Openness, industrialization and geographic concentration of activities in China•

Maurice Catin°

Xubei Luo*

Christophe Van Huffel°

Abstract: Rapid development, a widening regional gap, and growing concentration of activities have characterized the Chinese economy since the economic reforms in the late 1970s. This paper examines the spatial disparities of the economic concentration in different stages of development from a geographic approach in the case of China. The paper aims at offering empirical support on (i) how concentrated the economic activities are; (ii) what factors determine the economic concentration; and (iii) whether this concentration differs in the coastal and inland regions. The results show that the high-tech industries are concentrated highly in the coastal provinces. The limited diffusion of the labor intensive activities within the coastal region does not significantly modify the major trend of the location and specialization of the industries in the inland region, and does not contribute to narrowing the regional disparities.

The paper argues that in order to stimulate the geographic diffusion of economic activities to the inland region, it is important to appropriately alleviate internal migration control, reduce unnecessary state intervention, and further encourage domestic market integration.

Key Words: China, stages of development, specialization, spatial concentration.

JEL Code: F15, L60, O53, R12.

World Bank Policy Research Working Paper 3706, September 2005

• We would like to thank Jean-Jacques Dethier, Shahrokh Fardoust, Alan Gelb, Gillmore Hoefdraad, Bert Hofman, Russell Pittman, and Mark Sundberg for helpful comments, and participants at the Workshop on Economic Development and Transition (Journées de l'Association Française de Science Economique) in Clermont-Ferrand, May 2005, for fruitful discussions.

° CRERI, University of South Toulon-Var, France.

* World Bank, Development Economics Vice Presidency.

1. INTRODUCTION

The Chinese economy has grown rapidly since the reforms in 1978 at the expense of a widening development gap between the coastal and inland regions (see for example, Chen and Fleisher, 1996; Kanbur and Zhang, 1999; Lee, 2000; Kim and Knaap, 2001; Hu, 2002; Wu, 2002; Luo, 2003).[1] Built on the advantageous geographic positions, the gradual open-door policies have contributed to the rapid take-off of the coastal provinces (Gao, 2004; Fu, 2004; Zhang, 2001; Jones, Li and Owen, 2003; Fujita and Hu, 2001; Wen, 2004). For example, in 2003, 25 years after the reforms, the coastal provinces had around 85% of total Foreign Direct Investment (FDI), and more than 90% of total foreign trade of China.[2] We argue that the selective policy inclination and the gradual extension of the open-door policies biased growth in favor of the coastal areas beyond the natural advantages this region already had (Léon, 1998; Démurger, 2001; Luo, 2001).

Many empirical studies and theoretical models have tried to retrace the trajectories of urban concentration during the major stages of development (see for example, Williamson, 1965; Wheaton and Shishido, 1981; Mac Kellar and Vining, 1985; Henderson, 2000). To our knowledge, few studies examine the spatial disparities and the polarization/dispersion forces at the different stages of development in China. In the context of developing countries, three great stages are worthy of consideration: the 1st stage, pre-industrial, which is characterized by a low income per capita and a weak urban concentration; the 2nd stage, where the economic take-off and the industrialization process push the urban concentration and the polarization of activities; the 3rd stage, where, with a concentration of the technological industries and a diffusion of the labor intensive industries, the widening of the regional inequalities and the concentration of activities in urban areas decelerate and then decrease when the GDP per capita approaches the threshold level of $5000 (constant 1985).[3]

China is a good candidate for a country case study that examines the spatial disparities of economic concentration in different stages of development using a geographic approach. On the one hand, openness may reinforce polarization, which characterizes the 2nd stage of development; while on the other hand, the progressive transition of the coastal region to the 3rd stage may lead to a relative diffusion of the labor intensive activities.

This paper presents an early attempt to offer empirical support on (i) how concentrated the economic activities are in China; (ii) what factors determine the economic concentration, and (iii) whether the concentration differs in the coastal and inland regions. We test two hypotheses in different stages of development with regard to both China as a country and the coastal provinces as a region: first, whether the openness has reinforced a polarization process that characterized the

[1] In general, according to the criterion of geographic position, we classify Chinese provinces into three categories: coastal, central, and west. According to the regional classification of the "Statistics of China's Fixed Assets and Investment 1950-1985," the coastal region includes Liaoning, Hebei, Beijing, Tianjin, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, Hainan; the central region includes Heilongjiang, Jilin, Nei Mongol, Shanxi, Henan, Anhui, Hubei, Hunan, Jiangxi; the western region includes Guangxi, Shaanxi, Gansu, Ningxia, Qinghai, Xinjiang, Chongqing, Sichuan, Yunnan, Guizhou, Xizang. The central region and the western region are considered as the inland regions. See annex 1 for more details.

[2] Data source: China Statistical Yearbook, 2004.

[3] See Catin and Van Huffel (2003).

2nd stage of development; second, whether the progressive transition to the 3rd stage – the specialization in high-tech industries – of the costal region leads to a diffusion of the labor intensive activities to the inland provinces. We study whether the labor intensive industries move inland from the coast when looking at the country as a whole; and we study whether these industries move within the region when looking at the coastal region alone. Of course, the economic concentration may depend on a number of factors. The study presented here is subject to data constraints. The objective of this analysis is to provide a first step in understanding the complexities of the spatial disparities of economic concentration in different stages of development in a broader context.

The study is structured as follows: In section 2, we study the polarized development in China, and describe how the gradual open-door policies and the inflow of FDI have led to a strong concentration of the activities and an upgrade of the production structure in the coastal provinces. In section 3, we empirically examine the determination of the geographic concentration of different industries using panel data at the provincial level of the period 1988-97. The conclusions are presented in section 4.

2. POLARIZED DEVELOPMENT IN CHINA

2.1. Polarization related to openness and foreign direct investment

Since the early 1980s, the government of China has gradually extended the open-door policies from the coast to the inland (see map 1). In 1980, the first Special Economic Zones (SEZ) were established in four cities (Shenzhen, Zhuhai, Shantou, and Xiamen) in the coastal provinces Guangdong and Fujian, hometowns of many oversea Chinese investors, to attract FDI.[4] In order to scale up the success to the entire coastal region, the open-door policies were further extended to 14 coastal cities in 1984, to the Delta of Yangtze, the Delta of the Pearl River, and the Delta of Minnan in 1985, and to Hainan in 1988. After the coastal region took-off in the 1980s, the open-door policies were gradually extended to the inland region in the 1990s.

Thanks to special fiscal status and privileges, the coastal region developed into a huge export-oriented workshop. Jones, Li and Owen (2003) study the growth of 200 Chinese cities, and show that the SEZs and the open coastal cities grew at 5.5 and 3 percentage points, respectively, faster than the national average. In 1999, the GDP of the SEZs reached 44.2 billion dollars, which was about 15 times higher than the level achieved before these zones were established in the late 1970s. The exports of the SEZs reached 36 billion dollars, which reflected more than 20% of the total of the entire China. [5] China became a key actor of the international trade thanks to the rapid integration of its coastal region to the world economy since the 1980s (Golub, 1999). In the early 2000s, China became the fourth largest economic power in international trade with a world export market share of 6.1% (Conférence des Nations Unies sur le Commerce et le

[4] The Special Economic Zones have a status close to that of the duty-free zones (where are these duty-free zones) that allows the experimentation of the western management modes.

