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China's Automotive Industry Development from the Perspective of Industrial Clusters

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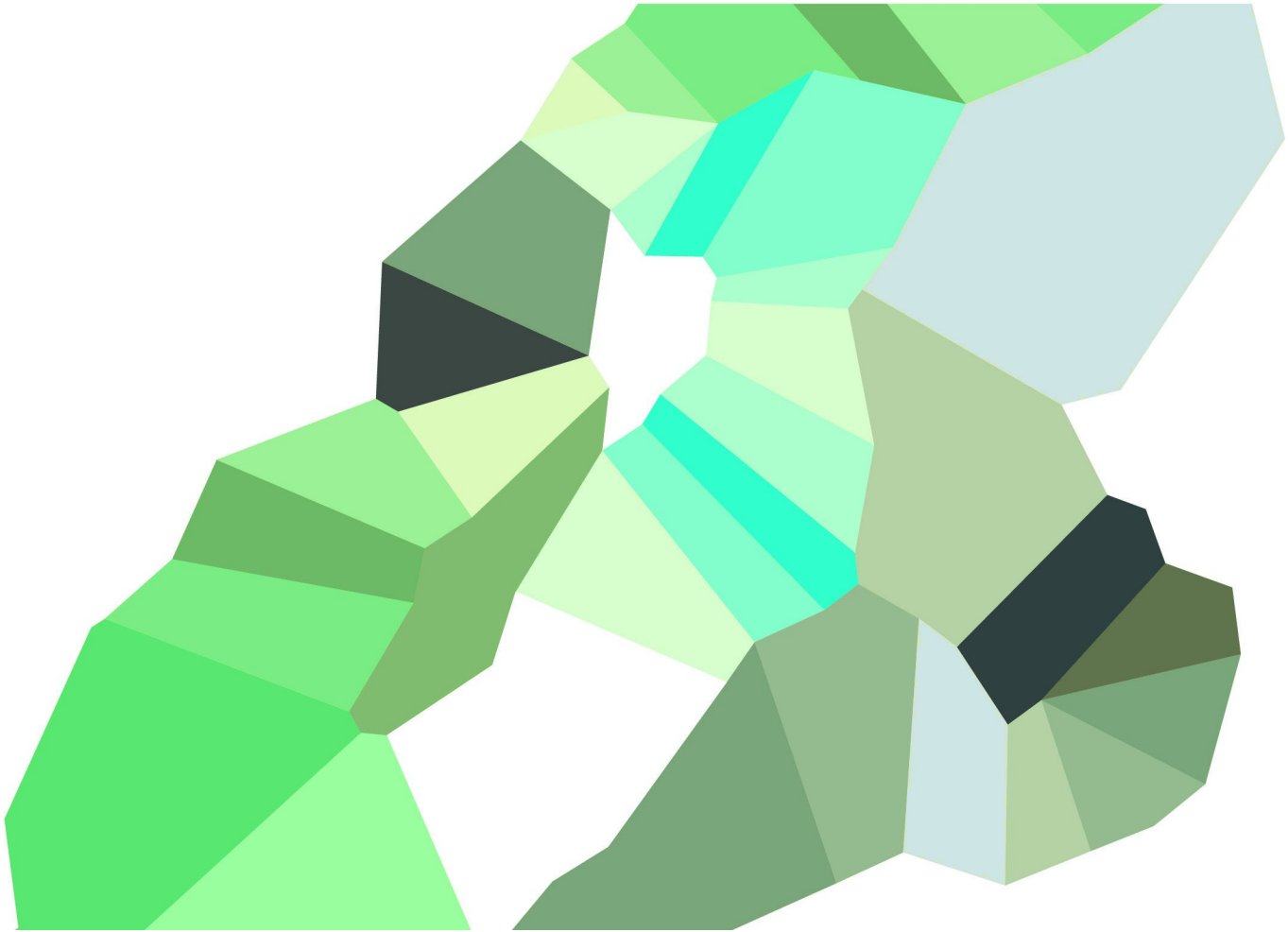

SAMMENDRAG

Utviklingen av næringsklynger har gjort et stort bidrag til internasjonal økonomi. Lokale klynger ikke bare danner den grunnleggende rammen av den nasjonale økonomien , men også representerer konkurranseevnen en region eller et land. Bilindustrien, på den annen side er et lands søyle industri og spiller en stadig viktigere rolle i landets utvikling. Kinesiske bilindustrien er en av de viktigste delen av verden bilindustrien, men i form av konkurranseevnen, er Kinas bilindustri fortsatt langt bak de i utviklede land. Derfor, for å oppfylle overgangen fra store bilproduksjon land til konkurranse bilbransjen landet , bør Kina etablere flere automotive næringsklynger .

Papiret først introduserte historien av Kinas bilindustri og derctter analysert forutsetningene for å formulere bildeler næringsklynger. Basert på empiriske data, forskning implementert Sted kvotient (LQ) teknikk for å beregne været Kina har automotive næringsklynge eller ikke . Den nåværende situasjonen for kinesiske bilindustrien næringsklynger og en sammenligning med japanske bilen næringsklynge er også gitt i avisen. Endelig, årsakene til utvikling av kinesiske bilindustrien næringsklynger, er utfordringene spennende i bil næringsklynger og tilnærminger for ytterligere å forbedre de klynger utforsket.

Hensikten med denne artikkelen er å finne ut hvordan næringsklynger kan øke utviklingen av Kinas bilindustri. Videre, gjennom å gjøre denne forskningen, forskeren håper å vise et klart bilde av den kinesiske bilindustrien til leserne.

PREFACE

This master thesis is an obligatory part of the two-year Master of Science in Business education at Bodø Graduate School of Business. It has been written for the specialization of International Business and Marketing (BE309E) and counts for 30 credits. Through doing this thesis, the main task is to improve the ability of solving problems independently.

Here, I would like to give my sincere thanks to my supervisor Professor Dominique Thon, who has broad knowledge and academic experience in International Economics, for his assistance, advice and comments, which significantly helped me carry out the whole process of this research. A special thanks goes to Professor Tor Korneliussen, for his interesting course and valuable help.

I would like to show my appreciation to my classmate and friend Hongbo Zhang who has helped me a lot ever since we were in China; to Xiao'ou Zou who provided me with the access to the research data; to Yan Zhao who is always so friendly and give many help during the two-year study. Also, I need to give acknowledgment to all my friends, without your assistance and supports I would not have such a happy life here in Norway.

Finally, I would like to express my gratitude to my parents, sister and my boyfriend, for everything they did to help me in carrying out the research. And always make me know they are proud of me and love me deeply.

As the Author, I'm responsible for any shortcoming or error.

ABSTRACT

The development of industrial clusters has made a great contribution to the international economy. Local clusters not only form the basic frame of a nation's economy, but also represent the competitiveness of a region or a country. Automotive industry on the other hand is a country's pillar industry and plays an increasingly significant role in the country's development. Chinese automotive industry is one of the most important parts of the world automotive industry, but in terms of competitiveness, China's automotive industry is still far behind the ones in developed countries. Therefore, in order to fulfill the transition from a big automobile production country to a competitive automotive country, China should establish more automotive industrial clusters.

The paper first introduced the history of China's automotive industry and then analyzed the prerequisites for formulating the automobile industrial clusters. Based on the empirical data, the research implemented the Location Quotient (LQ) Technique on calculating whether China has automotive industrial cluster or not. The current situation of Chinese automotive industrial clusters and a comparison with the Japanese automobile industrial cluster are also given in the paper. At last, the reasons for developing Chinese automotive industrial clusters, the challenges exiting in the automotive industrial clusters and approaches for further improve the clusters are explored.

The purpose of this paper is to find out how industrial clusters can boost the development of China's automotive industry. Moreover, through doing this research the researcher hopes to show a clear picture of the Chinese automotive industry to the readers.

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ABBREVIATIONS

FAW - First Automotive Works

GNP - Gross National Product

WTO - World Trade Organization

SUV - Sports Utility Vehicles

FDI - Foreign Direct Investment

SEZs - Special Economic Zones

ATM - Automatic Teller Machine

USSR - Soviet Union

JV -Joint Venture

GAC - Guangzhou Automotive Corporation

GM - General Motor Company

SMEs- Small and Medium Sized Enterprises

BMW - Bavarian Motor Works

1 Introduction

1.1Background for the Study

The automobile industry is one of the most significant economic locomotives and large scaled industries among the world which takes a big account in the manufacture sector. For the last century, the car culture has spread over the entire globe. It has been estimated that one job in an automobile manufacturing company can produce as many as ten jobs in the industry (component manufacturers, dealers, service providers). In Europe alone, the automotive industry accounts for roughly 12 million jobs; in the US, more than 8 million; and in Japan, over five million. According to the data from statistic portal, the amount of the worldwide automobile production has witnessed an increasing trend during the last decades from 58.4 million in 2000 to 84.2 million in 2012. And it is predicated that the number will continue rising, a total of 97 million vehicles are going to be produced worldwide in 2017. The biggest manufacturing plants can be found in China, Germany and the United States. To some degree, the capability and development level of the auto industry reflects a country's competitiveness and its comprehensive national power.
(http://www.statista.com/statistics/262747/worldwide-automobile-production-since-2000/).

The history of the Chinese automotive industry dates back to 1953, when the First Automobile Works (FAW) was founded in the northern city of Changchun, Jilin Province. Production amount was relatively low at that time, about 1600 units per year. Until about 1975, there was virtually no passenger car production in China. Most vehicle production was comprised of trucks, and to an extremely small extent, motorcycles. However, by 2009, China, with a production of 13.79 million automobile, of which passenger cars were 10.38 millions and the rest 3.41 million units were commercial vehicles, became the largest auto market in the world (China Auto Industry Yearbook, 2010). The automotive industry has now become a leading industry in China and is playing a guiding and supporting role in the overall national economic situation. According to Yan (2008), adding 1 Yuan value to the domestic automotive industry can effectively add 2.64 Yuan to its upstream and downstream related industries, which involves 20 kinds of different industries. The data of 2010 shows that, the output of the auto industry accounted for 6.13 percent of GNP (Gross National Product) and 13% of the national tax revenue. The number of the related employment has reached 40

million which accounted for 12% of the total urban employment (China Statistic Yearbook, 2011).

Since the early 1990s, China's automotive industry has been in rapid development. The annual production capacity of China's automobile first exceeded 1 million in the year 1992. By 2000, the producing was more than 2 million. After China getting accepted by the World Trade Organization (WTO) in 2001, the automobile market of China has been accelerated greatly. Between 2002 and 2007, the average growing rate of China's automotive market was 21%, or 1 million vehicles year-by-year. China's vehicle production amount successfully exceeded 6, then 7 million in 2006, and in the year 2007, China made more than 8 million automobiles. In 2008, it was over 9 millions. The amount of China's automobile production accounted for approximately 18% among the world in 2011. According to Wang et al. (2012), by 2020, China's new car sales are expected to exceed the figures of the European and North American markets and reach 22 million units per year, and to record annual growth of the global auto market of 35%.
(http://english.people.com.cn/90001/90776/90882/6789497.html).

