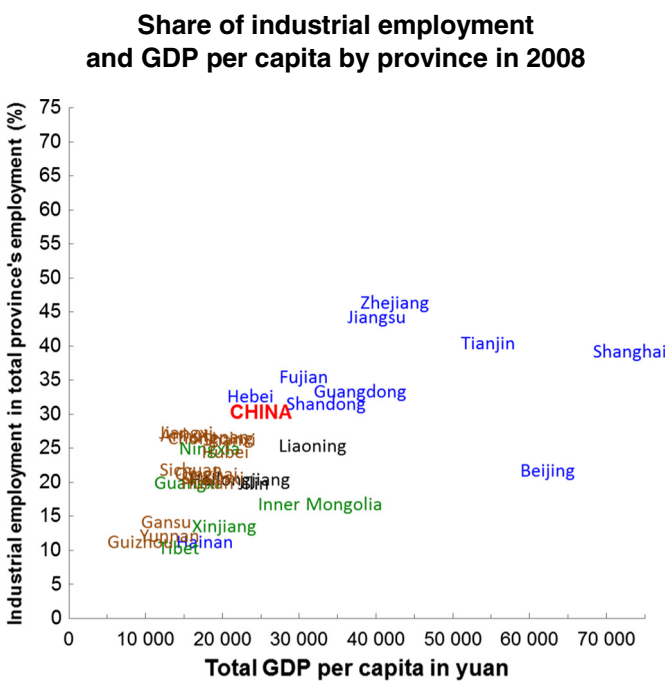

Fig. 15. Share of industrial employment and GDP per capita by province in 2008. Source: National bureau of statistics, statistical yearbook.

and less export oriented sectors. This is consistent with our overall message that the convergence in labor productivity is unconditional and equal to 9% per year.

Table 4 reports the results based on the panel specification. It pools data for three 3-year periods (1998–2002, 2002–2005, and 2005–2008). The magnitude of the convergence coefficient, capturing the average yearly convergence speed, roughly doubles suggesting stronger convergence forces in the short run. However the main message remains: Chinese manufacturing industries exhibit strong unconditional convergence in labor productivity. Comparison of beta coefficients in columns 1 and 2 confirms that the speed of unconditional convergence is similar to that of conditional convergence. Column 3 looks at parameter heterogeneity across the three time periods and shows that convergence forces are stronger after 2002 than before. The speed of convergence remains however similar in the last two sub-periods (2002–05 and 2005–08).

Our finding of powerful convergence in Chinese manufacturing stands in sharp contrast with the growing inter-regional growth disparities measured in the literature up to the mid 2000s. This confirms Rodrik's message obtained on cross-country analysis that strong convergence forces may operate in manufacturing industries even when economies as a whole diverge. The Chinese case illustrates well the main reasons why manufacturing convergence does not translate into aggregate convergence.

The main explanations proposed by Rodrik is that non-manufacturing activities (contrary to manufacturing) do not exhibit unconditional convergence and that the share of employment in manufacturing is low in the poorest economies and typically rising over the course of development. China fits this pattern. Employment in industry (including construction) accounts for on average 27%, but is much lower in poorer locations (14% in Xinjiang and 17% in Inner Mongolia) than in the richer ones (reaching more than 40% in the Jiangsu–Zhejiang–Shanghai area), as shown in Fig. 15 above. This gives the latter a growth boost, but depresses the contribution of industry to overall productivity growth in the less developed locations. As, the share of industrial employment increased over the period, its impact on overall convergence has become more discernible.

5.3.2. Heterogeneity across geographic zones

We use two complementary approaches to verify that the process of convergence is at work across the whole Chinese territory.

First we check that β-convergence also exists within Chinese provinces. Our regressions so far were pooling information at the city level for all provinces. It could be a possibility that our finding of convergence over time holds only for a sub-set of provinces or that labor productivity converges between provinces but diverges within provinces. To improve the estimation fit labor productivity is computed at the county level[2] (instead of the prefecture level). We estimate the individual convergence coefficients on a province-by-province basis for each of the 24 provinces that have a sufficient number of (county) sub-locations.

They are obtained from regressing, separately for each province, the growth rate of an industry's labor productivity against its initial level across all counties and industries in cross-section for the 1999–2009 period. Regressions include the same controls as in Table 3 as well as sector fixed effects at 2 digit level.[3] Beta coefficients are shown in Table 5. There is very little evidence of parameter heterogeneity across provinces as the beta coefficient only varies between 9 and 10%.