[5] Data source: Official website of the embassy of China, www.amb-chine.fr/Documents/ Economique/Eco-news/tequ1116.htm.

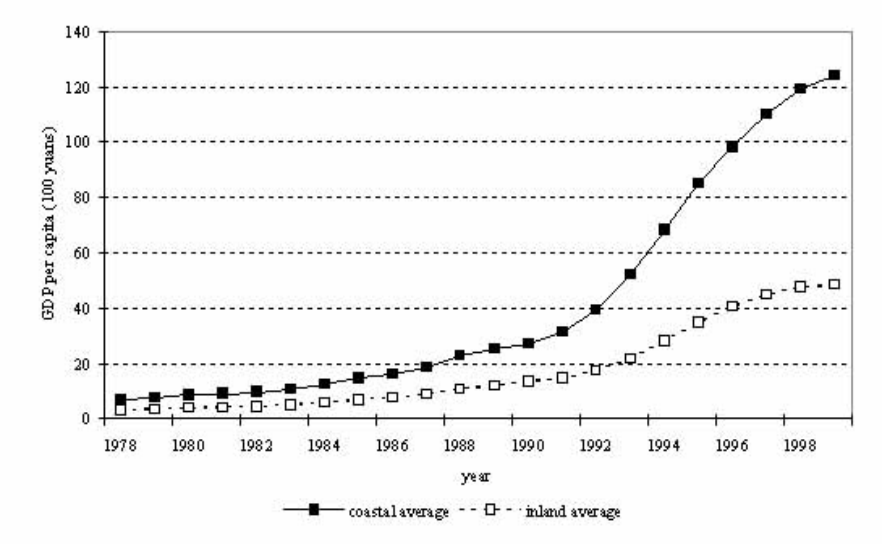
Développement , *World Investment Report*, 2002).

Map 1: Spatial Gradualism of the open-door policies in China

The development of the export sectors and the inflow of the FDI contribute to a rapid growth of the coastal provinces (see Fujita and Hu, 2001). The manufacturing industries have become increasingly concentrated since the economic reforms (Wen, 2004). In the 1990s, the coastal region developed much faster than the western region – the average annual growth rate of real GDP per capita of the former was around 11%, while that of the latter was less than 8% (see table 1). However, the rapid growth of the coastal region has not had the expected positive spillover impacts on the Western provinces, and the regional disparities increased (Chai, 1996). Kanbur and Zhang (1999) argue that the urban-rural inequality, a major component of the total inequality in China, tends to stay unchanged; while the coastal-inland inequality significantly increases.[6] Luo (2003) reaches similar conclusions by decomposing the Theil index (see graph 2). The regional development gap widened thereof – the coastal region emerged as the economic center, while the inland region lagged behind as the periphery.

[6] See also Chen and Fleisher (1996) and Wei (2002).

Graph 1: The GDP per capita of the coastal and inland regions (1978-1999)



Source : Luo (2003).

The foreign owned export-oriented assembly firms rapidly developed in the coastal region.[7] For example, in 2001, at the national level, 31.3% of the total industrial production was carried out by multinational firms. However, this national average masks the overwhelming inequalities at the provincial level: 2.4% in Xinjiang, 58% in Tianjin, 61% in Guangdong, and 65% in Fujian (Amiti and Javorcik, 2004). The distribution of foreign firms is also highly unequal across sectors: in some technology-intensive sectors, such as photocopier, computer, communication equipments or integrated circuits, more than three-quarters of the total industrial production is carried out by the foreign enterprises. The inequalities are more significant if we look at the numbers of the new foreign firms established recently in different provinces: in 2001, Guangdong and Zhejiang each hosted around 600 new foreign firms, while not one of the central or western provinces received more than 40 new foreign projects (Amiti and Javorcik, 2004). Being aware of such regional inequalities, the central government tried to canalize the foreign investments to the inland region in the late 1990s. However, the success was limited.

Resources continue to concentrate and the agglomeration effects cumulate. The international openness accentuates the economic concentration in the coastal region (Zhang, 2001). Between 1993 and 2002, the exports of the coastal region increased from 78.8% to 91.5% at the expense of the inland region (although the absolute volume of export of the inland region noticeably increased) (Fu, 2004). In 2002, more than 60% of the exports of China concentrated in the Delta of the Pearl River and the Delta of Yangtze.[8] The export-oriented firms, even those that produce labor-intensive standardized manufacturing products, concentrate near the large ports rather than moving to the inland areas.

[7] See Fu (2004).
[8] Data source: China foreign economic statistical yearbooks.

Table 1:GDP per capita of the Chinese provinces

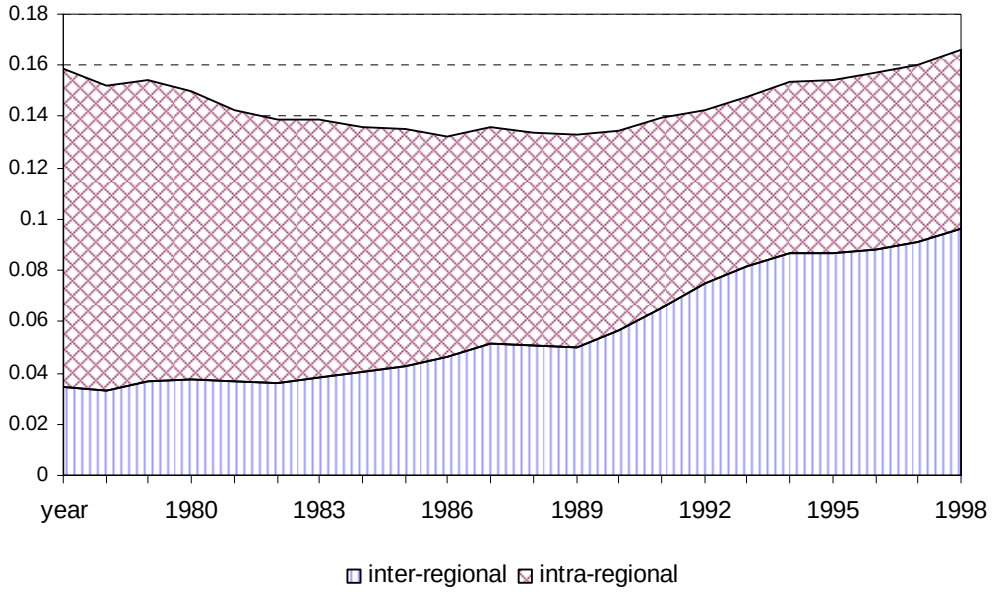
	Real GDP per capita				Average annual GDP per capita growth rate (%)		
	(hundreds of yuan 1978)						
	1978	1985	1992	1999	79-89	90-99	79-99
Coastal Region	**4.9**	**9.1**	**16.1**	**36.3**	**8.5**	**10.9**	**9.7**
1 Beijing	12.5	21.1	33.6	62.2	7.0	8.4	7.7
2 Tianjin	11.4	19.4	27.1	56.6	6.1	9.3	7.6
3 Hebei	3.6	5.9	9.9	22.4	7.0	10.5	8.7
6 Liaoning	6.8	11.1	17.6	31.6	7.2	7.5	7.4
9 Shanghai	24.8	40.3	61.6	140.7	6.7	10.6	8.7
10 Jiangsu	4.3	8.7	17.2	40.8	9.9	11.6	10.8
11 Zhejiang	3.3	8.1	15.3	38.0	10.7	12.7	11.6
13 Fujian	2.7	5.7	11.0	29.0	9.7	13.0	11.3
15 Shandong	3.2	6.1	11.0	26.1	8.7	11.6	10.1
19 Guangdong	3.7	7.3	16.4	36.0	10.1	11.8	10.9
Central Region	**3.1**	**5.6**	**8.4**	**16.9**	**7.3**	**8.8**	**8.1**
4 Shanxi	3.6	6.4	9.1	16.1	6.7	7.5	7.1
5 Nei Mongol	3.2	6.3	9.6	17.5	8.2	8.0	8.1
7 Jilin	3.8	6.7	11.0	21.2	8.0	8.3	8.2
8 Heilongjiang	5.6	8.4	12.2	21.0	5.6	7.1	6.3
12 Anhui	2.4	4.8	6.6	15.5	8.1	9.7	8.8
14 Jiangxi	2.7	4.9	7.8	16.2	7.5	9.6	8.5
16 Henan	2.3	4.5	7.0	14.8	8.3	9.4	8.9
17 Hubei	3.3	6.6	9.7	21.1	8.1	9.6	8.8
18 Hunan	2.9	4.6	7.0	13.6	6.4	8.7	7.5
Western Region	**2.5**	**4.5**	**7.0**	**12.6**	**7.3**	**7.9**	**7.6**
20 Guangxi	2.2	3.3	5.3	10.6	5.2	10.0	7.4
21 Sichuan	2.5	4.8	7.4	13.6	7.7	8.4	8.0
22 Guizhou	1.7	3.3	4.7	7.7	7.7	6.3	7.1
23 Yunnan	2.2	4.0	6.5	11.4	7.9	7.6	7.8
24 Shaanxi	2.9	5.0	7.8	14.2	7.8	7.2	7.5
25 Gansu	3.5	5.2	8.4	14.9	6.7	7.2	6.9
26 Qinghai	4.3	6.3	8.1	13.6	4.8	6.3	5.5
27 Ningxia	3.7	6.2	8.9	15.3	7.1	6.5	6.8
28 Xinjiang	3.1	6.2	11.0	17.7	8.7	7.6	8.2
Total China	**3.6**	**6.6**	**10.9**	**22.9**	**7.9**	**9.8**	**8.9**

