■論　文

The Manufacturing Sector in Low-Income Cities:
Lessons Learn from Sukabumi Regency, Indonesia

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Abstract: In developing countries, the manufacturing sector is still believed as one of the fastest engines to improving the economic sector and narrowing the economic disparity compared to developed countries. However, for developing countries with so many limitations, some tradeoffs exist in terms of closing the economic gap through capitalizing on the manufacturing sector. While it is believed that local governments need to pay attention to managing the regional growth through market-driven manufacturing concentration, a lack of resources often makes the control function of the local governments impotent in terms of properly managing the development. This improper management usually leads to disastrous conditions which are contradictory to the development goal. This paper shows the tradeoffs needed to be addressed in Sukabumi Regency, as one of the low-income cities in the West Java Province that tried to improve regional development by using the manufacturing sector as the main engine. Quantitative methods using statistical and spatial distribution analysis were deployed to study the phenomenon. The results show that while manufacturing can absorb much low-skilled labor in urban areas, it also contributes to the severe traffic congestion in the urban corridor because of the unplanned distribution of locations.

Keywords: Manufacturing, low-income cities, traffic congestion

I.　Introduction

Starting in 1960, labor-intensive manufacturing industries began to relocate from advanced industrial countries to less developed countries for a single reason: improving the level of competitiveness by reducing their operational costs (Lim, 1983). Low standards of wage, higher numbers of workers, and lower taxes gave less-developed countries a comparative advantage in terms of labor-intensive industries. Indonesia, as one of the least industrialized of the large developing countries, also experienced economic growth with the manufacturing sector as the main source. In 1970, the Indonesian economy grew mainly because of the oil and mining industry until the beginning of 1980, when the oil prices began to decrease (Ishida, 2003). When the oil prices began to dip in 1980, the manufacturing industry took the lead as main sector for economic growth in Indonesia, which was marked by a boom of non-oil exports and the growth of the manufacturing sector from 3% in 1980-1986 to 9% in 1987-1997 (Pangestu, 2003). In 1993, Indonesia was recognized as one of East Asian countries that had a strong economic performance by World Bank in their report, with manufacturing sectors being the main driving force of growth (Ishida, 2003). Even though

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it suffered major setbacks after the financial crisis in 1997–1999 and was dethroned in 2007 by the export of primary products such as oil and gas (Yusuf & Nabeshima, 2009), the manufacturing industry still later became the lead sector in driving the Indonesian economy, contributing 21.04% to the national income of Indonesia in 2014.

The manufacturing sector in Indonesia is highly concentrated mainly in Java Island, with Jakarta and West Java as the core regions (Deichmann, Kaiser, Lall, & Shalizi, 2005). However, the role of the cores began to shift in 1980, when manufacturing development—which was previously highly concentrated in Jakarta—started to move into more peripheral regions in West Java, and became the core industrial area for Indonesia (Syamwil & Tanimura, 2000). Mainly in Bogor, Tangerang (now separated and part of Banten Province), Bekasi, and the Depok region, West Java also developed two other industrial corridors: Bandung-Cirebon in the northern part, and Bogor-Sukabumi in the western part[1]. The industrial sector become the main sector in terms of provincial revenue, contributing approximately 43–45% of the total domestic income from 2010–2014, while the agricultural sector become the third (9–10%) after the trade sector (14–15%).[2]

There is a significant amount of literature about the industrial development and agglomeration in Indonesia before and after the catastrophic financial crisis hit Indonesia in 1997–1998 (Deichmann   Somik V. Redding, Stephen J. Venables, Anthony J., 2008; Hofman, Rodrick-jones, & Thee, 2004; Ishida, 2003; Mcgee & Firman, 2000; Sjöberg & Sjöholm, 2004; Syamwil & Tanimura, 2000; Tjandraningsih, 2000; Tybout, 2000; Wade, 2010; Widodo, Salim, & Bloch, 2014). Mainly, this literature studied agglomeration in both the regional and national scope, which is mainly concentrated around Jakarta as the capital of Indonesia. However, considering the fact that the locations are shifting into more peripheral spaces, the regional development related to the manufacturing sector face new problems, whereas the local government needs to solve the problem of excess growth with quite limited resources in terms of financial and human resources. Unfortunately, from the literature highlighted above, the study about the manufacturing sectors in low-income cities is considerably limited. Providing local level context of the study—particularly in low-income cities—can enhance existing scholarship related to the manufacturing sector in Indonesia and how it is related to regional development.