Clusters have been around for a very long time and played a significant role in the automobile industry. They create many economic benefits, for example, they guarantee higher productivity and help companies and research institutions build connections to better learn and innovate. Furthermore, business reconstruction is more likely to be generated in clusters (Porter, 1998). The first auto industrial cluster in the world is in Detroit (USA) in the 20th century. From then on, a great number of clusters have emerged. The ones in Turin (Italy) and Toyota (Japan) are well known examples. China's automotive industry is a wide spread one, automobile manufacturers distribute not only in Pearl River Delta area, Yangtze River delta area and Bohai Sea Rim, but also in many inland provinces. Recently, rapid increasing demand of automobile products and encouragement policies has made the automobile industry an attractive filed in many local government's regional development strategies. In order to improve the regional economy and competitiveness many local governments, such as Shanghai, Guangdong, Jilin, Zhejiang, Jiangsu and Anhui, have emphasized industrial clusters' role in their automobile industry development plans. Now the main clusters are around the key regional industrial centers – Changchun, Shanghai, Beijing, Hubei, Chongqing and Guangzhou.

Changchun was chosen for First Automobile Works (FAW) in 1950 because of the short distance to the Soviet Union, from where assistance can be initially delivered, moreover, the northeast of China was also an industrial base in the past.
Shanghai was selected as one of the automobile production clusters mainly because of its long industrial history. In the 1950s, Chinese government established Shanghai Automotive Works. Because of the convenient geographical location which allows for efficient deep sea logistics for imports to and, more recently exports from China, Volkswagen then chose Shanghai Automobile Works as a partner. From then on, entrepreneurial young local independent auto makers (e.g. Geely and Chery) have set up their plants in this area.

Beijing was also chosen as one of the first four cities to develop local automobile plants, and is still remaining as one of the largest regional personal automobile markets in China.

Because of the Second Automotive Works (Dongfeng), Hubei province is considered as one of the automotive centers. Dongfeng was established for security and military reasons in Shiyan in the central mountains of Hubei during the Cold War era. However, because of the logistic disadvantages, Dongfeng is in a relatively slow development.

The automotive industry in Guangzhou started to develop after the economic reforms of the mid-1980s. Peugeot's venture in Guangzhou started in 1985 and closed in 1997, was among the first joint ventures (JVs). The cooperation with Honda Motor Company, Toyota Motor Corporation and Nissan Motor Company make Guangzhou a leading one of China's automotive industry. Dongfeng is now increasingly transferring its business to Guangzhou. Because of the proximity to economic centers in southern China, important international trading ports and especially Hong Kong, the development of Guangzhou's automobile industry has been accelerated greatly.

Chongqing is one of the economic and industrial centers of western China. A large number of automobile manufacturers and suppliers can be found in Chongqing, such as Chang'an Automotive Group (also called Chang'an Motors and Chang'an auto, or simply Chang'an) and its partners Ford Motor Company and Suzuki Motor Corporation, Chongqing Isuzu Motor Company, Hongyan Heavy Truck Co. and Sichuan Heavy Truck Co. Chang'an.

The development of the automobile industry in China depends on establishing successful

industrial clusters. For practices, exploiting new ways to arrange clusters in auto industry is pressingly, and for researchers, through studying the current situation of the China's auto industry and comparison with successful automotive industrial clusters examples from the worldwide, it is supposed to conclude and analyze the industry's development prospects and raise new and feasible cluster strategies for China's automobile industry development.

1.2 Purpose of the Study

The aim of this study is therefore to explore and find out the challenges that the Chinese auto industry meet during the implementation of the cluster method and how industrial clusters can promote the development of China's automobile industry. There are considerable researches on the automotive industry which analyzed the rather complex industry structure and joint ventures between domestic and foreign manufacturers, but it is not so many articles explaining how clusters are established in the automobile industry and why they are important for this industry. Here in this paper, we focus on the role clusters play within the auto industry and the significance of establishing industrial clusters. Toyota automobile industrial cluster (a successful example) as a comparison will help to find out mature experience and ways to better undertake the industrial cluster. Cluster strategies for promoting the development of the industry are also investigated during the study.

1.3 Problem Statement

The problem statement of the study can be formulated as follows:
The main questions exist in the China's automobile industry: Why industrial clusters are important for the Chinese automotive industry? How can they boost the development of China's automotive industry?

1.4 The Structure of the Thesis

The paper is constructed in the following way. The entire thesis has six chapters: introduction, theoretical framework, methodology, empirical study, analysis and conclusion. In the chapter 2, I will present the theoretical framework of reference that is going to be used to structure and analyze the empirical data. In the chapter 3, it will present the methodological approach used for grasping insight into the present phenomena. In the chapter 4, how China developed

its automotive industrial clusters is given. In the chapter 5, according to the theoretical framework chosen above, it will analyze the reality phenomenon. The last chapter contains a summary and the conclusions of the thesis; it also gives suggestion for further study. Through doing this work, I hope to gain a deep insight into the automotive industry in China, and to find ways to boost its development.

2 Theoretical Framework

2.1 Introduction

In the past 30 years, particularly since China's admission to the WTO in 2001, China's economy has experienced a rapid growth and attracted worldwide attention. China is now the second largest economy in terms of GDP and is a leading producer and consumer of many different product categories. Automobile industry is a good example. However, the automotive industry in China is not advanced as the ones in America and Japan. Moreover, the industry is experiencing its bottleneck and the automotive value chain in China is in transition. Industrial clusters could help to deal with these problems and promote the development of China's automotive industry. When clusters are established, the value chain of this industry will be modified which will further boost the industry.

2.2 Theory for Automobile

2.2.1 Definition for Automobile

An automobile is defined as a wheeled motor vehicle which is used for transporting passengers as well as carrying its own engine or motor. With a typical four wheels, it was primarily designed to run on roads. The principal purpose of an automobile was to transport people rather than goods. According to the newest Chinese national automobile classification standards, automotive products can be categorized into 8 types which include cars, buses, trucks, sport utility vehicles (SUV), dump trucks, semi-trailers, tractors and special purpose vehicles.
(http://en.wikipedia.org/wiki/Automobile).

2.2.2 Definition for the Automotive Industry

The automotive industry is an industry which consists of a variety of companies and organizations involving design, manufacture, marketing, development and selling vehicles. It is one of most significant economic pillars in the world. Industries related to the maintenance of automobiles, such as automobile repair shops and petrol stations are not included in the automotive industry.

(http://en.wikipedia.org/wiki/Automotive_industry).

2.2.2.1 Characteristics of the Automotive Industry

Compared with other traditional industries, automotive industry has many unique characteristics which can be summarized as follows:

First, it is a typical industry which has economies of scale features. The economies of scale mainly come from companies' mass production which reduces the manufacturing costs efficiently. Generally, small scaled enterprises with a yearly production less than 300,000 vehicles may have difficulty in getting into the automotive industry (Zhang, 2005).

Second, it is a capital intensive industry. Because of the high production costs, it requires a huge investment on fixed assets in order to reach enough production scale. The total investment on automotive industry in China is showing a growing trend ever since the found of the country. For example in 2003, China invested 49.86 billion Yuan in the automobile industry, which increased by 76.1% over 2002. The table below shows the total investment on the automotive industry from 1953 to 2000, from which we can see the investment is increasing rapidly.

Unit: 0.1 billion Yuan

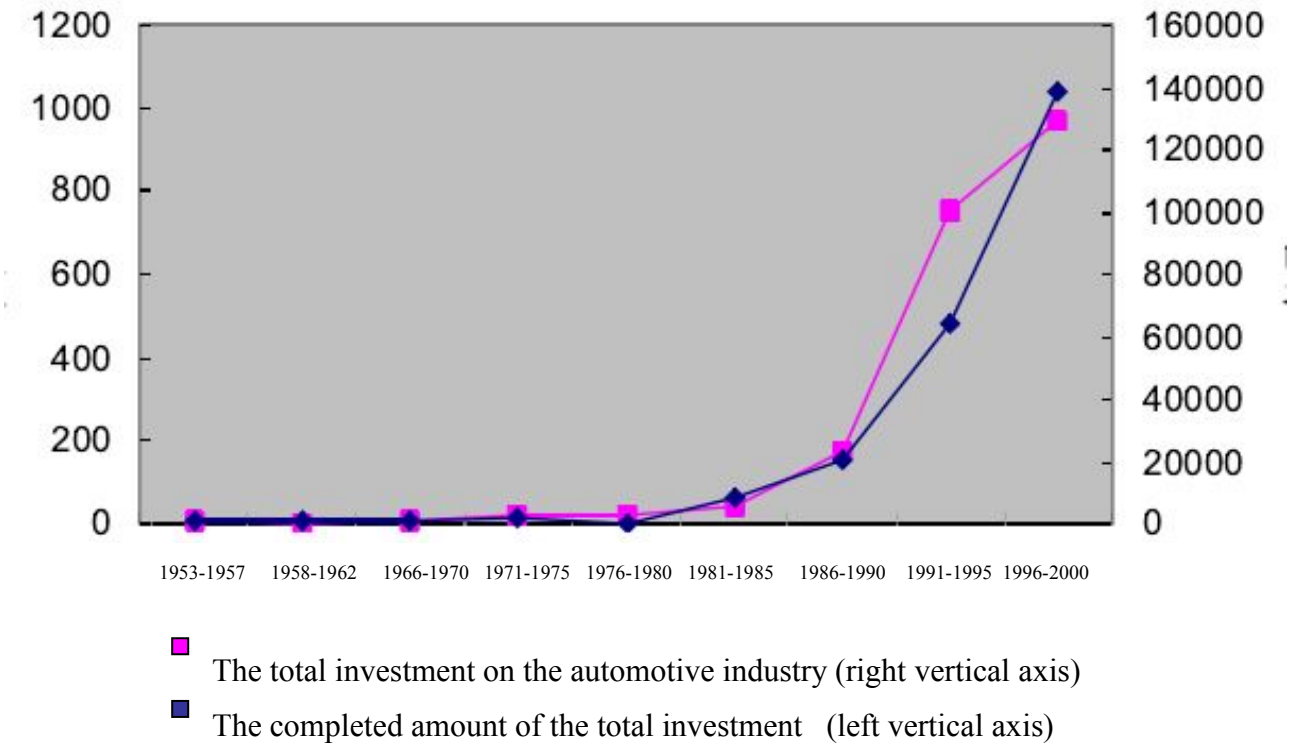

Figure 1 the auto industry total investment and increasing trend for these years
Figure from: China Auto Industry Yearbook (2004).

Third, the automotive industry is a traditional technology intensive industry; it is the integration of technology in many fields which involves steel, nonferrous metals, chemicals, machinery, electronics, instrumentation, textile, hardware tools, etc. Moreover, automotive industry is also a carrier of advanced technologies. Computers, global positioning satellite, new materials, new energy, intelligent transportation systems, the Internet, e-commerce technologies can all be found in an automobile (Fu, 2003).

