can be extrapolated for analysing the current state of public services networks across the space and planning their evolution according to population needs.

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ID 1502 | SPATIAL PATTERN ANALYSIS OF MIXED-USE AND VERTICALIZED URBAN MANUFACTURING INDUSTRY IN THE SEOUL METROPOLITAN AREA OF SOUTH KOREA

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1 INTRODUCTION

Despite long-term job losses, manufacturing remains a critical part of the economic base of most metropolitan areas in South Korea. Most of the existing literature on urban manufacturing is focused on the locations of manufacturing and its economic impacts. Very little empirical research has been conducted on the spatial patterns of urban manufacturing industries which are characterized by mixed-use and verticalization. Using the Establishment Census Spatial database (DB) in 2013 of the Korea National Statistical Office, this research attempts to examine mixed-use patterns of urban manufacturing industry in the Seoul metropolitan area of South Korea. It calculates the urban industrial space mixed-use index, which is a modified entropy index, for each building unit based on individual establishments. Further, it attempts to examine the verticalization patterns of the urban manufacturing industry by calculating the average number of floors of establishments with respect to manufacturing subsectors.

2 URBAN MANUFACTURING AND ITS SPATIAL PATTERNS

There is a large body of existing literature which claims that manufacturing remains a leading sector in local and regional economies, with a much larger share of employment, higher wages, and a greater proportion of tax revenues vis-à-vis other industries (Helper, 2008; Helper, Krueger, & Wial, 2012; Leigh, Hoelzel, Kraft, & Dempwolf, 2014). Furthermore, a recent increase in interest in manufacturing around world is linked to the development of manufacturing technologies and processes (Reynolds, 2017). It is important to consider the location manufacturing facilities when coping with changes in the industrial environment, such as the fourth industrial revolution, the convergence of industries, the servitization of manufacturing, and the proliferation of smart factories.

While the traditional manufacturing establishments have moved their production activities to the outskirts of metropolitan areas, seeking lower land and production costs, the new manufacturing establishments in the knowledge-based or advanced industries tend to be spatially concentrated in large urban or metropolitan areas. In an analysis of the establishment dynamics of the knowledge-based industry, Park and Seo (2016) found that the metropolitan areas, especially the Seoul metropolitan area, are the growth hubs of the knowledge-based industry of South Korea. Their study revealed that 83.3% of knowledge-based manufacturing establishments started within the five major metropolitan areas between 2010 and 2013. Further, 92.5% of the knowledge-based manufacturing establishments have relocated within these metropolitan areas (Park & Seo, 2016). These spatial patterns can be associated with positive external economies or agglomeration economies of large urban areas or metropolitan areas (Glaeser, Kallal, Scheinkman, & Shleifer, 1992; Hoover, 1937; Jacobs, 1969; Krugman, 1993; Marshall, [1860] 1961). By selecting a location near each other, urban manufacturing establishments can receive access to specialized input suppliers and customers, a shared pooled market for skilled workers, and the benefits of technological spillovers.

Manufacturing establishments located in large urban areas or metropolitan areas may have a mixed-use and verticalized pattern. While traditional manufacturing industries are spatially concetrated in a single industry or a small number of industry sectors, urban manufuacturing industries with their demands for locations in large cities tend to accumulate in various industries to perform different functions. As Jacobs (1969) pointed out, the urban manufacturing industries tend to seek knolwledge spillover by stimulating growth between industries, rather than within them. In addition, urban manufuacturing industries may prefer verticalization to horzontalization strategy in high-density urban spaces as a way to overcome relatively high land prices and utilize the space efficiently. Recently Rappaport's (2016) study revealed that urban factories are built as vertical and hybrid buildings as they are smaller, cleaner, and quieter.