Data source : *China Statistical Yearbooks* and authors' calculations. The data of Chongqing are included in Sichuan for a better coherence; Hainan (an island and a Special Economic Zone) and Xizang are excluded for their special characteristics.

As argued by Léon (1998), the development in China is polarized in the coastal region. The infrastructure investment has not kept pace with the demand, which hinders the spillover of the economic development to the entire territory. The difference in the cumulative regional growth results in the widening of the intra-national disparities.

Graph 2: The regional inequalities in China

(Coastal vs. inland regions)



Source : Luo (2003). The value of the Theil index is equal to zero if the distribution (here, the distribution of real GDP per capita) is uniform; it is equal to 1 if the distribution is extremely unequal.

2.2. Polarization related to the process of industrialization

Many theoretical and empirical works have tried to retrace the evolution of the regional inequalities and the trajectories of urban concentration, which characterize the major stages of development.

The empirical studies by Williamson (1965), Wheaton and Shishido (1981), Hansen (1990), Mac Kellar and Vining (1995), Ades and Glaeser (1995), Moomaw and Shatter (1996), Henderson (2000), and Henderson, Shalizi and Venables (2001), focus on the degree of urban concentration in the process of development, and suggest that, beyond the threshold of income per capita of US$5000 (the so-called "rule of $5000" by Kellar and Vining (1995)), the urban concentration in a country tends to decelerate or reduce.[9] Catin and Van Huffel (2003) argue that three major stages of development can be used to characterize the developing countries: the 1st stage, pre-industrial, where the per capita income and the urban concentration are weak; the 2nd stage, where the industrial process leads to the development and the polarization of the labor intensive activities; and the 3rd stage, where, with the concentration of the technological industries and the diffusion of the labor intensive activities, the widening of the regional disparities slows down and then decreases when the GDP per capita reaches the threshold of $5000 (constant 1985).

[9] The critical threshold of $5000 (1985), beyond which the urban de-concentration appears, corresponds to the GDP per capita of $2000 (1970), as suggested by Wheaton and Shishido (1981).

In this regard, various models of the new geographic economics show the major forces of polarization and urban-regional dispersion of activities in the three stages of development from different angles: 1). the center/periphery model (Krugman, 1991a and 1991b) and its extensions, which take the agglomeration and the dynamism of the endogenous growth into account (see the literature review in Catin and Ghio, 2000) and examine the different stages of development (Catin and Ghio, 1999, 2004); 2). the multi-regional models of industrial agglomeration (Fujita and Thisse, 2001 and 2002); 3). the model of urban economic geography applied to the developing countries (Krugman and Livas Elizondo, 1996) and its extensions (Ghio and Van Huffel, 1999; Catin, Ghio and Van Huffel, 2001, 2002; Alonso-Villar, 2001); and 4). the "historical" typology (Duranton, 1997 and 1999), etc.

The strong polarization, combined with the reduction of transport costs and the increase of productivities (resulted from the internal and external economy of scale), characterizes the 2nd stage of development – urbanization and industrialization. From the economic history of today's developed countries, we can find numbers of examples of regional urban concentration of activities in the period of pre-industrialization – the establishment of the American "industrial belt" in the second half of the 19th century (Krugman, 1991a; 1991b), the increase of the disparities between the eastern and western regions in France in the 19th century and the early 20th century (Catin and Van Huffel, 2003), etc. The urban concentration is even more unbalanced in the developing countries in the current world (Puga, 1998)

We can consider that all of China is characterized by the 2nd stage of development, with a GDP per capita of around $4020 (adjusted by the Purchasing Power Parity) in 2001, which corresponds to about $2500 (constant 1985). In parallel, China witnessed a growing polarization of the economic activities. Different cumulative process tends to lead to the centre/periphery pattern of development and widens the spatial disparities in favor of the coastal provinces. FDI concentrates in the coastal region. The inter-regional diffusion of growth is limited, and the western region lags behind (Brun, Combes and Renard, 2002; Catin and Van Huffel, 2004a; Cheng and Kwan, 2000).

2.3. Polarization of high-tech activities and diffusion of labor intensive activities

In general, during the 3rd stage of development, the urban regional inequalities continue to increase but at a lower speed. On the one hand, the economy of agglomeration in the more developed urban regions encourages the concentration of the high-tech industries (Catin, 1995). On the other hand, the centrifugal forces become apparent and progressively attenuate the initial spatial polarizations, so that the peripheral regions begin to attract the footloose labor intensive industries, which are sensitive to factor costs.[10]

In China, the coastal provinces are more or less at the 3rd stage: it is particularly clear for Shanghai (with a GDP per capita 6 times the national

[10] See also Ng and Tuan, 2003; He, 2003.

average in 1999), Beijing and Tianjin (more than 2.5 times the national average), Jiangsu, Zhejiang and Guangdong (between 1.5 and 2 times the national average). During the period of 1990-2000, the textile exports of the coastal region decreased from 32% to 26% (compared to their total exports), and that of the electric and electronic materials increased from 11% to 33%, although the latter were mainly assembly activities. Through import diversification, the increasing openness also leads to an upgrade of the production structure. In 1999, 69% of the imports in China were intermediate products, which enabled China to have a greater variety and a better combination of inputs. With an average high-tech content of 15%[11], the imports greatly encourage the transfer of technology and the modernization in China (Lemoine and Ünal-Kesenci, 2002).

