



The effect of agglomeration on the productivity of urban manufacturing sectors in a leading emerging economy



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ABSTRACT

This study investigates the effect of agglomeration on urban labor productivity in the manufacturing sector of Korea, a leading emerging economy. We expand upon the production density model of Ciccone and Hall (1996) by employing Ke's (2010) indicators, including variables for the labor density and manufacturing output density of the urban economy. To measure spatial spillover and labor pooling effects, we use the control variables of intra-city labor movement and the number of employees in each manufacturing sector who graduated from local higher educational institutions. The research is based on a panel data analysis of 200 Korean cities during the five-year period from 2004 to 2008. We find that urban labor productivity is determined by traditional inputs of agglomeration economies. While labor density has a negative effect on urban labor productivity, output density has a positive impact on urban manufacturing productivity.

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1. Introduction

The productivity of a city depends on various factors, such as capital stock, labor force, technology, R&D, geographical position, and human capital. These factors influence not only city-level productivity but also national and firm-level productivity. Urban agglomeration, however, is a unique factor that exclusively influences urban productivity, and much empirical research has investigated its contribution to urban economies. However, given the elusive nature of agglomeration economies, the empirical findings are indirect (Ke, 2010).

In general, urban agglomeration has two main contrasting effects on the productivity of a city. On the one hand, it increases the cost of transportation and commuting time and, therefore, negatively affects urban productivity² (external diseconomy effect). On the other hand, it promotes the spillover of knowledge and information between economic agents (external economy effect). Knowledge and information spillover is significantly associated with the economic performance of cities and firms. Some argue that knowledge spillover influences the profit, market value, and patent output of enterprises

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² The GDP of each city is divided by the labor force in the city.

Table 1

Existing literature concerning the effect of agglomeration on productivity.

Study	Sample	Methods	Independent variables	Dependent variable(s)	Key finding
Ciccone and Hall (1996)	46 US states	Extended Cobb–Douglass production function, OLS	Employment density and education	Labor productivity	Doubling of employment density increases average labor productivity by 6 percent
Ciccone (2002)	628 NUTS-3 regions, European countries	Extended Cobb–Douglass production function, OLS and 2SLS	Employment density and education	Labor productivity	Agglomeration as part of TFP increases productivity
Ke (2010)	617 Chinese cities	Extended Cobb–Douglass production function, 3SLS	Employment density and human capital	Labor productivity	Agglomeration causes higher productivity in large industrial cities and neighboring cities
Brulhart and Mathys (2008)	245 NUTS-2 regions, European countries	Extended Cobb–Douglass production function, system GMM, OLS	Employment density and education	Labor productivity	Agglomeration has a positive effect on labor productivity
Bode (2004)	German NUTS-3 regions	Extended Cobb–Douglass production function, spatial econometric model	Employment density	Labor productivity	Agglomeration has a positive effect on labor productivity
Lee and Zang (1998)	Korean cities with a population of 50,000 or more	Extended Cobb–Douglass production function, OLS	Capital per worker, city population, and industry-specific employment	Production per worker	Material input contributed about 60 percent of productivity growth in Korea and localization economies are dominant in the Korean economy
Kim (2002)	Korean cities	Extended Cobb–Douglass, OLS	Capital per worker, location quotient index, and population and relative proportions of non-manufacturing industries	Value added per production worker	Agglomeration economy effect depends on the type of manufacturing in the region
Glaeser et al. (1992)	170 US cities	Maximization of production function minus labor cost	Specialization index, local monopoly index, diversity index and initial condition (initial employment)	Employment	Local competition and urban variety, but not MAR, encourage economic growth
Carlino et al. (2007)	US cities	A linear method showing which factors affect patent creation	Employment density, university R&D, manufacturing shares, college-educated population size	Log patents per capita	Patent activity is positively associated with density and highly urbanized areas
Kubis et al. (2007)	German cities	Extended Cobb–Douglass, SCR model	Capital stock, labor, human capital spatial labor supply, and spatial human capital effect	Change in the gross value added per inhabitant	Spatial spillover effect of growth poles on neighboring regions

Notes: 2SLS denotes two-stage least squares; 3SLS denotes three-stage least squares; GMM denotes generalized method of moments; MAR, NUTS is nomenclature for territorial units of statistics; OLS denotes ordinary least squares; SCR denotes spatial cross-regressive; TFP denotes total factor productivity.

(Jaffe, 1986). Recent literatures emphasize the positive role of agglomeration as a facilitator of knowledge spillover ([Carlino et al., 2007](#); [Ciccone and Hall, 1996](#); [Ke, 2010](#); [Kubis et al., 2007](#); [Lee and Zang, 1998](#)). However, other studies demonstrate that labor and employment congestion lead to diseconomies (e.g., [Brulhart and Mathys, 2008](#); [Ciccone, 2002](#)). Hence, agglomeration can also increase costs and restrict productivity in urban economies.

As a fast-growing urban economy, Korea has experienced rapid industrialization and manufacturing agglomeration over the last 40 years. In particular, Seoul, the capital of Korea, experienced accelerated population growth throughout the 1990s.

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