3 METHODOLOGY

3.1 DATA

To examine the mixed-use and verticalization patterns of the urban manufacturing industry in the Seoul metropolitan area, this study uses the ‘Establishment Census Spatial DB’ of 2013 of the Korea National Statistical Office. It combines the floor plan information of the building with the Census on Establishments of 2013 of the Seoul metropolitan area (Seoul, Incheon, and Gyeonggi-do), as well as Busan, the second largest city in South Korea. It provides various information not only on establishments, such as industrial classification, organization type, and the number of employees, but also on buildings, such as their addresses, number of floors, highest and lowest floor, and the total floor area of the establishment. Thus, it is useful for the analysis of mixed-use and verticalization patterns of urban industrial location. However, the spatial DB does not include all establishments within these areas, as it includes only those buildings with more than 15 establishments. This research focuses on establishments within the Seoul metropolitan area. The spatial DB provides information on about 358,000 establishments, which constitutes about 20.6% of 1.7 million establishments in the area.

3.2 METHODS

3.2.1 MEASURING MIXED-USE

A modified entropy index can be used to measure the mixed-use pattern of the urban manufacturing industry (Chang et al., 2016). Using the total floor areas of establishments and buildings, this research measures a pattern of combination and segregation of different industrial subsectors (2-digit level of the Korean Standard Industrial Classification, KSIC) within each individual building unit. The mixed-use index can be expressed as :

$$-\sum_{i=0}^{k}[(p_{ij}) \cdot (\ln p_{ij})] / \ln k_j$$

Where

- ppi: Percentage of total floor area of industrial subsector i (2-digit level of the KSIC) in the total floor area of building j
- $kkjj$: Number of represented industrial subsectors in building j

The mixed-use index indicates the concentration or dispersion of different industrial subsectors within a building unit. It takes a value between 0, which implies that it is composed of a single industrial subsector, and 1. The closer the value is to 1, the higher is the mixed-use. The mixed-use index is depicted for each building using different shades of a colour to indicate its level in Figure 1 below.

3.2.2 MEASURING VERTICALIZATION

To analyse the verticalization patterns of the urban manufacturing industry, the number of floors of establishments in the manufacturing industry was measured based on the Establishment Census Spatial DB of 2013. Further, the average number of floors for 2-digit level of manufacturing subsectors was calculated.

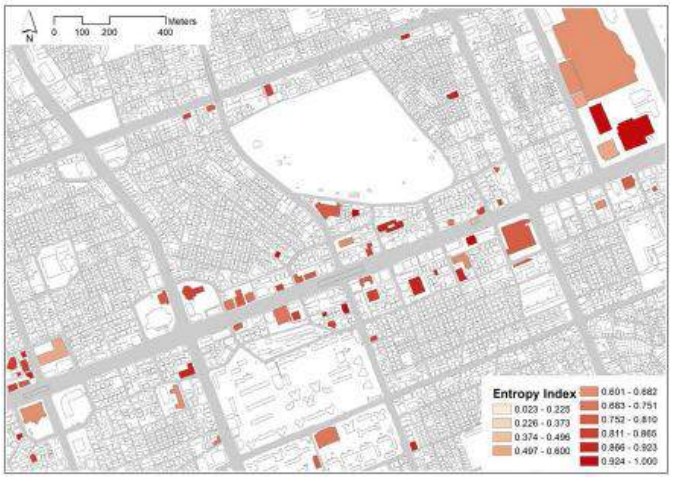

Figure 1. Mixed-use (Entropy) Index of Each Building Unit

4 ANALYSIS

4.1 MIXED-USE OF URBAN MANUFACTURING

4.1.1 MIXED-USE PATTERN BY MANUFACTURING SUBSECTOR

After calculating the mixed-use indexes of each individual building unit, they were aggregated for each industrial subsector to compare the mixed-use pattern differences among the manufacturing subsectors.

As depicted in Figure 2, the mixed-use patterns vary considerably across different manufacturing subsectors. The motor vehicles, trailers, and semitrailers indicates the highest mixed-use index (0.812), followed by the coke, hard-coal and lignite fuel briquettes, and refined petroleum products (0.809), pharmaceuticals, medicinal chemicals, and botanical products (0.807), electronic components, computer, radio, TV and communication equipment and apparatuses (0.796), and chemicals and chemical products (0.792).