The giant scale of the Chinese market is becoming increasingly attractive to foreign investors. FDI increased in the Delta of Yangtze, a region with good access to the domestic market, from 25% of the total in 1996 to 35% in 2002.[12] In particular, the FDI strongly contributed to an acceleration of the specialization. In 1999, more than two-thirds of the assembly trade in high-tech industries was carried out by the subsidiaries of foreign firms (Lemoine and Ünal-Kesenci, 2002). The FDI in the Research & Development (R&D) activities, which did not exist until 1986, has grown rapidly. However, the FDI in R&D activities is still limited (in 2002, R&D activities was around 0.5% of the total foreign investments), its distribution is highly unequal across provinces. Cheung and Lin (2004) show that there exists a positive and significant relation between the amount of FDI and the number of patents registered by domestic firms, although most of these patents are minor innovations. Using a sample of the large and medium enterprises in the electronic and textile sectors, Hu and Jefferson (2002) show that the productivity of the firms with foreign participation is higher. If, in the short-run, the competition from the foreign firms may reduce the productivity of the domestic firms; in the long-run, by contrast, it will benefit those domestic firms that survive.

For example, in Shenzhen, with an annual growth rate of 50%, the production of the high-tech sector reached 46% of total industrial production in 2002 (compared to 11% in 1991). This city has hence become a principal technology pole in China, and it has attracted the investments from many large world-class high-tech companies, such as IBM, Compaq, Sanyo, Olympus (Marti, 2003). In the Delta of Yangtze, the zone of Pudong hosts 87 R&D centers and 303 high-tech enterprises (information and communication technologies, bio-technologies), of which the production represents 42.6% of its regional GDP. In China, the regional specializations change with the deepening of the openness and the participation in international division of labor. Brun, Combes and Renard (2002) show that, thanks to the open-door policies and the advantageous geographic positions, firms located in the coastal provinces benefit from a larger economy of scale. The economy of urbanization (externality of the type of Jacobs) strengthens the concentration of activities. A sector grows faster when it benefits from a diversified local environment (Batisse, 2002). Naughton (2002) and Kraay (2002) show that the gap of competitiveness in manufacturing can explain most of the difference of regional growth in China: the increase in productivity is one of the major reasons that leads to the rapid growth of the South-East provinces;

[11] For the sake of comparison, this ratio is 4% in India.
[12] Data source: China Statistical Yearbook.

while the inefficiency of the aging heavy industries results in the relative decline of the Northern provinces.

3. THE SPATIAL CONCENTRATION OF TECHNOLOGY AND LABOR INTENSIVE INDUSTRIES: A TEST WITH PANEL DATA

3.1. Statistics

The strong overall industrial growth in China masks overwhelming differences at the sectorial level. The Chinese industrial economic statistical yearbooks classify the industries in 30 groups[13]. We divide these 30 industries into 2 large categories: 4 high-tech industries (electronic and telecommunications equipment manufacturing; instruments, meters and other measuring equipment manufacturing; medical and pharmaceutical products; and electric equipment and machinery manufacturing) as category A, and the other 26 industries as category B. Among the 26 industries of category B, we further divide them into two sub-categories: 9 industries as category C "primary materials, energy and foodstuffs", and the other 17 industries as category D "labor intensive industries".[14]

We measure the importance of a category of industry in time t, noted as $ICAT_{cate,t}$, by the ratio of the value-added of all the industries of the category in question (A, B, C, or D) to the value-added of the entire 30 industries:

$$ICAT_{cate,t} = \frac{\sum_{j} \sum_{i \in cate} va_{i,j,t}}{\sum_{j} \sum_{i \in 30} va_{i,j,t}},$$

where j stands for the provinces, i the industries, t the year, $cate$ the category, and va the value–added of the industry.

Our results show that the high-tech industries grew more rapidly than the labor intensive industries. In 1988, the value added of the industries of category A represented only 12% of the total value-added, while it increased to 16% in 1997. To a large extent, the growth of the industries of category B is pulled up by that of the industries of category C – the value-added of the industries of category C was 24% of the entire category B in 1988, and 38% in 1997. In contrast, the value-added of the industries of category D was more than two-thirds of that of all the industries in 1988, but only about a half in 1997.

The relative decline of the labor intensive industries and the rapid growth of the high-tech industries imply an upgrade of the production structure in China. However, this upgrade is not equally distributed across the entire territory. The

[13] We focus our analysis using the data of 1988-1994 and 1997 for those of 1995 and 1996 are not available, and the industry classification changes after 1998.
[14] See more detail in Table 2.

ratio of the value-added of the high-tech industries to that of all the industries was around 8% in the inland provinces throughout the whole period of 1988-1997, while such ratio increased from 13% to 18% in the coastal provinces.

Following Wen (2004) and Amiti and Wen (2001), we measure the degree of geographic concentration of an industry by calculating its Gini coefficient as follows:

$$G_i = \frac{1}{2n \times n \times \bar{s}_i} \sum_{k=1}^{n} \sum_{j=1}^{n} \left| s_{ij} - s_{ik} \right|$$

where s_{ij} stands for the ratio of the value-added of the industry i to the industrial value-added of province j; s_{ik} the ratio of the value-added of industry i to the industrial value-added of province k; n the number of provinces (here, n=30); $\bar{s}_i$ the average portion of the industry i in comparison of the entire 30 industries.

If the industry i is equally distributed among all provinces, G_i is equal to zero; if the industry i is concentrated in only one province, the value of G_i approaches 1. In other words, the higher the value of G_i, the more concentrated the industry i.

As the primary material industries and the non-manufactured industries are highly dependent on factor endowments, these are the most geographically concentrated (table 2). For example, the industries of “petroleum and natural gas extraction” and “ferrous metals mining and preparation” are the least dispersed. By contrast, the industries of category D, except some specific products, are most equally distributed.

Table 2 – The geographic concentration of the industries in China: Gini coefficients

Category	Code	Industry	Gini (1988)	Gini (1997)
A	8	Electronic and telecommunications equipment manufacturing	0.45	0.64
A	12	Instruments, meters and other measuring equipment manufacturing	0.40	0.47
A	7	Electric equipment and machinery manufacturing	0.28	0.39
A	16	Medical and pharmaceutical products	0.27	0.32
Average of category A			**0.35**	**0.46**
C	9	Ferrous metals mining and preparation	0.83	0.68
C	20	Petroleum and natural gas extraction	0.80	0.76
C	14	Logging and transport of timber and bamboo	0.75	0.79
C	5	Coal mining and preparation	0.59	0.61
C	29	Tobacco manufacturing	0.53	0.65
C	28	Timber processing, bamboo, cane, palm bibber and straw products	0.43	0.44
C	25	Running water production and supply	0.36	0.31
C	22	Power generation, steam and hot water production and supply	0.27	0.20
C	10	Food manufacture	0.26	0.34
Average of category C			**0.53**	**0.53**
D	6	Cultural, educational and sports articles manufacturing	0.58	0.65
D	2	Chemical fibers	0.58	0.58
D	11	Furniture manufacturing	0.42	0.29
D	13	Leather, furs and manufactured goods	0.40	0.48
D	30	Transportation equipment manufacturing	0.39	0.45
D	26	Smelting and pressing of ferrous metals	0.38	0.45
D	24	Rubbers manufactured goods	0.37	0.48
D	4	Clothing and other chemical fiber products	0.31	0.50
D	1	Beverage manufacturing	0.30	0.61
D	21	Plastics manufactured goods	0.29	0.37
D	27	Textile	0.29	0.40
D	18	Non-metal mineral products	0.28	0.25
D	19	Paper making and manufactured goods	0.27	0.34
D	3	Chemical material and products manufacturing	0.26	0.21
D	23	Printing and record medium manufacturing	0.22	0.29
D	17	Metal products	0.22	0.25
D	15	Construction materials	0.20	0.31*
Average of category D			**0.34**	**0.41**
Average of category B			**0.40**	**0.44**

Note: *The Gini coefficient of industry 15 is the value of 1994, for the data of 1997 is missing.

