Graduate School of Development Studies

THE EFFECT OF SPATIAL CONCENTRATION OF MANUFACTURING INDUSTRIES ON LOCAL ECONOMIC GROWTH (A CASE OF SUKABUMI REGENCY-INDONESIA)

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Abstract

Spatial concentration of economic activities especially in manufacturing industries has been an interesting phenomenon to analyze since it may give the positive impact for local economic performance. The objective of this research is to investigate the effect of spatial concentration of manufacturing industries on local economic growth in Sukabumi regency. Using OLS on panel data we estimated both production function and output growth model by combining 45 districts data (cross sectional data) in 5 year (2001-2005/time series data). We use Location Quotient (LQ) form which represents the industrial concentration index as one of important variable in determining industry output. The results show that the industrial concentration indices (LQ) are statistically significant in affecting both production level and the output growth level in positive directions. Using LQ indices we found that food and beverage industry, textile and wearing apparel industry and fabricated metal and machinery industry, which have the LQ value greater than 1, are the main sub-sectors in manufacturing industry in Sukabumi regency.

CHAPTER I

Introduction

1.1 Introduction

Spatial concentration of economic activities especially in manufacturing industries has been an interesting phenomenon to analyze since it may give the positive impact for local economic performances. Therefore, the objective of this study is to analyze the effect of spatial concentration of manufacturing industries on local economy growth in Sukabumi, as one of the region in West Java province, Indonesia. For this purpose, we analyze some data qualitatively and by quantitatively with econometric model and estimating them by using ordinary least square (OLS) with panel data.

1.2 Background

Regional economics analysis plays an important role for analyzing regional and national economic development. According to Kuncoro (2004), the presence of UU No 22 in 1999 about Local Government explained that there was a changing in development policy orientation from sectoral development policy conducted by central government to the spatial and regional development policy conducted by local government. Therefore, local government now has its own responsibilities to arrange and organize its region by choosing the best plans and strategies related to its economic activities.

According to empirical views in 2000, generally, manufacturing sector has given a significant role for economic development in Indonesia. Its average annual growth is 13,04 %, it is larger than agriculture as a leading sector (4,16 % per year). This condition shows that Indonesia should give more attentions to the manufacturing sector development in order to accelerate its growth. For this purpose, government has to see the manufacturing sector development as a key to economic development both in the national and regional level.

The regional contribution of manufacturing sector to national economy is very huge including from West Java province since almost 60 percent of manufacturing industries are located in West Java (BPS, 2005). Therefore the performance of West Java manufacturing industry may affect the performance of the whole economy nationally.

Sukabumi regency as one of the region in West Java province also has an important role for manufacturing industry development in West Java province. In 2005, manufacturing

industries contribute 17.8 % of regional economic/GRDP, and absorb about 16,9 % of labor force in West Java. Those conditions show that manufacturing industries can also be placed as the key to the economic development in Sukabumi regency.

The spatial concentration is one of the geographical features of economic activities that also happen in most of manufacturing industries in Indonesia including in Sukabumi regency. Theoretically this feature can create products specialization which may change the comparative advantage to competitive advantage to cope with global competitiveness. Therefore, country or region can achieve the competitive advantage strategy by developing of their manufacturing industries based on spatial concentration.

1.3 Indication of Problem and Justification of the Study

Manufacturing industries in Sukabumi regency have grown rapidly since 2000, after the huge economic crises in 1997. Along with their growth, industries tend to locate spatially close one to another to achieve external economies advantages. These spatial concentrations have created product specialization in some districts. However, the benefits of spatial concentration from these industries are difficult to capture and measure directly, so that the Sukabumi policymakers still do not concern about this tendency although they believe it does exist and may give the positive impact on local economic development. Therefore, this study aims to analyze the effect of spatial concentration of manufacturing industries on local economic growth in Sukabumi Regency.

There are no studies about the effects of industry concentrations on local economic growth in Sukabumi regency so far, so that the study of the impacts of industry spatial concentration is necessary to determine whether it can generate positive or negative effect on local economic growth. If it is positive, it can be used as one of economic regional strategic to promote and encourage the spatial concentration activity in selected industrial sector, or if it is negative, the other way around.

1.4 Research Objective and Working Hypothesis

The objective of this paper is to analyze the effect of spatial concentration of manufacturing industries on local economy growth in Sukabumi Regency. Associated with the objective, the working hypothesis is that spatial concentrations on manufacturing industries give positive effects and enhance the local economic growth in Sukabumi regency. The reason for this hypothesis is that industry concentrations will improve economic competition among industries, increase knowledge spillover, increase

demand for labors and industriy productions which finally will lead to local economic enhancing.

In order to achieve the objective, this paper have to answer the main question as "Do spatial concentrations on manufacturing industries give the significant effects to the local economic growth in Sukabumi regency?

1.5 Methodology

To answer the question in introduction, we analyze some data quantitatively and qualitatively. For this purpose, we need to observe labor, capital, material and output data related to manufacturing sector in 2001-2005 for all 45 districts in Sukabumi Regency. We use secondary data from BPS/Statistic of Sukabumi, BPS/Statistic of West Java, Sukabumi Trading and Industry Agency and also from Sukabumi Regional Planning and Development Board. Then this study will be approached by using the qualitative and quantitative methods.

1.6 Scope and Limitation of the Study

This study primary uses data from some government institutions and it will cover a period 2001-2005 and 45 districts in Sukabumi regency. The main limitation of this study is the time constraints, the availability of sufficient data. There are some difficulties related to the availability of the data for each year since firms often go in and out of manufacturing industries in a particular year. The analysis will be limited to this data condition. We know that many factors that involve in measuring the effects of industry spatial consentration, however this study intends to look only into the relationship between spatial concentration and local economic growth.

1.7 Organization of the Paper

This paper is organized in five chapters. Chapter one is the introduction that consist of research background, problem and justification of study, the objective and working hypothesis, methodology, scope and limitation of the study, and organization of the paper. Chapter two provides theoretical framework. It explains the concept of spatial concentration of industries, cluster, growth theory, and how this spatial concentration has given the benefit to economic performance in particular region. This chapter also describes the methodology and the model specification. Chapter three gives manufacturing industries condition in Sukabumi regency. Chapter four present the

empirical results. Chapter five is a concluding part. It provides the main findings and the policy recommendations.

CHAPTER II

Theoretical Framework

2.1. Introduction

This chapter deals with the concept of the spatial concentration on economic activities and its impact on economic growth. It further looks at the other variables that influenced the economic growth. It also includes the literature review of previous researchers that related to the spatial concentration of economic activities. The theoretical framework we develop here can help to shed a light on the question of which models and variables are the most relevant according to the indicated problem.

2.2. The Concept of Spatial Concentration

According to Fujita spatial concentration is defined as a group of economic activities spatially in the certain location and they have a highly interdependent in trade activities such as input-output interdependency and non trade such as the exchange of information and knowledge (Fujita et al, 1999). The decision for industries to form cluster together in one place actually is driven by (1) the availability of resource endowments in certain area, (2) the existence of input suppliers (intermediate inputs sellers) and (3) the existence of output buyers that can access to that area.

Marshall (1920) who had observed the source of spatial concentration on economic activities and agglomeration economies argued that firms within the same industry continue to cluster in the same location if they can achieve the increasing return to scale through that cluster. This economic of scale can be achieved through information spillovers, local non-traded inputs and a local skilled labour pool. However, there are also many firms in different industry decide to cluster together in order to achieve significant economies of scale. According to Marshall, industries cluster for three basic reasons and all related to minimizing costs. First, industries cluster in order to reduce transportation costs. Since the transportation costs for some goods and services are very high, the location of establishments in some industries is largely dictated by the location of either their primary inputs or markets for their outputs. Second, industries tend cluster to reduce labour costs by increasing the local labour supply or by increasing labour productivity. Third, industries will cluster in order to take advantage of what are called "knowledge spillovers" for nearby establishments. This term of knowledge spillover refers to the spread of information about technology or market from one firm to

another. Krugman (1991) also defined that spatial concentration is one of geographic aspect, which is a very important aspect to industry location decision. He emphasized the interaction among economic scale, transportation costs, and local demand on spatial concentration decision. To enhance economic scale, industries tend to concentrate spatially and serve the market from certain area. While to minimize transportation costs, industries tend to locate in the area that has the huge local demand. However, the huge local demand tends to locate around the concentrated economic activities.

All the reasons to cluster above just mentioned positive externalities that can increase the functions and the size of the cluster. However clustering can generate both positive and negative externalities. The negative externalities can be generated from the increased costs due to increased competition among firms in cluster for getting the additional land and labour and increased costs associated with congestion.

Agglomeration economies can be classify into three types which was first employed by Ohlin (1933) and Hoover (1937, 1948) as :

(1) Internal return to scale. The internal economies of scale are gained because the large level of investment is located in the similar place. Since a large firm needs a large quantity of capital and labour force to be located in the same place. Therefore, these internal production economies of scale are associated with a high spatial concentration of both investment and people.

(2) Localization economies. The internal return to scale can be achieved through the agglomeration of firms within the same industry that are located close to their customer firms. The supply firms may benefit from frequent information transfer with the customer firms. The firms in the same sector can also benefit from specialist non- traded local service and a local skilled labour pool.

(3) Urbanization economies. The internal return to scale is achieved from the agglomeration of firms across different sector. These various activities although not directly related to the sector experiencing internal return to scale and localization economies will still cluster to provide services for the firms and employees of this sector. For instance people who work in sector need real estate, retail, health service, etc. while firms require service such as marketing, catering, advertising etc.

However, Kolehmainen (2002) had classified industry cluster based on economic externality that formed them into three types,

(1) Pure Agglomeration Cluster. This type of cluster also knows as *industrial districts* that are formed because of agglomeration externalities. These externalities are related to

the externalities that had been mentioned by Marshall (1920). Krugman (1991) and Porter (1990) also argued that industrial district models will be formed if there are the externalities. These externalities are related to (a) the declining in transaction costs (e.g. communication and transportation costs), (b) the declining in labour costs since skilled labour are more concentrate, (c) the availability of natural resources, inputs and specific infrastructure, (d) the availability of ideas and information and also informal relation among firms. While according to Gordon and McCann (2000) interfirm relations in the model of pure agglomeration are inherently transient. Firms are essentially atomistic, in the sense of having no market power and they will continuously change their relations with other firms and customers in response to market arbitrage opportunities. In this model, there are no free riders, access to the cluster is open, and the cluster actually unintentionally exist without any interference from government.

(2) The Industrial Complex Model. The industrial complex is characterized primarily by long term stable and predictable relations between the firms in the cluster. This type of cluster is most commonly observed in industries such as steel and chemicals. This model is more stable than industrial district since it needed more investment to develop the relation among firms. Access to the group is therefore severely restricted both by high entry and exit costs. Actually, cluster in this model is also formed because firms want to minimize transaction costs. In addition, firms intentionally decide to locate close to other firms, which have value chain to support their firms. In many cases, the existences of cluster are caused by the existence of particular export oriented firms in one place and they stimulate other firms to enter the cluster.