Considering the highly limited existing studies about agglomeration in low-income cities, this study was conducted in the micro-level of Sukabumi Regency, West Java, Indonesia. Sukabumi Regency, which was only promoted from *lagging-region* status to *developing-region* status in 2014, tried to boost the economic sector, using manufacturing as the main engine. Already established long before the crisis with the metal industry (Hadi, 2006), basic manufacturing factories such as garment, textile, and footwear were concentrated in the northern part of the region, which is located close to the Bogor Regency and Jakarta capital cities, as part of the immense agglomeration area in Indonesia. Accessibility and other advantages—such as sharing intermediate input, labor pool, matching, and knowledge spillover—were believed to be the main reason that the factories clustered in the northern part of the regency (O'Sullivan, 2007). However, in some cases, the localization often cannot generate enough agglomerated area in order to gain these advantages because the agglomerated area is too small and the number of specialized industries in those areas is considerably limited (Ravix, 2014; Thissen, van Oort, Diodato, & Ruijs, 2013).

Through this paper, more empirical data related to the distribution of manufacturing locations in

low-income cities is provided in order to give a better understanding about the micro-level circumstances of regional development. The objective of this paper is to evaluate the spatial distribution of the manufacturing sector in Sukabumi Regency and to examine how it affects urban transport. The micro-level approach of the study—which was conducted in peripheral cities with quite limited resources that were surrounded by immense agglomeration areas—will enhance the existing literature about manufacturing development in developing countries.

Secondary data about the location, number, and gender of workers is used in order to understand the pattern of employment in Sukabumi Regency. The study was undertaken in the corridor of Strategic Area of Sustainable Economy in Sukabumi Regency. The main road (National Road) is used as an axis to limit the area of the study. While the pattern of the employment sector is studied, the government response will be evaluated using the existing land use policy at the local level. In the end, this paper will provide policy recommendations related to the findings of the study.

II. Sukabumi Employment Sector

As the largest Regency[3] in West Java, the agricultural and maritime sectors became the leading sectors in the economic structure of Sukabumi Regency. The abundance of vacant fertile land and a long coastal line allowed these sectors to become the main engine in terms of helping Sukabumi leave behind the *lagging region* status in 2014. In addition to these two sectors, the industrial sectors are also growing in Sukabumi Regency. However, contrary to the agricultural and maritime sectors that spread throughout the Regency, the manufacturing industry is concentrated in the main access of Sukabumi, that defined as the Strategic Area of Sustainable Economy Corridor along the Cicurug, Cisaat, and Sukalarang Regency in the Sukabumi Spatial Planning Document.[4]

Figure 1 showed the employment distribution based on data from the Employment and Transmigration Agency of Sukabumi Regency. The data was limited only to formal employment that was registered with the agency. The figures also only presented information about places of employment that employ more than 50 workers at the location. There are 306 employment places that meet the criteria based on the data available.