It is interesting that the knowledge-based manufacturing industries (indicated by yellow bars in Figure 2) seem to have a higher mixed-use index than other manufacturing industries (indicated by grey bars in Figure 2). This implies that manufacturing establishments in knowledge-based industries are more likely to be located in a building with a diverse industrial composition. On the other hand, the traditional manufacturing subsectors, such as tobacco products, textiles (except apparel), beverages, and apparel, clothing accessories, and fur articles, have a lower mixed-use index, indicating that establishments in the traditional industries are more likely to be located in a building composed of a single or less diverse industrial subsectors.

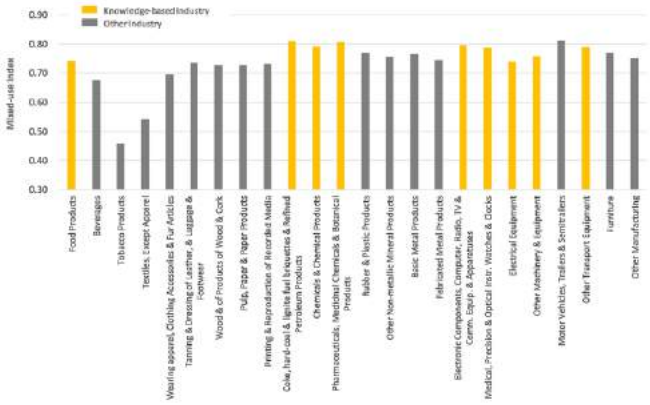

Figure 2. Mixed-use Index by Manufacturing Subsector

4.1.2 SPATIAL PATTERN OF MIXED-USE URBAN MANUFACTURING

This research conducts a spatial pattern analysis in Geographic Information Systems (GIS) to identify and compare agglomeration patterns of mixed-use urban manufacturing industries within the Seoul metropolitan area. In particular, hot spot analysis was performed to identify spatial clusters of areas with either high or low values of mixed-use within the manufacturing subsector. As depicted in Figure 3, the hot spot analysis indicated a spatial clustering of mixed-use patterns in Gangnam and Geumcheon areas in Seoul, as well as Anyang, Uiwang, Suwon, and Goyang areas in the Gyeonggi-do province. Gangnam is one of the well-known clusters of knowledge-based industries which have emerged spontaneously in South Korea. Meanwhile, Geumcheon is one of the clusters of knowledge-based industries with a planned national industrial park which started as Guro Industrial Park and became the Seoul Digital Industrial Park in the 2000s. Anyang, Uiwang, Suwon, and Goyang areas in the Gyeonggi-do are also representative high-tech industrial clusters of IT, R&D, Mobile, and LCD. On the other hand, Jongno and Yeongdeungpo areas were cold spots with a low tendency for mixed-use. These areas are famous as a cluster of traditional manufacturing industries such as precious metals and mechanical metals.