(3) The social network model

The social network model argues that mutual trust relations between key decision making agents in different organizations may be at least as important as decision making hierarchies within individual organizations. These trust relationship will be manifested by a variety of feature, such as joint lobbying, joint ventures, and informal alliances. Interfirm cooperative relations may therefore differ significantly from the organizational boundaries associated with individual firms, and these relations may be continually reconstituted. All these behavioral features rely on a common culture of mutual trust, the development of which depends largely on a shared history and experience of the decision making agents (Stimson et al, 2002).

Several studies highlight the strong presence of social networks, inter-personal relations, face-to-face encounters, casual or tacit information flows and culture (norms of trust and reciprocity) among local actors as invaluable assets for the success of this cluster (Piore and Sabel 1984)

2.3. Economic Growth

2.3.1. Neoclassical Growth Theory

The neoclassical model of economic growth which was introduced by Sollow (1957), emphasized on the role of saving and investment as a source of economic growth. By using the notation of Romer (1994), the simple version of the neoclassical model of growth starts with an aggregate production function of the Cobb-Douglass can be formed as follows:

$$\mathbf{Y = A(t)\, K^{\beta}\, L^{1-\beta}}$$

In this equation, Y is denotes as total product, A is the level of technology, K is the stock of capital, L is the stock of labor, and β denotes the share of output attributable to labor. For neoclassical growth theory, growth can be resulted from the increasing in variables of labor (L), capital (K), the capital/labor ratio (K/L), and from the productivity increases resulting from changes in A(t). Therefore, economic growth can come from the movements along the existing, aggregate production function (by increases in L, K, and the K/L ratio) or from a shift to a new production function (by increasing in technological progress).

In this neoclassical growth theory, as K/L raises through time the marginal product of new capital will decreases. This is known as a decreasing return to capital. It means that the new investment additions to capital decrease to the point where they are just sufficient to cover depreciation and equip new entrants to the workforce (e.g. adding one tractor to a field increases labor productivity greatly; the second tractor increases it less, etc.). At this point, the economy is at its long run equilibrium, economic growth stalls, and the standard of living stagnates (steady state level).

2.3.2. Endogenous Growth Theory

Solow (1957) shows that the growth in output is due to capital accumulation and technological progress, but he did not give more explaination about this function. With the diminishing marginal product of capital coupled with the exogenous technological progress, the economy reaches its long run level of output called the steady state level. At

this point, the economy stop to grow due to the amount of new capital produced is just enough to replace the capital lost because of the depreciation. This is different with the endogenous growth model which introduced by Romer (1986, 1990b), Lucas (1988), Grossman and Helpman (1991). They found a brief explanation to the importance of knowledge as an endogenous determinant of growth.

According to them, economic growth depends on productivity while productivity depends on the level of technological progress in the long run. If the level of technological progress is high, then productivity will increase since factors of production become more efficient. Furthermore, the growth rate of output will also increase. This has been the main motivation why companies and government gave the huge expenses on education and research and development (R&D) puposing at upgrading the level of domestic knowledge to improve the efficiency of factor inputs. Endogenous growth model which is more known as Romer model (1990) has incorporated human capital as a source of skills and knowledge that affect the economic productivity. Therefore, this model can be used to determine the externalities such as knowledge spillover of industrial cluster.

In endogenous growth theory, it is also relevant to discuss about the role of foreign direct investmen (FDI). In the trade globalization which characterized by the open trade among countries, foreign direct investment has become the important factor to accelerate economic growth. Theoretically, there is the strong relation between economic growth and the implementation of foreign direct investment. FDI can lead to increasing returns to scale in domestic production through technology and knowledge spillovers. FDI has therefore been seen as a major channel through which countries get the needed capital and technology in a sense that the technology would spillover to domestic firms thereby enhancing the overall level of domestic productivity.

A number of studies have been undertaken to determine the impacts of FDI on economic growth which are noted by different authors. Alfaro (2004) argued that in addition to the direct capital financing it supplies, FDI can serve as a source of valuable technology and knowledge to the host developing countries by fostering linkages with local firms. These technological innovations by MNEs (multinational enterprises) play an important role in the economy and they are some of the most important areas where MNEs serves as catalyst to growth in developing countries. MNEs have the financial capabilities to invest in large firms. This might be very difficult for local investors due to their lack of huge investment funds. Through FDI, scarce capital can be available to the

developing countries. So the presence of FDI is very crucial to economic growth.

However, related to spatial concentration of industries, many literatures noted that there no such determinants for the decision location of FDI whether they concentrate or not. According to Sergio Mariotti and Lucia Piscitello (1995), foreign investors are more likely to be concentrated than local firms if information are limited. Because there is likely to be few foreign firms in a given industry in the first place, then they decide to be more concentrated by force of larger size and smaller numbers. Besides that, foreign affiliates are act as a part of larger networks that collaborate in the host market. These networks of producers and suppliers are particularly important among Japanese firms for instance in the case of foreign investor in Indonesia. The availability of other infrastructure such as, international schools and other facilities for foreign staff and their families, might also be additional determinants to a clustering of foreign firms. A study about the manufacturing industries in Indonesia which had also been conducted by Sjöberg and Sjöholm (2001) concluded that foreign firms are likely to be more spatially concentrated than domestic firms. Their estimation result indicates that foreign establishments are more concentrated than domestic establishments and the difference seems somewhat large.

2.3.3. Growth Paths and Their Determinants

There are many variables actually can affect economic growth. Theory and prior researches have highlighted consideration in defining alternative growth paths and their determinants. The empirical studies by economic development research group, inc.(2007) has summarized the source of regional economic growth.This study examines six major classes of economic growth paths, as in the table 2.1.

Tabel 2.1. Definition of Six Major Classes of Economic Growth Paths

Indicators	Description
Trade Center	Growth pattern generating from a small urban cluster that provides goods and services to the exurban communities & rural hinterlands
Agglomeration/Cluster economy	Growth resulting from geographic concentrations of interconnected businesses and institutions that enhance the productivity of the core industries.
Supply-Chain/dispersal economy	Remote location is chosen over the central metropolitan area to host a node of economic activities (distribution or assembly) that is part of a larger (geographic) production chain.
Natural Amenity or Cultural Assets	Growth as a result of either quality-of-place attracting new households or efforts to actively develop & promote cultural, recreation, ecotourism venues and their supporting visitor services.
Knowledge Assets	Growth opportunities derived from the collective knowledge embodied in the region, including social capital, technical applications / commercialization, institutional assets (educational and financial), entrepreneurial start-ups.

Other Growth Paths	Growth made possible by the existence of long-standing mineral, lumber or agricultural resources, or by the decision of government agencies to site major regional or national facilities in an area.

Trade centre development path

This paths indicate that a trade center is characterized by having a larger concentration of retail stores and consumer and professional services (for instance: barbers, doctors, loan, companies) than would be expectedin a given population base. The indicators for this path are:

1. Economic Base: trade linkages, this is an indicator of the extent to which economic activity for each industry in a given county is supported by demand generated in neighboring counties. There is a lingkage between the counties in providing goods and services (urban-rural lingkage).
2. Labor Market Area (Scale), this is an indicator of the size of the labor force or population base that lives within a given (minute) drive time of the population center of a county. In this indicator, a market area can be interpreted as an indicator of the relative size of both the labor market for any industry and the shopper customer market for retail and consumer service industries.
3. Compound Trade Center Indicator, this indicator combines trade area indicators with information on distance to the closest larger city.

Industry Agglomeration Cluster Path

Similar with the previous concept, agglomeration-based economic growth is derived based on development of geographic concentrations of interconnected businesses and institutions that enhance the productivity of the core industries. It most often depends on achieving some form of: (a) economies of scale in operations of a single industry, or (b) economies of vertical integration associated with clustering industries that buy from and sell to each other (value chain model), or (c) economies associated with several industries sharing a common skill or resource base in a given region. This leads to the following indicators of existing conditions:

1. Economic Base: Manufacturing Concentration, this indicator is an index which is reflecting the extent to which manufacturing industries have a higher concentration (location quotient index) in the study area that the statewide average.
2. Economic Base: Vertical Integration of Suppliers, this indicator is an index reflecting the extent to which the dominant manufacturing industries also have a strong relative concentration of their supplier industries within the region (value chain model).

Supply-Chain (Dispersal) Path

This path is defined based on development of suppliers and distributors who stayed in a highway corridor. This arrangement makes use of dispersal economies to for keep labor costs low, and it more useful in the transportation connection efficiencies related with same day delivery. This leads to the indicators of existing conditions as follows:

1. Economic Base: Logistics Concentration*,* this is an index which is reflecting the extent to which warehousing/distribution, wholesaling, and trucking industries have a higher concentration in the area that the statewide average. This is reflected in a composite location quotient index for those logistics-related industries.
2. Economic Base: Fabricated Parts Suppliers*,* this is an index indicating the extent to which a particular industries such as metal, plastic or glass fabrication industries have a higher concentration in the area that the statewide average. This is also reflected in a composite location quotient index for those industries.

Amenity & Cultural Asset Growth Path

Amenity and cultural assets can be seen as a quality of place features that can serve to attract people to an area for a tourist visit or as a reclusion destination. The attractions one place can be related to its climate, interesting mountains or water features, or developed cultural activities or recreation venues. This leads to the following indicators of existing conditions:

1. Economic Base: Hotel, Lodging, Restaurants and Recreation Concentration, this is an index reflecting the extent to which local lodging, food restaurants, and recreation services have a higher concentration of employment for those activities.
2. Population Base: Retirees*,* this is an index reflecting the extent to which the local area has a higher share of population that is retired and living in the region shorter than five periods of time/years.

Learning and Technology Growth Path

Learning and technology growth path is the form of economic development that stimulates the collective knowledge of specialized technologies and the entrepreneurial base that is embodied in the residents and laborforce in a particular region.

These forms are typically the result of two main factors: (1) specialized labor training, including experience with technical applications and commercialization processes, and (2) the strength of specialized supporting system such as research and development facilities, financial institutions and high levels of broadband availability.

Natural Resource & Other Growth Path

There are other economic growth paths that need to be recognized, they are:

1. Natural resource-based economic growth, this can be supported by the existence of mineral, lumber, agricultural, and many other resource assets.
2. Government and institution-based economic growth, this development can be achieved through the external decision of government agencies and private institutions to site major regional or national facilities in an a particular area.

2.4 Industrial Clusters and Regional Economic Development

Agglomeration theory, which focuses on the reason of the existence of spatial concentration and its relationship to the location decisions of individual industries, have provided a basis for the later theoretical and empirical developments into the industrial clustering literatures. These literatures then give consideration to the important role of knowledge spillovers, social networks, and other institutions. A short review of the literatures that explicitly relate industrial clustering and regional economic performance specifically has been provided by Porter and Romer (Romer 1986, Porter 1990) as follows.