Based on Figure 1, the distribution of employment in Sukabumi Regency was concentrated in the northern part of the Regency, which is passed by national road and rail ways. There are seven types of employment, which consist of construction, distribution, plantation, manufacturing, poultry, the beverage industry, and others. For the "others" category, the sector consists of employment places at which the count number less than 15 employment places. It includes the service sector, finance, fisheries, pharmacy, regional government-owned enterprises, energy, mining, tourism, sawmill, and transportation.
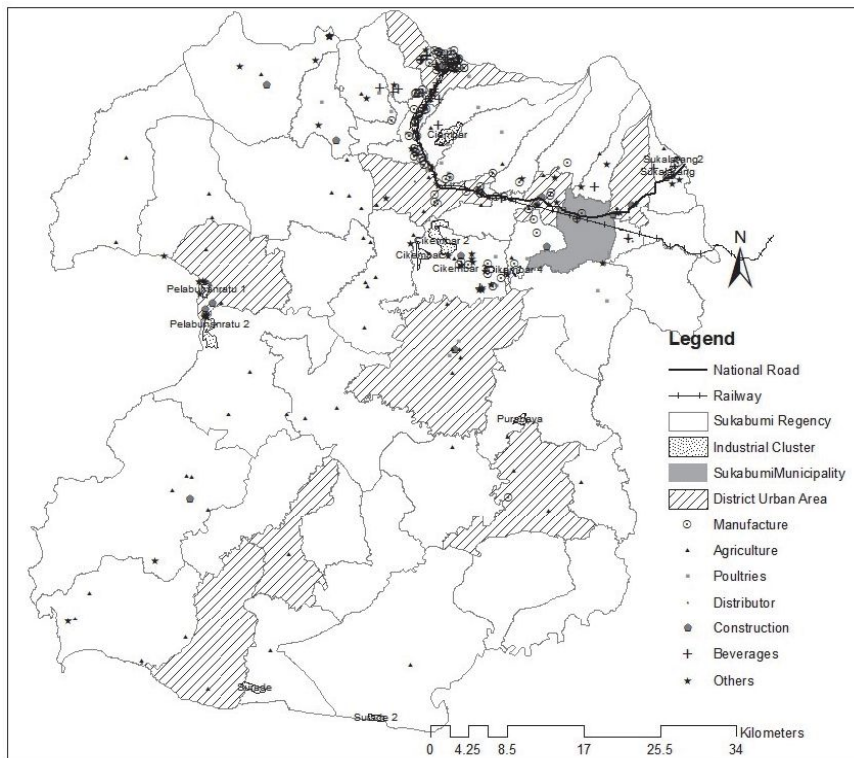
Figure 1. Employment Distribution in Sukabumi Regency
(Source: Employment and Transmigration Agency of Sukabumi Regency and authors)

In terms of employment places and distribution, the agricultural sector became the most dominant sector in the Regency. This is an obvious finding, considering Sukabumi's role as a supporting area for the surrounding larger cities in terms of providing a food source. The agricultural sector absorbs more than one third of the total employment (formal and informal), and made Sukabumi into one of the biggest three Regencies that employ people in the agricultural sectors.[5] Based on Figure 1, we see that the locations are spread out evenly between the southern and northern parts of the Regency, and it exists in almost every Regency area in Sukabumi Regency. Meanwhile, other sectors are concentrated in the northern part of the Regency, where the main access points in Sukabumi Regency are located. The most notable employment sectors concentrated in the corridor are the distribution, manufacturing, and service sectors.

III. Sukabumi Spatial Planning and Transportation

This study was conducted on the corridor of sustainable economy, one of the strategic areas that stretch between the Cicurug, Cibadak, Cisaat, Sukaraja, and Sukalarang districts in Sukabumi Regency. The corridor of sustainable economy became the main economic-based strategic area, since it contains many districts and was believed to be the growth engine of Sukabumi Regency. However, while the area became the main center of economic activities, traffic congestion also became a significant issue that needed to be addressed in this strategic area. Due to the severity of the traffic problem caused by traffic jam chains (Hadi & Yoshida, 2017), the traffic congestion was often labelled as a traffic disaster. Considering the subtlety of

the problem, the labeling above is understandable, since the problem has existed for years, and up until now there has been no viable solution except for waiting for the construction of the new highway that would connect Sukabumi to the toll roads.

Limited infrastructure also became a main problem in low-income cities such as Sukabumi Regency. There has been no significant improvement to the available road length for the past five years, while the number of vehicles has continually increased.[6] The same goes for the public transport system, which consists of formal paratransit services. Using a minivan that could carry approximately 10–12 people, *angkot*[7] became the main public transport service in the Regency, with a total number of approximately 3,500 vehicles. Since no improvements in roads are available, the number of *angkot* has also been steady for years.

While the issue of a lack of infrastructure becomes a common problem in developing countries, the urban spatial form as an important factor is usually overlooked by the policy makers. Low density and the sprawl pattern in Sukabumi Regency (Hadi & Yoshida, 2017) has become a challenge, considering that sprawl is never the best option in terms of promoting development (Pojani & Stead, 2015). This is not even to mention the importance of urban spatial form and topography as the most dominant impact factors to urban transport demand (Dimitriou, 1995). In the case of Sukabumi, the location of manufacturing factories is also believed to be one of the causes of the traffic disaster.

Based on the real-time traffic reports on Google Maps, the disaster of the traffic congestion is primarily located around the factories and the traditional market. This is understandable, since the number of the workers using the same road at the same time is more than 100,000. It is also believed that the emergence of the factories could influence other economic activities such as housing rentals around the factories or an informal transport service (motorcycle taxi) to provide mobility alternatives. However, the existence of a motorcycle taxi terminal in the intersection of the main road is also believed to hamper effective traffic flow.

