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Specialization and its changes in Chinese Provinces: Is the international integration still matters?

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Abstract: It has been widely recognized that China's regional specializations are characterized by unbalanced coastal and inland distributions due to the different international integration level. It was wondering if this has already changed after three decades’ development. This paper investigated the factors underpinning changes in regional specialization of the Chinese manufactures over the period 1997-2007. Based on a unique panel data set of Chinese regional input-output tables during 1997-2007, we estimate the model of production location across Chinese provinces combines factor endowments and geographical considerations, that are previously identified in the regional literature. Results emphasize that the forces of the new geographic economy are at work in Chinese provinces. In addition, we estimate our model on two different sub-samples of provinces corresponding to coastal and inland provinces, paying particular attention to the role of international integration. The results show that the international integration still matters, however, with much less importance on the location of economic activities in Chinese provinces.

JEL codes: F02, F14, P2, R12.

Key words: China, regional specialization, industry concentration, international integration.

Preliminary work, Please do not cite.

**1. Introduction**

Ever since China’s opening up policy and started the economic reform from the year 1978, unprecedented economic growth has been achieved in China. Manufacturing has continuously concentrated into the coastal region which is believed to lead higher regional specialization and industry concentration. China’s industrial geographic distribution and regional specialization thus attracted a great deal of attention of economists. Although different measures may lead to biases, the empirical studies from both firms level and regional level seem to support an overall conclusion that China’s regional specialization declined in 1980s and then turned to increase after the late 1980s (See, e.g. Young, 2000; Poncet, 2003; Bai et al., 2004; Liang and Xu, 2005; Wei & Fan, 2006; Zhang & Tan, 2007; Long and Zhang, 2011). Long and Zhang (2011), for example, use data from census data at the firm level, showed that Chinese manufacturing industries have become increasingly geographically concentrated ever since 1995. Based on a panel data set of 32 industries in 29 provinces, Bai et al. (2004) similarly found that the geographic concentration of industrial production has become increased for the period of 1984–1997.

From 1990s, research on industrial concentration and regional specialization developed very fast coming with the development of new economic geography (NEG) theory. The NEG theory appeals to increasing returns to scale and transport costs to explain the agglomeration of economic activity (Krugman, 1991 and Krugman and Venables, 1995). As the growing data availability, its empirical studies also made serious progress (see, e.g. studies on U.S. by Kim (1995), Ellison and Glaeser (1997), studies on North America by Holmes and Stevens (2004), and studies on EU by Amiti (1998) and Brülhart (2001) for the representative contributions). Recent empirical work on China’s dynamics of production activities location data highlights the role of economic geography in the explanation of dynamics of production activities location and includes Batisse and Poncet (2004), Lin (2005), Ma (2006), De Sousa and Poncet (2007), Amiti and Javorsik (2008) and Hering and Poncet (2009, 2010a, 2010b). Among them, the international integration has been thought to be one crucial factor, since it is accompanied by better factor endowment (e.g. capital and labor) and market access compared with interior regions.

Some of more recent literature, however, found a decreasing trend of manufacturing specialization in coastal regions especially after 2004 (Wu and Li, 2010; Zhao, 2011). This is very possibly caused by lower transport cost due to better infrastructure investment, and higher land and labor cost in coastal regions due to concentrations (Zhao, 2011). Due to data limitation, they do not conduct empirical study to support their guess. Based on a unique dataset of regional input-output tables at 1997, 2002 and 2007 and supplementary data, this paper aims to analyze the change of regional specializations at the industrial level and its causes. The intermediate input account for almost 85% of total output in China. With the input-output dataset, not only the demand-side factors, such as home market access, but also the supply side factors, such as supply linkages, resources endowments can be considered in this paper.

The paper is organized as follows. Section 2 will give the descriptive analysis of China’s regional specializations. Section 3 introduces our empirical model and its estimations. In section 4 we conclude the paper.