2.4.1. Industry Clusters and Competitiveness

A wide literature of industrial clustering actually has been developed from competitiveness point of view in the last two decades. This perspective considers industrial clustering as a key of business strategy that strengthens regional economies to cope with the competitive environment. The study by Porter on industry clusters seeks to find the dynamics of industrial clustering in the context of changing business strategy and competitiveness by relating industry clusters with a wider theory competitive advantage in a global economy (Porter 1990). Porter argued that the competitiveness of a nation or a region actually depends on the competitiveness of the industries and other companies forming the industry clusters. In this case, industry clusters are considered to be the sources of jobs, income, export growth, and innovations. Furthermore, a successful cluster policy can be seen as an important key to regional economic performance or as a model of regional competitive advantage.

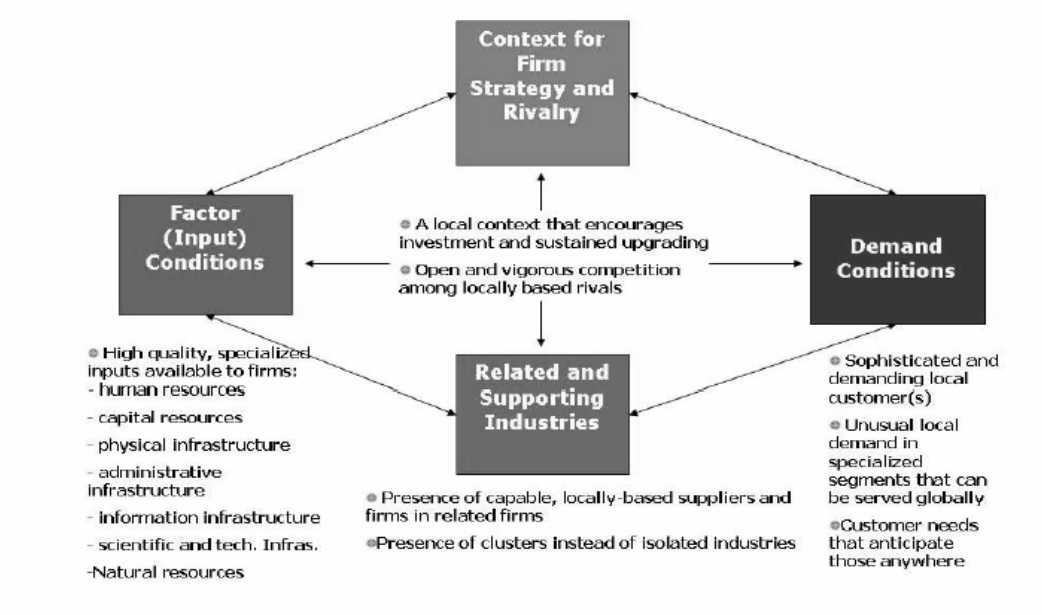
Clusters may create important linkages, complementarities, and spillovers in terms of technology, skills, information, marketing, and customer needs which give advantages to firms and industries. These advantages allow firms in the cluster to become more productive and more innovative compare which will increase their competitiveness. The

competitiveness of industry clusters can also be derived from the concentration of related industries, suppliers and services in the same place, access to supporting economic infrastructure, rivalry and collaborative efforts between firms and other institutions, and knowledge spillovers (Porter, 1990). Or in other words, these concentrations of related industries in one place may be explained by the concepts of forward and backward linkages which show the interrelationship among various industrial activities through the input-output relationships or the economic value chain. According to Porter (1985) this value chain concept describes the full range of economic activities and interactions of firms that are needed to bring products and services to end users through the different phases of production.

Clusters actually are composed of collections of firms and institutions that perform many of function segmented in value chains. They describe both horizontal and vertical links between the different business and other organizations that are important in producing products and closely related products. However, value chain business performance strongly depends on the business environment in which the value chain operates. In the diamond model of competitiveness, Porter (1990) also introduces four attributes that shape environment in which firms compete for business. The interactions among these determinants can be seen in the Porter's Competitiveness Diamond model as in the figure 1. These four determinants individually and the interaction among them as a whole in the system will create the competitive environment for firms in an industry.

The concept of value chain can also be used in economic planning and policy making, especially in targeting the growth of such industries that have high forward and backward linkages in a sense that the establishment of these industries will facilitate and stimulate the growth of other linked industries in a country or a region. However, this is only one reason why clusters develop. There are many additional reasons such as for scale economies and cluster advantages like availability of skilled manpower and common infrastructure of roads/ports or concentration of market demand which attract more firms to concentrate. Therefore linked industries not need to be all in clusters. Many cases have shown how industrial enterprises spread across different countries are linked in a value chain showing that all linked industries do not need to be located in clusters.

Figure.1. Porter's Competitiveness Diamond



Source: Porter (1990)

2.4.2. Dynamic Externalities and Economic Growth

For the recent year there is a substantial growth of interest in the role of externalities associated with knowledge spillovers (dynamic externalities) on local economic growth. The significant idea is that cluster has an important impact on innovation, knowledge transfer. The relation of this idea to economic growth has become important since Romer (1986) and Lucas (1988) put technological change and economic growth in an endogenous framework.

Romer had put technology advance endogenous in his model and suggests that the size of the stock of ideas such as the quality of human capital and the size of the labor force engaged in the production of ideas and innovations are key factors in innovation and hence economic growth. Endogenous growth theorists have emphasized the role of externality effects from education and research, the role of knowledge accumulation, and the importance of geographical proximity in the transmission of ideas which have provided the theoretical foundation for the importance of localization economies in regional economic growth. The main focus is on dynamic information externalities that operate over time, enhancing productivity and skill formation in the economy, and in turn enhancing innovation and hence economic growth (Romer 1986, Lucas 1988).

A study by Marshall (1890) and later formalized by Arrow (1962) and Romer (1986), the Marshall-Arrow-Romer (MAR) model, concluded that the effects of spatial concentration in the transmission of ideas and technology from one firm to another within the industry are very important to industry development. However, the dissemination of ideas through imitation, spying, and mobility of labor without compensation is argued to have a negative effect on a firm's ability to appropriate the economic value of its investment and sustain the competitive advantage. For this case, local monopoly is preferred as a tool to strengthen a firm's competitive level, in a sense that it allows technology externalities to be internalized by the innovator and prevents a firm's capabilities from being imitated by an expanding group of competitors.

2.5. Literature Review

The effects of spatial concentration of industry activity and their advantages to regional growth have been studied over the past years. Gabe, T. (2004) examined and compared the effects of industry concentration on growth indicatirs such as firm location, employment growth and earnings in Maine by estimating separate business location model for 54 2-digit SIC industries and establishment growth and wages model for 58 2-digit sectors. By analyzing the establishment growth models, the results suggest that all three indicators positively associated with industry concentration which is represented by location quotient (LQ) index. The spatial concentration appears to matter according to at least one indicator of growth or development in 35 of the 58 2-SIC industries. Focusing on each indicator individually, the study found that industry concentration encourages business location in 17 of 54 industries, it promotes establishment growth in 17 of 58 sectors, and this concentration increases establishment wages in 9 of 58 industries.

To examine the effects of spatial concentration on local economic growth Bernat, G.A.Jr (1999), explained the evidence of a positive association between industry clusters and rural earnings growth, supporting the notion that a cluster-focused development strategy may be effective in some rural area. By calculating annual growth rates for earnings in industries SIC 36 (electronic and other electrical equipment) and SIC 38 (instruments) for counties with a cluster and counties without a cluster, the empirical result shows that the growth rate for the instruments industry earnings was higher in counties with a cluster in seven of the eight years. This clearly suggests that the presence of a cluster may enhance industry growth prospects for these counties. In contrast, no such relationship is evident for other industries. Industry earnings growth in counties with clusters was higher than in counties without clusters in only the first two years of the period.

Mitra and Sato (2006) in their study about agglomeration economies in Japan addressed the issue of agglomeration economies and its effect on economic growth and unemployment. They found that the major links between external scale economies and growth are perceived in terms of technical efficiency, and higher growth is taken to reduce the unemployment rate. By using the stochastic frontier production function framework the technical efficiency index for each of the prefectures is estimated for most of the two-digit industry groups. In the second stage the relationship among the efficiency index corresponding to each industry, agglomeration specific variable(s), growth indicator (per capita income) and welfare indicator (the unemployment rate) is examined in terms of factor analysis. For the external scale variables two alternative indices are selected: one is population density and the other is percentage of total manufacturing employment in total work force. The empirical results are suggestive of the positive effect of agglomeration economies on efficiency, though efficiency does not take high factor loadings in a large majority of the cases. However, they also explained that it would be misleading to ignore the agglomeration effects either. In some of the light goods industries particularly the effect is relatively stronger. The study also verifies that agglomeration effects are seen in terms of higher growth indicator and lower unemployment rates. It may, therefore, be concluded that technical efficiency is only one of the various mechanisms in terms of which agglomeration effects translate themselves into higher economic growth. The policy implication of the study is that concentration can be effective in raising higher productivity and growth, and dispersal policy can prove to be counter-productive.

2.6. Methodology

This research uses qualitative and quantitative methods to determine the effect of spatial concentration of manufacturing industries on economic growth. Qualitative method is used to analyze factors that underlie the spatial concentration of manufacturing industries, their contribution to regional economic and the regional policies which related to these activities. Furthermore, quantitative method is used to measure the spatial concentration index of industry in each district by using location quotient (LQ) formula. The LQ index is also used as an independent variable to determine the effect of spatial industry on regional economic in the econometric model with panel data.

2.6.1 Concentration Index

Industry concentration in this study is represented by location quotients index which is one of the most-often used measure of concentration and specialization of industry.

Location Quotient (LQ), also recognized as the Hoover-Balassa coefficient which is usually used to measure the concentration index of industries within a region. The location quotient can examine the relative concentration of industry employment in a particular area relative to another larger, or base, area. Therefore, Location Quotient (LQ) is commonly used to assess industry concentration by dividing the employment shares of each industry in a particular region to employment share of the same industry based on a larger reference region such as a state or nation. The excellence of LQ variable is that the measures are relatively easy to calculate yet provide a potentially valuable insight into a local labor market's industry structure, relative to the larger base area. The location quotient is also a very powerful mean to identify export and import industries within a region. Export industries are very important to a region in a sense that they bring in money to a region, rather than circulate money that is already in that region like retailers and restaurants (Lafaurcade and Mion, 2003).

The value of LQ greater than one for a particular industry in an area indicates that the percentage of people employed in that industry in the area is greater than that for the base area. This suggests the industry may be a "basic" industry that is important to the economic base of the area. Location Quotient index can be computed as follows:

$$\mathbf{LQ = s_i / \chi_i \ or}$$

$$\mathbf{LQ = (E_{ir}/E_r)/(E_{iN}/E_N)}$$

where :

s_i = share of sector i in region r

χ_i = share of sector i in aggregate level

E_{ir} = employment in sector i in region r

E_r = total employment in region r

E_{iN} = employment in sector i in reference area (aggregate level)

E_N = total employment in the aggregate level

2.6.2. Model Specification

Specification indicators are neeeded in order to determine which variables are important in explaining the model that we will construct. There are many variables that can be used as indicators to economic growth based to theoritical framework above. Since the objective of this study is to analyze the effect of spatial concentration of manufacturing industries on local economy growth so we only focus on the spatial concentration variable and other variables which affect the manufacturing production directly. The constructed model is then needed to know which important variables will be choosen in

the estimation and to distinguish between dependent and independent variables.