Second, we use our benchmark sample as the prefecture level and allow the initial productivity term to vary by regions. We use the regional division into 4 groups: coast, center, north-east and west (periphery). The coefficient on initial productivity captures the convergence for the coast which acts as the reference group. The beta coefficient for the other regions is to be computed by adding their specific coefficient to that of the reference group. As shown in column 2 of Table 6, convergence forces are stronger in the central and north-eastern regions (at 9.5 and 9.6% respectively). The speed of convergence in the most backward western area by contrast does not appear to be significantly different than the most advanced Coastal area when capital intensity and export orientation are controlled for suggesting that western locations have more difficulties to catch-up than less peripheral areas. This would be in line with the issue of limited absorption capacity in the poorest locations.

5.3.3. Investigating the drivers of convergence

Our investigation of the factors susceptible to be conducive to convergence exploits successively the heterogeneity across industries and across firm-type.

Table 7 shows the individual convergence coefficients estimated on an industry-by-industry basis for each of our 2-digit industries. Regressions are run separately for each industry. The growth rate of an industry's labor productivity between 1999 and 2009 is regressed on its initial level across all prefectures added the same controls as in Table 3. The tobacco sector stands as the only exception in our findings of rapid β-convergence. This highly-regulated sector has an average labor productivity 10 times higher than the manufacturing average. This anomaly which derives both from very low labor intensity and high and administratively set prices may be at the root of the absence of convergence dynamics in this sector. The Chinese tobacco market is dominated (at 97%) by the government monopoly China National Tobacco Corporation (CNTC). The tobacco industry is hence not subject to market forces. The absence of convergence in this sector is consistent with the absence of incentives for technological spillover and catch-up.

[2] Counties correspond to the geographical level just below the prefectures: there are between 50 and 150 counties by province. Given the low number of counties, we do not consider intra-provincial convergence for the following provinces: Hainan, Tibet, Ningxia, Beijing, Tianjin, Jiangsu, and Chongqing.

[3] The 3 digit level used in the previous regressions appears to be too detailed for this specification.

Table 5
Labor productivity convergence rates at the province level: cross-section for the 1999–2009 period.

Code	Province	Number of counties	Beta coefficient	Significance
13	Hebei	167	−0.093	***
14	Shanxi	47	−0.093	***
15	Inner Mongolia	55	−0.099	***
21	Liaoning	100	−0.098	***
22	Jilin	57	−0.097	***
23	Heilongjiang	110	−0.095	***
32	Jiangsu	92	−0.094	***
33	Zhejiang	74	−0.093	***
34	Anhui	87	−0.093	***
35	Fujian	70	−0.097	***
36	Jiangxi	51	−0.089	***
37	Shandong	123	−0.091	***
41	Henan	134	−0.092	***
42	Hubei	96	−0.093	***
43	Hunan	116	−0.095	***
44	Guangdong	101	−0.093	***
45	Guangxi	54	−0.100	***
51	Sichuan	127	−0.093	***
52	Guizhou	79	−0.089	***
53	Yunnan	77	−0.092	***
61	Shaanxi	57	−0.096	***
62	Gansu	32	−0.100	***
63	Qinghai	21	−0.093	***
65	Xinjiang	66	−0.090	***

Data source: Industrial enterprise surveys (National bureau of statistics) aggregated to the county–industry level.
Notes: These coefficients are obtained by running pure cross-section regressions of Eq. (1) for each province separately (at the county level) including industry fixed effects. ** denote significance at the 1% level.

The convergence speed measured in the remaining manufacturing sectors stands in a narrow range, between 6.7% in basic chemicals and 10% for non-ferrous metals. The rate is over 9% in Food products, Pharmaceuticals, Telecommunications-Computers and Measuring instruments.

Table 6
Regional heterogeneity in the baseline specification: cross-section for the 1999–2009 period.

Explained variable	Annual growth rate of labor productivity (prefecture–industry)	
	(1) Unconditional	(2) Conditional
log initial productivity	−0.090***	−0.091***
	(0.001)	(0.001)
log initial productivity × Western area	−0.006**	−0.001
	(0.003)	(0.002)
log initial productivity × Central area	−0.005***	−0.004***
	(0.002)	(0.002)
log initial productivity × North-eastern area	−0.006***	−0.005**
	(0.002)	(0.002)
Capital Intensity (fixed assets per worker)		0.002***
		(0.001)
Size (number of employees)		0.000
		(0.000)
Export on sales		−0.017***
		(0.003)
Share of public production		0.000
		(0.002)
Share of foreign production		0.004
		(0.002)
Prefecture fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Observations	18,986	18,986
Number of prefectures	336	336
R-squared	0.655	0.655

Data source: Industrial enterprise surveys (National bureau of statistics) aggregated to the prefecture–industry level.
Notes: Heteroskedasticity-robust standard errors are reported in parentheses. *** and ** respectively denote significance at the 1% and 5% levels. Productivity is computed as value added per employee. Control variables (capital intensity, size, export on sales, production shares) are measured in the initial year. Capital Intensity is computed as fixed assets per worker and Size corresponds to the number of employees.
Western area is a dummy equal to 1 for Guangxi, Inner Mongolia, Ningxia, Tibet and Xinjiang. Central area is a dummy equal to 1 for Anhui, Gansu, Guizhou, Henan, Hubei, Hunan, Jiangxi, Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan and Chongqing. North-eastern area is a dummy equal to 1 for Liaoning, Jilin and Heilongjiang.