**2. The Change of China’s regional specialization, 1997-2007**

We firstly have a descriptive analysis on the change of regional specialization and the industrial concentration of China, by using the regional input-output tables of 1997, 2002, and 2007. The regional tables are aggregated into 31 sectors for the temporal comparison (See table 2 for the detail). We employ the widely-accepted location quotient to describe the relative specialization/concentration for each sector and region, that is

in which the superindex *i* represent sectors and the subindex *k* and *n* indicate regions and the nation respectively, yik is the total output of sector *i* in region *k*. If LQki > 1, region k can be considered to be specialized in sector i.

For each region k, we use the location quotient correspond to a sum over all sectors to measure how much region k’s production differs from the national average, that is

Table 1 gives the values of regional specializations. Our first observation is a general decrease of specialization in coastal regions and an increase of specialization in central region between 1997 and 2007, while the specialization of western regions firstly declined during 1997-2002 and then increased during 2002-2007. More specifically, 7 out of 9 coastal regions (Beijing, Guandong, Jiangsu, Liaoning, Shandong, Shanghai and Tianjin) experienced continuous decrease of specialization during 1997-2007. Most central regions (Anhui, Hebei, Henan, Hubei) increased their specializations simultaneously. If we pay our attention on the later period 2002-2007, all coastal region and most western regions show decreasing specialization, while most central regions and few western regions (Chongqing and Shaanxi) were benefited from it by showing increasing specialization. It should be noted, however, that the coastal regions have still higher average specializations over central and western regions.

Table1. Indices of provincial specialization, 1997-2007

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1997 | 2002 | 2007 |
| **Coastal** |  |  |  |
| Beijing | 1.23 | 1.20 | 1.18 |
| Fujian | 1.01 | 1.07 | 1.04 |
| Guangdong | 1.09 | 1.05 | 1.05 |
| Jiangsu | 0.96 | 0.94 | 0.94 |
| Liaoning | 1.04 | 1.02 | 0.95 |
| Shandong | 1.02 | 1.00 | 1.00 |
| Shanghai | 1.07 | 1.00 | 0.95 |
| Tianjin | 1.08 | 0.98 | 0.92 |
| Zhejiang | 0.96 | 1.05 | 1.05 |
| Average | 1.052 | 1.035 | 1.010 |
| **Central** |  |  |  |
| Anhui | 0.89 | 0.94 | 0.97 |
| Hebei | 0.92 | 0.95 | 0.97 |
| Henan | 0.95 | 1.03 | 1.11 |
| Heilongjiang | 1.12 | 1.11 | 1.02 |
| Hubei | 0.94 | 0.96 | 1.00 |
| Hunan | 1.00 | 0.95 | 1.02 |
| Jilin | 0.97 | 0.87 | 0.92 |
| Jiangxi | 0.99 | 0.94 | 0.97 |
| Shanxi | 1.13 | 1.23 | 1.06 |
| Average | 0.992 | 0.998 | 1.003 |
| **West** |  |  |  |
| Chongqing | 0.96 | 0.87 | 0.91 |
| Gansu | 1.06 | 0.92 | 0.92 |
| Guangxi | 0.90 | 0.86 | 0.85 |
| Guizhou | 0.82 | 0.84 | 0.99 |
| Neimeng | 0.93 | 0.97 | 1.02 |
| Ningxia | 0.97 | 1.00 | 0.95 |
| Shaanxi | 0.99 | 0.96 | 1.00 |
| Sichuan | 0.90 | 0.96 | 0.92 |
| Yunnan | 0.85 | 0.81 | 0.84 |
| Average | 0.931 | 0.919 | 0.933 |

We now switch the focus from regions to sectors, to understand the geographic concentrations of a given economic industry. For each industry *i*, we use the location quotient correspond to a sum over all regions to measure how much sector is relatively concentrated from the average spread of this sector, that is