In order to examine the effect of spatial concentration of manufacturing industry on Iocal economic growth in Sukabumi regency case we construct the growth model based on production function as the the following:

$$\mathbf{Y = f\{K, L, M, LQ\}} \quad (1)$$

We choose capital (K), labour (L), material (M) and concentration index (LQ) as a function of total output (Y). We applied this function in the Cobb Douglass production function, we add consentration index into the function so that the equation then become:

$$\mathbf{Y = AK^{\alpha 1} L^{\alpha 2} M^{\alpha 3} LQ^{\alpha 4}} \quad (2)$$

Productivity growth can be obtained by differentiating the equation above with respect to time as the following function:

$$\mathbf{\partial Y/\partial t = \alpha_1 (\partial K/\partial t) L^{\alpha 2} M^{\alpha 3} LQ^{\alpha 4} K^{\alpha 1-1} + \alpha_2 (\partial L/\partial t) K^{\alpha 1} M^{\alpha 3} LQ^{\alpha 4} L^{\alpha 2-1} + \alpha_3 (\partial M/\partial t) K^{\alpha 1} L^{\alpha 2} LQ^{\alpha 4} M^{\alpha 3-1} + \alpha_4 (\partial LQ/\partial t) K^{\alpha 1} L^{\alpha 2} M^{\alpha 3} LQ^{\alpha 4-1}} \quad (3)$$

Then to estimate the local economic growth we divide productivity growth above by output (Y) so that the final equation become :

$$\mathbf{gY = \alpha_1 gK + \alpha_2 gL + \alpha_3 g\, M + \alpha_4 gLQ} \quad (4)$$

Where **g** represent the value of local growth. We will use this equation to find the relationship between the industry spatial concentration and growth of output in Sukabumi regency. This model then will be transformed into econometerics (panel data) model.

However, the common problem in econometric model is determining whether change in one variable are cause of change in another. For this study we have to find whether change in spatial concentration cause change in economic growth, vice versa, or are spatial concentration and economic growth both endogenously determined. To test this problem, we will use causality test approach by using Granger and Sims method. Granger causality test will only analyze the effect of the past value on today condition, therefore it can be done only by using timeseries data. The basic idea that if spatial concentration (LQ) causes eoutput growth (Y) then changes in LQ should precede change in Y. If LQ causes Y, two conditions must be met. First, LQ should help to predict Y, second, Y should not help to predict LQ. The reason is that if LQ helps to predict Y and Y helps to predict LQ, it is likely that one or more other variables are in fact causing the observed change in both LQ and Y. Mathematically, there are several

steps to see whether LQ causes Y or not.

a. Build the hypotesis Ho : LQ does not cause Y,

   that can be written as Ho: $\beta_1 = \beta_2 = \beta_3 = \ldots\ldots\ldots = \beta_m = 0$

b. Run unrestricted regression and find sum square of error (SSE)

   $$\mathbf{Y = \Sigma\alpha_i\, Y_{t-i} + \Sigma\beta_i\, X_{t-i} + \varepsilon_t}$$

c. Run restricted regression and also find SSE

   $$\mathbf{Y = \Sigma\alpha_i\, Y_{t-i} + \varepsilon_t}$$

d. Do F test related to SSE which are found from two regression above,

   $$\mathbf{F = (N - k)\ (SSE_{restricted} - SSE_{unrestricted})/q\ (SSE_{unrestricted})}$$

   Where : N = the number of observations

   k= the number of parameter on unrestricted model

   q = the number of parameter on restricted model

e. If Ho is rejected, it means LQ causes Y. The similar way also can be done to check whether Y causes LQ.

From this causality test we expect that LQ will affect output (Y) , and not for the other way around. And if the result shows that there is no correlation between the two, then we have to drop the independent variable.

After doing causality test and if the variable is accepted as independent variable then the model will be estimated by using panel data model. By using panel data model we combine time series data (5 years) and cross section data (45 districts) that will give 225 observations that form the following function:

$$\mathbf{gY_{it} = \alpha_0 + \alpha_1\, gK_{it} + \alpha_2\, gL_{it} + \alpha_3\, gM_{it} + \alpha_4\, gLQ_{it} + e_{it}}$$

where :

i = 1,2,3,.....45 (i stands for the i^{th} cross sectional unit)

t = 1,2,3,4,5 (t stands for the t^{th} time period)

We use the hypothesis to suspect that coefficients α_1, α_2, α_3 and α_4 are positive. Meaning that all variables have positive effects to local economic growth with cateries paribus assumption. Since we observe each district in 5 obervations (5 year) then our model can be defined as a balance panel. It means that we combine each cross sectional unit to each

time series observation.

There are three models in panel data :

1. The Pooled model, this model pools cross sectional and time series data. This pooled data is treated as one unit observation. Then the model will be estimated by using Ordinary Least Square Method (OLS).

2. The Fixed Effect Model, this model is formed to anticipate the omitted variables which leads to the unconstant intercepts. These omitted variables can affect the changing of intercepts of each individu (cross section data) and period (time series data). To overcome this problem, the dummy variables are required within the model. So that it allows the changing intercepts to exist. Then the model can be estimated by using OLS.

3. Random Effect Model, this model accomodates the difference among individuals (cross sectional data) and periods (time series data) not in the intercepts but in th error terms. This model also considers that error terms may also correlated with the cross sectional and time series data. The best method to estimate the random model is the Generalized Least Square (GLS).

All models above have advantages and disadvantages, so that we have to check which model is more appropriate to accomodate our data. To compare all models we use the statistical check tools namely The Hausman test. To apply this test we have to construct the model and then build the hypothesis. The Hausman test results can be seen and interpreted by using the Chi-square statistical distribution and the degree of freedom k. If the statistical value of this test greater than the critical value, then we can reject the null hypothesis. It means the appropriate model is the fixed effect model, and vice versa.

2.6.3. Data

The constructed model above is estimated using data in all manufacturing firms in Sukabumi regency. For this purpose we observed data which cover all levels of industry from small industry (household level) up to large industry. All variables in this study are identified as follows :

a. Capital Variable

   In production theory we usually use capital as working capital such as fixed costs of each manufacturing industry minus depreciation. These capital data will be used to estimate one of the determinant factors that affect the spatial concentration of

manufacturing industry in the model.

b. Labor Variable

Labors data in this study are all labors in each manufacturing industry who work for permanent job and for temporary job/contractual (at least one year). These data will be used to examine the concentration of manufacturing industry by using Location Quotient (LQ) index.

c. Material Variable

Material is measured from total values of all row materials that used for processing in one year in rupiah currency.

d. Output Variable

Output is defined as production values of manufacturing industry in one year in rupiah currency.

e. LQ index Variable

The spatial concentrationcan indext can be measured by using the Location Quotients (LQ) formula . This formula shows the specialization of industry in one region by comparing the regional share of sector i to the national share of sector i.

Having looked at the spatial concentration concept, its impact on economic growth, other factors that influences economic growth, literature reviews that related to spatial concentration and economic growth, and the model specification, then it is necessary to look at the Sukabumi manufacturing industries condition in the next chapter three.

CHAPTER III

Manufacturing Industries in Sukabumi

3.1 Introduction

The objective of this chapter is to show the general overview of Sukabumi Regency and its economic development with the main focus on the performance of manufacturing industries.

3.2 Overview of Sukabumi Regency

Sukabumi regency is located in West Java province, Indonesia, which is administratively bordered southerly by Indonesian Ocean, easterly by Cianjur regency, northerly by Bogor regency and westerly by Lebak regency (Banten province). It has a strategic position that gives many advantages for local/regional people because there are many accessibility to enter Sukabumi regency. Sukabumi regency is also noted as the biggest regency in Java island with many natural resources pontentions. The width of the land is approximately 4.200 km^2, or it is about 9.18 % of West Java province, and 3.01 % of Java island. Sukabumi has divided into 45 districts and 343 villages since 2001.

The number of population is about 2.188.722 people in 2005. This value actually tends to increase every year. The rate of population growth is about 1.52% in period 2001-2005. This rate is actually higher than the rate of population in the national level (1.49%). The main factor for this rate is the huge birth rates since 1970s (birth momentum). Total fertility rate is about 5.6 child per reproductive age woman (Dinas KBPP Sukabumi, 2004).

Population density in 2005 is about 530.21 people per km^2. Most of people tend to dwell in the North side rather than in the South side of Sukabumi since the lands are more fertile in the North than in the South. This condition leads the economic development to concentrate more in the districts in the North side. The most dense district is Cisaat (5.005 people /km^2) and the less dense district is Cibitung(157.05 people/km^2).

Figure 2. The Indonesian Map

3.2.1 Economic Performances

The rate of economic growth data (Laju Pertumbuhan Ekonomi) has shown the increasing in the value of economic indicators for every year both in constant and current market prices. In 2005, the regional economic structure at 2000 constant market price shows the contribution of each sector to the GDP which are consist of agriculture sector 33.35 percent, mining and quarrying sector 3.86 percent, manufacturing industry 17.8 percent, electricity, gas and water supply 1.36, construction 2.96 percent, trade, hotel and

restaurant 15.76 percent, transportation and communication 7.22 percent, financial, ownership and busines services 4.25 percent, and services 13.29 percent. While at current market price, the contribution of agriculture sector 33.92 percent, mining and quarrying sector 4,92 percent, manufacturing industry 17.85 percent, electricity, gas and water supply 1.42, construction 3.21 percent, trade, hotel and restaurant 14.99 percent, transportation and communication 7.79 percent, financial, ownership and busines services 3.27 percent, and services 12.13 percent. The rate of economic growth gained, PDRB (Gross Regional Domestic Product/GRDP) and income per capita can be shown in the table 3.1 and 3.2 below.

Tabel 3.1. Economic indicators at '2000 constant market price

Economic Indicators (at 2000 constant market price)	2003	2004	2005
Economic growth rate (%)	5,69	5,17	6,57
GRDP (Million, rupiah)	6.562.912,68	6.822.407,78	7.105.103,91
Per capita income (rupiah)	1.179.641	1.221.653	1.281.238

Tabel 3.2. Economic Indicators at current market price

Economic Indicators (current market price)	2003	2004	2005
Economic growth rate (%)	12,60	10,40	11,23
GRDP (Million, rupiah)	8.493.539,54	9.488.683,24	11.337.840,41
Per capita income (rupiah)	3.496.526	3.801.064	4.160.729
Inflation Rate (%)	6,59	5,08	4,44

Source: Badan Perencanaan dan Pembangunan Daerah Kabupaten Sukabumi (BAPPEDA) (Sukabumi Planning and Development Board)

Investment

Investment rate as one of the engine of growth also tends to increase for every year. This has been shown by the indicator of Gross Domestic Fixed Capital Formation (Pembentukan Modal Tetap Domestik Bruto, PMTDB). Its value at 2003 current market price was Rp. 1.274.468,94 billion rupiah or had been increase at 12.81 percent.