IV. Analysis of Sukabumi Industrial Sector

As one of the most prominent sectors in terms of absorbing the workforce in the Regency, it is important to understand the local government planning related to the industrial sector. According to the spatial regulation, the industrial area in Sukabumi Regency is divided into three different industrial area types. The first type of industrial area provides for medium and large scale industries, which are determined by comparative local advantages. The next industrial area types are based on local potency of the district, while the last clustering is for existing industries which were already established before the regulation was set. However, the largest industrial area is in the Ciambar and Cikembar districts, which are set for the manufacturing industry and producing such products as garments, electronics, machinery, and automobile parts.

To achieve the objective of the research, this paper examines industrialization in three different areas of analysis. The first analysis is related to the proximity of the factories to the national road as a main access, using a boxplot graph to display the data distribution of the factories. The second analysis is related to the spatial distribution of the factory locations in the Regency, using a kernel density analysis and spatial autocorrelation in ArcMap 10.1 software. The final analysis is a correlation analysis between the industrial

sector and the availability of motorcycle taxis as an informal transport mode to evaluate the new center of activities.

IV.1 Proximity Analysis

The proximity of the factories from main road becomes the key factor of public transport affordability,[8] especially for the workers. This is quite understandable, because while the agglomeration generates urban growth, vehicle ownership and vehicle use increase more rapidly than the number of available roads in the cities (Carruthers, Dick, & Saurkar, 2005). In the case of Sukabumi, it is not only about transport affordability, but is also related to the traffic jam chain on the national road. While the transport problem is increasing due to the growth of the number of vehicles, the preference of location from the factory which tends to locate the factory near the main road also adds more transport problems for the Regency. This section will examine the pattern of agglomeration areas and their proximity to the national road as the main access in Sukabumi Regency.

There are two different proximity analyses, based on shortest distance and actual distance. The shortest distance is counted manually in Google Maps software as the straight line from the gate of the factories to the nearest axis. The actual distance is counted by tracing the shortest possible course based on the map from the factory gate to the axis. The box (interquartile) presents the distribution of 50% of the data, and the lower line of the box shows the first quartile while the upper side of the box shows the third quartile. The longer the length of the box, the more varied the data. Since the distance data was presented with the minimum value as zero, only upper whiskers[9] exist, which shows the data outside the interquartile zone.
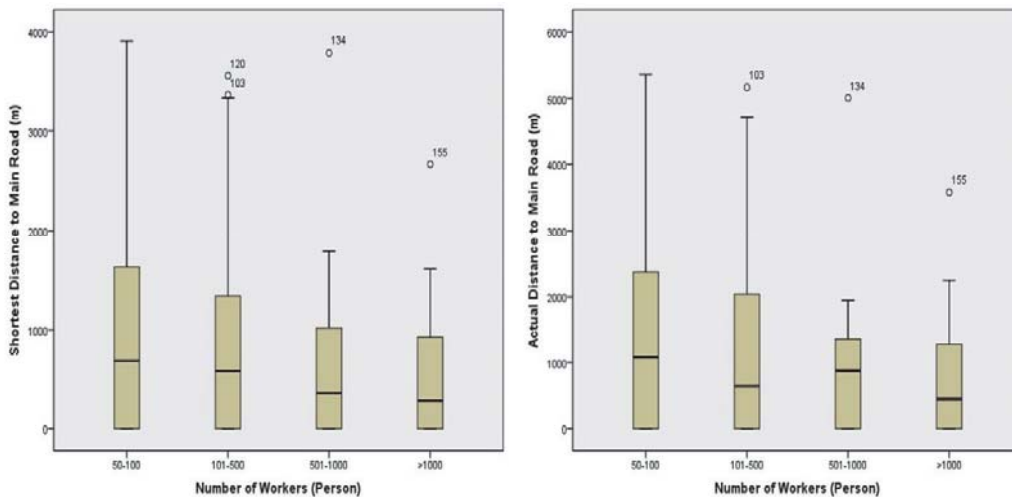

Figure 2. The Factories Average Distance to The National Road (source: Authors)

Based on Figure 2, the pattern of factory proximity to the national road shows the same pattern whether it used shortest distance or actual distance. The same pattern was also shown by each industrial group, which tend to get more varied in distance as the industrial sector gets smaller. It is logical that the

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companies tend to concentrate the factories in the nearest possible locations to the axis as main access. However, the land acquisition price is related to the capital owned by the companies, which will increase concomitantly with the accessibility. The more land that is near the national road, the higher the necessary price paid by the company. Since the price is higher, the companies that can afford the price are limited only to the largest companies. Meanwhile, positive skewness of the boxplot area means that more companies located closer to national road compared with the opposite.