During 1988-97, at the national level, the high-tech industries (category A) became more and more concentrated (G_i increased from 0.35 to 0.46), while the Gini coefficient of the non high-tech industries (category B) hardly changed. Most

of the high-tech industries tend to concentrate in the relatively developed coastal provinces.

Table 3 – The geographic concentration of some industries in the coastal region: Gini coefficients

Category	Code	Industry	Gini (1988)	Gini (1997)
A	8	Electronic and telecommunications equipment manufacturing	0.27	0.42
A	12	Instruments, meters and other measuring equipment manufacturing	0.33	0.31
A	7	Electric equipment and machinery manufacturing	0.25	0.22
A	16	Medical and pharmaceutical products	0.16	0.21
Average of category A			**0.25**	**0.29**
C	28	Timber processing, bamboo, cane, palm bibber and straw products	0.41	0.31
Average of category C			**0.52**	**0.49**
D	3	Chemical material and products manufacturing	0.24	0.15
Average of category D			**0.26**	**0.28**
Average of category B			**0.34**	**0.34**

However, table 3 shows that industries are less concentrated in the coastal provinces, which are at the 3rd stage of development, than in the entire territory. In the coastal region, the high-tech industries are not highly concentrated – the value of the Gini coefficient was 0.25 and 0.29 in 1988 and 1997 respectively. The concentration of the industries "electronic and telecommunications equipment manufacturing" and "medical and pharmaceutical products" increased, but that of the industries "instruments, meters and other measuring equipment manufacturing" and "electric equipment and machinery manufacturing" slightly decreased. At the national level, the concentration of the non high-tech industries increased (Gini of category B increased from 0.40 to 0.44); in the coastal region, it stayed at 0.34. Some industries, such as the "timber processing, bamboo, cane, palm bibber and straw products" and the "chemical material and products manufacturing" became much less concentrated in the coastal region.

In the following sections, we will empirically study whether the relative concentration of the high-tech industries in the coastal provinces results in a relocation of some labor intensive activities to the provinces that are at a lower stage of development.

3.2. Description of the variables

We will study the determinants of the concentration of different industries at the national level and at the regional level (coastal / inland). We measure the relative concentration of industry i (i=1…30) in province j (j=1…30) in time

t (t=1988….1994, 1997) by an indicator of specialization, noted as $IS_{i,j,t}$, as follows:

$$IS_{i,j,t} = \frac{\dfrac{va_{i,j,t}}{\sum_j va_{i,j,t}}}{\dfrac{\sum_i va_{i,j,t}}{\sum_i \sum_j va_{i,j,t}}}$$

In a relative sense, the more specialized a province j is in the industry i in time t, the higher is the value of this indicator. We examine the impacts of the FDI, the level of the economic development, the dynamism of the neighbor regions, and the population growth on this specialization.

To capture the effects of the FDI on the concentration of the industries, we introduce the indicator "openness ", noted as $FDIOVER_{j,t}$, which is measured by the ratio of the FDI to the GDP of the province j in time t in logarithmic form. [15]

If we follow the hypotheses that the Chinese provinces are at different stages of development, we may expect that, the development level of one province may condition the types of industries it hosts. To capture the role of the stage of development, we introduce a variable "initial development level", noted as $yt_{j,t-1}$, measured by the real GDP per capita of province j in time t–1 in logarithmic form.

The location choice of firms does not only depend on conditions of the hosting province, but also those of the neighboring provinces. For example, a firm may choose to establish in Zhejiang in order to have good access to the market of Shanghai. A province surrounded by dynamic neighbors may be more attractive to some industries. To measure the influence that one province may receive from its partners, in other words, the growth spillover effects that the immediate neighbor[16] have on the performance of the province in question, we construct our indicator "neighbor performance", noted as $GAW_{i,t}$, which is defined as the weighted average of the growth rate of the neighbor provinces.[17]

$$GAW_{i,t} = \sum_{q=1}^{m_i} (ga_{q,t} \times impor\tan ce_{i,q,t})$$

[15] Because the information of the FDI by sector in each province of the period in question is not available, we have to use the total volume of FDI without distinguishing the hosting sectors.

[16] For the sake of simplicity, we limit the "neighbors" as the provinces that share common borders, and do not take into account the linkages through inland waterway. See Poncet (2003) and Amiti and Javorcik (2004) for discussions on the strong border effect among the Chinese provinces. And see, for example, Evenett and Keller (1998), Bergstrand (1985), and Deardorff (1995), for further discussions on the significant negative role of the distance on bilateral trade.

[17] See Luo (2005).

where $impor\tan ce_{i,q,t} = \frac{GDP_{q,t}}{\sum_{q=1}^{m_i} GDP_{q,t}}$, $ga_{q,t} = \ln(y_{q,t}) - \ln(y_{q,t-1})$, $y_{q,t}$ stands for the real GDP per capita of the neighbor province q in time t, and m_i the number of the neighbor province of i. In our case, m_i is an integer between 2 and 8.[18] The value of $GAW_{i,t}$ is conditioned by the growth rate of the neighbor provinces q, $ga_{q,t}$. The influence of the growth rate of each neighbor province q is conditioned by its economic size relative to all the m_i provinces surrounding province i.

In order to control for the effects of the labor supply, we introduce the variable $GPOP_{j,t}$, which measures the population growth of the province j in time t.

Hence, for each industry i, we estimate separately the following model in panel with fixed effects using the data of 1988-1997 at the provincial level:[19]

$$IS_{i,j,t} = \alpha + \beta_1 FDIOVER_{j,t} + \beta_2 yt_{j,t-1} + \beta_3 GAW_{j,t-1} + \beta_4 GPOP_{j,t} + \varepsilon_{j,t}$$

We will study the geographic concentration of activities and the change in location of the non high-tech industries at the national level in section 3.3; and at the regional level in section 3.4.

3.3. Geographic concentration of activities at the national level

Our econometric results are mixed. They suggest that the geographic concentration of activities differs across industries. For the sake of readability, we only present the determination of the concentration of some representative industries: two high-tech industries that are the most concentrated ("electronic and telecommunications equipment manufacturing" and "instruments, meters and other measuring equipment manufacturing"), one less concentrated labor intensive industry ("chemical material and products manufacturing"), and one relatively concentrated industry that is based on natural comparative advantages ("timber processing, bamboo, cane, palm bibber and straw products")[20].