Based on industrial origin/sector, the biggest investment is still in agriculture 35.78 percent, manufacturing industry 25.29 percent and services 18.68. This data indicate that agriculture sector is the prominent sector in Sukabumi followed by manufacturing and service sector.

Employment

The improvement in local economic condition after the economic crises actually has not able to absorb the additional labour forces and or to reduce unemployment. Labor data shows that the participation rate of labor force in 2003 is about 57,1 percent, in 2004 is

about 48.61 percent and in 2005 is about 59.4 percent. Whereas the open unemployment rates in 2003-2005 are about 6.15 percent, 9.10 percent and 9.9 percent.

3.2.2. Infrastructure

The development of infrastructure is an important part of economic development since it can support many economic activities. The availability of a good transportation sector as well as other sectors such as electricity and energy, telecommunication and information, and finance sector can directly affect the growth of manufacturing sector.

Transport infrastructure has given the huge contribution in supporting economic activities since it has served human mobilities as well as the distribution of goods and services in Sukabumi regency. Sukabumi has about 1.903,43 Km of road infrastructure which can be divided in national road of 41.40 km, provincial road 360.65 km, and regencial 1492 km. These roads connect Sukabumi with other regencies such as Bogor, Lebak and Cianjur regency. It has facilitated the distribution of raw materials (inputs) and final products (outputs) of manufacturing sector among these regencies. Nevertheless, only 85 percent of these roads are in a good condition. This is because of the weakness of road users who have often used the road with over capacity.

The railways actually are needed to reduce the number of traffic jam especially in the Sukabumi-Bogor route. However the railways in Sukabumi remain undeveloped. Most of the rails, bridge, signal systems and telecommunications are still technically poor and very old to operate. Therefore, Sukabumi local government now has corncerned to attract investors to reconstruct the railways especially for Sukabumi-Bogor and Sukabumi-Cianjur-Bandung route. Besides that, the West Java Province government has also created the feasibility study of development on air transportation for the long term transportation development in Sukabumi regency.

Energy and electricity infrastructure has actually developed in Sukabumi. It is reported that the program of "Listrik Masuk Desa" (Rural Electricity Program) has been 100 percent realized for all 343 villages. Although the realization of this program needed a huge efforts and costs since Sukabumi regency geographically is very large and the topography is very bumpy.

The financial and banking sector performance in Sukabumi regency tends to improve for the last five years. The domestic banks (such as Bank Rakyat Indonesia (BRI), Bank Negara Indonesia 2946 (BNI), Bank Jawa Barat, Bank Perkreditan Rakyat (BPR) have an important role for business development. Most of them have provided credit as a

financial source for business not only for large and medium enterprises but also for small/household firms.

3.3 Manufacturing Industries in Sukabumi Regency

As one of the region in West Java province, Sukabumi regency has an important role for manufacturing industry development in West Java province. The share of manufacturing sector is about 17,8 percent to Sukabumi gross regional domestic Product (GRDP) or about 1.246.733,58 Million rupiah in 2005.

Tabel 3.3. The Contribution of Manufacturing Sector to Sukabumi Total GRDP 2001-2005

No	Year	Manufacturing Sector (Million Rupiah)	Contribution to Total GRDP (%)
1	2001	1.029.767,82	17.2
2	2002	1.102.057,52	17.7
3	2003	1.144.156,12	17.7
4	2004	1.179.167,30	17.6
5	2005	1.246.733,58	17,8

Source : Biro Pusat Statistik Kabupaten Sukabumi 2006 (BPS Statistic of Sukabumi, 2006)

The contribution of manufacturing sector in absorbing labour force also tends to increase over year except in 2004 which can be seen as in the table 3.5 below.

Tabel 3.4. Sukabumi Manufacturing's Employments 2001-2005

No	Year	Manufacturing Employment	Contribution to Labour Force (%)
1	2001	40183	13.17
2	2002	40805	13.91
3	2003	47341	14.78
4	2004	45160	13.18
5	2005	49426	14.43

Source: Dinas Kependudukan dan Tenaga Kerja Kabupaten Sukabumi 2005
(Sukabumi Regency's Population and Labour Affairs Agency 2005)

It is reported that industrial enterprises/establishments are spreaded in all districts with the number of establisments is about 1282 in 2005. By using standard classification of ISIC 2 digit, the number of establishments in manufacturing industry sector can be plotted into nine subsectors as shown in the following table 3.5

Tabel 3.5. Number of Industrial Establishments Based on ISIC 2 digit Classification 2005

ISIC CODE	Subsectors	Number of establishments/ownerships		
		Domestic	Foreign	Total
3.1	Food, Beverage and Tobacco Industry	348	15	363
3.2	Textile,Wearing Apparel and Leather Industry	94	21	115
3.3	Wood and Wood Products Industry	281	-	281
3.4	Paper, Paper Products, Printing and Publishing Industry	56	1	57
3.5	Chemical, Petroleum Product, Rubbers and Plastics Industry	33	3	36
3.6	Other Mineral non Metal, except Petroleum and Coal Industry	212	4	216

3.7	Basic Metal Industry	-	-	-
3.8	Fabricated Metal, Machinery and Equipment Industry	138	-	138
3.9	Other manufacturing Industry	76	-	76
Total		**1238**	**44**	**1282**

Source : Sukabumi Industry and Trading Agency 2005

Basically investment in manufacturing industry can be divided into foreign investment and domestic investment. It is noted that the value of foreign investments as well as the the number of foreign establishments in manufacturing sector tends to increase every year. However, the level of foreign investments and the number of foreign firms are still lower than domestic investments. The foreign investment increasing tendency can be seen as in the table 3.6.

Tabel 3.6. Foreign Investment in Manufacturing Industry 2001-2005

Year	Number of foreign Establisments/ownerships	Total Investment (Million/US$)
2001	19	24.8
2002	22	26.9
2003	25	31.3
2004	37	50.9
2005	44	58.7

Source: Badan Komunikasi Promosi dan Pengembangan Usaha Kabupaten Sukabumi (The Sukabumi Communication, Promotion and Business Development Board)

Productions of most foreign industries in Sukabumi regency are largely for foreign consumers (export). These export values have been dominated by the textile, wearing apparel and leather industry (ISIC 3.1), fabricated metal, machinery and equipment industry (3.8) Food and beverages industry (3.1), and wood and wood product industry (3.3), only a small part of them is consumed by domestic market.

Tabel 3.7. Export value of manufacturing industry in Sukabumi Regency 2005

ISIC CODE	Subsectors	Export (Million/US$)
3.1	Food, Beverage and Tobacco Industry	17.469
3.2	Textile,Wearing Apparel and Leather Industry	35.931
3.3	Wood and Wood Products Industry	12.161
3.4	Paper, Paper Products, Printing and Publishing Industry	0
3.5	Chemical, Petroleum Product, Rubbers and Plastics Industry	0
3.6	Other Mineral non Metal, except Petroleum and Coal Industry	0
3.7	Basic Metal Industry	0
3.8	Fabricated Metal, Machinery and Equipment Industry	18.305
3.9	Other manufacturing Industry	8.279
TOTAL		**92.145**

Source: Dinas perindustrian dan Perdagangan Kabupaten Sukabumi, 2005
(Sukabumi Industry and Trading Agency, 2005)

Most of manufacturing industries in Sukabumi are owned by domestic people (1238 firms), and these industries are categorized as small and medium enterprises

(BPS/Statistic Kabupaten Sukabumi, 2004). We can see the distribution of the establishments and the ownerships of manufacturing industry in table 3.5, 3.6 and 3.8.. Food, beverage and tobacco industry is the dominant subsector in manufacturing sector in Sukabumi in 2005 since most of firms placed there (363 out of 1282 establishments). This is happened because food, beverage and tobacco firms are dominantly owned by traditional and small/hausehold level of firms which are apparently distributed in all districts.

The foreign investors ownerships increase from 33 establishments in 2004 become 44 establishments in 2005. These foreign firms participate in 5 out of 9 manufacturing subsectors. Textile, Wearing Apparel and Leather Industry (ISIC 3.2) is the largest subsector based on the number of foreign establishments. Whereas paper, rubbers and plastic industry (ISIC 3.4) is the smallest one. This is very interesting that there is no firm/establishments both domestic and foreign firms on basic metal industry in Sukabumi regency although there are 138 firms are concerned in fabricated metal, machinery and equipment industry (ISIC 3.8). By looking at the distribution of each subsector in each district we can say that most of these fabricated industries (106 firms) are located in Cisaat district as shown in the following table 3.8.

Table 3.8. The Industrial Establishments Distribution for Each Districts in 2005

No	Districts/ISIC	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	Total
1	Ciemas	3	0	0	0	0	0	0	0	0	**3**
2	Ciracap	0	0	2	0	0	0	0	0	0	**2**
3	Waluran	0	0	2	0	0	0	0	0	0	**2**
4	Surade	3	0	5	0	0	0	0	0	1	**9**
5	Cibitung	0	0	2	0	0	0	0	0	0	**2**
6	Jampangkulon	6	0	11	0	0	0	0	0	0	**17**
7	Kalibunder	3	0	3	0	0	0	0	0	0	**6**
8	Tegal Buleud	1	0	5	0	0	0	0	0	0	**6**
9	Cidolog	0	0	6	0	0	2	0	0	0	**8**
10	Sagaranten	3	0	6	0	0	0	0	0	0	**9**
11	Cidadap	4	0	0	0	0	0	0	0	0	**4**
12	Curugkembar	1	0	1	0	0	0	0	0	0	**2**
13	Pabuaran	5	0	2	0	0	7	0	0	0	**14**
14	Lengkong	2	0	2	0	0	0	0	0	0	**4**
15	Palabuhanratu	14	4	11	5	0	16	0	0	6	**56**
16	Simpenen	2	0	0	0	0	0	0	0	3	**5**
17	Warung Kiara	8	0	7	0	0	3	0	0	5	**23**
18	Bantargadung	3	2	0	0	0	0	0	0	0	**5**
19	Jampangtengah	7	0	12	0	0	18	0	0	2	**39**
20	Purabaya	2	0	3	0	0	1	0	0	0	**6**
21	Cikembar	17	3	16	0	13	31	0	0	0	**80**
22	Nyalindung	1	0	8	2	0	2	0	0	3	**16**
23	Geger Bitung	2	1	2	0	1	5	0	0	0	**11**
24	Sukaraja	31	11	15	9	2	10	0	2	13	**93**
25	Kebon Pedes	3	1	1	0	0	0	0	0	0	**5**
26	Cirenghas	2	0	1	0	1	1	0	0	0	**5**
27	Sukalarang	2	1	1	2	0	0	0	0	1	**7**
28	Sukabumi	17	7	4	7	1	3	0	0	3	**42**
29	Kadudampit	1	0	0	0	0	0	0	5	0	**6**
30	Cisaat	61	8	38	11	6	33	0	106	11	**274**
31	Gunungguruh	4	1	14	3	0	8	0	0	1	**31**