Table 7
Sectoral heterogeneity in labor productivity convergence rates: cross-section estimates for the 1999–2009 period.

GBT code		Number of prefectures	Beta coefficient	Significance
13	Food processing	328	−0.078	***
14	Food products	304	−0.099	***
15	Beverages	314	−0.088	***
16	Tobacco	83	−0.023	n.s.
17	Textiles	288	−0.080	***
18	Wearing, footwear & caps	227	−0.087	***
19	Leather, fur & feather	185	−0.085	***
20	Wood	249	−0.089	***
21	Furniture	178	−0.087	***
22	Paper	270	−0.078	***
23	Printing	257	−0.086	***
24	Culture & sport	138	−0.086	***
26	Basic chemicals	314	−0.067	***
27	Pharmaceuticals	292	−0.093	***
28	Chemical fibers	116	−0.077	***
29	Rubber	202	−0.084	***
30	Plastics	287	−0.089	***
31	Non-metal mineral	332	−0.071	***
32	Ferrous metals	259	−0.085	***
33	Non-ferrous metals	244	−0.100	***
34	Metal products	272	−0.083	***
35	Machinery	290	−0.086	***
36	Special machinery	283	−0.090	***
37	Transport equipment	276	−0.079	***
39	Electrical machinery	261	−0.089	***
40	Telecomm. & computers	199	−0.098	***
41	Measuring Instruments	165	0.094	***

Data source: Industrial enterprise surveys (National bureau of statistics) aggregated to the county–industry level.
Notes: These coefficients are obtained by running pure cross-section regressions of Eq. (1) for each sector separately (at the prefecture level) including prefecture fixed effects. *** denote significance at the 1% level.

Table 8
R&D and skill intensity drivers in sectoral convergence: cross-section for the 1999–2009 period.

Explained variable:	Annual growth rate of labor productivity (prefecture–industry)	
	1 Education	2 R&D
log initial productivity	−0.096***	−0.096***
	(0.001)	(0.001)
log initial productivity × high R&D		0.004***
		(0.002)
log initial productivity × medium R&D		0.002*
		(0.001)
log initial productivity × high qualification	0.005***	
	(0.002)	
log initial productivity × medium qualification	0.002	
	(0.001)	
Capital intensity	0.003***	0.003***
	(0.001)	(0.001)
Size	0.000	0.000
	(0.000)	(0.000)
Export on sales	−0.017***	−0.017***
	(0.003)	(0.003)
Share of public production	0.000	0.000
	(0.002)	(0.002)
Share of foreign production	0.004*	0.004
	(0.003)	(0.002)
Prefecture fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Observations	18,986	18,986
R-squared	0.655	0.655
Number of prefectures	336	336

Data source: Industrial enterprise surveys (National bureau of statistics) aggregated to the prefecture–industry level.
Notes: Heteroskedasticity-robust standard errors are reported in parentheses. *** and * respectively denote significance at the 1% and 10% levels.
Productivity is computed as value added per employee. Control variables (capital intensity, size, export on sales, production shares) are measured in the initial year.
Capital intensity is computed as fixed assets per worker and Size corresponds to the number of employees.

Table 9
Firm ownership and convergence: cross-section 1999–2009.

Explained variable	Annual growth rate of labor productivity(prefecture–industry)			
	(1)	(2)	(3)	(4)
	Interacting base productivity with firms type	Only public firms	Only private firms	Only foreign firms
log initial productivity	−0.097***	−0.088***	−0.095***	−0.093***
	(0.001)	(0.002)	(0.001)	(0.001)
log initial productivity × public type	0.009***			
	(0.002)			
log initial productivity × foreign type	0.010***			
	(0.002)			
Capital intensity	0.004***	0.005***	0.002***	0.005***
	(0.001)	(0.002)	(0.001)	(0.001)
Size	0.001*	0.001	0.001	0.004***
	(0.000)	(0.001)	(0.001)	(0.001)
Export on sales	−0.014***	−0.010	−0.007**	−0.016***
	(0.003)	(0.009)	(0.003)	(0.004)
Prefecture fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	20,550	5436	10,172	4942
R-squared	0.581	0.424	0.702	0.614
Number of prefectures	332	323	325	264

Data source: Industrial enterprise surveys (National bureau of statistics) aggregated to the prefecture–industry level.
Notes: Heteroskedasticity-robust standard errors are reported in parentheses. ***, ** and * respectively denote significance at the 1%, 5% and 10% levels.
Productivity is computed as value added per employee. Control variables (capital intensity, size, export on sales, production shares) are measured in the initial year.
Capital Intensity is computed as fixed assets per worker and Size corresponds to the number of employees.