IV.2 Location Distribution Analysis

The pattern of industrial development in Sukabumi Regency also examine through location distribution analysis. Spatial Autocorrelation (SA, Global Moran Index I) tools in ArcMap 10.1 is used to provide better descriptions about the industrial development pattern. SA, as a weaker effect of spatial dependency, is one of the specifications in spatial effects that showing the commonplace in geographies (Anselin, 2001). In this paper, the SA was calculated based on number of workers and administrative boundaries. If the value of SA is positive, then the locational distribution is clustered; otherwise, it is dispersed (Guillain & le Gallo, 2006).

On the Regency scale analysis, the distribution of the location of factories is spread out randomly around the national road. This pattern was also confirmed by SA analysis using all of the industrial data available on the District level. The *z-scores* of the analysis will determine whether the location of distribution is random (*z-scores* between -1.65 and 1.65), dispersed (*z-scores* lower than -1.65), or clustered (*z-scores* higher 1.65). Table 1 shows the value of the *z-scores* and *p-value* for each analysis.

Table 1. Spatial Autocorrelation Result using ArcMap 10.1

Area	Moran Index	Z-Score	P-Value
Cicurug	0.0030605	0.454962	0.649137
Parungkuda	-0.030521	0.159936	0.872932
Cibadak	0.012503	0.643525	0.519884
Sukalarang	-0.688112	-0.5258	0.599027
Cikembar	-0.287859	-1.268091	0.204766
Sukabumi Regency	0.015513	0.807652	0.419921

IV.3 Correlation Analysis

As mentioned above about another excess from the industrial sector in terms of economic activities, this section will examine the correlation between the existence of an industrial sector and the motorcycle taxi terminal around it. Basic assumptions in this analysis are that the existence of motorcycle taxi terminals is influenced by the demand from the market, and in this case, the market is made up of the workers. The next assumption is related to the market. Since it only examines the motorcycle taxi terminal and the industrial sector, the motorcycle taxi terminals that are located 1 km or less from the traditional market will be excluded from the analysis, avoiding the possibility of bias due to the traditional market's existence as the city hub

where many motorcycle taxis wait for their passengers. The last assumption is that the analysis of motorcycle taxis was only conducted for the terminal located in the concentrated area of the industrial sector, determined by KDA analysis. Otherwise, the terminal is excluded from the analysis.

Based on those criteria, there are 21 motorcycle taxi terminals that could be analyzed with the industrial sector in the study area. Buffering zones are created based on the terminal location and by counting the total number of workers and factories that are covered in the buffer zone. Buffer zone radii are determined, as the previous research indicated that the maximum correlation between built-up area and the motorcycle taxi terminal was performed when the radii of the buffer was set at 1 km. Table 2 shows the result of the correlation analysis. Using 1-tailed analysis based on the table, we see that there is a weak correlation between the number of motorcycle taxi drivers and number of female and total workers. The correlation between the drivers and female workers are slightly weaker compared to the total number of workers. However, the correlation of motorcycle drivers and male workers is not statistically significant, since the significance test shows more than 0.05. Meanwhile, there are no more correlations between other variables, such as number of factories and number of neighborhood terminals.

Table 2. Correlation Analysis between Industrial Workers and Motorcycle Taxi Drivers

Correlations		N Factories	M Male Workers	N Female Workers	Total Worker	N Ojek Driver
N Ojek Driver	Pearson Correlation	.270	.237	.382	.388	1
	Sig. (1-tailed)	.118	.151	.044	.041	
	N	21	21	21	21	21

V. Findings and Discussion

Based on the analysis, there are several findings worthy of discussion. The first is related to the location of the factories that tend to be located closer to main road when the size is getting bigger. Since there are no significant improvements of the road around the concentrated areas, their existence has added an extra burden to the traffic load that already been nearly saturated. The corridor will become one of the most prone areas of traffic jams in the regency area, and at some point will halt the regency development for several reasons: Sukabumi will lose its comparative advantage related to the proximity and accessibility to the capital of Indonesia, and Sukabumi will experience a negative labor supply.