32	Cibadak	36	21	24	4	2	17	0	12	5	**121**
33	Citantayan	9	3	2	3	3	26	0	4	4	**54**
34	Caringin	2	2	0	0	0	0	0	0	0	**4**
35	Nagrak	4	2	2	0	0	0	0	0	0	**8**
36	Cicurug	43	20	6	3	0	29	0	9	5	**115**
37	Cidahu	19	4	1	0	1	2	0	0	0	**27**
38	Parakan Salak	4	0	7	0	0	0	0	0	0	**11**
39	Parungkuda	14	20	43	7	2	0	0	0	10	**96**
40	Bojong Genteng	1	0	3	1	1	0	0	0	0	**6**
41	Kalapa Nunggal	7	0	3	0	0	0	0	0	0	**10**
42	Cikidang	3	2	4	0	0	0	0	0	0	**9**
43	Cisolok	6	2	4	0	0	1	0	0	2	**15**
44	Cikakak	2	0	0	0	3	1	0	0	0	**6**
45	Kabandungan	5	0	2	0	0	0	0	0	1	**8**
	Total	**363**	**115**	**281**	**57**	**36**	**216**	**0**	**138**	**76**	**1282**

Source : Sukabumi Industry and Trading Agency 2005

3.4 Local Government Policy

Prior to 2000, manufacturing industry policies were conducted by central government (Ministry of Trading and Industry). Most of those policies and plans were formulated centrally (top-down policy) and they often did not consider about the local interest. However, in 2000 there has been a change in the development policy orientation from central to regional which was indicated in the Indonesian law No. 22/1999 about regional autonomy. Under this autonomy, manufacturing industry policies, plans and regulations are independently conducted by local government which is institutionally in Sukabumi regency represented by Trading and Industry Agency. However, in the process of regional autonomy implementation, there was still an overlapping interest between local and central government in formulating industry policies.

Related to the autonomy era, the main objective of Sukabumi local government is to develop regional economic based on prominent sectors in order to obtain its regional revenue (Pendapatan Asli Daerah-PAD). As mentioned before, the main sectors which have given the significant contribution to GRDP are agriculture, manufacturing industry and services. In fact, most of farmers who work in agriculture sector are subsisten farmers. Although the contribution of manufacturing sector to GRDP is somewhat large, firms in the manufacturing industries are also noted as hausehold, small and medium enterprises which are characterized by the limitation of technology, lack of skills, and domestic market orientation.

Considering the huge availability of natural resources, land, and labours with the limitation of technology and knowledge, local government has formulated plans for exploring them largerly by improving the development in manufacturing industry as one of prime sector in Sukabumi. The development of this sector actually requires more efforts and financial supports. However the availability of them are very limited especially

since economic crisis hit business environtments in 1997. For this purpose, local government was created another institution namely The Sukabumi Communication, Promotion and Business Development Board (Badan Komunikasi Promosi dan Pengembangan Usaha Kabupaten Sukabumi) in 2000 in order to promote sukabumi to attract more domestic and foreign investors. To stimulate investment inflow, bureaucracies and procedures to invest were also simplified through one roof service program. Besides that, in 2001 The Investment Protection Team (Tim Perlindungan Investasi) has also been created under trading and industry agency in order to guarantee the rights and to impose responsibility of investors.

For short term, local government has arranged economic development policies such as (1) creating a condusive investment climate and considerable investment opportunities in agriculture, industry, mining, trading and tourism sectors, (2) improving infrastructure both for its quantity and its quality, (3) strenghtening economic-base community institutions and cooperative society, (4) supporting the growth of household industries, small and medium enterprises especially for industries which are concerned with manufacturing products by giving skill trainings and other technical assistances.

For long term, local government through Trading and Industry Agency has also formulated policies such as (1) maximizing the utilization of local resources in order to improve regional earnings (PAD), (2) accelerating the growth of manufacturing industries by attracting more investors (3) improving intersectoral regulation (4) improving export oriented small and business enterprises by expanding market network and financial scheme.

At the first glance, it is reported that these regional policies seem to have had an impact on the development of manufacturing sector. In particular, they appear to have fostered the settlement of industries in promoted regions and also contributed to explain the significant increase in the share of the Sukabumi in total manufacturing employment.

CHAPTER IV

The Empirical Results

4.1 Introduction

This chapter is going to show the empirical results. Then the diagnostic test result will also be discussed in order to know which model is appropriate to our data.

4.2. Concentration Index

The location quotients index results show that manufacturing industries are unevenly distributed across districts in Sukabumi regency. The analyzing results from table 4.1 show that there are 11 out of 45 districts have the large values of LQ (LQ > 1) in 2001-2005, it means that the share of manufacturing sector from those districts are larger than regional share, or in other words those districts are more specialized in production of manufacturing sector.

Table 4.1. LQ index for Manufacturing Industry for All Districts in Sukabumi Regency 2001-2005

No	Districs	2001	2002	2003	2004	2005
1	Ciemas	0,00749	0,09253	0,09113	0,16442	0,15366
2	Ciracap	0,00224	0,00524	0,00115	0,00325	0,00482
3	Waluran	0,01895	0,00922	0,00915	0,02145	0,02762
4	Surade	0,01891	0,01876	0,01995	0,02187	0,03014
5	Cibitung	0,00895	0,00854	0,00789	0,00926	0,01364
6	Jampang Kulon	0,00299	0,00357	0,04115	0,04587	0,06236
7	Kali Bunder	0,00887	0,00998	0,01455	0,01548	0,01415
8	Tegal Buleud	0,02154	0,02114	0,02254	0,03321	0,03212
9	Cidolog	0,08854	0,09145	0,09581	0,10325	0,11462
10	Sagaranten	0,19745	0,19851	0,15814	0,11447	0,10482
11	Cidadap	0,00665	0,00654	0,00521	0,00998	0,01836
12	Curugkembar	0,00875	0,00955	0,01554	0,08854	0,01663
13	Pabuaran	0,15448	0,13655	0,12549	0,41253	0,3088
14	Lengkong	0,76251	0,75004	0,89754	0,9325	0,91234
15	Pelabuhan Ratu	0,89562	0,88472	0,98547	0,14581	0,34729
16	Simpenen	0,05521	0,05421	0,03345	0,03582	0,03738
17	**Warung Kiara**	**1,03251**	**0,95479**	**1,03354**	**1,02254**	**1,09041**
18	Bantargadung	0,08857	0,09987	0,11458	0,11525	0,10989
19	Jampang Tengah	0,44211	0,51218	0,65652	0,6525	0,67833
20	Purabaya	0,00441	0,00415	0,00225	0,00234	0,04502
21	**Cikembar**	**0,99887**	**0,99782**	**1,69824**	**1,7552**	**1,78086**
22	Nyalindung	0,10035	0,21145	0,15668	0,31233	0,35027
23	Geger Bitung	0,09887	0,18955	0,19866	0,21369	0,25434
24	**Sukaraja**	**1,21156**	**1,2213**	**1,63027**	**1,56032**	**1,97348**
25	Kebon Pedes	0,16785	0,18551	0,18965	0,19455	0,21762
26	Cirenghas	0,08635	0,07551	0,09441	0,08755	0,02712
27	Sukalarang	0,08772	0,09569	0,05879	0,07711	0,08869
28	**Sukabumi**	**0,98775**	**0,99544**	**1,40213**	**1,98857**	**1,95332**

29	Kadudampit	0,09884	0,09993	0,09981	0,25884	0,24187
30	**Cisaat**	**1,00986**	**1,03654**	**1,23557**	**1,44125**	**1,48203**
31	Gunungguruh	0,26654	0,26554	0,19861	0,35017	0,35007
32	**Cibadak**	**1,89455**	**1,75642**	**1,88956**	**2,01145**	**2,47619**
33	**Citantayan**	**0,79558**	**0,99965**	**0,99856**	**1,00551**	**1,18022**
34	Caringin	0,03114	0,03345	0,05326	0,04985	0,05185
35	Nagrak	0,04752	0,06998	0,07624	0,07555	0,08321
36	**Cicurug**	**3,03652**	**3,05232**	**3,08512**	**3,00247**	**3,18636**
37	**Cidahu**	**0,9985**	**1,00255**	**1,49851**	**1,54621**	**1,42083**
38	Parakan Salak	0,29557	0,2568	0,18895	0,19857	0,22411
39	**Parung Kuda**	**3,75421**	**4,00224**	**4,00354**	**4,00125**	**4,00081**
40	Bojong Genteng	0,19956	0,22153	0,10223	0,10561	0,13764
41	Kalapa Nunggal	0,09987	0,08856	0,09887	0,09558	0,10912
42	Cikidang	0,11458	0,12541	0,09958	0,10051	0,11023
43	Cisolok	0,08957	0,09596	0,11784	0,15542	0,15432
44	**Cikakak**	**0,99535**	**0,98956**	**1,00978**	**1,01547**	**1,04746**
45	Kabandungan	0,48553	0,45215	0,67412	0,65417	0,49869

The big magnitude of LQ in those 11 districts shows that the manufacturing industry employments in Sukabumi regency are more concentrated in those districts, and this spatial pattern does not seem to have changed significantly over time.

Data from table 4.2 shows the LQ indices of each subsector in 2005 for all districts. It is shown that Cicurug and Parungkuda districts tend to specialize in sub sector food and beverage industry. The greater value of LQ = 1. 89 and 1.67 indicates that food and beverage industry is the main subsector of manufacturing industry in Cicurug and Parungkuda.