Table 8 explores two potential drivers of the sectoral differences in productivity convergence: skill level of employees and R&D intensity. In 2004 the NBS survey breaks down employment depending on the education level of employees. Four categories are proposed: postgraduate, undergraduate, college, high school and below. We compute the share of employees with at least college education for each 3-digit industry and categorize them into 3 groups of equal size: low, medium and high. In column 1 of Table 8 we allow the beta coefficient to be different for the latter two categories compared to the average. Column 2 introduces similar interactive terms based on the ratio of R&D over value-added. Information on R&D is only available for 2005, 2006 and 2007. We compute

Table 10
Policy determinants of sectoral convergence: Panel specification of Chinese prefectures: three-year sub-periods (1999–2002, 2002–05, 2005–08).

Explained variable	Annual growth rate of labor productivity (prefecture–industry)					
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Subsidy over sales		Road infrastructure		Minimum wage	
Position with respect to median	Below	Above	Below	Above	Below	Above
log initial productivity	−0.214***	−0.227***	−0.214***	−0.226***	−0.214***	−0.227***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Capital intensity	0.020***	0.017***	0.015***	0.022***	0.021***	0.016***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Size	0.004***	0.006***	0.004***	0.006***	0.006***	0.004***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Export on sales	−0.044***	−0.050***	−0.048***	−0.046***	−0.046***	−0.047***
	(0.008)	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)
Share of public production	−0.044***	−0.028***	−0.037***	−0.035***	−0.041***	−0.032***
	(0.007)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Share of foreign production	0.000	0.023***	0.015*	0.007	0.011	0.011
	(0.006)	(0.008)	(0.008)	(0.006)	(0.007)	(0.007)
Observations	27,251	27,225	25,077	29,399	26,850	27,626
R-squared	0.368	0.385	0.363	0.386	0.359	0.392
Number of prefectures	128	158	115	171	129	157

Data source: Industrial enterprise surveys (National bureau of statistics) aggregated to the prefecture–industry level.
Notes: Heteroskedasticity-robust standard errors are reported in parentheses. *** and * respectively denote significance at the 1% and 10% levels.
Change in road density and minimum wage are computed over the various sub-periods.
Productivity is computed as value added per employee. Control variables (capital intensity, size, export on sales, production shares) are measured in the initial year of the various sub-periods. Capital Intensity is computed as fixed assets per worker and Size corresponds to the number of employees.

the average R&D over VA ratios at the 3-digit level over the three years and use them to split the sectors into three groups of equal size (low, medium and high).

The two columns report a positive interactive term for the sectors with higher qualification of employees and with higher R&D intensity. They hence suggest that convergence forces are stronger in sectors with low qualification and R&D. This somewhat surprising result may reflect the fact that sectors that are closer to the local comparative advantages converge faster. Indeed in China, sectors with lower qualification or R&D may be more likely to benefit from spillovers and exploit the backwardness advantages. By contrast, sectors in the higher end of the qualification or R&D spectrum may have more limited links with the local productive structure and thus may be in a less favorable position to capitalize on the existing productive knowledge. This result would be in line with findings in the context of China that consistency with the local productive structure yields positive spillovers, such as knowledge externalities and economies of scale and scope (Poncet & Starosta de Waldemar, 2015). Also they are in line with Cai et al. (2011) who find that policy interventions in favor of low skill-intensive or R&D intensive sectors were associated with higher productivity levels and growth rates.

We now exploit the information on the ownership structure of firms in the census data to determine whether convergence forces vary across firm-types. We distinguish between three categories of firms: domestic state-owned, domestic private and foreign owned. Column 1 of Table 9 allows the speed of convergence to differ depending on the three firm types. The positive and significant coefficients on the interactive terms for public and foreign firms indicate that convergence forces are stronger for private firms. This result is confirmed when splitting the sample according to the three groups. Higher beta coefficient is found for private firms.

Lower convergence speed for state-owned activities may relate to the well-documented inefficiency and lack of incentives in the public sector in China. Results in columns 2 to 4 of Table 9 indicate that state-owned activities display a lower convergence speed than private (domestic or foreign) ones. It is interesting to note that the foreign capital is not associated with a faster speed of convergence of Chinese prefectures. The convergence speed for foreign and domestic private activities are not statistical different at 9.3 and 9.5% respectively. This result is in line with growing evidence of fewer spillover gains emanating from foreign activities (Hale & Long, 2011; Poncet & Starosta de Waldemar, 2015).