Forth, it is an industry with high connection. From the perspective of the supply chain, it involves a series of upstream enterprises which related to the iron and steel, nonferrous metals, rubber, plastic and glass, machinery and electronics; downstream industries like auto repair, auto components, finance and insurance. From the perspective of value chain, automobile as a high intensive processing product is located at the end of the chain. Its production requires a great number of products coming from the other industries, therefore, the development of the automotive industry can effectively boost the improvement both for the upstream and downstream industries (Fu, 2003).

Fifth, the automotive industry can create a large number of jobs. Due to its big industry scale and high connection with the upstream and downstream industries, it can promote the employment for a country. For example, in Germany, direct and indirect employment in the automotive industry had reached to 5 million in 1997, which accounted for 13.96% of the total employment (35.805 million) (Guo, 2001). China has a large population; the development of the automotive industry can be an efficient method for providing employment opportunities.

2.3 Theory for Clusters

2.3.1 Definition for Clusters

Born in the strategic management literature, the concept of clusters has spanned over time through a wide range of disciplines, changing, adapting, and gaining theoretical power by finding application to different fields (Porter, 1990, 1998). Today, several definitions of clusters coexist as well as several applications to different social economic contexts, each one of them emphasizing one or more of the specific features of the cluster.

In its literal and most general meaning a cluster is simply defined as **"**a group of similar things or people positioned or occurring closely together" (The Oxford Dictionary, 2014). In economics, Krugman (1991) states that clusters are not seen as fixed flows of goods and services, but rather as dynamic arrangements based on knowledge creation, increasing returns and innovation in a broad sense.

Porter (1998) describes a cluster as a critical mass of companies in a particular location, whether it is a country, a state or region, or even a city. Clusters take varying forms depending on their depth and sophistication, but most include a group of companies, suppliers of specialized inputs, components, machinery, services and firms in related industries. Clusters also often include firms in downstream (e.g., channel, customer) industries, producers of complementary products, specialized infrastructure providers and other institutions that provide specialized training, education, information, research, and technical support, such as universities, think tanks, vocational training providers, and standards setting agencies. Finally, many clusters include trade associations and other collective bodies covering cluster members.

Porter redefined the concept of cluster in a new analysis in 2000, concentrating on the types of relationships between cluster members "a geographically proximate group of inter-connected firms and related institutions in a specific field, related by commonalities and complementarities" (Porter, 2000), and defining its boundaries that can "extend from a single region or city to a country or even a group of neighboring countries" (Porter, 2000).

Three important aspects are involved in the definitions of clusters. The first one is geographical location. The key driver of clusters is proximity, and often they are concentrated in an area within a larger nation and in one town or sometimes even are generated in a group of neighboring countries. The second aspect is value creation. Activities performed by companies from different industries within a cluster can create value on the goods or services. The third one is the business externalities. Clusters are driven by various types of externalities, relationships between different suppliers, common factor inputs like specialized labor markets, government agencies or spillovers of knowledge. Most of these positive externalities are naturally occurred, the dynamics of them can be stimulate via a mix of networking, cooperation and competition (Best, 2001).

The success of a cluster depends on the cooperation between each entities within the cluster. For example, in a tourism cluster, the ability of a hotel to create value for its customers is strongly relied on the quality of local firms coming from the connected and supporting industries, such as agro-industry, transportation, restaurants, shops, travel agents and financial services etc.

Clusters can create economic benefits (Porter, 2008). The benefits of a cluster can be classified into three dimensions. First, clusters increase productivity and efficiency. Companies have more opportunities to particular inputs, employees, institutions, services, information, training programs, and other "public goods" (local outsourcing), the coordination and transactions across firms are also simplified. Moreover, clusters insure the rapid diffusion of best practices. They also stimulate companies to generate visible performance comparisons and strongly encourage strategies to improve their capabilities. Second, clusters encourage and enable innovations. Clusters improve the likelihood of perceiving innovation opportunities (e.g., unmet needs, sophisticated customers, combinations of services or technologies), with the presence of multiple suppliers and institutions, clusters assist companies in knowledge creation. And given the locally available resources, clusters can ease

experimentation. Third, clusters facilitate commercialization and new business formation. Clusters make the opportunities more apparent for new firms and new lines of exciting business. Moreover, spin-offs and startups are encouraged by the presence of other companies, commercial relationships, and concentrated demand. Compared with the past, commercializing new products and opening new companies is much easier when clusters are established, because skills, suppliers are easily available now.

Ketels and Olga (2008) states that clusters are to some extend the consequence of the general business environment, they are more likely to be established and fully developed in a strong overall business environment. Therefore, the nature and depth of a cluster depends on the development situation of an economy. There is huge literature on industrial clustering observed in developed countries. For example in United States, the steel industry is concentrated in Pittsburg; the automobile industry is in Detroit, the financial industry in New York, and the film industry in Hollywood. However, in less developed countries, clusters are often not mature and the activities firms perform are less advanced (Lu, 2007). The competition between firms are mainly based on cheap labor or local natural resources, imported intermediary inputs, machinery and technology are also heavily depended on developed countries. Specialized local infrastructure and innovation institutions, e.g. educational program and industry associations, are inadequate or absent. However, as economies get more advanced, the development of clusters has been improved. In some Asian and south American countries the development of clusters has attracted the attention from the entire world.

Clusters have been in this world for a long time, there is a variety factors which affect and trigger the emergence of clusters. These include geographical location, local demand, suppliers, transportation infrastructure, and chance events like wars, crucial innovations, and political and economic shocks. Once a cluster is established a self-reinforcing cycle will automatically promote its growth, especially with the help of local public and private institutions.

2.3.2 Types of Clusters

Clusters differ in many aspects: the type of products and services they produce, their stage of

development, and the knowledge environment that surrounds them, to name a few (Ketels, 2003).

First, clusters can be categorized by the type of product and/or services they supply. There are clusters in automobile, in financial services, in tourism, in film, and many more. Second, clusters can be classified by the stage of development they have reached. Generally, there are four types of clusters : Geographical cluster - a geographic concentration of related firms, a variety of suppliers, and associated institutions in a particular field; Sectorial clusters -a bunch of related businesses performing activities together from the same commercial sector; Horizontal cluster mainly refers to the cooperation between companies at a sharing of resources level ; Vertical cluster- based on a supply chain. Thirdly, clusters can be classified by different kinds of knowledge. Two types of clusters are identified: High-tech clusters - they are advanced technology-oriented and adapt to the high speed economy; Historic know-how-based clusters - firms within this clusters generate traditional activities which maintain their advantages in know-how over the years or even over the centuries.

According to the categorization above, each cluster is unique because of different classification standards. However, Markusen (1996) states that there are still similar characteristics which can be shared among different industrial clusters, therefore clusters can also be categorized into four general types: Marshallian, hub-and-spoke, satellite platforms, and state-anchored clusters.

- Marshallian clusters are comprised of small, locally owned firms that make investment and production decision locally. Firms in these clusters generally are concentrated in technical expertise industries, design-intensive industries, or advanced producer and financial services industries.
- Hub-and-spoke clusters are dominated by one or several large, vertically integrated firms surrounded by suppliers and service providers, examples are Toyota city in Japan and Seattle in United States.
- Satellite platforms are industry clusters composed of branches of large, externally owned and headquartered firms, cooperation and linkages between firms are relatively high. An outstanding high-end example is North Carolina' Research Triangle Park.
- State-anchored industry clusters as regions where the local business structure is

dominated by one or several large government institutions such as military bases, states or national capitals, large public universities surrounded by suppliers and customers. Scale economies in each part are high here.

2.3.3 Cluster-Based Economic Policies

The economic benefits of clusters suggest that governments and economists should focus on policies that create or support clusters. The wide variety of policy initiatives that were carried out to take advantage of the economic potential of clusters are generally classified into three groups: polices to create clusters, polices to leverage clusters and polices to strengthen clusters (Ketels and Olga, 2008).

- Policies to Create Clusters

In the past, some countries and regions have used many policies to create entirely new clusters. Those policies involves stimulating essential investments in specialized infrastructure, providing financial incentives to targeted areas and offering temporary protection to prevent competition from other regions. However, the successful rate was not high, because of the sophisticated interactions within a cluster.

In contrast, improving the overall business environment conditions is considered to be a more appropriate strategy to create clusters, through upgrading skills, providing access to finance and infrastructure, streamlining government rules and regulations, supporting sophisticated local demand, and being open to foreign investment and competition, cluster development processes are much more likely to occur.

- Polices to Leverage Clusters

Clusters as useful tool are leveraged by many government agencies, in order to improve the regional development and economic diversity. A great number of Foreign Direct Investment (FDI) attraction agencies have also shifted their focus to specific clusters. Special economic zones (SEZs), innovation zones, industrial parks and workforce skill development programs were established for firms and related institutions from particular clusters.

Through focusing policies on clusters, governments can better make their efforts on areas which influence the competitiveness of many companies simultaneously. Moreover, governments can gain benefits from spillovers which were attributed by the policies.

- Policies to Strengthen Clusters

Policies to strengthen clusters refers to the collaborative actions operate by related companies, research and educational institutions and government agencies etc. The purpose of these policies is to improve the competitiveness of a specific cluster. Generally these polices can generate the following three benefits. First, with the methods to raise the companies' awareness, they help the companies to be aware of their existence and the cooperation with the others. Second, they create more effective platforms for interaction. Dialogues between private and public sector become more efficient, especially during decision making process. Third, those policies bring companies together to jointly upgrade their sophistication, such as through making joint investments in provision of research or testing facilities, better studying export markets, searching for strategic partners, and developing more differentiated and mutually supportive strategies.

2.3.4 Advantages and Disadvantages of an Industry Cluster Strategy

2.3.4.1 Advantages

Targeting an industry cluster strategy will provide a great number of local economic development benefits. The principal advantages associated with clusters are grouped into four areas (David & Mark, 2001):

- clustering strengthens localization economies:

The concentration of an industry at a particular location may result in significant cost savings to firms in the cluster. These cost savings are considered as localization economies.

- clustering fosters industrial reorganization:

The transition in industrial organization from large firms engaged in mass production to small firms focused on specialty production is well documented. This change in industrial structure is attributed to increased global competition and the emergence of new production technologies.

- Clustering stimulates networking among firms:

Networking is cooperation among firms to take advantage of complementary, exploit new markets, and integrate activities, rare resources or knowledge. Within industrial clusters, this kind of cooperation occurs more naturally and frequently.

- clustering encourages greater focusing on public resources:

The implementing of industry development efforts permits regions to use their limited

economic development resources more efficiently.

2.3.4.2 Disadvantages

The potential benefits of industry clusters are strong incentives to pursue a strategy focused on cluster development. However, some shortcomings are still inherent in a clustering strategy. The principle one is that the possibility of carrying out such a strategy may be low for many regions. Industry clusters are difficult to establish for three reasons (David & Mark, 2001):

- regions will have difficulty picking winners:

Communities may have a hard time identifying clusters that best fit their local economies and firms that are most desirable for these clusters. In other words, "picking winners" is very difficult.