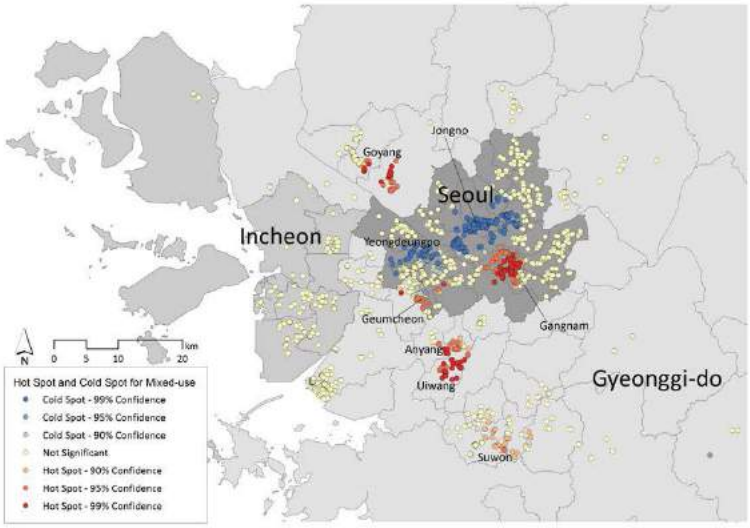

Figure 3. Hot Spot and Cold Spot for Mixed-use of Urban Manufacturing

4.2 VERTICALIZED URBAN MANUFACTURING

4.2.1 VERTICALIZATION PATTERN BY MANUFACTURING SUBSECTOR

To identify and compare the verticalization pattern of urban manufacturing, this research calculated the average number of floors of establishments with respect to manufacturing subsectors. As depicted in Figure 4, the average number of floors in the entire manufacturing industry was 4.0, with significant differences in the average number of floors of each manufacturing subsector. The manufacturing industry with the highest average number of floors was coke, hard coal and lignite fuel briquettes, and refined petroleum products industry with eight floors. It is followed by electronic components, computer, radio, TV and communication equipment, and apparatuses manufacturing (5.9 floors), medical, precision and optical instruments, and watches and clocks manufacturing (5.8 floors), other transport equipment manufacturing (5.7 floors), chemicals and chemical products manufacturing (5.7 floors), and pharmaceuticals, medicinal chemicals, and botanical products manufacturing (5.7 floors). All of these belong to the knowledge-based industry. Therefore, manufacturing establishments in the knowledge-based industry sectors (indicated by yellow bars in Figure 4) tend to be more verticalized within urban industrial spaces.

In contrast, food products, tobacco products, and fabricated metal products manufacturing industries have the lowest average number of floors with 1.2, 2.0, and 2.2 floors, respectively. Except food product manufacturing, the traditional manufacturing subsectors (indicated by grey bars in Figure 4) seems to have a tendency to be located in lower floors of a building. This seems to be related to the convenience of parts unloading, production, and storage spaces.

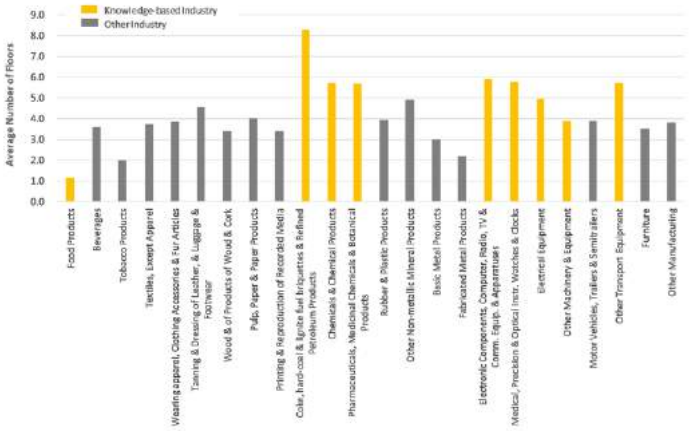

Figure 4. Average Number of Floors by Manufacturing Subsector

4.2.2 SPATIAL PATTERN OF VERTICALIZED URBAN MANUFACTURING

As depicted in Figure 5, hot spot analysis was performed to identify a spatial cluster of either high or low values of verticalization. Similar to the mixed-use patterns in Figure 3, Gangnam and Geumcheon, the clusters of knowledge-based industries, in Seoul are hot spots for verticalized urban manufacturing. In addition, the figure depicts a new emerging hot spot area in Seoul. Mapo is a cluster of new media and entertainment industry based on digital technology where Sangam Digital Media City (DMC) is located. Manufacturing establishments in these areas tend to have a more verticalized pattern.

However, in the outskirts of Seoul, Gyeonggi-do province indicates different patterns. Anyang and Uiwang continue to be hot spots for verticalized urban manufacturing, but their degrees of verticalization are not high. Further, Suwon, and Goyang are no longer hot spots for veticalization. Instead, some areas in Gyeonggi-do such as Suwon and Siheung have become cold spots for veticalization, indicating that manufacturing establishments in those areas tend to be located on the lower floors. In fact, Siheung has one of the old industrial parks with many low-rising flat factories.