Lower convergence for state-owned firms in part reflects initial productivity differences across firm types. We measure (after accounting for sector and province differences through fixed effects) that the average productivity of foreign firms is 65% higher than that of state owned firms. The average productivity in private domestic firms is 38% higher than in SOEs. When zooming on foreign firms, we do not measure that initial productivity differs between wholly owned and JV firms. However for foreign firms, a ten percentage point rise in the proportion of state capital in total paid capital is associated with a decrease by 2.4% in productivity. In unreported results available upon request, we investigate how convergence speed depends on state capital for the sample of foreign firms. When splitting the "foreign" sample of column 4 into two depending on whether the share of state capital is lower than the median or not, we measure that convergence speed is lower for activities of foreign firms with stronger partnerships with SOEs. The convergence speed in that case is similar to that of SOEs, at 8.7%.

The finding of uniform convergence of productivity across different regions, sectors and firm types is consistent with the story of "unconditional convergence". Indeed, as suggested by Rodrik (2013), there are in manufacturing activities intrinsic forces that allow firms with lower than average productivity to catch-up with the most productive ones, hence displaying larger growth rates. As already discussed in Section 4.7, it is unlikely to be driven by any sectoral policy. While government investment policies such as the "go west policy" may bring about convergence, there is no clear cut evidence that investment policy has been a determinant of regional catch-up in China.

Table 10 attempts to evaluate the role of different local policies in shaping the speed of regional convergence. It builds on the results based on the panel specification from Table 4 and splits the sample into two groups of prefectures depending on their relative proactive stand to sustain the economic activity. We look at three dimensions successively: the provision of production subsidies, the building of transport infrastructure and the rise in minimum wage. Columns 1 and 2 differentiate between locations with a rate of subsidies over sales[4] respectively below and above the median of our sample. Higher beta coefficient is found in prefectures with more generous subsidization to firms. Columns 3 and 4 split the sample according to the change in road infrastructure density. We look at the rise in the road length in km per km^2 of surface area over the overall period 1999–2008.[5] Convergence is faster in prefectures with above median infrastructure push. The median minimum wage rise is used as the cut-off in columns 5 and 6. Minimum wages have risen very fast over the 1999–2008 period (by 80% on average).[6] The prefectures with the faster rise display a larger speed of convergence.

Taken together our results indicate that government efforts in infrastructure provision, production subsidies and minimum wage rise promote convergence. The point estimates however suggest that the repercussions are limited. For all three policies, the difference between the two samples is roughly one percentage point (that is one twentieth of the average convergence rate). Again this consistent with the fact that convergence in manufacturing activity is predominantly unconditional, i.e. independent of the local governmental initiatives.

[4] It is computed using the industrial enterprise census as the ratio of total subsidies over sales reported by the firms in a prefecture.
[5] These macroeconomic indicators at the city-level are taken from http://chinadataonline.org/, provided by the University of Michigan.
[6] Data on minimum wages at the prefecture level come from various official websites such as China Labour Net (Mayneris et al., 2014).

6. Conclusions

China has entered a new phase in its growth trajectory, characterized by a spatial rebalancing of economic growth in favor of the interior. The gap in GDP per capita between the coast and inland has narrowed and this macroeconomic catch-up reflects, with a time lag, the convergence process which has been at work in manufacturing industry since the end of the 1990s. This time lag can be explained by the fact that the contribution of manufacturing to overall productivity growth has risen over time as the share of industrial employment has increased in the least-developed regions.

The Chinese case exemplifies Rodrik's finding of an unconditional convergence in the manufacturing industry, i.e. a systematic propensity of lagging behind countries to catch-up with richer ones irrespective of their characteristics. It also highlights how the "flying geese" model operates within a vast country with still large regional disparities. It suggests that inland industry has been catching up the labor productivity level of the coastal industry, thanks to the transfer of technology and capital from these most advanced regions. China is thus becoming increasingly integrated in terms of technological level. Our results suggest that local government efforts in infrastructure provision, production subsidies and minimum wage shape the speed of regional convergence in a significant but limited manner.

The driving force behind the recent geographic rebalancing may be crucial for China's long-term development as the tilting of the center of gravity of the economy from the coastline to the center is in line with the transition to a new growth regime. The industrialization of the inner regions opens up new prospects for the Chinese development. Inland industrial pattern relies mainly on domestic markets and capital and is thus in line with China's transition to a growth model, less dependent on global markets. However, this inland industrialization drive will have to be made compatible with the new priority of promoting consumption over investment and of protecting the environment.