- latecomers may not be competitive:

The benefits available to members of a cluster provide early clusters with distinct competitive advantages over late imitators. Latecomers may have difficulty in surpassing the advantages inherent in existing clusters.

- supportive institutions are not easy to establish:

Communities may have difficulties (especially financial and political difficulties) in developing the institutional environment required to support the establishment and development of industrial clusters.

2.4 Theory for Value Chain

2.4.1 General Theory

Porter (1985) describes the value chain as the internal processes or activities a company perform "to design, produce, market, deliver and support its products." He further states that "a firm's value chain and the way it performs individual activities is a reflection of its history, its strategy, its approach to implementing its strategy, and the underlying economics of the activities themselves."

Based on the process view of organizations, value chain theory emphasizes that a

manufacturing or service organization is considered as a system, which consists of inputs, transformation and outputs. And all these processes involve the acquisition and consumption of resources, from money to labor, to materials, to equipment, to buildings and land, to administration and management. The costs and profits of an organization are highly depended on these activities.

The concept of value chains being treated as decision supporting tools, was first added onto the competitive strategies paradigm by Porter as early as 1979. According to Porter (1985), most organizations take part in hundreds, or even thousands of activities in the process of transferring inputs to outputs. These activities can be generally grouped as either primary or support activities.

The primary activities include:

- Inbound Logistics-involve relationships between suppliers and include all the activities related to receiving, storing, and disseminating inputs.
- Operations-are the activities required to turn inputs into outputs e.g., products and services.
- Outbound Logistics - involves all the activities related to collecting, storing, and distributing the output.
- Marketing and Sales - activities giving buyers insight into the products and services, information about how to purchase them and facilitate their purchase are included.
- Service - involves all the activities required to keep the efficiency of the product or service for the buyer after selling and delivering it.

The support activities are:

- Procurement - are activities related to the acquisition of inputs, or resources for a firm.
- Human Resource Management - consists of all activities related to the personnel of the firm, such as recruiting, hiring, training, compensating and firing.
- Technological Development - activities involved in equipment, hardware and software, procedures and technology brought to help the firm to fulfill the transformation of inputs into outputs.

- Infrastructure-includes functions or departments from accounting to legal, to planning, to public affairs, to government relations, to general management and quality assurance. It serves the company's needs and bonds various parts together.

The firm's margin or profits then rely on its effectiveness in carrying out the above activities, in other words, the amount that the customer is willing to pay on the products should exceed the cost of the activities in the value chain. It is these activities that give the firm the chance to gain superior value.

The value chains are comprised of value-adding activities and generally they can be broadly classified into two types:

- Physical/traditional value chain: based on a physical-world the activities performed in this value chain is for the purpose to enhance value of products or services. Such activities have been changed over time by the experienced people who are driven by the will of earning higher profit.
- Virtual value chain: This value chain starts with the content supplied by the provider, which is then distributed and supported by the information infrastructure; therefore the context provider supplies actual customer interaction. It can be treated as a supporting tool for the physical value chain of procurement, manufacturing, distribution and sales of traditional companies.

The concept of value chain has been expanded beyond individual firms. It can be perfectly applied to the whole supply chains and distribution networks. According to Porter (1985), it is rather unusual that a single company performs all activities from product design, production of components, final assemble, to delivery to the final user by itself. Most often, organizations are elements of a value system or supply chain. A value system is composed of a firm's suppliers' value chains, the firm itself, the distribution channels and the buyers of the firm.

Companies experience several critical benefits by applying value chain management principles with distribution channel partners. For example, it improves the cooperation between different players. A company in a value chain such as a cloth market might work

with retailers, processors, and other producers to build a better connection with its customers. Working together, different firms in the same market benefit not only the customers, but also each other. They show great interest in their products as well as services in the market, and each player creates a specialty. The relationships between all businesses work to maximize value for customers, in turn, these companies also maximize their profits within their specialty. Moreover, value chain management helps to reduce the cost and accelerate delivery time. Since the inefficiencies and non-value added activities are taken away from the value chain, companies and other organizations will achieve cost saving in different work activities and area. Furthermore, using the value chain to compare the business model with competitors can give the company a deeper understanding of its strengths and weaknesses.

2.4.2 Global Value Chain

A global value chain illustrates the whole range of activities undertaken to bring a product or service from its conception of production to its end use and how these activities are distributed over geographic space and across international border. In the past, most industrial activities like producing products or generating services needed to be concentrated in one location, but changes in policy and technology have given possibilities to perform individual activities in the area that is economically most profitable and to integrate them again by connecting these locations in real time, in global value chains and innovation networking (Gereffi and Korzeniewicz, 1994).

Studies from different disciplines show a clear picture that global value chains are becoming more and more prevalent and complex. A large number of firms have generated international operations and have established trading relationships for decades; a few even for more than a century. The activities in the global value chains are now tightly integrated and often generated on a daily basis. This implies that companies and workers from widely separated regions affect one another more than they used to have. Among these effects, some are obvious and straightforward, as when a company from one country starts a new factory or engineering center in another country. Some are more complicated, as when a firm in one country signs a contract with a firm in another country for the purpose to coordinate production in plants owned by another firm in a third country.

2.5 Summary

In the theoretical part, the thesis mainly encloses three aspects to explain the theories- Automotive industry, Clusters and Value Chain. Definition of Automotive industry as well as the characteristics of it is depicted. It will give the readers a basic understanding of the automotive industry. Different types of clusters are given, in order to help the policy makers and industry to make better choices. Benefits and shortcomings within an industrial cluster are also illustrated which gives a knowledge about how to exploit the advantages and avoid disadvantages during the implementation of clusters. The purpose of choosing cluster based economic policies is that those policies are essential in improving the automotive industry and promoting its development, it can also give guidelines for governments and decision makers. Value Chain is chosen in this part mainly because it gives us a deeper insight into the structure of the industry. It also shows us a clear picture of the current capabilities and challenges at the different tiers in the automotive value chain. The Global Value Chain is selected because of the rapid economic globalization. All these together will assist the researcher for the later analysis parts.

3 Methodology

3.1 Introduction

As a research, it is very important to have a clear overview of the methodology. Because, it can give the readers a better explanation of how and why the researcher analyzed the data and gave out the conclusion. In this chapter, I will present the research methods and data collecting procedures that were used in writing the master thesis.

What is methodology? According to Smith (2008), methodology is a combination of explicit rules and procedures of techniques used to inquire into a specific situation, upon which research is based and against which claims of knowledge are evaluated. In other words, methodology is to solve problems in a systematic way and study how research is to be carried out. Generally, procedures like describing, explaining and predicting phenomena are considered as research methodology. The aim of the methodology is to make a work plan for the research. Hellevik (1980) states that methodology gives the readers an idea of how to conduct a scientific research and what tools are to be used to collect empirical data as well as the validity and reliability of the results. However, there are neither good nor bad methodologies, but more adequate ones to the topic and condition of the specific research. Methodologies are not assessed by right or wrong but whether they are suitable in acquiring the problem or not, such as the positivism and social constructionism methodologies.

Generally, method can be classified into two types: quantitative method (based on statistics) and qualitative method (interview, observation, questionnaire, etc). According to Maurice Godelier (1972), method expresses the subjective approach of the thinker and the objective content of what he/ she is thinking about at the same time. In the last expression, though, it is the content that provides the "grounds" for the method, since the method expresses the procedure adopted by the thought process, the latter also expresses the nature of what is being thought about by the researcher.

3.2 The Choice of Research Design

3.2.1 Definition

The research design plays an important role in creating the foundation of the entire research and helping the researchers to perform the chosen task in a systematic way. According to (Green et al., 1998), research design is an instruction of what methods and procedures are used to acquire information that are needed to structure or to solve research problems. It is the overall operational pattern of the project that illustrates what kind of information is to be collected, from which resources, and by what procedures. Once the objectives of the research are determined and the sort of data required is planned, the researcher should decide on a research design, which in turn will affect the task involved in the remainder of the project. Nachmias (1992) states that research design gives a guideline to the investigator in the process of collecting, analyzing, and interpreting observations. It is a logical model that allows the researcher to draw inferences concerning causal relations among the variables under investigation. Smith (2008) says: the research design marks out the methods implemented in the research and the data collection procedures which aim to achieve the research goals.

Many factors can influence the designing and implementing processes of a research. The study topic is a good point of case which filters out many scheme of the research design at the very beginning. The type of accessible data is another example which gives the boundary of the selection of research methods. The research design is contextualized in terms of Churchill's (1999) design typology; conceived as "descriptive", it is seen in practice to involve "exploratory" elements as well. The research design expresses what procedures are supposed to apply in connections with collecting necessary information (Parsuraman, 1991).

3.2.2 Qualitative Method and Quantitative Method

In this part we will discuss these two methods. They are tools for collecting information and data. It is not easy to say which method is better. It depends on what kind research will be carried out and what is the objective and what kind data or information researchers want to get. It is very common for researchers to jump into one of the two camps: either depending exclusively on the "objective" quantitative methods, such as survey questionnaires and

statistical analyses, or choosing to use only qualitative methods while rejecting the quantitative approach since it is considered as de-contextualizing human behavior. However, it is accepted by many social researchers that each method has positive attributes, and that using different approaches together may result in gaining the best of both research worlds. Qualitative and quantitative methods may be used according to both constructionist and positivist epistemologies, and be underpinned by both nominalist and realist ontology.

3.2.2.1 Qualitative Method

Punch (1998) states that qualitative research is an empirical research where the data is not in the numerical form. "Qualitative research is a type of social inquiry which gives focus on how people interpret and make sense of their experiences and the world in which they live. Many different approaches coexist within the wider framework of this form of research, but most of them have the same objective: to make a better understanding of the social reality of individual people, groups and cultures. Researchers choose qualitative methods to explore the behavior, experiences and perspectives of the people that the research mainly related to. The basis of qualitative research relies upon the interpretive approach to social reality," (Holloway, 1997). According to Skrtic (1995) qualitative methods are preferable to quantitative methods when the phenomena to be studied are complex human and organizational interactions and therefore not easily translatable into numbers. Although qualitative methods provide less explanation of variance in statistical term than quantitative methods, they can yield data from which process theories and richer explanations of how and why processes and outcomes occur can be developed (Macus & Robey, 1988).

The researchers of qualitative method want the people who are studied to truly represent themselves, to show their perspectives in words and other forms of actions. In other words, qualitative research is an interactive process within which the individuals being studied interpret their lives to the researcher. It is common for a qualitative researcher to immerse herself/himself in the setting. The contexts of inquiry are natural, nothing is contrived or predefined. The objective of a qualitative research is to understand the experience of those studied individuals as unified.

According to Smith (2002), there are three main types of qualitative methods: interview, observation and diary method. These types of qualitative methods go deeper than quantitative methods when being employed in data collection. There are many advantages of using the qualitative methods. For example, because of the close involvement, researchers can gain a deep insight into the research field, which allows researchers to find out issues that are often easily missed by the scientific or more positivistic inquiries, like subtleties and complexities. Moreover, qualitative approaches can play an important role in explaining possible relationships, causes, effects and dynamic processes. Apart from these, qualitative methods give access to rich, detailed data which leave the participants' perspectives intact and provide a context for healthy behavior. However, some limitations also exit in qualitative methods. For instance, lacking of validity or reliability is a big criticism. Due to the subjective nature of the data, conventional standards of reliability and validity cannot be easily applied to qualitative method. Furthermore, it is time consuming to collect, analyze and interpret data. Also, the presence researcher will make a profound influence on the subjects of study.

