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# Trends and determinants of China's industrial agglomeration

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ABSTRACT

This paper investigates trends and determinants of the geographic concentration of China's manufacturing industries using large firm-level data for the period of 1998 to 2005. It is found that the extent of industrial agglomeration in China, measured by the Ellison–Glaeser index, has increased steadily throughout the sample period, though it is still much lower than those of selected developed countries such as France, United Kingdom, and the United States. It is also found that local protectionism among China's various regions obstructs the process of geographic concentration of manufacturing industries, and this result is robust to the use of instrumental variable estimation for dealing with possible reverse causality and omitted variable problems and to the control for traditional determinants of industrial agglomeration such as Marshallian externalities, resource endowments and scale economies.



## 1. Introduction

Since China initiated its economic reform in 1978, it has undergone dramatic transformations from a centrally planned economy to a market economy. Along with this process, there have been significant changes in the geography of China's economic activities. Before 1978, almost every major economic activity, including its location choice, was centrally planned, and those plans were not necessarily drawn according to market forces but rather influenced by political considerations. For example, in the late 1960s, there was a drive to relocate production of key industrial products from coastal areas to interior provinces in preparation for possible wars with neighboring countries and regions. With the economic reform, it is expected that the market forces for industrial agglomeration should have redressed some of the poor location choices of economic activities caused by the central planning and played an important role in determining China's new economic geography.

However, both anecdotal evidence and statistical analysis suggest that the same economic reform in China has led to the rise of local protectionism among China's various regions, which in turn slows down the process of market-driven industrial agglomeration.[1] Before 1980, all revenues collected by the local governments were handed over to the central government, and local expenditures were then budgeted by the central government. There was weak correlation between revenues collected and expenditures budgeted (Jin et al., 2005). Hence there was little incentive for local governments to pursue economic development. From 1980 to 1993 the central government experimented with a series of fiscal decentralization policies as a key component of its economic reform, and since 1994 it has adopted a uniform policy of fiscal decentralization across China's various regions (see, for example, Bahl, 1999; World Bank, 2002; Jin et al., 2005). Under the 1994 fiscal decentralization policy, local governments can keep all the business taxes and income taxes of local enterprises (all enterprises located in its regions except those state-owned enterprises affiliated at the central government level), and 25% of the value added taxes of all

[1] Based on aggregated sectoral data and inter-regional input–output tables, Young (2000) and Poncet (2003) argue that local protectionism in China grew more and more serious over the 1990s. Meanwhile, Fan and Wei (2006) find that both the pattern and the speed of price convergence in China are highly comparable to those measurements in well-developed market economies, providing support for the view of market integration in China. Using industry-level data, Bai et al. (2004) show that the degree of industrial agglomeration in China first went down and then climbed up during the period of 1985–1997. Contrasting China's coastal area with its interior for the period of 1985–1994, Fujita and Hu (2001) find that China's industrial production showed strong agglomeration toward the coastal area, and that income disparity between the two areas had been increasing.

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enterprises located in its regions. Clearly, the fiscal decentralization policy provides the local governments with strong incentive for developing the local economy. But it also leads to local protectionist policies for shielding local firms and industries from regional competition.

The market forces for industrial agglomeration, against the local governments' incentive for protecting local firms and industries, make the study of China's economic geography exciting and challenging. In this paper, using a large data set of China's manufacturing firms for the period of 1998 to 2005 we investigate the trends and determinants of China's industrial agglomeration, with a focus on the impacts of local protectionism on industrial agglomeration.

The data set we use in this paper comes from the Annual Survey of Industrial Firms conducted by China's National Bureau of Statistics for the period of 1998 to 2005. One possible reason for the mixed results in the literature about the trends of China's industrial agglomeration is the use of different data sets. In particular, without firm-level data sets, it is difficult to control for the impacts of industrial structures and provide an accurate measure of China's industrial agglomeration (Ellison and Glaeser, 1997). Our firm-level data set allows us to construct the Ellison and Glaeser index of China's industrial agglomeration. We find a consistently increasing time trend of industrial agglomeration in China from 1998 to 2005, in sharp contrast to some of the findings in the literature (Young, 2000; Poncet, 2003). However, comparisons with the Ellison and Glaeser indices of manufacturing industries in selected developed countries such as France, United Kingdom and United States reveal that the extent of industrial agglomeration in China remains considerably low despite its increasing time trend.