The advanced coastal regions are losing their comparative advantage in labor intensive industries and have now to build up new specialization in high value-added industry and services. The opening of the services sector to Chinese private investors as well as foreign companies becomes crucial for coastal economies. The recent "special economic zone" that opened in Shanghai embodies the need for the coast to find new growth opportunities.

Appendix A

The database

Harmonization and adjustments

The industrial enterprise census database provides data at firm level and covers all state-owned and non-state-owned industrial enterprises with annual sales above 5 million yuan.

We made the following harmonization and adjustment in the data set.

The industry codes changed in 2003, and we connected the old codes with the new ones using the concordance file proposed by Zheng Wang (http://zhengwang.weebly.com/research.html; Excel File: 3-digit Chinese GB/T industry codes consistent before and after 2003).

There were changes in the prefecture codes assigned to the same firm during the period. These codes have been converted into the relevant ones. For the four municipalities which have a provincial rank (Beijing, Chongqing, Shanghai and Tianjin), we have merged the different prefectures' codes because they were not relevant for our convergence analysis.

There is no data for value-added value in the database for the following years: 2001, 2004, 2008, and 2009. For 2001 and 2004, we have the data for the Gross value of industrial output (GVIO) and the intermediate input. So we calculated the value added by subtracting the input from the output. For 2008 and 2009, we had data only for GVIO. Considering that the ratio value added/output by industry is quite steady over time, we have calculated the average ratio on 2006–2007 and applied this ratio to estimate the value added by industry in 2008 and 2009.

For 2000, 2008 and 2009, the data concern only the average number of employees. But the difference between this variable and the total number of employee at industry level is minimal in the years when the comparison can be made.

In our dataset, some variables take abnormal values (excessively low or high) which is likely to be due to unit problems (e.g. 1000 yuan instead of 10,000). In order to correct this, we dropped the following firms:

- Those with negative fixed assets
- The very small firms (i.e. with less than 8 workers) because their accountability system is presumably not reliable enough. These firms don't fill generally the criterion of at least 5 million yuan annual sales.
- The firms which record a ratio of value added/sales which is negative or above 1.

The representativeness of the new database (which excludes the above mentioned firms) compared to the initial database is described below.

Representativeness

Our database includes all state-owned and non-state-owned industrial enterprises with annual sales above 5 million yuan. In principle, the aggregated data should be identical with the data published in China's statistical yearbooks (CSY).

In order to measure the representativeness of our database, we compared the two statistical data sets by year, region, industry and firm type.

1— In a first step, we compare the initial database with the CSY data to capture the general representativeness of our database (Table A.1). We compare four variables: number of firms, output value (in current prices), industrial value added and employment (this variable is not exactly the same in the CSY which give the annual average of employees; however the differences between these two variables are small).

Table A.1
Old database representativeness by year.

Year	Firm number	Output value	Value added	Employment
1998	100	100	100	91
1999	100	100	100	100
2000	100	100	100	97
2001	99	99	99	97
2002	100	100	100	100
2003	99	99	99	98
2004	100	100	104	101
2005	100	100	100	101
2006	100	100	100	100
2007	100	100	100	101
2008	97	95		96
2009	100	100		100
2009*	94	96		96

*2009 excluding firms without a code (6.2% of the firms in our database in 2009 have no code nor region).

Table A.1 presents the discrepancy for the four variables between the initial data set and the CSYs (ratio: the value of the variable in the initial dataset/the corresponding variable in the CSY).

First observation, our database seems to represent quite well the number of firms with an annual sales income of over 5 million yuan, especially during the period from 1998 to 2007 (we lose 1.3% of the firms in 2001 and 2003). Concerning industrial employment the representativeness of the data set is less clear mainly because of the differences in the definition of the variables. But, except in 1998, the gap is not large.

Second observation, the two last years of our database shows a less good coverage. The line 2009* corresponds to the database without the firms having no code or region and which will not be used in our convergence analysis. However we still have a good coverage in terms of all variables (around 95% of CSD's values for all variables).

We have checked the representativeness of the data set at the level of province, industry and category of types. Due to space limitation, the tables are not shown here but the following observations stand out.

The coverage is the best at the level of firm category, less good at the level of provinces, and the worst at the level of industry. The main issues are the following:

- In 2001 and 2008, the number of firms is under-reported in Non-ferrous metal industries (including the Smelting and Pressing of Non-ferrous Metals industry which represents 4.5% of firms present in our database for other years) and the number of firms is over-reported in the recycling industry.
- The codes of Logging and Transport of Timber and Bamboo industry have changed after 2002 and we have included it in the sector Wood-Paper. In the same way, Recycling and Disposal of Waste is present in the database only since 2003 and we have included it in Other manufacturing.
- In 2003, there is no data for the Tibet (Xizang) province, and half of the firms for Yunnan and Shaanxi provinces are missing.
- In 2008 and 2009, the data set shows a better coverage for Coastal and North-East region provinces than that for the Central and Western provinces.
- The data set over-represents Cooperative firms in 2009.