3.2.2.2 Quantitative Method

Quantitative method is the reliance on experimental and statistical control as the defining feature of the research (Kaplan & Duchon, 1998).

Quantitative research is the systematic scientific investigation of quantitative properties and their relationships. The objective of quantitative research is to develop and utilize mathematical models, theories and/or hypotheses belonging to natural phenomena. The process of measurement is essential for the research for the reason it provides the basic connection between the empirical observation and mathematical expression of quantitative relationships. Quantitative researches are mostly used in both the natural sciences and social sciences, from physics and biology to sociology and journalism. They are also used as a way to research different aspects of education. The term quantitative research is widely used in the social sciences in contrast to qualitative research.

(Wikipedia.org/wiki/Quantitative_research).

Usually there are four well used ways to collect quantitative data: interviews, questionnaires, tests/measures and observation (Smith, 2002). The research result generated by quantitative method should be more convincible than qualitative method as numbers always represent absolute fact as long as the number is correct.

Quantitative methods emphasize the use of numbers and statistics to understand and explain phenomena. Particularly, quantitative research is mainly suited to the following four types of research questions:

1. Questions which demand a quantitative answer. For example: How many ATM does that city have? Or how many banks provide online service? For this kind of questions it is obvious that we need to use quantitative research.
2. Questions related to numerical change. Such as: Are the customers of that shop rising or falling compared with last year? Is the profit going up or down? Quantitative study will help us find out the answers.
3. Questions which aim to find out the state of something or explain phenomena. What factors predict the popularity of a bank? What factors cause the changes in the profits of a bank over time?
4. Quantitative research is also suited for testing of hypotheses and especially for explaining something. For example, is there a relationship between the bank's profits and its online service? After looking at the theory we may come up with the hypothesis that better online service can result in high profits. Quantitative research can assist us test this kind of hypotheses.

The strengths of quantitative methods lie in many aspects, for example, in a quantitative research, researchers will not affect the result of the subject being studied, since usually they are not involved with the subject. This prevents the subjects' responses or behaviors from being influenced by the outside person (Gall & Borg, 2003). Johnson and Onwuegbuzie (2004) suggest that the data collection process of quantitative research is fairly fast; Data is precise since it is numerical; Data drawing from relatively large random samples can also allow for generalization. Finally, the answers of the quantitative studies are solid if done properly, they are not like an opinion or common sense answers which can be changed easily (Ratnesar & Mackenzie, 2006).

There are also several weaknesses of quantitative methods, one of the first weaknesses is that the data of the quantitative methods is not easy to read and understand (Burns, 2000). Also, it is also difficult for average readers to distinguish quantitative and educational journals. Another shortcoming is that it de-contextualizes human behavior in a way that removes the event from its real world setting and ignores the effects of variables that have not been included in the mode (www.social-marketing.com, 2007).

Below is a table which shows the differences between qualitative methods and quantitative methods.

Qualitative Methods	**Quantitative Methods**
Methods include focus groups, in-depth interviews, and reviews	Surveys
Primarily inductive process used to formulate theory	Primarily deductive process used to test prespecified concepts, constructs, and hypotheses that make up a theory
More subjective: describes a problem or condition from the point of view of those experiencing it	More objective: provides observed effects (interpreted by researchers) of a program on a problem or condition
Text-based	Number-based
More in-depth information on a few cases	Less in-depth but more breadth of information across a large number of cases
Unstructured or semi-structured response options	Fixed response options
No statistical tests	Statistical tests are used for analysis
Can be valid and reliable: largely	Can be valid and reliable: largely

depends on skill and rigor of the researcher	depends on the measurement device or instrument used
Time expenditure lighter on the planning end and heavier during the analysis phase	Time expenditure heavier on the planning phase and lighter on the analysis phase
Less generalizable	More generalizable

Table 1 Differences between qualitative method and quantitative method

3.2.2.3 Research Design in the Paper

In this paper, quantitative method is chosen as the main approach. Many researchers have used this way to write economic thesis. For example Krugman (1991) uses such method to calculate the geographic boundaries of industrial clusters. Kim (1996) uses such method to measure U.S. Regional Manufacturing Structure. For learning the automotive industrial clusters in China, a great number of secondary data is needed. Therefore, using quantitative method is an efficient way to obtain and analyze data. In my thesis, I also choose quantitative method. More concretely, that is Hoover's Location Quotient (LQ). First, I collected the data which are required by LQ, and then based on the value of LQ to measure if China has automotive industrial clusters or not.

3.3 Data Collection

Once the research problem is defined and clearly specified, the research effort logically turns to data collection (Churchill and Iacobucci, 2005). Data collection is a term used to describe a process of preparing and collecting data. The purpose of data collection is to obtain information to keep on record, to make decisions about important issues, to pass information on to others (wikipedia.org/wiki/Data collection). Data Collection helps researcher to check whether the process is healthy or not. To do so, the researcher need to identify the key quality characteristics that are going to be measured, the methods that are used to measure them, and how to deal with the data you collect (Deming, 1982).

Data Collection is nothing more than planning for and obtaining useful data and information for the later use of the research. However, researcher cannot simply rely on data collecting, because it does not ensure that you will obtain relevant or specific enough data to tell you what is occurring in your process. The key problem is not: How do we collect data? But: How do we acquire useful data? Why do we need to collect data? Data collection helps a research team to work out and test working assumptions about a process and develop information that will lead to the improvement of the key quality characteristics of the product or service. Through helping the research focus on objective information about what is happening in the process rather than subjective opinions, data collection improves the researcher's decision making ability (Deming, 1982).

There are two types of data that we should know and understand: primary data and secondary data.

3.3.1 Primary Data

Primary data is data collected specifically for the research project being undertaken (Saunders et al., 2006). Richard, Lommel and Hartz (2005) state that primary data, is the information you can get directly from people in the community - presents a much different set of challenges than the numeric and statistical data you have encountered as part of your secondary data collection. For one thing, it requires you to deal with actual people, which can be a daunting task after staring at a flickering screen full of excel charts all day. Primary data could be accumulated by way of interviews, questionnaires and general observations. Research has a road map that should be followed in order to gain credibility; every bit of information gathered has to be analyzed using recognized procedures, in other words, data has to be collected, analyzed and a conclusion has to be drawn.

3.3.2 Secondary Data

Secondary data, is data not directly collected by the user but someone else. Common sources of secondary data for social science involve censuses, organizational records and data collected through qualitative method or qualitative research (Wikipedia: Secondary data). According to Churchill and Iacobucci (2005), secondary data are statistics that already exist; they had been gathered for a previous purpose, not your particular study. News in periodicals, published material from commercial research organizations and published material from academic or official institutions are the generally sources of secondary data. These secondary data will provide the thesis with the first-hand materials and give readers a general impression with the research body.

The advantages for secondary data are: 1) it saves time. It does not need to spend much time to collecting. 2) It can provide larger and higher quality databases than do research individually. 3) Save cost. The data is already finished, so can be found on Internet or government papers. The disadvantages for secondary data are: 1) Quality of research. 2) Not specific to researcher‘s needs.

3.4 Validity and Reliability

Reliability and validity in reference to a research assignment are of distinct meanings. The possession of reliability and validity characteristics or consideration is required to ascertain good quality of a research. To simply collect and analyze data for research is not enough to ensure the quality of the research. Reducing the possibility of getting wrong answers means that attention has to be paid to two particular emphases on research design: Reliability and Validity (Saunders, 2000).

3.4.1 Validity

According to Joppe (2000), validity determines if the research truly measures what it was supposed to measure or how trustful the research results are. Smith (2008) states that the validity is how closely the data correspond to reality, and it is a matter of whether a sufficient data is observed. And it has two aspects that are internal validity, which is related to bias of data, and external validity, which concerns about how generalized the result is.

According to Yin (1994), three tests are crucial to measure the validity for researc: construct validity, internal validity and external validity. The first one determines the adequate operational measures for the concepts of the research. This can be measured by the use of multiple sources of evidence, establishing a chain of evidence and using key informants review case study reports. The constructive validity is crucial in the data collection stage. Internal validity establishes causal relationships between the variable studied by using pattern matching, explanation building and time series analysis techniques. Internal validity is crucial in the data analysis stage. External validity determines the sphere in which findings of a research can be generalized, mainly by using the replication logic in multiple case studies. External validity is important in the research design stage.

In this thesis, the data was collected as much and strongly related as possible to the research questions. The typical data were directly dealing with China's automotive industry. And I chose data from 31 different provinces, autonomous regions and municipalities in China, which can give the readers a clear picture of Chinese automotive industrial clusters.

3.4.2 Reliability

Reliability measures if the same result will be reached in other occasions, i.e. the stability of the research result (Easterby-Smith et al., 2008). Reliability is the consistency of your measurement, or the extent to which results are consistent over time, if the results of a study can be reproduced under a similar methodology then the research instrument is considered to be reliable. In other words, it is the reparability of your measurement. According to (Proctor, 2003) it is the extent to which measures are free from random error and give consistent results. (http://dg-waymade.blogspot.no/2010/10/characterisitics-of-good-measuring.html).

Researchers should evaluate stability and transparency in how sense it was made from the collected data. As a researcher, it does not mean to record all you hear from the interviewees. Get answers what researcher need, and guide interviewee tracing the questions what you want to ask. By investigator triangulation, it will keep the reliability. Reliability is enhanced by the triangulation of data collection and multiple analysis methods (Yin, 1989).

In order to increase the reliability, some factors should be taken into consideration. First, the automobile industrial clusters chosen by the paper are those with mature experience on how to develop clusters. Second, the data collection and processing procedure should be standardized and processed in the most universal way. Third, the data resources should be authorized and open, therefore, in this paper, all the data were collected from the official website and online database of automotive institutes. Furthermore, the model used in the research is one of the most commonly used method for economic research and the calculation was done with the valid data.

4 Empirical Part

4.1 Structure of the Empirical Part

The empirical part will give a basic understanding about the research. It contains of six main sections.

The first part, the thesis introduces the history of China's automotive industry and depicts the phases of China experienced when developing the automobile industry. The second part tells what prerequisites are needed, in order to formulate automobile industrial clusters. The third part illustrates the mathematic method (Location Quotient Technique) used in the thesis for checking whether China has automotive industrial clusters or not. The forth part gives a clear picture of the current situation of China's automotive industrial clusters. The fifth part explores the development of Japan's automotive industrial cluster, mainly Toyota automobile industrial cluster and the final part is a brief summary of this chapter.