Overall, the spatial pattern of verticalization is clearly different between Seoul and its surrounding areas. These patterns may be associated with the high land prices in the urban areas. Thus, urban manufuacturing industries may prefer verticalization to horzontalization strategy.

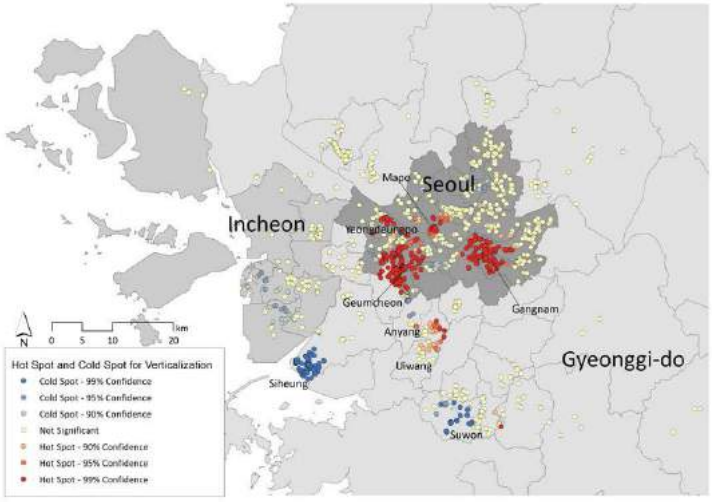

Figure 5. Hot Spots and Cold Spots of Verticalized Urban Manufacturing

5 CONCLUSION

This research analysed industrial location patterns of urban manufacturing in the Seoul metropolitan area of South Korea, which is characterized by mixed-use and verticalization, using the Establishment Census Spatial DB of 2013 of the Korea National Statistical Office. By calculating the modified entropy index for each individual building unit, this research found that the mixed-use patterns vary considerably among different manufacturing subsectors, with manufacturing establishments in the knowledge-based industries having a greater likelihood of being located in a building with a diverse industrial composition. In addition, the spatial pattern analysis indicated that several clusters of knowledge-based or high-tech industries in the Seoul metropolitan area, such as Gangnam and Geumcheon in Seoul as well as Anyang, Uiwang, Suwon, and Goyang in Gyeonggi-do, are identified as hot spots with a high tendency of mixed-use.

This research also examined the verticalization pattern of urban manufacturing by calculating the average number of floors of establishments with respect to manufacturing subsectors. The verticalization patterns vary significantly among different manufacturing subsectors, with manufacturing establishments in the knowledge-based industry being located in higher floors of buildings, indicating a highly verticalized pattern within the urban industrial spaces. The hot spot analysis of verticalization indicated a clear difference between Seoul and its surrounding areas.

The mixed-use pattern analysis was applied only to individual building units. However, the techniques in the research are methodologically replicable and extendable. Thus, the modified entropy index can be

extended for a certain district unit or grid zone. Furthermore, the mixed-use index in this research only identified the mixed-use patterns between industries, but it can also be based on functional classifications such as production, education, research, commerce, culture, finance, and transportation.

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ID 1685 | PRIORITIZATION OF THE LOCAL ECONOMIC DEVELOPMENT FACTORS: TR41 AND TRC1 NUTS II REGIONS IN TURKEY

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1 INTRODUCTION

One of the reasons for the emergence of the local economic development approach is the interregional development disparities and the inequalities created by these disparities. On the other hand, each country has not benefited from the offer made by the global economy and economic inequality between countries has continued to increase over time. With the impact of globalization, trade has been liberalized and borders have been abolished. ‘Top-down’ approaches have weakened and left their place in intervention on the local economy. Through this ‘bottom-up’ approach, local needs are better defined and strategies are being developed parallel to local targets (ILO).

This paper searches how the prioritization of local economic development factors differ by the actors in TR41 and TRC1 NUTS II regions which has different socio-economic development levels. In this context, the local economic development factors that have been determined by Wong (1998) as a result of extensive literature review and agreed upon in different scientific studies have been used and the frame developed by Wong has been the basis for this study.