2— Second we measure the representativeness of the new database (dropping the small firms and those showing abnormal values, as mentioned above). The comparison is presented in Table A.2.

Table A.2
New database representativeness by year.

Year	Firm number	Output Value	VA	Employment
1998	85	92	95	84
1999	91	97	99	95
2000	89	96	97	95
2001	92	97	97	94
2002	94	98	99	97

(*continued on next page*)

Table A.2 *(continued)*

Year	Firm number	Output Value	VA	Employment
2003	95	98	97	96
2004	95	98	101	98
2005	97	98	99	98
2006	97	98	99	98
2007	97	98	98	99
2008	96	94		96
2009	99	100		100
2009*	93	96		95

*2009 without firms without a code (6.2% of the firms in our database in 2009 have no code, nor regions).

Table A.2 shows that we lose from 1% to 15% of the firms, depending of the year, compared with the CSY. The loss is smaller for the other variables (less than 5%, in general, for output, value added and employment); mainly because we dropped small firms (i.e. the ones with less than 8 workers). Moreover, it is likely that the firms which show abnormal values (negative fixed asset, value added or sales) are the small ones.

To sum up, the initial database provides data which are, in general, quite close to that of the China statistical yearbooks, with some exceptions (industry, province and year). The revised database, which excludes the small firms and the firms showing abnormal variable values, is also relatively close to the CSY. Except for 1998, more than 90% of our four main variables (number of firms, value added, output and employment) are covered.

References

Andersson, F. N. G., Edgerton, D. L., & Opper, S. (2013). A matter of time: Revisiting growth convergence in China. *World Development*, *45*, 239–251.

Bergère, M. -C. (1989). *The golden age of the Chinese bourgeoisie.* Cambridge University Press.

Bergère, M. -C., Bianco, L., & Domes, J. (1990). *La Chine du XXème siècle.* D'une révolution à l'autre,1895–1949. Editions Fayard.

Berthélemy, J. -C., & Démurger, S. (2000). Foreign direct investment and economic growth: Theory and application to China. *Review of Development Economics*, *4*, 140–155. http://dx.doi.org/10.1111/1467-9361.00083.

Cai, J., Harrison, A., & Lin, J. (2011). The Pattern of Protection and Economic Growth: Evidence from Chinese Cities. *Mimeo*.

Chen, J., & Fleisher, B. M. (1996). Regional income inequality and economic growth in China. *Journal of Comparative Economics*, *Vol. 22*(2), 141–164 (Elsevier, April).

Chen, A., & Groenewold, N. (2013). Does investment allocation affect the inter-regional output gap in China? A time-series investigation. *China Economic Review*, *26*(2013), 197–206.

Démurger, S., Sachs, J., Woo, W. T., Bao, S., & Chang, G. (2002). Geography, economic policy and regional development in China. *Asian Economic Papers*, *1*(1), 146–195.

Deng, P., & Jefferson, G. (2010). Is inequality bad for China's economic growth? *China Growth Center Discussion Paper Series* (n°8 July).

Deng, P., & Jefferson, G. (2011). Explaining spatial convergence of China's industrial productivity. *Oxford Bulletin of Economics and Statistics*, *73*(6), 818–832.

Feng, L. (2009). New trends in China's regional economic development. In Swee-Hock Saw, & John Wong (Eds.), *Regional economic development in China.* Saw Center for Financial Studies, East Asian Institute, National University of Singapore, Institute of Southeast Asian Studies.

Gaulier, G., Lemoine, F., & Ünal-Kesenci, D. (2007). China's emergence and the reorganisation of trade flows in Asia. *China Economic Review*, *18*, 209–243.

Gipouloux, F. (2009). *La Méditerranée asiatique.* Villes portuaires et réseaux marchands en Chine, au Japon et en Asie du Sud-Est. Editions CNRS, XVIè–XXIè siècle.

Giroir, G. (1999). Processus de développement et dynamiques régionales en Chine. In J. -P. Larivière (Ed.), *La Chine et les Chinois de la diaspora.* SEDES.

Golley, J. (2007). *The dynamic of Chinese regional development.* Market Nature, State Nurture. Edward Elgar Publisher.

Goodman, D. S. (2004). The campaign to "open up the west": National, provincial-level and local perspective. *The China Quarterly*, *178*, 317–334 (N° 178 June).

Hale, G., & Long, C. (2011). Are there productivity spillovers from foreign direct investment in China? *Pacific Economic Review*, *16*(2), 135–153.