4.2 The History of China's Automotive Industry

Since the first birth vehicle in the 1950s, China's automobile industry has experienced stages which include establishment, growth and comprehensive development etc. The first wave of auto production began in 1950s, when the First Automobile Works (FAW) was founded. From then on, China had invested to establish many automobile factories, such as Nanjing Automotive Company and Beijing Automotive Company. However, because of the immature technology, high manufacture costs, economy and political constrains, the production was relatively small, and the growth rate was slow. This situation has not been changed until the reform and opening up, China then began to cooperate with the rest of the world, not only did it bring in the advanced technology and management methods, it also attracted foreign investment. Beijing Jeep Corporation established in 1983 was the first joint venture in the automotive industry, in 1985 Shanghai Volkswagen was set up, in 1987 China issued a three automobile base construction decisions, namely Shanghai, FAW and the Second Automotive Works. Thereafter, China's automobile industry has stepped into the era of rapid development. Firm size, amount of production and sales, manufacturing techniques and diversity of goods all have been improved greatly (Deng, 2010).

4.2.1 The Phases of China Develops its Automotive Industry

Generally, the history of China's automotive industry can be classified into four essential phases in terms of its development (Luo, 2009): 1949-1979 the central control and planning phase, the proliferation phase (1979–1994), the concentration phase (1994–2004) and the most current phase, since 2004.

4.2.1.1 1949-1979 the Central Control and Planning Phase

Before the founding of new China in 1949, the development of the automotive industry was extremely slow, there was almost no automotive industry in China. The early alliance of China was with the Soviet Union, which provided help with a number of large projects during the period of 1950–1960. The First Automobile Works (FAW) founded in 1953 was one of such projects.

The FAW is in the northern city of Changchun, Jilin Province. In 1956, it began the production of Jiefang (Liberation) trucks and the amount for that year was 1600 units. This product had not been changed until 1980s. In 1958, the Hongqi (Red Flag) limousine a high specification vehicle started to be produced at the FAW. In 1991, a joint venture (JV) between the FAW and Volkswagen started. Santana was initially produced and later the Audi 100, the Jetta and the Golf.

International circumstance changed during 1960s. Because of the frequent border conflicts, relationship between China and the USSR deteriorated. The Soviet Union called in 1390 experts, terminated 3,343 contracts, and ended its assistance in August, 1960. In 1965, the war between North Vietnam and the United States began, China was involved in it. As part of the war effort, many heavy and medium truck plants were set up including the Second Automotive Works (Dongfeng), Shanxi Auto Works and the Sichuan Auto Works.

Since the relationship between USSR worsened, China had to depend on its own resources for

these plants. As a result, all new automobile projects were designed, build and carried out by personnel from the existing auto plants. For example, The Second Automotive Works was established through using the personnel from the FAW.

4.2.1.2 1979-1994 the Proliferation Phase

Again, the international circumstances changed, in the 1970s. China opened up to the world, the focus of China has been switched from political to economic issues. Most importantly, a planned economy had been replaced by a market economy. More autonomy was given to the local governments. With more freedom to make decisions, many provincial and municipal governments chose the auto industry to develop the economy of their regions or departments. The automotive industry was then entered what might be called a 'proliferation' phase. Both the volume of output and the range of products had been increased significantly.

During the period between 1949 and 1978, the output and variety were not controlled by the market, but strictly controlled by the central government. Turks were the main products and there was very limited passenger cars production. Only senior officials have the chance to use saloons. With the decrease of planning, the number of customers as well as the scale of the market for saloons and other vehicles has been greatly expended. For instance, during the central planning period, taxis cannot be found in China, therefore when restrictions were relieved, a large number of cars and mini vans were produced in order to meet the demand of the taxi market. Moreover, Large sized factories like FAW and Dongfeng (Second Automotive Works) put more focus on its production. Under the direction of local governments, an increasing number of small automotive factories began to develop. Some machinery factories also started to produce vehicles such as large passenger car, mini vans and light trucks. The number of automobile companies rose from 55 in 1979 to 114 in 1985 (Luo, 2009).

4.2.1.3 1994-2004 the Concentration Phase

Until China's accession to the World Trade Organization (WTO) in 2001, the Chinese market

for automobiles was under the protection of high tariffs. For example, the tariff in the 1980s was 200% and in 1990s it was still as high as almost 100% (Gao, 2002). The price of automobiles was mainly decided by the government. Small scaled automobile factories survived under this absence of market mechanism. However, due to the weakness of spreading capital and other resources, these small scaled manufacturing factories hindered the development of large scaled automobile plants and further decreased their capability of competing with foreign auto makers.

After China's accession to the WTO, Chinese enterprises had to compete with foreign corporations and the tariff protection had been gradually reduced. With the rapidly expanding market and the increasing pressure from the growing number of foreign companies, some large scaled competitive automobile plants had been set up by the Chinese government. On the other hand, local governments had also made efforts to boost the development of local industrialization, a range of small auto factories had emerged because of that. Nanjing Automotive Company is a good example, Nanjing used to be a small scaled truck manufacturer, however, because of the pressure from both the market and foreign competitors, car production had been entered into its manufacturing and later it became a Joint Venture (JV) partner of Fiat in China.

In the year of 1994, in order to promote the national economy, a variety of industries had been chosen as 'Pillar Industries' by the Chinese government. Automotive industry was selected as one of these industries. It is not difficult to find the reasons for that. An automobile consists of more than 10,000 components and parts. Moreover, many other industries are related to the automotive industry such as chemistry, electronics, metallurgy, textiles and petroleum. Therefore, the development of the automotive industry would boost the specialization and coordination between other industries.

4.2.1.4 The Recent Phase (since 2004)

The growth of Chinese automotive industry has been rapidly advanced ever since its entrance into the WTO in 2001. The overall production has also been increased dramatically, in 2004

with a total amount of 5,234,496 unit vehicles, China ranked the fourth among the world, while in 2006, China's automotive production leapfrogged Germany and became the third largest auto manufacturing country. In year of 2009, because of the server influence of financial crisis, Japanese and American automotive industries were in their difficult period. In contrast, China with a stable increase in the total output was then became the largest auto producer (China Auto Industry Yearbook, 2001-2010). The figure below shows that after the year of 2000, China's automotive industry has entered into a relatively rapid development period; car production increased more than 10% year by year.

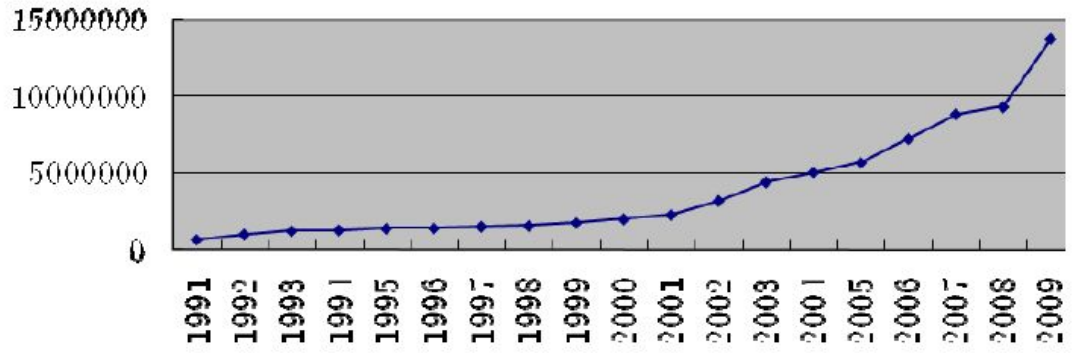

Figure 2 1991-2009 yearly automobile production

Resource from: China Automotive Industry Yearbook (1992-2010).

Due to the rapid increase, considerable foreign investment has been attracted to the automotive industry in China. This includes those enterprises that already had operations in China and are seeking opportunities to expand their capacity and production and those that had not set up any plants there before. A large number of joint ventures have emerged in China, such as GAC (Guangzhou Automotive Corporation) Toyota, FAW - Volkswagen Motor Company, Shanghai Volkswagen Motor Company and Shanghai General Motor Company.

4.3 The Prerequisites for Establishing and Developing Automotive Industrial Clusters

With the rapid development of the world economy, the importance of the automotive industry is emerging. Many countries choose it as the pillar sector of their national economy. Establishing industrial cluster is an efficient way to improve the development of the automotive industry, because it can greatly reduce the production costs and generate highly specialized division as well as large scaled production and sales. Moreover, it can also improve the competitiveness of the automobile industry (Yan, 2008). In this sub-chapter, the prerequisites for establishing an automotive industry cluster are explored, which will give the readers a deep insight into the factors which contribute to the formation of the automotive industrial clusters.

4.3.1 External Prerequisites

4.3.1.1 Capital Factor

Resource endowment is one of the original reasons for the formation of industrial clusters. In a market economy, production factors generate free movement and optimal allocation, which provides the foundation for an industrial agglomeration (Deng, 2010). In the production function, the basic factors are natural resources, capital and labor. However, because of the improvement of the transportation system, corporations now reduce their reliance on the natural resources when choose their location, especially for those technology and capital intensive industries. Therefore, here in this paper, we mainly discuss the role that capital factor plays in helping establish automotive industrial clusters.

The automotive industry is a capital intensive business; the development of its industrial cluster is inseparable from adequate financial support and efficient investment and financing system. Generally, a successful industrial cluster is always consisting of large, medium and small sized corporations as well as innovation institutions. Therefore, establishing a multilevel investment and financing system is essential for the overall coordination and rapid development of automotive industrial clusters. For example, the success of Silicon Valley high technology clusters is attributed to the formation and prosperity of the venture capital

industry in 1950s and 1990s respectively.

The investment ratio of the automotive industry in China accounts for roughly 8% of the total national level. In 1996, China invested 19.49,043 billion Yuan to the automotive industry, whereas, in 2008, merely for the fixed assets the amount has reached to 77.22,619 billion Yuan (China Auto Industry Yearbook, 2009). Generally, there are two ways for the automobile industry to get capital: Through the rolling development of an enterprise; through external financing.

Through the rolling development of an enterprise: one of the successful examples is Shanghai Volkswagen Motor Company. The annual production of Shanghai Volkswagen was only 1700 units in the first a few years of its establishment, in 2008 with the production of 494,178 units it ranked the first among Chinese automotive industry. Shanghai Volkswagen is also very successful in terms of preserving and increasing the value of capital. The registered capital of it has been increased almost 40 times from the original 160 million Yuan to the current 6.3 billion Yuan.

According to Yan (2008), external financing method generally includes three channels; the first one is raising funds in the capital markets through the issuance of stocks and bonds. The second one is getting loans from commercial banks, which is currently mostly used channel for automotive enterprises to get financial support. The third way is foreign direct investment (FDI). Since the reform and opening up, in order to deal with the inadequate capital and technology, Chinese automobile industry has brought in a large amount of foreign direct investment. Joint ventures and cooperation with foreign companies are the main ways to develop the automobile industry in China. Many world famous automotive enterprises such as General Motor Corporation (GM), Volkswagen Motor Company and Ford Motor Company, have carried out extensive cooperation with China's large auto companies for many years.