We next investigate the determinants of China's industrial agglomeration, with a focus on the possible impacts of local protectionism in explaining China's low albeit increasing industrial agglomeration. Indeed, a critical condition for industrial agglomeration is the free flow of goods and services across regions without any government interference, but this precondition often breaks down in reality. Local protectionism slows down the process of industrial agglomeration within a country, similar to the adverse impacts of national protectionist policies on international trade and specialization.[2] Despite their importance, studies on the impacts of protectionist policies are quite limited mainly due to the difficulty of measuring protectionism. In this paper, we focus on the incentive of local government officials to protect local firms and industries, and develop an indirect measure of local protectionism – the share of state-owned enterprises in employment (measured at the 3-digit industry level – with a higher share indicating a greater incentive for local protectionism. Ordinary least squares estimation shows that the share of state-owned enterprises in employment has negative and statistically significant impacts on industrial agglomeration.

Our result could be biased due to some reverse causality and omitted variable problems. To address the potential endogeneity problems, we use the share of state-owned enterprises in the number of enterprises in 1985 (also measured at the 3-digit industry level) as an instrument for the share of state-owned enterprises in employment for the period of 1998–2005, and find that our result regarding the negative impacts of local protectionism on industrial agglomeration is robust to instrumental variable estimation. While our focus is on the impacts of local protectionism, we also control for the traditional determinants of industrial agglomeration, including Marshallian externalities (Smith, 1776; Marshall, 1920), resource endowments (Ohlin, 1935), and scale economies (Krugman, 1991). Again, our result regarding the negative impacts of local protectionism on industrial agglomeration remains robust to these controls.

There is a large literature on the determinants of industrial agglomeration. Kim (1999) and Ellison and Glaeser (1999) examine the explanatory power of the resource endowment theory, Audretsch and Feldman (1996) look into the importance of knowledge spillovers, Holmes (1998) studies the role of input sharing, and Rosenthal and Strange (2001) provide a comprehensive test of multiple determinants of agglomeration. See Rosenthal and Strange (2004) and Duranton and Puga (2004) for excellent surveys of recent empirical and theoretical studies on agglomeration economies. This paper contributes to the literature by focusing on the impacts of local protectionism on industrial agglomeration, and also providing evidence for Marshallian externalities in the setting of a developing economy.

The rest of the paper is organized as follows. In Section 2, we describe our data set, construct the Ellison–Glaeser index of China's industrial agglomeration, examine its time trend, and make comparisons with the indices of industrial agglomeration in France, United Kingdom and United States. In Section 3, we present our econometric analysis on the determinants of China's industrial agglomeration, with a focus on the impacts of local protectionism. We use the instrumental variable estimations to deal with the possible reverse causality and omitted variable problems, and control for the traditional determinants of industrial agglomeration. The paper concludes in Section 4 with some discussion for future work.

## 2. Trends of China's industrial agglomeration

### 2.1. Data

The main data set for this study comes from the Annual Survey of Industrial Firms (ASIF) conducted by China's National Bureau of Statistics for the period of 1998 to 2005. The survey covered all state-owned enterprises and those non-state-owned enterprises[3] with annual sales of five million Renminbi[4] or more in the following three categories of industries: (1) mining, (2) manufacturing, and (3) production and distribution of electricity, gas and water. Table 1a shows the number of enterprises covered in the survey throughout the sample period: it ranges from 161,000 to 270,000. The location choice of enterprises in the first and third categories is heavily influenced by the regional disparities in resource endowments. We thus focus on the sub-sample of manufacturing firms with the goal of investigating the trends and determinants of industrial agglomeration. As shown in Table 1a, the number of manufacturing firms covered in the sample ranges from 146,000 to 251,000. There is a clear upward time trend, mainly because manufacturing firms in China have been growing rapidly over the sample period with more and more firms having annual sales of five million Renminbi or more. It is also because the year 2004 was an industry census year, meaning there was more comprehensive survey coverage in that year, which may explain the jump from 2003 to 2004 in the number of enterprises and the slight decrease from 2004 to 2005. Following the literature (Ellison and Glaeser, 1997;

[2] In recent years, research focus has been shifted towards political factors that may facilitate or obstruct the process of geographic concentration of economic activities. For example, Ades and Glaeser (1995) show that political instability is associated with urban concentration. Holmes (1998) classifies states in the United States as either pro-business or anti-business, and finds that the manufacturing share of total employment increases by about one-third when one crosses the border from an anti-business state into a pro-business state, which suggests that state policies matter in attracting businesses.

[3] According to the classifications of China's National Bureau of Statistics, non-state-owned enterprises include three types of enterprises: collectively-owned enterprises (such as township and village enterprises), China's indigenous privately-owned enterprises, and foreign multinationals operating in China.

[4] It is equivalent to US$735,300 at the exchange rate of 1 US$ to 6.8 Renmimbi in October 2008.