Manufacturing Location: Bigger vs Smaller Cities

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The purpose of this study is to extend the body of empirical research on agglomeration economies. Agglomeration economies are external economies of a location size resulting from clustering of people, businesses, and institutions. This study examines the impact of external spatial scale on the production technology and organization of the manufacturing industries in the United States.

The study uses an explanatory and quantitative design and a least square regression method to examine the impact of city size on the elasticity of substitution of a CES Production Function.

The elasticity of substitution measures the degree of substitutability between capital and labor producing a product when the price of capital and labor changes in the market. Change in the wage or capital rental alters the technique and factors proportion choice of a firm. Efficiency and cost reduction stipulates to switch to less expensive factor and intensive mode of production. The elasticity of substitution measures the degree of change in factor proportion when the factor price ratio changes.

At the industry level, the production involves multiple products. Firms within an industry produce the core competency product of the industry and intermediate products, such as parts, financial services, information technology, marketing, transportation services and energy. Then the industry's elasticity of substitution between capital and labor applies to the entire production activities of the industry.

Clustering of manufacturing industries provides demand for the intermediate products that result in specialization, efficiency and market supply of intermediate products. Availability of the intermediate products in the bigger cities stipulates outsourcing of these products by the industry instead of in-house production. Therefore, the city size causes the change in the production organization of the industry and technical proportion between capital- labor ratio employed by the industry.

It is hypothesized that the city size significantly affects the elasticity of substitution of manufacturing industries. The empirical model allowed examining the impact of the city size on the elasticity of substitution parameter of the production function of each manufacturing industry.

The data for this study are collected from U.S. Census of Manufacturing 2007. The data are for twenty (20) NAICS three (3) digit industries across eight hundred and thirty- six (836) cities in the United States. For each industry, the data was available for a minimum of 250 cities. The total size of the manufacturing industry, the total size of the service industry and population of each city used to measure the city size.

The results of the empirical testing show that the total industrial size of a city significantly affects the elasticity of substitution parameter. For the majority of manufacturing industries, the industrial size of a city was a significant variable affecting the elasticity of substitution between labor and capital. The findings of this study present the importance of input-output relationships and inter-industry linkages for location choice of manufacturing industries. The results also show that for a few industries that directly serve customers, the population size of a city is a significant factor representing the external benefits of market size.