Table 4.2. LQ based on manufacturing industry sub-sectors 2005

No	District	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9
1	Ciemas	0.89	0.34	0.56	0.65	0.78	0.65	0.67	0.65	0.56
2	Ciracap	0.65	0.45	0.76	0.67	0.76	0.45	0.54	0.40	0.78
3	Waluran	0.76	0.45	0.89	0.65	0.75	0.65	0.45	0.67	0.65
4	Surade	0.43	0.32	0.87	0.64	0.76	0.38	0.32	0.58	0.34
5	Cibitung	0.23	0.56	0.86	0.65	0.67	0.54	0.76	0.49	0.56
6	Jampangkulon	0.45	0.76	0.87	0.56	0.75	0.67	0.68	0.30	0.78
7	Kali Bunder	0.67	0.76	0.56	0.57	0.69	0.54	0.95	0.29	0.34
8	Tegal Buleud	0.98	0.98	0.78	0.59	0.58	0.65	0.45	0.35	0.65
9	Cidolog	0.90	0.76	0.79	0.49	0.71	0.78	0.65	0.65	0.98
10	Sagaranten	0.23	0.56	0.87	0.72	0.73	0.76	0.27	0.87	0.76
11	Cidadap	0.21	0.45	0.54	0.62	0.53	0.52	0.98	0.67	0.78
12	Curugkembar	0.65	0.32	0.56	0.68	0.45	0.54	0.90	0.45	0.65
13	Pabuaran	0.86	0.65	0.76	0.67	0.65	0.43	0.54	0.32	0.34
14	Lengkong	0.32	0.67	0.90	0.63	0.76	0.78	0.65	0.86	0.56
15	Pelabuhan Ratu	0.45	0.73	0.92	0.65	0.73	0.65	0.34	0.65	0.78
16	Simpenen	0.65	0.21	0.95	0.54	0.81	0.78	0.73	0.78	0.67
17	Warung Kiara	0.87	0.34	0.64	0.65	0.65	0.56	0.67	0.54	0.98
18	Bantargadung	0.76	0.67	0.81	0.67	0.67	0.12	0.45	0.54	0.54
19	Jampangtengah	0.56	0.90	0.87	0.59	0.39	0.32	0.84	0.90	0.56
20	Purabaya	0.54	0.87	0.56	0.54	0.91	0.65	0.63	0.76	0.87
21	Cikembar	0.35	0.89	0.78	0.56	0.78	0.97	0.45	0.78	0.65
22	Nyalindung	0.61	0.76	0.79	0.57	0.98	0.48	0.38	0.54	0.67
23	Geger Bitung	0.23	0.43	0.96	0.58	0.65	0.67	0.76	0.34	0.43
24	Sukaraja	0.45	0.56	0.45	0.59	0.76	0.56	0.54	0.65	0.63
25	Kebon Pedes	0.76	0.56	0.75	0.58	0.89	0.45	0.34	0.33	0.45
26	Cirenghas	0.78	0.76	0.78	0.45	0.32	0.76	0.78	0.54	0.62

27	Sukalarang	0.66	0.54	0.82	0.67	0.45	0.59	0.70	0.78	0.80
28	Sukabumi	0.67	0.56	0.89	0.68	0.67	0.56	0.40	0.55	0.98
29	Kadudampit	0.39	0.90	0.76	0.58	0.54	0.76	0.34	**1.23**	0.65
30	Cisaat	0.99	0.89	0.65	0.54	0.89	0.80	0.56	**1.15**	0.43
31	Gunungguruh	0.65	0.97	0.43	0.56	0.23	0.39	0.78	0.64	0.43
32	Cibadak	0.32	0.65	0.45	0.57	0.45	0.45	0.54	0.45	0.56
33	Citantayan	0.56	0.56	0.78	0.59	0.54	0.65	0.74	0.56	0.78
34	Caringin	0.77	0.46	0.98	0.87	0.65	0.75	0.29	0.67	0.89
35	Nagrak	0.56	0.97	0.45	0.76	0.32	0.39	0.76	0.74	0.75
36	Cicurug	**1.89**	**3.77**	0.32	0.65	0.45	0.72	0.83	0.56	0.67
37	Cidahu	0.76	0.87	0.65	0.43	0.56	0.36	0.45	0.80	0.54
38	Parakansalak	0.67	0.76	0.78	0.67	0.76	0.45	0.74	0.89	0.80
39	Parungkuda	**1.67**	0.78	0.79	0.89	0.95	0.87	0.59	0.32	0.92
40	Bojonggenteng	0.65	0.90	0.76	0.87	0.54	0.65	0.54	0.54	0.45
41	Kalapanunggal	0.89	0.54	0.76	0.76	0.67	0.67	0.32	0.76	0.65
42	Cikidang	0.43	0.78	0.56	0.75	0.34	0.54	0.64	0.78	0.78
43	Cisolok	0.76	0.76	0.91	0.75	0.54	0.87	0.98	0.56	0.34
44	Cikakak	0.76	0.98	0.92	0.69	0.56	0.56	0.65	0.45	0.65
45	Kabandungan	0.78	0.76	0.63	0.58	0.78	0.76	0.65	0.65	0.76

According to Ellison and Glaeser (1997), concentration can be happened because the existence of natural advantages include climate, topography proximity to location inputs, location that minimize transportation related to distribution of inputs and outputs and location with access to pools of labor with desired characteristics (e.g. low wage labour). Generally, most of industries which are concentrated in Cicurug and Parungkuda districs are mineral water industries. In line with Ellison and Glaeser ideas, those districts are concentrated there apparently because Cicurug and Parungkuda are located close to the specific natural resources (spring water) and to domestic markets (Bogor, Bandung and Jakarta). The other reason is that most of labors in Cicurug and Parungkuda are skilled labors especially for food and beverage industries because those typical firms has been exist there since 1995 (Sukabumi Industry and Trading Service, 2005). While based on Gordon and McCann (2000), this type of cluster can be classified as *industrial district,* since access to the cluster is open, and the cluster is unintentionally exist without any interventions from government.

Looking at the tabel 4.2, Cicurug district also dominated by textile industry with LQ = 3.77. The typical reason could be specialization according to comparative advantage, e.g. low-wage, labour-rich in producing a relatively large amount of clothing and textiles. This value also can be explained by looking the investors location decisions regarding the transportation costs of product distributions. Cicurug district geographically is located in the main road of Sukabumi-Bogor, so that investors tend to locate their firms there in order to get the easiest accessibility to market their products in and out of Sukabumi regency. This concentration has also been partially driven by the improvement in some infrastructures there such as provincial roads, financial and banking sectors, and commercial markets by the local government since 1990. The other reason is that textile

and apparel fabrics usually need larger spaces compare to other fabrics in Sukabumi, and these lands are still available in Cicurug district.

If we look at the manufacturing industry in Kadudampit and Cisaat districts, they tend to specialize in subsector fabricated metal products, machinery and equipment. The greater value of LQ = 1.23 and 1.15 shows that in Kadudampit and Cisaat districts fabricated metal products, machinery and equipment is the dominant subsector in their manufacturing industry. This concentration can be classify as the Social Network type. This is because those industries are noted as a group of hereditary firms which is passed on from one generation to the others and still there is no interference from government to this behaviour (Trading and Industry Agency, 2005). This type of cluster causes most of labors who work in this areas are more specialize in fabricated metal industries (labor pools of fabricated metal industry).

4.3. The Value Chain and Export Conditions

Basically, most of industries in Sukabumi regency are independently producing the final products which are directly marketed in both domestic and foreign markets. Therefore the concentrations of industries in Sukabumi may not be explained by the concepts of forward and backward linkages or by the economic value chain. For instance, food and beverages industries which are higly concentrated in Cicurug and Parungkuda districts, are selling their products directly to the market without any interactions with other firms in the cluster. They indeed need different inputs and also do the different phases of production to bring products to end users. However most of them established the different factories to support their full range of production under one firm in or out of the cluster. This can be seen in Aqua Golden Mississippi Tbk. and PT. Ades Waters Indonesia which are the biggest firms in the food and beverages industry. They have more then two factories in Cicurug, Cidahu and Parungkuda districts which are produced supported products to mineral water product. For example, they produce plastic bottles in their factory in Cidahu, produce water mineral in Cicurug and package all final products in Parungkuda district. So, we may say that there is no interrelation among different firms in conjuction with input-output, but there is interrelation among districts under the same firm.

According to Lafaurcade and Mion (2003), the location quotient is also a very powerful tool in helping identify export and import industries within a region. Since export industries are very important in that they bring in money to a region, rather than other circulates money, then it is important to identify the subsectors and districts which

support export activities in Sukabumi. The greater LQ values in four districts (table 4.2) mean that the manufacturing industry's share of the total employment in those districts is greater than the share of employment in the region. This would be an indication that those districts are producing more than average share of output in manufacturing industry and some of that outputs are likely being exported. While the districts with LQ index lower than 1 means that those districts are the net importer of industrial goods. The notable industries with large location quotients in this Sukabumi case are foods and beverages, textiles and apparel and fabricated metal industries. It is also indicated in the table 3.4 in chapter 3 which noted that these 3 subsectors are the biggest exporter out of 9 subsectors. This is an indication of the strength of these industries which can be noted as the economic based of Sukabumi regency from manufacturing industry sector.

4.4. Regional Industry Policy

Although Sukabumi local government realized that most of industries tend to concentrate in a particular district, there are no such industrial policies that support it specifically. In general, government has only concerned on how to develop manufacturing industries in Sukabumi by formulated regulations, plans and policies to attract investors to establish their business in Sukabumi. However, those efforts are only concern on the investment climate. All industrial concentrations intentionally exist without any supports and interventions from local government. These concentrations are mostly driven by the similarity on firm's interests regarding to resource endowment availability in a particular district. However, since the presence of spatial concentration resulting from natural advantage (the availability of resource endowments) may be purely the incidental result of individual firm optimizing behaviour (McCann, 2000), then the presence of other firms in industry at the cluster may not provide any benefit in terms of external economies. These firms will decide not to cluster if the availability of resources does not exist anymore. Therefore, the role of local government is very important to support this firm's behaviour by providing the strategic industrial zone, improving infrastructure, and creating economic planning and policy especially in targeting the growth of such industries that have high forward and backward linkages in a cluster. The establishment of these industries will facilitate and stimulate the growth of other linked industries in a region. So that the benefits gained from concentrations are not only from the availability of natural resource but also from the external economies such as technological spillover and the forward-backward lingkage industrial activities.

4.5. OLS Estimation Results

Before we construct the panel data model in our estimation, we have done the Granger Causality Test to find out the causality between output (Y) and location quotient index (LQ) and the result is presented as STATA program output as follows:

```
. granger y lq, lags(1)
Granger Causality test (asymptotic) y    --->    lq,
 H0:  y  does not Granger-cause  lq,
F(   1,   222)  =  .80747507
Prob  >  F  =     .37
Granger Causality test
 H0:  lq  does not Granger-cause  y,
chi2(1)  =  2.4551607
Prob  > chi2   =   0.1171


. granger y lq, lags(2)
Granger Causality test (asymptotic) y    --->    lq,
 H0:  y  does not Granger-cause  lq,
F(   2,   220)  =  2.4051276
Prob  >  F  =    .093
Granger Causality test
 H0:  lq  does not Granger-cause  y,
chi2(2)  =  7.3793689
Prob  > chi2   =   0.0250
```

The granger causality test result shows that in lag-1 the value of probability of both null hypotheses (H0) are not significant (more than 0.05). It means that we accept the both hypotheses that (Y) does not granger cause (LQ) and (LQ) does not granger cause (Y). However since we are expecting only LQ causes Y and not for the other the way around, then we try to do the test by choosing lag = 2. The result finally shows that in lag-2 the value of probability of H0: Y does not Granger cause LQ is not significant, means that we accept H0. The value of probability of H0: LQ does not Granger cause Y is significant, means that we reject H0. Thus, we can use LQ as independent variable that affecs Y. We can continue to use the previous constructed model as the following:

$$\mathbf{gY_{it}} = \alpha_0 + \alpha_1 \mathbf{gK_{it}} + \alpha_2 \mathbf{gL_{it}} + \alpha_3 \mathbf{gM_{it}} + \alpha_4 \mathbf{gLQ_{it}} + \mathbf{e_{it}}$$

Based on this model we do panel data regression by using fixed effect and random effect model. Then to check the appropriate model we also do the Hausman Test. We do regressions for two models based on our constructed model. Firstly, we use the model of the production level by using log-linear model of Cobb Douglass production function in order to know the effect of each choosen independent variables to the level of production/output. Secondly, we use the original model of growth to identify the effect of each independent variable to the growth of ouput.