Table 4 shows that openess plays a positive role in the concentration of the labor intensive industry "chemical material and products manufacturing" and the primary material industry "timber processing, bamboo, cane, palm bibber and straw products".[21] However, it plays a negative role in the high-tech industries "electronic and telecommunications equipment manufacturing" and "instruments, meters and other measuring equipment manufacturing". In the case of China, FDI

[18] For example, Shanghai has only 2 neighbors (Zhejiang and Jiangsu); while, Sichuan has 8 neighbors (Gansu, Qinghai, Xizang, Yunnan, Guizhou, Hunan, Hubei, and Shaanxi).

[19] The results presented in the paper are based on fixed-effect estimations. The estimations of the two-step GMM with two year-lagged dependent variables as IV matrix do not suggest the superiority of the GMM over the fixed-effects estimations.

[20] Not each independent variable plays a significant role in the determination of the concentration of all industries. In addition, some industries only concentrate in a very limited number of provinces, for example, tobacco in Yunnan. We exclude these from our analysis. The results of the estimations of the 30 industries at the national level and at the regional level are available upon request.

[21] The role of openness is significant in the former but insignificant in the latter.

is associated with a concentration of the labor-intensive industries. This corresponds to the fact that in the late 1980s and early 1990s most FDI came from the Asian economies (in particular, Hong Kong), and was largely directed towards export processing industries in the sectors that China had revealed comparative advantages (The World Bank, 2001).

The results show that the high-tech industries and the labor intensive industries concentrate in the provinces with different characteristics. The initial development level ($yt_{j,t-1}$) and the growth of the neighbor provinces ($GAW_{i,t}$) play a significantly negative role on the concentration of the chemical industry. It suggests that chemical firms tend to agglomerate in the provinces that are relatively less developed and surrounded by less dynamic neighbors. The concentration of the industry "timber processing, bamboo, cane, palm bibber and straw products" is negatively associated with the initial development level $yt_{j,t-1}$, which shows that the less developed provinces are more attractive to the natural resource-intensive industries, other things being equal. By contrast, the roles of openness, the initial development and the growth of the neighbor provinces are completely different in the determination of the concentration of the two high-tech industries "electronic and telecommunications equipment manufacturing" and "instruments, meters and other measuring equipment manufacturing" from that of the two non high-tech industries. These activities tend to concentrate in the rich provinces with a relatively low FDI to GDP ratio and surrounded by dynamic neighbors.[22]

Table 4 – The determination of the concentration of some representative industries at the national level

	Chemical material and products manufacturing (3)	Electronic and telecommunications equipment manufacturing (8)	Instruments, meters and other measuring equipment manufacturing (12)	Timber processing, bamboo, cane, palm bibber and straw products (28)
$FDIOVER_{j,t}$	0.061***	-0.084***	-0.122***	0.037
	(3.18)	(-3.62)	(-4.55)	(1.28)
$yt_{j,t-1}$	-0.1789**	0.213**	0.271**	-0.287**
	(-2.34)	(2.20)	(2.39)	(-2.33)
$GAW_{j,t-1}$	-0.979**	1.316**	1.249**	-0.016
	(-2.29)	(2.55)	(2.08)	(-0.02)
$GPOP_{j,t}$	-6.343**	8.259**	3.205	-6.148
	(-2.39)	(2.62)	(0.86)	(-1.52)
Constant	1.918***	-0.289	-0.486	2.042***
	(6.68)	(0.84)	(-1.21)	(4.68)
No. of obs.	219	216	219	219
Adjusted R sq.	0.0748	0.0974	0.1088	0.038

Note: *t*-students are in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

[22] Here, we argue that one important factor that attracts FDI is the low labor costs. The relation between FDI and high-tech industry concentration would be an interesting topic for future research.

3.4. Geographic concentration of activities at the regional level

Given the difference in the stages of development between the coastal region and the inland region, we estimate the determination of the concentration of each category of industries at the regional level (coastal/inland).

Table 5 shows the sharp contrast in the determination of the concentration of the four representative industries in the coastal and inland regions. The role of openness is mixed. The results offer no support that large FDI inflow encourages the concentration of high-tech industries, which corresponds to the reality of the limited foreign investments in R&D in China. In the period of our study, most multinational firms were specialized in labor intensive activities. FDI did encourage the concentration of the non high-tech industries in the coastal provinces.

The relatively developed coastal provinces seem to be attractive to the two high-tech industries. However, an inland province with a relative high level of initial development is not attractive to these high-tech industries. It implies a strong tendency that the high-tech industries concentrate in the coastal poles. As to the non high-tech industries (chemical and bamboo), in the inland regions, the geographic concentration is independent of the level of development and most of the other variables listed above. By contrast, in the coastal region, provinces with a relatively low development level seem more attractive to the labor intensive industries. We argue that the diffusion of the labor intensive industries is limited within the coastal region.

Table 5 – The determination of the concentration of some representative industries at the regional level

	Chemical material and products manufacturing (3)		Electronic and telecommunications equipment manufacturing (8)		Instruments, meters and other measuring equipment manufacturing (12)		Timber processing, bamboo, cane, palm bibber and straw products (28)	
	coast	inland	coast	inland	Coast	inland	coast	inland
$FDIOVER_{j,t}$	0.100*	0.027	-0.105	-0.034*	-0.073	-0.072**	0.201***	0.005
	(1.89)	(1.43)	(-1.51)	(-1.90)	(-1.30)	(-2.50)	(3.57)	(0.15)
$yt_{j,t-1}$	-0.411***	0.093	0.505**	-0.258***	0.576***	-0.363**	-0.656***	-0.165
	(-2.69)	(0.93)	(2.52)	(-2.81)	(3.56)	(-2.38)	(-4.02)	(-0.82)
$GAW_{j,t-1}$	-1.482**	-0.121	1.834*	-0.021	1.158	-0.022	-0.515	-0.257
	(-2.01)	(-0.23)	(1.89)	(-0.04)	(1.48)	(-0.03)	(-0.65)	(-0.25)
$GPOP_{j,t}$	-9.521**	-0.244	12.284**	-0.214	3.974	-1.851.	-4.981	-5.250
	(-2.17)	(-0.07)	(2.13)	(-0.07)	(0.86)	(-0. 37)	(-1.06)	(-0.82)
Constant	2.915***	0.921***	-0.789	0.881***	-0.893	1.104**	3.768***	1.612***
	(4.59)	(2.80)	(-0.95)	(2.90)	(-1.33)	(2.20)	(5.56)	(2.53)
No. of obs.	80	139	80	136	80	139	80	139
Adjusted R sq.	0.1548	0.0926	0.1478	0.3025	0.2459	0.3015	0.2389	0.011

Note: *t*-students are in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

To some extent, the role of the variable *GAW* echoes that of the GDP per capita in the location choice of the activities. As table 5 shows, the role of *GAW* differs: in the coastal region, the electronic industry tends to concentrate in the provinces with dynamic neighbors; while the chemical industry tends to concentrate in the provinces with less dynamic neighbors. It suggests that, high-tech industries tend to concentrate in the provinces that are more developed and surrounded by dynamic neighbors.

In addition, the concentration of the high-tech industries in the coastal provinces may be associated with the growing supply of the active population.