4.3.1.2 Economies of Scale

Li (2004) states that economies of scale refer to the sate when the total average costs for producing a product fall as the output increase. The significance level of economies of scale differs from industry to industry. Some corporations have obvious economies of scale while some not. The automobile industry is prominent in terms of economies of scale, because it requires huge capital investment on equipment and technology development; moreover, barriers for corporations to enter into the automotive industry are relatively high. Therefore, in order to achieve economic profit, the automobile manufacturers must have a large scale. The scale of an enterprise is an important factor in determining its capability. According to Deng (2010), corporations with a scale of 4 million units annual production has a significant competitive advantage and holds a stable position in the international automotive industry. The United States has GM, Ford Motor Company and Chrysler Motor Company. Japan on the other hand has Toyota Motor Company, Nissan Motor Company, Honda Motor Company and Mitsubishi Motor Company. All these are large scaled enterprises which have a high degree of industrial concentration. China has a great number of automotive corporations, however, the size of the companies is too small to reap the benefits of economies of scale, furthermore, independent innovation ability of Chinese automobile enterprises is weak, and therefore the competitiveness of the automobile industry in China is not strong compared with the ones in foreign countries.

4.3.2 Internal Prerequisites

4.3.2.1 Advanced Technology

An important feature of modern society is that science and technology has become the first productivity and plays an important role in economy development of a society. Therefore, analyzing the driving factors of an industrial cluster from a technical point of view is of great significance. Generally, technical factors promote the formation of automobile industrial clusters in three aspects:

Firstly, the endogenous characteristic of technology is the driving force of automobile

industrial clusters. Because of its agglomeration quality, the technology development in a particular region can effectively contribute to a large number of technical innovations. And due to the less mobility of some techniques, corporations can only gain the benefits within the specific area, thus, in order to take advantage of the advanced technology, a large number of enterprises have been attracted to that region, which help to build the foundation of an industrial cluster.

Secondly, improvement of technology is the reason for concentration of automotive corporations. Technology improvement can be considered as a procedure of equipment upgrade, breakthrough of the technological process and extension of production. It can increase the economic benefits of enterprises existing on the automotive industry chain. As an endogenous variable, technology generates evolution and division of work together. Moreover, evolution and division of work promote each other and give rise to large scaled production. In order to fulfill the large scaled production, cooperation between enterprises is required, which stimulates the concentration of corporations. According to Yan (2008), the trend of formulating an industry cluster appears when there exists a large amount of advanced technology.

Thirdly, technology chain is the foundation for the formation of automobile industrial clusters. The technology chain is a chain for the inner parts of the automobile industry to mutual cooperate and depend on each other. It connected all the related corporations during the production process, and forms a network for them. It also unified the entire economic system organically. Actually, it is the technology chain within the automotive industry that connected the related enterprises to form a cluster.

4.3.2.2 The Network for the Automotive Industry

Industrial clusters gain competitiveness from the interaction between companies within a cluster network. Actually, the capability of an industry cluster is the network's capability. Thus, establishing a regional network for the automobile industry is of great significance.

A network is composed with nodes and lines between each node. Each node in the network represents an act or a transaction subject. According to Lei and Chen (2004) the characteristics of the industrial cluster network are as follows: First, corporations within the network generate specialization, which refers to a great number of enterprises and employees agglomerate in a specific industry generating specialized production in a particular region. Second, the network has regional characteristic, enterprises in a cluster area usually use production system to set up the local network and form horizontal and vertical partnerships.

Based on the above characteristics, the network of the automobile industrial cluster can be classified into three types: Market relationship network; Technology relationship network and Social relationship network.

The market relationship network picks the market players namely suppliers, manufacturers and retailers of the industry cluster as its nodes and use their competition and cooperation relationship as its connecting lines. Basically, the market relationship network of the automotive industry consists of three parts: (1) Upstream and downstream corporations, which formed the vertical agglomeration because of the supply and demand relationship; (2) Automobile parts companies and whole vehicle manufacturers, which formulated the horizontal agglomeration; (3) A variety of service institutions like finance, logistics, technology, consulting, advertising, entertainment, dining, etc. All these enterprises and institutions play an important role in keeping the industrial cluster in a dynamic equilibrium.

The technology relationship network mainly chooses the demander and supplier of the internal automotive industry as its nodes. These nodes include corporations, universities, social research institutions, automotive trade associations, chambers of commerce and government agencies etc. Links between them are based on the technical demand and supply. Usually the links are between different corporations, corporations and research institutions, corporations and trade associations as well as corporations and government agencies.

The social relationship network of the automotive industry is a social communication network

which based on industrial kinship and geopolitical characteristic. People within the automobile industrial cluster are used as its nodes. Mutual trust between familiar corporations and institutions is considered as the foundation for carrying out business transactions within the cluster. Companies can get useful sources through their social relationship. Information and resources are highly shared in the social network which promotes the innovation and development of the automotive industry cluster.

From the above analysis it is not difficult to summaries that lacking of cooperation between cluster members will lead to enterprises agglomerate only on the formal aspect. Moreover, automobile companies within the cluster are more likely to be in a discrete state. Many of the existing automotive industrial clusters in China are in this case. Qian (2003) states that static and lacking of cooperation industrial cluster can only generate simple economic accumulations. The competitiveness of a cluster can be achieved only when the members of the cluster establish a conscious and active cooperation.

4.4 Measuring

China's automobile industry has gone through 60 years of development and has achieved a great success especially during recent years. But whether there are clusters exist in the automotive industry is still a question for many people. Therefore, in this chapter the goal is to find the answer for the above question. The main mathematic tool used here is Hoover (1936)'s Location Quotient (LQ).

4.4.1 Hoover's Location Quotient

4.4.1.1 Definition and Example

Hoover's Location Quotient Technique is considered as the most commonly used method for economic base analysis. It was developed in order to provide a slightly more complicated model to various analysis tools available to economic issues. This mode makes a comparison between the local economy and a reference economy, attempting to identify whether there are specializations in the local economy or not. A ratio between the local economy and some

reference unit's economy is the base of the Location Quotient (LQ) technique. The ratio is called an industry "location quotient" which gives the name to this technique.

(http://mailer.fsu.edu/~tchapin/garnet-tchapin/urp5261/topics/econbase/lq.htm).

LQ is an index for making a comparison between an area's share of a specific activity and the area's share of some basic or aggregate phenomenon. Assume X is some assets' amount in a region (e.g. financing jobs), and Y is supposed as the total amount of the comparable types of assets in that region (e.g. all jobs). Then X/Y is the regional "concentration" of that asset. Similarly, if X1 and Y1 are the same data points for some larger reference unit (like a state or country), then (X/Y)/(X1/Y1) is the LQ or relative concentration of that asset in the region compared to the state or country.

The Location Quotient (LQ) plays an important role in economic studies, because it better explains what makes the region's economy unique compared to its state and/or the country. Here is an example for us to gain a deep insight into this technique. Assume that people working in finance sector have an LQ larger than 1, then the concentration of people working in finance sector in the region is higher than average level. If there exit positive percent changes in LQ, then number of people working in the finance sector in the region is growing greater than the ones of the country. "State LQ" calculates the regional LQ(s) through dividing the regional concentration of a particular economy by the state concentration. "National LQ" on the other hand, calculates the regional LQ(s) through dividing regional concentration by country's concentration. For instance, suppose that in a specific region, 7.5% of the population is taking financial work. In the region's state, this working group accounts for 6% of the population, and in the country it consists of 5.8% of the population. Thus, the concentration of people working in the finance sector is 1.25 times higher in the region than the state (7.5% divided by 6%), and 1.29 times more concentrated in the region than the country (7.5% divided by 5.8%). Therefore, the LQ for the state would be 1.25 and the LQ for the country would be 1.29.

(http://mailer.fsu.edu/~tchapin/garnet-tchapin/urp5261/topics/econbase/lq.htm).

The data in this sub-chapter is from the China Statistical Yearbook (2011, 2012, and 2013). Since the samples here in the research are 31 different provinces, autonomous regions and

municipalities, it will be a huge work to get data for many years. Therefore, in this paper I only chose the data from 2010 to 2012 (the data are usually collected by Chinese Statistical Yearbook one year after the sample year), using this three year's data as the representative. And the employed person selected here are from urban, people from rural area are not included. Furthermore, because there is no specific data for the automotive industry, here I use the data of manufacturing industry, for the reason that manufacturing industry includes rail transportation equipment manufacturing, automobile manufacturing, motorcycle manufacturing, bicycle manufacturing, ship and floating device manufacturing, aerospace manufacturing and other transportation equipment manufacturing industries, and among which the automobile manufacturing takes a big account. Thus, using the data of manufacturing industry will not give a big effect on the analysis result.

4.4.1.2 Concrete Data for Automotive Industrial Cluster

Unit: 10 thousand

Year	Total employed person in China	Number of employed person in automotive industry in China
2010	13051.5	3637.2
2011	14413.3	4088.3
2012	15236.4	4262.2

Table2 Employment in China

Figure from: Chinese Statistical Yearbook (2011-2013).

Unit: 10 thousand

	Total employed person in that area			Number of employed person in automotive industry in that area		
Year	2010	2011	2012	2010	2011	2012
Beijing	646.6	685.9	717.4	100.6	107.8	180.0
Tianjin	205.7	268.2	289.1	75.3	112.7	120.2
Hebei	519.6	555.4	619.9	119.7	130.6	145.4
Shanxi	394.4	409.7	436.0	71.7	70.2	70.3
Inner Mongolia	249.2	262.4	270.8	37.2	40.0	42.7
Liaoning	518.1	579.6	598.7	144.8	167.6	168.3
Jilin	267.6	277.9	285.5	60.8	64.9	64.8
Heilong Jiang	460.0	466.2	471.0	66.8	65.7	63.3
Shanghai	392.9	497.3	555.7	141.3	186.8	218.7
Jiangsu	763.8	811.3	830.9	335.5	353.7	359.7
Zhejiang	883.6	995.7	1070.1	351.7	376.7	327.5
Anhui	372.9	411.6	436.8	76.0	85.5	90.9
Fujian	507.1	596.3	637.9	241.2	283.0	292.4
Jiangxi	297.4	344.4	385.8	71.6	87.8	102.0
Shandong	956.2	1050.4	1110.2	346.4	372.2	395.0
Henan	751.7	839.1	881.2	158.8	193.8	218.3
Hubei	510.3	586.1	598.0	138.5	168.2	160.6
Hunan	505.7	551.4	567.5	106.2	129.0	128.2
Guangdong	1118.5	1238.2	1304.0	476.7	519.0	540.9
Guangxi	316.7	341.6	358.0	62.5	67.8	71.9
Hainan	81.3	85.1	90.1	8.0	8.4	9.5

Chongqing	266.4	337.2	353.2	62.5	79.6	82.3
Sichuan	570.6	614.0	640.9	124.2	141.6	144.5
Guizhou	224.3	241.0	269.5	36.9	39.9	47.6
Yunnan	322.8	350.1	392.7	58.8	63.2	70.5
Tibet	22.2	23.3	25.2	0.8	0.7	0.7
Shanxi	364.8	393.7	411.2	81.0	85.1	86.2
Gansu	194.3	199.3	211.3	35.3	33.9	33.8
Qinghai	52.6	60.6	61.7	9.8	12.1	11.7
Ningxia	59.3	60.9	67.4	10.6	10.8	10.8
Xinjiang	255.0	279.4	288.8	26.0	30.1	30.6

Table 3 Employment in different areas in China

Figure from: Chinese Statistical Yearbook (2011-2013).