Table 2. Indices of industry concentration, 1997-2007

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | 1997 | 2002 | 2007 |
|  |  |  |  |  |
| 1 | Agriculture | 1.17 | 1.18 | 1.28 |
| 2 | Coal mining, Crude petroleum and natural gas extraction | 1.37 | 1.54 | 1.53 |
| 3 | Metal ore mining | 1.13 | 1.18 | 1.52 |
| 4 | Nonmetal mineral mining | 1.07 | 1.21 | 1.02 |
| 5 | Manufacture of food products and tobacco processing | 1.04 | 1.00 | 1.00 |
| 6 | Textile goods | 0.70 | 0.65 | 0.63 |
| 7 | Wearing apparel, leather, furs, down and related products | 0.67 | 0.63 | 0.63 |
| 8 | Sawmills and furniture | 0.93 | 0.88 | 0.76 |
| 9 | Paper products, printing and record medium reproduction | 0.84 | 0.81 | 0.72 |
| 10 | Petroleum processing and coking | 1.15 | 1.09 | 1.22 |
| 11 | Chemicals | 0.91 | 0.88 | 0.85 |
| 12 | Nonmetal mineral products | 0.95 | 1.00 | 0.90 |
| 13 | Metals smelting and pressing | 1.13 | 1.16 | 1.16 |
| 14 | Metal products | 0.83 | 0.81 | 0.66 |
| 15 | Machinery and equipment | 0.84 | 0.84 | 0.77 |
| 16 | Transport equipment | 1.13 | 1.06 | 1.04 |
| 17 | Electric equipment and machinery | 0.72 | 0.69 | 0.64 |
| 18 | Electronic and telecommunication equipment | 0.77 | 0.66 | 0.56 |
| 19 | Instruments, meters, cultural and office machinery | 0.78 | 0.73 | 0.66 |
| 20 | Other manufacturing products | 0.89 | 0.84 | 0.68 |
| 21 | Electricity, gas and water production and supply | 1.10 | 1.07 | 1.21 |
| 22 | Construction | 1.05 | 1.19 | 1.27 |
| 23 | Transport and storage, post and telecommunication | 1.11 | 1.10 | 1.12 |
| 24 | Wholesale and retail trade, catering trade | 1.03 | 1.04 | 1.07 |
| 25 | Finance and insurance | 1.04 | 1.00 | 0.96 |
| 26 | Real estate | 0.91 | 1.00 | 0.98 |
| 27 | Social services | 1.00 | 0.96 | 0.94 |
| 28 | Health services, sports and social welfare | 1.05 | 1.16 | 1.19 |
| 29 | Education, culture and arts, radio, film and television | 1.08 | 0.95 | 1.09 |
| 30 | Scientific research and general technical services | 1.20 | 1.07 | 1.09 |
| 31 | Public administration and other sectors | 1.13 | 1.12 | 1.26 |
|  |  |  |  |  |

Values of these indices for each industry are summarized in table 2. The aggregate index shows a general tendency to decrease in the concentration of most manufacturing industries over the period 1997-2007. The strongest activity concentrations are always found for extractive industries and they show an increasing concentration trend, including Coal mining, Crude petroleum and natural gas extraction (1.53 in 2007); Metal ore mining (1.52); Petroleum processing and coking (1.22); Electricity, gas and water production and supply (1.21). This follows Batisse and Poncet (2004)’s findings for 1992-2007. As they pointed out, these extractive industries (incl. agriculture) are spatially concentrated too, are industries for which proximity of natural resources is essential. These sectors are spatially tied to the natural resources that they exploit. Mayor increase in the concentration index between 1997 and 2007 are found for these resource-dependent industries.

**3. Model and Empirical Result**

Input-output tables have been extensively accepted to analyze the production activities locations in China, since it provides not only the market potential data, but also the supply access data (Batisse and Poncet, 2004; Amiti and Javorcik, 2008; Sousa and Poncet, 2008; Hering and Poncet, 2009, 2010a, 2010b). Combined with supplementary socio-economic data, we try to explain how comparative advantages and geography interact to determine location.