One of the main reasons that the basic factories are shifting their factories to Sukabumi Regency is the proximity of the region to the capital of Jakarta, which has the biggest port in Indonesia. However, if the traffic disaster problem is not solved by the government, the geographic advantage means nothing. The traffic jams are also affecting the labor supply, because the labor force needs extra time and cost for their commutes to workplace. This condition will affect the minimum wage structure in Sukabumi Regency, which makes investors rethink their investment in Sukabumi Regency. To solve the problem, the intervention of the central government is unavoidable in terms of providing highway infrastructure, considering the limitations of the

local government. The local government has also established several industrial cluster areas in the region. However, the local government needs to evaluate the spatial regulations about agglomeration areas in Ciambar Regency, since it will add an extra load onto the existing transportation burden. Providing affordable houses for the workers near factories has also become the most possible solution that local governments could enact to reduce traffic load. Cicurug, Cikembar, and Sukalarang Districts have to be prioritized for this solution, considering the numerous factories and employment places in those districts.

The analysis of location distribution also shows that the cluster of the factories is not concentrated enough to provide the advantages of the agglomeration area. This is mainly because of unplanned clustering areas which give the freedom to the investor to choose the factory location before the spatial regulation exists. However, the last finding shows that the number of the motorcycle taxi drivers have correlated with the total number of workers and female workers. This finding has confirmed that, although the cluster area of the factories does not provide enough agglomeration advantage, it has become a new center of activities, as is shown by the existence of Ojek, which usually wait for passengers in crowded areas. Through the corridor of the sustainable urban economic area,[10] local governments prioritize the development of these areas. The existing regulations need to be broken down into more detailed plans as soon as possible.

VI. Acknowledgmedgement

[Notes]
1） Regional Regulation Number 22 Year 2010 about West Java Spatial Regulation
2） West Java Statistical Bureau, 2010–2014
3） In this paper, The Hierarchy of Government from the national level are Central, Government, Provincial Government, Regency/Municipality Government, District Government, and Village Government.
4） Regional Regulation Number 22 Year 2012, Sukabumi Regency Spatial Planning
5） West Java Statistical Bureau, 2010–2014
6） Compiled from Sukabumi in Figures 2010–2015
7） Angkot is the acronym of Angkutan Kota, which means urban transport. Capacity of 10-12 people, operates on a fixed route with paratransit service in which there are no exact bus stops between route, only the terminal in the beginning and at the end of the route.
8） According to Carruthers et al., affordability is measured by three parameters: affordability, availability, and accessibility.
9） Maximum length of the whiskers is 1.5 of interquartile. Value outside the whiskers (> 1.5 interquartile) are considered as outliners or extreme data.
10） Corridor of sustainable economy prioritize the development of the new center of activities along the national road in Spatial Planning and Regulation of Sukabumi Regency Year 2012.

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低所得都市における製造部門
インドネシア・スカブミ県からの教訓

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ラガ　ペルダナ　ハディ, 吉田　友彦

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【要旨】開発途上国の製造部門は、先進諸国のそれと比べて、経済の改善と所得格差の解消のためのもより有力な動力と信じられているが、しかしながら製造部門の資本主義化を通して、所得格差を解消して終焉に導くためにはまだいくつかのトレードオフが存在しており、大抵の国においては限界が露呈している。市場を基盤にして製造部門の集中を管理していくのは地方政府が重視すべきことであると信じられている一方で、必要な資源の欠如によって地方政府の開発制御が適切に行われない場合も多い。こうした不適切な製造部門の集中の管理は通常、開発目標と矛盾する面もあり、ひどい状況に陥ることもある。本稿では、西ジャワ州の低所得都市の一つであるスカブミ県を事例として、製造部門を主たる動力として地域開発を進めようとした試みが招来したトレードオフ現象を論じる。この現象を研究するために、統計的検定および空間分布の分析による定量的手法を用いた。結果として、製造部門が都市域の多くの未熟練労働者を吸収することができる一方で、無秩序な立地分布のために都市回廊とも言うべき地域で交通渋滞を発生させていることを示した。

キーワード：製造部門，低所得都市，交通渋滞