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The effects of factor proximity and market potential on urban manufacturing output

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ABSTRACT

This paper derives a NEG-style model that outlines several spatial spillover channels and examines the effects of proximities to spatially distributed factor supply and market demand on Chinese urban economies. A panel dataset of 283 prefecture or higher-level cities from 2003–2013 is used for the empirical analysis. The estimation shows that proximities to government expenditure on science and technology, to professionals in science and technology, and to the domestic and foreign markets all contribute to urban manufacturing growth, while concentrations of specialized labor force and producer services in neighboring cities have negative effects. The spatial effects of factor proximities and market potentials differ in China's three regions. Surprisingly, cities in the central region have the most significant gain from spillovers of factor supply, and cities in the eastern and western regions benefit substantially from the domestic and foreign markets. Policy implications are derived from the findings.

1. Introduction

Despite the recent slow-down, China's urban economies have experienced unprecedented, rapid growth for more than three decades. Nevertheless, observers often question the widening disparities of regional development and the sustainability of long-term growth. For more than a decade, regional development policies, particularly the Western Development, the Revitalization of the Northeastern Industrial Belt, and the Central Rise policies, have assisted less developed regions in acquiring fixed capital and specialized workers that the market economy could not otherwise provide. Induced by preferential policies, manufacturing firms started to relocate plants from large cities to peripheral areas. However, the nation's modern industries are still primarily located in developed cities. As of 2012, capital stock per worker in the eastern region was 190,000 yuan, as opposed to 140,000 yuan per worker in the rest of the nation; nearly 15% of the eastern region's population were college graduates whereas less than 9% of residents in the rest of the country had a college degree (*China City Statistical Yearbook 2013*); in 2013, more than 245 million migrant workers floated in and out of cities, mostly large ones (National Health and Family Planning Commission, 2014). As indicated by economic theory and intuition, if economic activities are mismatched by factor supply and market demand, the aggregate productivity is lower and demand is weaker. Persistent regional disparities have been an active research field for years in China.

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Previous studies have found evidence of spillover effects from economic activities in Chinese regions and cities. Several papers used provincial level data to study growth spillovers between provinces and suggested that the growth of developed provinces had spillover effects on other provinces several thousand kilometers away (Brun, Combes, & Renard, 2002; Groenewold, Lee, & Chen, 2007; Pan, 2012). Other studies emphasized the spatial spillovers between cities (Ke, 2009; Ke & Feser, 2010) or even between individuals employed in the same cities (Combes, Démurger, & Li, 2013). The findings suggested that agglomeration of production factors, particularly labor pooling, producer services, and tacit knowledge spillover, had positive spillover effects on neighboring cities and that market access contributed to the differences in individual income and productivity.

This study is built on a synthesized framework of Marshallian agglomeration externalities and new economic geography (NEG). We derive a NEG-style model that outlines several spillover channels before specifying an estimating equation. We define factor proximity and market potential as accessibilities to the spatially distributed factor supply and market demand, respectively. The definitions are logical extensions of agglomeration of production factors and market demand in a central city, consistent with the economic reality that production factors and market consumption are spatially distributed. These definitions provide accurate measures of accessibilities or potentials. The estimating equation is applied to a panel dataset of China's prefecture or higher level cities to examine the effects of factor agglomeration and market potential on urban manufacturing production for 2003–2013. Despite the eastern region having accumulated more fixed capital, attracted more professional talents, and enjoyed more agglomeration economies and better accessibilities to the domestic and foreign markets, it has never been systematically tested how spatial proximities to the factor supply and market demand contribute to the urban economies of each region, especially considering the large scale regional development policies being implemented in the western, northeastern, and central regions. Therefore, this study also investigates the impacts of factor supply and market demand by region. This paper is organized as follows. The next section reviews the most relevant studies. Section 3 derives the model and paves the way for the empirical analysis. Section 4 describes the data, and Section 5 presents the empirical results. Section 6 concludes this study.

2. The effects of factor proximity and market potential on urban economies

Recent advances in the literature have provided more complete explanations of the spatial distribution and agglomeration of economic activities. Urban economic growth is not only determined by a city's own resource endowment, technology, and demand of local residents, but also influenced by the factor supply and market demand of other cities. Some of early studies relied on the traditional agglomeration theory to examine supply side factors, while others followed the NEG framework to analyze the effect of market potential or market access.

2.1. Factor supply and agglomeration externalities

The classical agglomeration theory articulates three supply-side sources of agglomerative economies: labor pooling, scale economies of intermediate inputs, and knowledge spillovers (Marshall, 1890). In a larger labor market it is easier for firms to adjust labor inputs and for skilled workers to find professional jobs than in a smaller one. A wide array of differentiated intermediate inputs with economies of scale reduces the production costs of the final goods. Workers obtain tacit knowledge through face-to-face contacts. In the past decades, research on agglomeration economies has become one of the most proliferated branches in urban economics. Some of the researchers studied the sources and effects of agglomeration economies in Chinese cities and found significant relationship between agglomeration and productivity (e.g., Au & Henderson, 2006; He, 2003; He & Pan, 2010). Most researchers treated agglomeration economies as an aggregate measure and presumed that the agglomeration externalities were limited within a city border.

However, technological advances have resulted in spatially expanded agglomeration economies. Several empirical studies examined the spatial spillover effects of factor endowments of neighboring cities. Feser (2002) evaluated the influences of suppliers, labor pooling, and knowledge spillovers on the productivity of two US manufacturing sectors of neighboring cities/counties using plant-level data. The study estimated that the low-tech machinery sector benefited little from the spillovers, while the high-tech devices sector benefited consistently from the spillovers of producer services and a specialized labor pool within a 50-mile shed. In a recent study, Drucker and Feser (2012) investigated the impacts of dominance of large firms and the three sources of agglomeration externalities. The establishment-level production functions of three US manufacturing sectors revealed mixed positive effects of the three agglomeration externalities within distances up to 75 miles. Despite the variations by year and by industry, the effects of regional labor pools were small, input supply demonstrated discernible and unambiguous impacts on production, and firms in regions with greater local patenting were more productive. Studies of Chinese cities also indicated that the agglomeration of manufacturing and productivity of cities were positively influenced by the capital stock, labor input, and production in neighboring cities within 100 km (Ke, 2009; Ke & Feser, 2010). Evidently, the agglomeration of factor inputs both within cities and in adjacent areas contribute to urban economies.[1]

[1] Recent studies on heterogeneous firms and workers suggest that previous empirical researches overstated agglomeration economies because the selection and sorting effects of firms were overlooked (Baldwin & Okubo, 2006; Combes et al., 2012). However, if the studies aim to test the existence of spatial spillover effects of factor supplies and market demand rather than quantifying agglomeration economies stemming from inside cities, the research findings are qualitatively valid.