**3.1 Model**

We followed Batisse and Poncet (2004)’s model for the explanation of production activity locations in 1992-1997 and made some further revision. The dependent variable is the share of output in industry i and region k, relative to both the output of region k and industry i in China’s total output, that is,

The following independent variables are considered:

1). Market Potential

One key determinant of the regional specialization in NEG models is the spatial distribution of demand. Locations closer to consumer markets (i.e. with better ‘market potential’) enjoy lower transport costs and have therefore a higher industrial concentration (Fujita et al., 1999). In this paper, we follow the Harris’s concept and define the market potential as

Market Potential i,k =

Where k1 only indicate the regions which are neighbors of region k, dis(k,k1) is indicated by the railway distance between the regional capitals. The intra-regional distance follows Zhao(2011) and set at 100, the final demand data is taken from regional/national input-output tables.

2). Factor Endowments

In this paper, we follow Batisse and Poncent (2004)’s study and consider the factor intensity/factor endowment interactions for capital, labour and natural resources. Industry-level dependence on capital of Chinese provinces is the share of gross formation of fixed capital by industry i and region k in the total formation of the region k and the total formation of the industry i, that is

Capital formationi,k =

Similarly, the industry-level dependence on labor of Chinese provinces is defined as

Labori,k =

Our measure of provincial industry-level dependence on natural resources is computed accordingly as the product of the endowment in natural resources in the province with the share of these resources in the total intermediate consumption of the industry in the province. We consider natural resources to include the three x sectors of oil, coal and ferrous and non ferrous minerals. The definition is as follows:

Natural resourcesi,k =

3). Supply Access

In Amiti and Javorcik (2008)’s study, the supply access is presented while the national input-output data represent the regional production structure. We adapt it so that the regional production differences are considered. The definition is as follows:

Supply accessi,k =

In which k1 indicate the neighboring regions of region k and dis(k,k1) is their railway distance. The share of inputs from industry j in the total intermediate inputs of industry i in region k is weighted by the importance of industry j in the neighboring regions k1. The idea is that the downstream industries would be benefited from the strong local presence of suppliers in the neighboring regions (or the region itself), by enjoying cheaper inputs of production. They save in transport costs and benefit from stronger competition between their upstream suppliers.

4) International Integration

As above mentioned, the international integration has been thought one of the most important reasons of coastal-interior imbalances in China and is often introduced in the model to explain the regional distribution of productions. In this paper, we pay particular attention to the role of international integration by estimating our model on two/three different sub-samples of provinces corresponding to coastal and inland provinces. In addition, the lagged region-industry output share is introduced as the dependent variables so that the regional distribution can be better explained. The empirical model thus is:

Our model is applied on a three-dimensional panel for 20 industries, 27 provinces and 2 years[[1]](#footnote-1). We rely on a panel fixed effects specification. We introduce simultaneously specific fixed effects by couple industry/year and province/year. This approach allows control for heterogeneity of industries and provinces separately for each year of the study.

**3.2 Empirical results**

Results are reported in table 3. We first estimate our equation on our complete dataset, that is pooling across the two years 2002 and 2007 (columns 1). The following two columns (2 and 3) run separate regressions for 2002 and 2007. The last two columns examine the heterogeneity in the industry localization process depending on the degree of international liberalization of provinces.

The three first determinants correspond to the influence of comparative advantages, respectively endowment in labour, capital and natural resources. The capital and labor intensities variables all enter significantly (at the confidence level of 1%) in the regression with the sign predicted by theory. The only exception is the variable of labour intensities which is not significant for year 2002. Natural resources enter significantly, however, with a negative sign which implies the production location of China may less depend on the natural resources. This is in line with Batisse and Poncet (2004) which found the natural resources only influence the localizations of inland regions during 1992-1997. With better infrastructure and less transport cost, the location of natural resources become less important, even for the inland regions. From 2002 to 2007, both labor and capital intensities have bigger influence on the production location, whereas the labor intensities are much more crucial by showing bigger growth of coefficients.