3.5. Policy suggestions

The limited diffusion of the labor intensive activities within the coastal region confirms the general principle of the bell curve of the spatial inequality for a country at the 2nd stage of development. It is also resulted from the policies of the Chinese government after the reforms. Catin and Van Huffel (2004) argue that the persistence of the numerous institutional constraints is one major factor that limits geographic diffusion of the activities. In particular, the inter-regional mobility of goods and services is relatively low. The residence registration system (*Hukou*) [23] seriously limits migration. The industrialization in the coastal region, to some extent, is fueled by the inflow of the labor from rural areas to urban areas. A recent study of the World Bank estimates the large potential gains from a greater labor market integration – using 2001 as a baseline, with a mere 1% labor relocation from rural areas to urban areas, the overall economy will gain by 0.5%. If the share of labor outflow reaches to 5% and 10%, the GDP will grow by 2.5% and 5% respectively (The World Bank, 2005). In addition, the gains are much higher in the western and central regions compared to the east and north-east regions. The *Hukou* system also results in the sub-optimal size and under-agglomeration in Chinese cities. Au and Henderson (2002) suggest that 85% of the Chinese cities are undersized and 43% are significantly undersized, which leads to economic welfare loss. The pace of urbanization is very slow in the central and western provinces, which limits their potential in reaping the fruit of the rapid economic growth through the economy of scale. Appropriately alleviating the restrictions of the rural-urban mobility across regions may strongly improve economic efficiency and reduce inequality.

The decentralization widens the gap of fiscal space between local authorities. The inland provinces disproportionately suffer from the local protectionism and the "border-effects". Multiple discriminations, such as the customs and the attribution of the "entrance-ticket" to local market, impede the penetration of the products from other provinces or from other countries. Although regional protectionism and product fragmentation have declined over the past decade, it is important that the authorities further reduce the barriers and encourage the domestic market integration in favor of the inland provinces.

[23] In China, non-residents have limited access to certain types of employments, housing, medical care, and children education, although the constraints began to soften in the recent years with the deepening of the marketization.

In addition, the sharp contrast in the importance of the public sector in the coastal and inland regions may also lead to the spatial disparities. In central and western China, more than 60% of the industrial production is carried out by public enterprises, which are often characterized by low profit, weak service, high pollution, and lack of forward/backward linkages to other industries. A large state-owned sector is often associated with low growth rates (Phillips and Shen, 2005). The coastal regions are less dependent on the public sector, where in general, less than 20% of the total industrial production is carried out by public enterprises. It would be more effective for the authorities to focus on the fundamentals and improve the investment climates to attract private investors.

4. CONCLUSIONS

In 1988-1997, the spatial distribution of activities in China was conditioned by two major factors: openness and industrialization. Economic development is polarized in the coastal provinces. Some of these coastal provinces have reached the 3rd stage of development. The empirical analysis, to some extent, confirms the famous bell curve of regional inequality that accompanies industrial development: in most of the developed coastal provinces, the proportion of high-tech industries in the total economy has increased; and some labor intensive activities have begun to de-concentrate.

However, the more remarkable result is that the relative diffusion of the labor intensive activities has taken place mainly within the coastal region, from the more developed coastal provinces to the less developed coastal provinces. It does not significantly modify the major trends of the industrial location and specialization of the inland provinces.

The widening regional disparities between the coastal and inland regions have become a major concern of the Chinese authorities. As indicated by Brun, Combes and Renard (2002), because of this concern, the central government gave priority to public investment in the inland provinces (in particular, the western provinces) in its 10th five-year plan, 2001-2005. Today's policy choice largely conditions China's future capacity for development, which would be conditioned by the growth of the vast inland market and the slowing-down of the widening regional disparities.

REFERENCES:

Ades A. F., Glaeser E. L., 1995, «Trade and circuses: explaining urban giants », *Quarterly Journal of Economics*, 110, 195-227.

Alonso-Villar O., 2001, « Large metropolises in the Third World: an explanation», *Urban Studies*, 38, 8, 1359-1371.

Amiti M., Javorcik B.S., 2004, « Trade costs and location of foreign firms in China », Economist Forum – Annual Bank Conference on Development Economics; Communication to the International Conference on China's economic geography and regional development, Hong Kong, 2003.

Amiti M., Wen M., 2001, « Spatial distribution of manufacturing in China », in Lloyd, P., Zhang X. (Eds), *Modeling the Chinese Economy*, Edward Elgar, London, 135-148.

Au C.C., Henderson J.V., 2002, « How migration restrictions limit agglomeration and productivity in China », *NBER Working Paper No. 8707*.
Batisse C., 2002, « Structure industrielle et croissance locale en République Populaire de Chine », *Région et Développement,* 16, 85-110.
Bergstrand J.H., 1989, « The generalized gravity equation, monopolistic competition, and the factor-proportions theory in international trade », *Review of Economics and Statistics*, 71, 1, 143-153.
Brun J.F., Combes J.L., Renard M.F., 2002, « Y-a-t-il une diffusion de la croissance entre les provinces chinoises ? », *Revue d'Economie du Développement,* 3-4, 61-72.
Catin M., 1995, « Les mécanismes et les étapes de la croissance régionale », *Région et Développement*, 1, 11-28.
Catin M., Ghio S., 1999, « Les étapes du développement régional : un modèle d'économie géographique », dans Catin M., Lesueur J. Y., Zenou Y. (dir.), *Emploi, concurrence et concentration spatiales,* Economica, Paris, 245-279.
Catin M., Ghio S., 2000, « Economies d'agglomération, concentration spatiale et croissance », in Baumont C., Combes P. P., Derycke P. H., Jayet H. (dir.), *Economie géographique : les théories à l'épreuve des faits,* Economica, Paris, 81-110.
Catin M., Ghio S., 2004, « Stages of regional development and spatial concentration », *Région et développement*, 19, 185-221.
Catin M., Ghio S., Van Huffel C., 2001, « Intégration économique, investissements directs étrangers et concentration spatiale dans les pays en développement », *Région et développement,* 13, 11-46.
Catin M., Ghio S., Van Huffel C., 2002, « Investissements directs étrangers, diffusion technologique et concentration spatiale dans les pays en développement», *Région et Développement,* 16, 55-84.
Catin M., Van Huffel C., 2003, « Inégalités spatiales et développement économique : le cas français (1850-2000) », *Revue d'Economie Régionale et Urbaine*, 5, 799-814.
Catin M., Van Huffel C., 2003, « Concentration urbaine et industrialisation », *Mondes en Développement*, 31, 121, 85-107.
Catin M., Van Huffel C., 2004a, « L'impact de l'ouverture économique sur la concentration spatiale dans les pays en développement », *Région et Développement*, 20, 123-158.
Catin M., Van Huffel C., 2004b, « Institutions, ouverture et inégalités régionales de développement en Chine », *European Journal of Development Research*, 16, 4, 809-826.
Chai J.C.H., 1996, « Divergent development and regional income gap in China », *Journal of Contemporary Asia*, 26, 1, 46-58.
Chen J., Fleisher B.M., 1996, « Regional income inequality and economic growth in China », *Journal of Comparative Economics*, 22, 141-164.
Cheng L. K., Kwan Y. K., 2000, « What are the determinants of the location of foreign direct investments? The Chinese experience », *Journal of International Economics*, 51, 379-400.
Cheung K., Lin P., 2004, « Spillover effects of FDI on innovation in China : evidence from the provincial data », *China Economic Review*, 15, 25-44.
Démurger S., 2001, « Infrastructure development and economic growth : an explanation for regional disparities in China ? », *Journal of Comparative Economics*, 29, 95-117.