1. The log-linear model of Cobb Douglass Production Function

Before doing regression we linearized the Cobb Douglass production function by

transforming all variables into natural logarithm model. Therefore, we write the transformed model as:

$$\mathbf{lnY_{it} = \alpha_0 + \alpha_1 ln\ K_{it} + \alpha_2 ln\ L_{it} + \alpha_3 ln\ M_{it} + \alpha_4 ln\ LQ_{it} + e_{it}}$$

By using this model we run the regression of fixed effect and random effect model. Then after doing the Hausman test for these two models we find that the value of probability is significant (Prob>chi2 =0.000). It means that we reject H0 and the appropriate model is the fixed effect model. This model permits the intercept to be varied across districts but it is constant over time. However, the slope of coefficients are constant over time. The value of determination coefficient (R^2) is very high (0.9623). It means that 96.23 % changes in the output growth is being explained by the model.

We find that only two variables are significant, capital and material variables, in affecting the dependent variable with 95% confidence interval. The LQ variable is also significant but in 90 % confidence interval. While labor variable is not significant in both 90% and 95 % confidence interval. A thorough results can be seen in appendix. Based on the result then a complete equation can be written as follows :

$$\mathbf{lnY = 6.160171 + 0.4952605 lnK + 0.0626389 lnL + 0.2766511 lnM + 0.0490602\ lnLQ}$$

(5.26) (6.77) (1.15) (7.17) (1.69)

The t-statistic values are shown in parantheses. It is shown that all variables are to some degree statistically affecting the level of output in a positive way as mentioned in the economic theory. It means that any improvement in independent variables will increase the dependent variable. Since our model is the logarithm model, then the interpretation of each coefficient value should be in term of percentage changing. The coefficient value of capital is 0.4952605, it means that 10 % increase in capital will increase the production level by 4.95 %., 10 % increasing in material will also increase the level of production by 2.76 % and 10 % increasing of the concentration index will increase 4.9 % of the production level.

2. The Output Growth Model

We do a similar treatment for this model with both the fixed effect and random effect regression. Then by using Hausman test we find that the value of its probability is significant (Prob>chi2=0.0009), it means that we reject H0. Therefore, the appropriate panel data regression for this model is also fixed effect model. By using fixed effect model, the intercept is alllowed to be varied across districts but it is constant over time, while the slope of coefficients are also constant over time. The value of R^2 (goodness of

fit indicator) is 0.1263. It indicates that all independent variables in the model can explain 12.63 % of the variation of dependent variable.

Based on the estimated fixed effect results, the growth equation can be written as follows:

$$\mathbf{gY = -10.2662 - 0.0088291\,gK + 0.3372941gL + 1.58049gM + 0.4281074gLQ}$$

(-1.85) (-1.29) (5.41) (5.98) (1.75)

All the t-statistic values are shown in the parantheses. Most of the coefficient estimates are statistically significant. Two variables (gL and gM) are statistically significant at 5 % levels, and have the expected signs. While the gLQ variable is statistically significan but in 10 % level. These results have supported the theory of growth. Theretically, all choosen independent variables should respectively affect the dependent variable in a positive way. One unexpected result is a negative coefficient sign of the growth of capital (gK), eventhough this variable is not statistically significant affecting the dependent variable. This result actually does not support the production and growth theories. Theoretically the growth of capital should be associated with the increasing in production level, and its growth level respectively. However from this result we can imply that the growth of capital does not significantly affect the growth of production, which is contrary to output level results above.

As we mentioned before that most of industries in Sukabumi regency are the small and medium industries which are strongly depended on labor instead of capital. Therefore the increasing in capital (the growth of capital) may cause the increasing in production costs but it may not give the significant improvement in output growth. The estimated coefficient of capital might capture this negative correlation.

Since most of studies about the effect of spatial concentration on growth have usually used the provincial and national data, we also suspect that this odd finding may be happened due to the weakness of the district data which may not well calculated by the local institutions that provide our data. We may say that because this condition has been mentioned in the previous chapter that this study will be limited to our data conditions.

CHAPTER V

Conclusions and Policy Implications

This study wants to analyze the effect of industry spatial concentration on local economic growth in Sukabumi regency from the period of 2001-2005. Theoretically industry spatial concentration gives the positive effect on local economic growth, and this have been proofed by many economic researchers.

The location quotient (LQ) index have been used to represent the level of industrial concentration in this study. The LQ estimation results suggests that 11 out of 45 districts have the large values of LQ (LQ > 1) based on 2110-2005 data. This means that the share of manufacturing sector from those districts are larger than regional share, or in other words those districts are more specialized in production of manufacturing sector. In addition, the prime subsector which have supported the development of manufacturing industry in Sukabumi are (1) foods and beverages, (2) textiles and apparel and (3) fabricated metal industries. The spatial concentrations of these industries are mostly driven by the natural advantages without any interventions from local government. So that, they can be classified into industrial district cluster and the social network cluster model.

This study combined time series (5 years) and cross section (45 districts) data in applying panel data analysis. The main results from the estimation on panel data show that spatial concentrations are statistically significant in positive ways both in Cobb Douglass production function and constructed output growth model. It means that the increasing in the concentration index should increase the level of total output and the growth of output. These results have supported our hyphotesis and have answered our main question in this study.

Therefore, the policy implications that have risen from this study are :

1. The LQ index also represents the specialization in manufacturing industry, so local government should use it as a guidance to develop a specific industry in a particular district. Because the specialization will improve the competitiveness of industry in the districts.
2. Since the presence of industrial concentration/clusters has significantly affect the local economic growth (total output level and output growth) then it is very important for local government to support this industry by developing the industrial cluster strategy for manufacturing development in Sukabumi.

3. Based on our analysis, the industrial development policies should be associated with the improvement in the big three subsectors (Food and Beverage, Textiles, wearing and Apparel, and Fabricated metal and machinery industries).
4. Government should develop industrial zone especially for firms which have a high forward and backward linkage, improving infrastructure and the industrial regulations.

APPENDIX

1. Panel Data Regression for The log-linear model of Cobb Douglass Production Function

a. With Fixed Effect Model

Fixed-effects (within) regression — Number of obs = 225
Group variable: no — Number of groups = 45

R-sq: within = 0.6545 — Obs per group: min = 5
between = 0.9641 — avg = 5.0
overall = 0.9623 — max = 5
F(4,176) = 83.34
corr(u_i, Xb) = 0.7313 — Prob > F = 0.0000

lnprod	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
lnk	.4952605	.0731751	6.77	0.000	.3508469	.639674
lnm	.2766511	.038602	7.17	0.000	.2004687	.3528336
lnl	.0626389	.0543354	1.15	0.251	-.0445938	.1698717
lnlq	.0490602	.0289795	1.69	0.090	-.0077385	.1058588
_ cons	6.160171	1.171478	5.26	0.000	-.0130098	8.472124

sigma_u | .90581569
sigma_e | .15349678
rho | .97208591 (fraction of variance due to u_i)

F test that all u_i=0: F(44, 176) = 49.44 Prob > F = 0.0000

b. With Random Effect Model

Random-effects GLS regression — Number of obs = 225
Group variable: no — Number of groups = 45

R-sq: within = 0.6497 — Obs per group: min = 5
between = 0.9692 — avg = 5.0
overall = 0.9673 — max = 5

Random effects u_i ~ Gaussian — Wald chi2(4) = 1852.15
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

lnprod	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
lnk	.5366905	.054073	9.93	0.000	.4307094	.6426717
lnm	.3991518	.0359055	11.12	0.000	.3287783	.4695253
lnl	.0646726	.0514665	1.26	0.209	-.0361999	.1655451
lnlq	.0422253	.0279879	1.51	0.133	-.0130098	.0974604
_ cons	2.7635	.6531403	4.23	0.000	1.483369	4.043632

sigma_u | .48654561
sigma_e | .15349678
rho | .90947999 (fraction of variance due to u_i)

c. The Hausman Test

	---- Coefficients ----			
	(b) fxd	(B) rdm	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lnk	.4952605	.5366905	-.04143	.0493022
lnm	.2766511	.3991518	-.1225006	.0141744
lnl	.0626389	.0646726	-.0020337	.0174222
lnlq	.0490602	.0422253	.0068349	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 80.34
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)

2. Panel Data Regression for the Output Growth Model

b. With Fixed Effect Model

Fixed-effects (within) regression — Number of obs = 225
Group variable: no — Number of groups = 45

R-sq: within = 0.2870 — Obs per group: min = 5
between = 0.1263 — avg = 5.0
overall = 0.1263 — max = 5
F(4,176) = 17.71
corr(u_i, Xb) = 0.7832 — Prob > F = 0.0000

gy	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
gk	-.0088291	.0068447	-1.29	0.199	-.223373	.0046792
gl	.3372941	.624034	5.41	0.000	.2141389	.04604494
gm	1.58049	.2644492	5.98	0.000	1.058591	2.10239
glq	.4281074	.2448796	1.75	0.082	-.0.0551709	.9113857
_ cons	-10.2662	5.5556929	-1.85	0.066	-.21.23299	.7005878

sigma_u | 4.8880685
sigma_e | .22048825
rho | .99796945 (fraction of variance due to u_i)

F test that all u_i=0: F(44, 176) = 796.15 Prob > F = 0.0000

b. With Random Effect Model

Random-effects GLS regression — Number of obs = 225
Group variable: no — Number of groups = 45

R-sq: within = 0.2417 — Obs per group: min = 5
between = 0.1463 — avg = 5.0
overall = 0.1463 — max = 5

Random effects u_i ~ Gaussian — Wald chi2(4) = 50.26
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

gy	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
gk	-.010101091	.0072219	-1.40	0.162	-.0242639	.0040455
gl	.2843728	.633125	4.49	0.000	.1602827	.408463
gm	.5496923	.1838272	2.99	0.003	.1893976	.9099869
glq	.643322	.2507413	2.57	0.010	.1518781	1.134766
_ cons	11.10614	3.973065	2.80	0.005	3.319072	18.8932

sigma_u | 2.9084778
sigma_e | 0.22048825
rho | .99420586 (fraction of variance due to u_i)

c. The Hausman Test

	---- Coefficients ----			
	(b) fxd	(B) rdm	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
gk	-.0088291	-.010101091	.0012801	.
gl	.3372941	.2843728	.0529213	.
gm	1.58049	.5496923	1.030798	.1901078
glq	.4281074	.643322	-.2152146	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 18.68
Prob>chi2 = 0.0009
(V_b-V_B is not positive definite)

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