Table 3. Regression results of model

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  | 02&07 | 2002 | 2007 | coastal | inland |
|  |  |  |  |  |  |
| cap | .570 | .521 | .652 | .800 | .496 |
|  | (4.910) | (4.163) | (2.825) | (2.994) | (3.852) |
|  |  |  |  |  |  |
| lab | 1.416 | .206\* | 2.291 | 1.317 | 1.568 |
|  | (7.938) | (.797) | (9.458) | (3.910) | (7.221) |
|  |  |  |  |  |  |
| resour | -.694 | -.268\* | -.870 | -1.101 | -.613 |
|  | (-3.681) | (-.936) | (-3.255) | (-2.419) | (-2.968) |
|  |  |  |  |  |  |
| sup | .635 | .840 | .977 | .440 | .723 |
|  | (6.891) | (7.733) | (2.514) | (2.628) | (6.549) |
|  |  |  |  |  |  |
| market | 1.401 | .953 | 3.517 | 1.567 | 1.365 |
|  | (9.043) | (5.302) | (9.317) | (6.005) | (7.002) |
|  |  |  |  |  |  |
| lag | 6.315 | 6.993 | 5.569 | 6.685 | 6.019 |
|  | (38.007) | (27.971) | (24.896) | (26.453) | (26.966) |
|  |  |  |  |  |  |
| R2 | .874 | .891 | .872 | .888 | .867 |

Heteroskedastic consistent standard errors in parentheses,

with \* denoting not significance at 5 level.

Estimations also consider two forces predicted by the NEG theory: the supply linkages (availability of intermediary inputs) and the demand linkages (size of the market potential). Both indicators enter with a significant and positive sign in the location equation. Results thus stress that access to suppliers and markets matters. This tie is even strengthened from 2002 to 2007 by showing bigger estimation coefficients. Industries tend to locate close to the production of their vital intermediary inputs and to their customers.

The last determinant considered in the regression is a lagged independent variable. It enters the regression with significant and positive sign, which implies a path-dependence of production activities of locations. Firms tend to locate as where as they located before. However, this effect of path-dependence becomes weaker from 2002 to 2007.

The explanatory power of our estimations is quite good. The R2 lies above 86%. Results confirm that the industry location in Chinese provinces is not completely disconnected from the logic of market. Comparative advantages and market externalities matter in firms’ location choices. Evidence supports predictions from the NEG theory. Localiztion of activities not only corresponds to factor endowments criteria (labour, capital) but also to supply and demand linkages.

The last two columns authorize a differentiated process of industry location depending on the degree of international integration. More specifically, we estimate our model on two different sub-samples of provinces. The two sub-samples correspond to high and low international integration between coastal and inland areas. Results evidence that the greater the international integration, the more demand linkages matter and the less the importance of supply linkages (dependence on intermediary inputs) in the determination of the location of activities. This is in line with Battise and Poncet (2004) in which that access to customers is more important in determining location of production than access to intermediate supplies. It should be noted, however, that the gap between coefficients of supply access and market potential has decreased in our studied period. It suggests that improving infrastructure and lower transport cost have lead smaller gap between coastal and inland regions in terms of market access. Instead, higher land, wage and intermediate cost have become more important in production relocations. This is also why we found decreasing regional specializations in coastal regions and increasing regional specializations in inland regions during 1997-2007.

**4. Conclusions**

This paper investigates the driving forces behind industry location in China between 1997 and 2007, paying particular attention to the role of international integration. This analysis is motivated by the finding of decreasing specializations in coastal regions and increasing regional specializations in inland regions, especially after 2004.

Results underline that New Economic Geography forces are still work at China. It shows that the influence of labor factor and supply access has moreover increased during 1997-2007, whereas the natural resources are less important. The influence of the various determinants to location of activities also differs depending on the degree of international integration of provinces. The influence of supply linkage in coastal regions is less than the one in inland regions whereas the influence of market potential in coastal regions is much stronger. It implies that the international integration still matters in China, however, with much less importance. With improving infrastructure and lower transport cost, the advantages of market access in coastal regions over inland regions started to disappear. Instead, higher land/wage cost and worse supply access have become the disadvantages for their further agglomerations of coastal regions. This is also why we found decreasing regional specializations in coastal regions and increasing regional specializations in inland regions during 1997-2007.

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1. We use a lagged dependent variable, thus we only have two years’ sample. [↑](#footnote-ref-1)