Inomata, S., & Ushida, Y. (2009). *Asia beyond the crisis — Visions from international input–output analyses. IDE-JETRO Spot Survey*, No.31, December.

Jefferson, G. H., Rawski, T. G., & Zhang, Y. (2008). Productivity growth and convergence across China industrial economy. *Journal of Chinese Economics and Business Studies*, *6*(2), 121–140 (Reprinted in China Economic Quarterly, 7,3, 809–826, May, 2008).

Jian, T., Sachs, J. D., & Warner, A. M. (1996). Trends in regional inequality in China. *China Economic Review*, *Vol. 7*(1), 1–21 (Elsevier).

Jones, D., Li, C., & Owen, A. L. (2003). *Growth and regional inequality in China during the reform era.* William Davidson Working Paper (no 561, May).

Lardy, N. (1980). Regional growth and income distribution in China. In Dernberger (Ed.), *China's development experience in comparative perspective*. Cambridge, Massachusetts and London: Harvard University Press.

Li, H., Liu, Z. N., & Rebelo, I. (1998). Testing the neoclassical theory of economic growth: Evidence from Chinese provinces. *Economics of Planning*, *31*, 117–132.

Lin, J., Cai, F., & Li, Z. (2002). Social consequences of economic reform in China: An analysis of regional disparity in the transition period. In M. F. Renard (Ed.), *China and its regions: Economic growth and reform in Chinese provinces*. Edward Elgar.

Liu, T. -C., & Yeh, K. -C. (1965). *The economy of Chinese mainland.* National Income and Economic Development. Princeton University Press.

Mayneris, F., Poncet, S., & Zhang, T. (2014). The cleansing effect of minimum wage: Minimum wage rules, firm dynamics and aggregate productivity in China. *CEPII working paper* (No 2014-16).

Meng, B., Wang, Z., & Koopman, R. (2013). How are global value-chains fragmented and extended in China's domestic production networks? *IDE Discussion Paper N°424* (August).

Naugton, B. (2002). Provincial economic growth in China: Causes and consequences of regional differentiation. In M. -F. Renard (Ed.), *China and its regions: Economic growth and reform in Chinese provinces*. Edward Elgar.

OECD (2010). *OECD economic surveys. Vol. 2010/6*, (China, February).

Poncet, S., & Starosta de Waldemar, F. (2015). Product relatedness and firm exports in China. *The World Bank Economic Review* (forthcoming).

Qu, Y., Cai, F., & Zhang, X. (2012). Has the 'flying geese' phenomenon in industrial transformation occurred in China? In McKay Huw, & Ligang Song (Eds.), *Rebalancing and sustaining growth in China*. The Australian National University Press.

Rodrik, D. (2013). Unconditional convergence in manufacturing. *The Quarterly Journal of Economics*, *128*(1), 165–204.

Ruan, J., & Zhang, X. (2010). Do geese migrate domestically? Evidence from the Chinese textile and apparel industry. *IFPRI Discussion Paper* (no 01040, December).

Saw, S. -H., & Wong, J. (Eds.). (2009). *Regional economic development in China.* Saw Center for Financial Studies, East Asian Institute, National University of Singapore, Institute of Southeast Asian Studies.

Wei, H. (2009). Regional economic development in China: Agglomeration and relocation. In S. -H. Saw, & J. Wong (Eds.), *Regional economic development in China*.
WU, H. X. (2014). *Accounting for the sources of growth in Chinese industry, 1980–2010*. ANU China Update (April).

Françoise Lemoine. A graduate of the Institute of Political Studies (IEP) Paris, the University of Paris I (in economics) and INALCO, Françoise Lemoine is adviser with the CEPII (Centre d'Etudes Prospectives et d'Informations Internationales, Paris). She is an associate researcher at the Centre d'études sur la Chine contemporaine (EHESS) and member of the editorial board of the journal China Perspectives. Her research focuses on China's economy and the integration of emerging economies in international trade.
Sandra Poncet is Professor at the University of Paris 1 and scientific advisor at CEPII. She is an associate member at the Paris School of Economics and Senior Fellow at Ferdi. Her research primarily focuses on international trade, economic geography and Chinese economics.
Deniz Ünal is a graduate of the University of Paris I (in international economics and development) and is an economist with the CEPII. She is editor-in-chief of Panorama du CEPII series which offer statistical insights on issues of the world economy. She has worked on trade specialization, regional trade areas, international comparisons of productivity levels, trade in services, China and Turkey. In addition, as a pastime, Deniz Ünal is in charge of Turkish literature with Bleu autour publishing and has translated several books of Turkish modern literature into French under the pseudonym Elif Deniz.