Duranton G., 1997, « La Nouvelle Economie Géographique : agglomération et dispersion », *Economie et Prévision*, 131, 5, 1-24.
Duranton G., 1999, « Distance, sol et proximité : analyse économique et évolution urbaine », dans Bailly A., Huriot J. M. (dir.), *Villes et croissance*, Anthropos, 91-131.
Eaton J., Kortum S., 2002, « Technology, geography and trade », *Econometrica*, 70, 5, 1741-1779.
Eaton J., Kortum S., 1997, « Technology and Bilateral Trade », *NBER working paper 6253.*
Frankel J., Stein E., Wei S., 1993, « Continental Trading Blocs: Are They Natural, or Super-Natural ? », *NBER working paper 4588.*
Fu X., 2004, « Limited linkages from growth engines and regional disparities in China », *Journal of Comparative Economics*, 32, 148-164.
Fujita M., Hu D., 2001, « Regional disparity in China 1985-1994: the effects of globalization and economic liberalization », *The Annals of Regional Science*, 35, 3-37.
Fujita M., Thisse J. F., 2001, « Agglomération et marché », *Cahiers d'Economie et Sociologie Rurales*, 58/59, 11-57.
Fujita M., Thisse J. F., 2002, *Economics of agglomeration*, Cambridge University Press.
Gao T., 2004, « Regional industrial growth: evidence from Chinese industries », *Regional Science and Urban Economics*, 34, 101-124.
Ghio S., Van Huffel C., 1999, « Politiques de libéralisation commerciale dans les pays en développement et niveaux d'infrastructures : les effets sur l'hyperconcentration urbaine », dans Catin M., Lesueur J. Y., Zenou Y., *Stratégies, concurrence et mutations industrielles*, L'Harmattan, Paris.
Golub P.S., 1999, « Recentrer la croissance », *Le Monde Diplomatique*, Janvier.
Hansen N., 1990, « Impacts of small and intermediate-sized cities on population distribution : issues and responses », *Regional Development Dialogue*, 11, 60-76.
Henderson J. V., 2000, « The effects of urban concentration on economic growth », *NBER working paper, 7503*.
Henderson J. V., Shalizi Z., Venables J., 2001, « Geography and development», *Journal of Economic Geography*, 1, 81-105.
He C., 2003, « Location of foreign manufacturers in China : agglomeration economies and country of origin effects », *Papers in Regional Science*, 82, 3, 351-372.
Hu D., 2002, « Trade, rural-urban migration, and regional income disparity in developing countries : a spatial general equilibrium model inspired by the case of China », *Regional Science and Urban Economics*, 32, 311-338.
Hu A.G.Z., Jefferson G.H., 2002, « FDI impact and spillover : evidence from China's electronic and textile industries », *World Economy*, 25, 8, 1063-1076.
Jones D.C., Li C., Owen A.L., 2003, « Growth and regional inequality in China during the reform era », *China Economic Review*, 14, 186-200.
Kanbur R., Zhang X., 1999, « Which regional inequality ? The evolution of rural-urban and inland-coastal inequality in China from 1983 to 1995 », *Journal of Comparative Economics*, 27, 686-701.
Kim T. J., Knaap G., 2001, « The spatial dispersion of economic activities and development trends in China : 1952-1985 », *The Annals of Regional Science*, 35, 39-57.

Kraay A., 2002, « Exports and economic performance: evidence from a panel of Chinese enterprises », in Marie-Françoise Renard (ed.), *China and its Regions : Economic Growth and Reform in Chinese Provinces*, Edward Elgar, Cheltenham, UK, 2002.
Krugman P.R., 1991a, *Geography and trade*, Leuwen University Press and the MIT Press, Cambridge, Mass.
Krugman P.R., 1991b, « Increasing returns and economic geography », *Journal of Political Economy*, 99, 483-499.
Krugman P., Livas Elizondo R., 1996, « Trade policy and the third world metropolis », *Journal of Development Economics*, 49, 137-150.
Lee J., 2000, « Changes in the source of China's regional inequality », *China Economic Review*, 11, 232-245.
Lemoine F., Ünal-Kesenci D., 2002, « Les industries extraverties en Chine : source de dépendance ou rattrapage technologique ? », *La lettre du CEPII*, 213.
Léon A., 1998, « Pôles de croissance régionaux et intégration mondiale : Afrique australe/aire économique chinoise », *Revue Tiers Monde*, 155, 623-645.
Luo X., 2001, « La mesure de la distance dans le modèle de gravité : une application au commerce des provinces chinoises avec le Japon », *Région et Développement*, 13, 163-180.
Luo X., 2003, *Impact des investissements en infrastructure sur la croissance régionale : le cas des provinces chinoises*, Ph.D. dissertation, Université d'Auvergne Clermont 1.
Luo X., 2005, « Growth spillover effects and regional development patterns: the case of Chinese provinces», *Policy Research Working Paper 3652*, The World Bank.
Mac Kellar F.L., Vining D.R., 1995, « Population concentration in less developed countries: new evidence », *Papers in Regional Science*, 74, 3, 259-293.
Marti S., 2003, « La Chine, atelier du monde, joue la carte du high-tech », *Le Monde Economie*, 8 avril.
Moomaw R. L., Shatter A. M., 1996, « Urbanization and economic development: a bias toward large cities? », *Journal of Urban Economics*, 40, 13-37.
Naughton B., 2002, « Provincial economic growth in China: causes and consequences of regional differentiation », in Marie-Françoise Renard (ed.), *China and its Regions: Economic Growth and Reform in Chinese Provinces*, Edward Elgar, Cheltenham, UK, 2002.
Ng L.F.Y., Tuan C., 2003, « Location decisions of manufacturing FDI in China: implications of China's WTO accession », *Journal of Asian Economics*, 14, 51-72.
Phillips K L., Shen K., (2005), «What effect does the size of the state-owned sector have on regional growth in China», *Journal of Asian Economics*, 15, 1079-1102.
Poncet S., 2003, « Measuring Chinese domestic and international integration », *China Economic Review*, 14, 1, 1-21.
Puga D., 1998, « Urbanization patterns : Europeans versus Less Developed Countries », *Journal of Regional Science*, 38, 2, 231-252.
State Statistical Bureau of the People's Republic of China. *China Industrial Economic Statistical Yearbook*, Beijing: China Statistics Press.
State Statistical Bureau of the People's Republic of China. *China Statistical Yearbook*, Beijing: China Statistics Press.

The World Bank, 2001, «Transport's contribution to stimulating economic growth in China's lagging provinces», *mimeo*.
The World Bank, 2005, «China: Integration of national product and factor markets – economic benefits and policy recommendations», The World Bank, Washington DC.
Wei S. J., 2002, « Chine: la mondialisation profite-t-elle aux plus démunis ? », *Finances & Développement*, 39, 3.
Wen M., 2004, « Relocation and agglomeration of Chinese industry », *Journal of Development Economics*, 73, 329-347.
Wheaton W., Shishido H., 1981, « Urban concentration, agglomeration economies, and the level of economic development », *Economic Development and Cultural Change*, 30, 1, 17-30.
Williamson J.G., 1965, « Regional inequality and the process of national development : a description of the patterns », *Economic Development and Cultural Change*, 13, 2, 3-84.
Wu Y., 2002, « Regional disparities in China: an alternative view », *International Journal of Social Economics*, 29, 7/8, 575-589.
Zhang W., 2001, « Rethinking regional disparity in China », *Economics of Planning*, 34, 1-2, 113-138.

Annex 1. Map of China