Based on Hoover's Location Quotient (LQ) (1936), the main data is from the number of employed person. The following data is required:

1. Number of Employed Person in the Automotive Industry in each different area in China

2. Total Employed Person in each different area

3. Number of Employed Person in the Automotive Industry in China

4. Total Employed Person in China

All this data can be found in table 2 and table 3.

The LQ of the Automotive Industry can be found in table 4.

	LQ of automotive industry in different areas		
Year	2010	2011	2012
Beijing	0.558	0.554	0.897
Tianjin	1.314	1.481	1.486
Hebei	0.827	0.829	0.838
Shanxi	0.652	0.604	0.576
Inner Mongolia	0.536	0.537	0.564
Liaoning	1.003	1.019	1.005
Jilin	0.815	0.823	0.811
Heilong Jiang	0.521	0.497	0.480
Shanghai	1.290	1.324	1.407
Jiangsu	1.576	1.537	1.548
Zhejiang	1.428	1.334	1.094
Anhui	0.731	0.732	0.744
Fujian	1.707	1.673	1.639
Jiangxi	0.864	0.899	0.945
Shandong	1.300	1.249	1.272
Henan	0.758	0.814	0.886
Hubei	0.974	1.012	0.960
Hunan	0.754	0.825	0.808
Guangdong	1.529	1.478	1.483
Guangxi	0.708	0.700	0.718
Hainan	0.353	0.348	0.377

Chongqing	0.842	0.832	0.833
Sichuan	0.781	0.813	0.806
Guizhou	0.590	0.584	0.631
Yunnan	0.654	0.636	0.642
Tibet	0.129	0.106	0.099
Shanxi	0.797	0.762	0.749
Gansu	0.652	0.600	0.572
Qinghai	0.669	0.704	0.678
Ningxia	0.641	0.625	0.573
Xingjiang	0.366	0.380	0.379

Table 4 LQ of automotive industry for different areas in China

Here I give an example on how to compute Tianjin's LQ in the year 2012.

LQ=(X/Y)/(X1/Y1)

X=120.2, Y=289.1, X1=4262.2 and Y1=15236.4

Then LQ=0.4158/0.2797= 1.486

Here LQ=1.486 means, if we let Chinese average level of Automotive industry equals 1 at 2012, and then the Tianjin's level was 1.486 times than the average level at such year. In other words, Tianjin had more concentration of automotive industrial clusters.

From the data above we can see that, Tianjin, Liaoning, Shanghai, Jiangsu, Zhejiang, Hubei, Fujian, Shandong and Guangdong all had LQ which are higher than 1, which means there are automotive industrial clusters in these areas. And according to the LQ theory, the greater the LQ is the more obvious the concentration in that area would be.

Based on the economic features of the automotive industrial clusters and the characteristics of China's geographical division, the automotive industrial clusters in China are generally

distributed in the following six regions: Yangtze River delta area (Shanghai, Jiangsu and Zhejiang); Pearl River Delta area (Guangdong); Bohai Sea Rim (Tianjin and Beijing); Central area (Hubei); Northeast area (Liangning, Jilin and Heilong jiang); Southwest area (Chongqing). These areas contain most of the major automobile enterprises.

4.5 The Current Situation of China's Automotive Industrial Clusters

Based on the measurement from last sub-chapter, we know that China's automotive industrial clusters have been distributed in six regions which are Yangtze River delta area, Pearl River Delta area, Bohai Sea Rim, Central area, Northeast area. In this sub-chapter, I will give some more detailed information about each cluster region. The data used in this part is from (China Auto Industry Yearbook, 2009). And the number of enterprises in this sub-chapter refers only to vehicle manufacturers and modified car manufacturers, automobile parts enterprises are not included.

4.5.1 Automotive Industrial Cluster in Yangtze River Delta Area

Yangtze River Delta area is composed of Shanghai, Jiangsu and Zhejiang these three main provinces and cities etc, the total land area of it is 211,200 km^2 which accounts for 2.2% of China (9.6 million Km^2). According to the (China Statistical Yearbook, 2013), the GDP of this area in 2012 was 899.5 billion Yuan holding 1.7% of the whole country (51932.2 billion Yuan). Yangtze River delta area is one of most competitive regions in China in terms of economic strength. In Shanghai there are a great number of automotive enterprises, for example, Shanghai First Automotive Work is located there, and being one of the largest corporations it has joint ventures such as Shanghai Volkswagen Motor Company and Shanghai General Motor Company. Apart from these, Shanghai also has Shanghai Maple, Shanghai Matthey and Shanghai BYD Auto these three private automobile companies. Some passenger vehicle manufacturers and motorcycle companies can also be found in Shanghai. Moreover, Shanghai also has the best automobile parts industrial base among China, more than 50 world-class auto parts joint ventures are clustered there. Zhejiang Province is also prominent in automotive industry. The most successful automotive private corporation, Greely Automobile Company is positioned there. As to the automobile parts production,

Zhejiang is in the leading position, Wanxiang Automotive Group and Huaxiang Automotive Group are the two best representatives of the many auto parts companies. Many of the products in Zhejiang have also been exported to foreign countries. While in Jiangsu, it has formed dense automobile industry park, Nanjing Fiat Automobile Company, Nanjing Changan Ford Motor Corporation, Yuejin Motor, Chunlan Automobile Corporation, Yangzhou Yaxing Automotive Company and Yancheng KIA Motor Company all these well known automotive corporation have chosen their positions in Jiangsu. Therefore, the automobile industry in Yangtze River Delta is in good development and it already has the basic condition for being the habitat of the automobile industry. Below is a table showing the number of automobile enterprises in this area, it is clear that the differences between each region are not large.

Region	**Number of enterprises**
Yangtze River Delta Area	**137**
Shanghai	23
Jiangsu	34
Zhejiang	36
Anhui	44

Table 5 Automobile enterprises distribution of the Yangtze River Delta Area in 2008
Figure from: China Auto Industry Yearbook (2009).

4.5.1.1 Automobile Production Distribution of the Yangtze River Delta Area in 2008

Unit: 10 thousand

Region	Total output	Proportional share of the region
Yangtze River Delta Area	195.91	100%
Shanghai	80.65	41%

Jiangsu	36.4	19%
Zhejiang	17.39	9%
Anhui	61.47	31%

Table 6 Automobile production distribution of the Yangtze River Delta region in 2008
Figure from: China Auto Industry Yearbook (2009).

From the table above we can see that Shanghai generated the majority of the production in Yangtze River Delta area, which accounted for more than 40%. Anhui and Jiangsu also took a relatively high proportion; however, with a production of 173,900, Zhejiang was less productive.

4.5.2 Automotive Industrial Cluster in Pearl River Delta Area

The Pearl River Delta area is the plain region which near the Pearl River estuary, it involves cities like Guangzhou, Shenzhen, Zhuhai, Huizhou, Dongguan, Jiangmeng, Foshan, Zhaoqing and Qingyuan etc. The total land area is 11,000 square kilometers, which holds 0.11% of the total area of China. Guangzhou is the main region for the automotive industry. The majority of the production there is Japanese automobiles. After Honda Motor Company and Guangzhou Automobile Group set up the joint venture -Guangzhou Honda Motor Company, Nissan Motor Company and Toyota Motor Corporation have gradually gathered in Guangzhou. Now it has formed a " three- pillars" pattern which refers to the automobile production centers located in Huangpu- generating most of Guangzhou Honda Company's production; Huadu which is selected as the camp for Dongfeng Nissan Passenger Vehicle Company; And Nansha for supporting Guangzhou Toyota Company's production. Currently, there are more than 200 automobile parts manufacturers in Guangzhou and most of them have built a solid relationship with the whole vehicle manufacturers. Manufacturing base, complementary conditions and market system in Guangzhou is well developed, which provides an advantageous environment for establishing the automotive industry cluster. The table below gives us some basic information about the number of the vehicle manufacturers in the Pearl River Delta area; from it we can see that most of the enterprises are gathered in Guangdong, Guangxi and Fujian together have less than 40 vehicle corporations.

Region	Number of enterprises
Pearl River Delta area	**142**
Guangdong	110
Guangxi	12
Fujian	20

Table 7 Automobile enterprises distribution of the Pearl River Delta area in 2008
Figure from: China Auto Industry Yearbook (2009).

4.5.2.1 Automobile Production Distribution of the Pearl River Delta Area in 2008

Unit: 10 thousand

Region	Total Output	Proportional share of the region
Pearl River Delta area	169.22	100%
Guangdong	88.18	52%
Guangxi	71.18	42%
Fujian	9.86	6%

Table 8 Automobile production distribution of the Pearl River Delta area in 2008
Figure from: China Auto Industry Yearbook (2009).

The table above shows us that 94% of the total output in the Pearl River Delta area was in Guangdong and Guangxi, However, in terms of competitiveness, Guangdong was more outstanding, because it has many automobile big giants such as Toyota Motor Corporation and Nissan Motor Company.

4.5.3 Automotive Industrial Cluster in Bohai Sea Rim Area

Beijing and Tianjin are the two central cities within the Bohai Economic Rim area; the distance between these two cities is 130 miles. At present, Beijing automobile industry has formed a "three plates" pattern which refers to three big automotive manufacturers: Beijing Hyundai Motor Company, Beijing Jeep Automotive Company and Beiqi Foton Motor Company. In Tianjin, on the other hand, it has core vehicle manufacturers like Tianjin Toyota Motor Corporation, Tianjin FAW and FAW Huali etc. A variety of competitive automobile parts corporations are also gathered in Bohai Sea Rim, such as Denso Tianjin, Tianjin Stanley, Motorola (Tianjin), Tianjin Jinfeng, Beijing Monopril and many other enterprises. Being the two most important cities in the Bohai Economic Rim, Beijing and Tianjin have advantages both in getting production sources and exploiting the convenient transportation network. Therefore, they have great potential for the development of the automobile industry. Table 9 shows us a picture of the distribution of the automobile enterprises, from which we can see that although, Hebei had most of automotive companies, but the production scale was not large compared with Beijing and Tianjin, this will be further proved by table 10.

Region	**Number of enterprises**
Bohai Sea Rim Area	**169**
Beijing	52
Tianjin	24
Shandong	28
Hebei	65

Table 9 Automobile enterprises distribution of the Bohai Sea Rim area in 2008
Figure from: China Auto Industry Yearbook (2009).

4.5.3.1 Automobile Production Distribution of the Bohai Sea Rim Area in 2008

Unit: 10 thousand

Region	Total Output	Proportional share of the region
Bohai Sea Rim	242.3	100%
Beijing	77.18	32%
Tianjin	53.8	22%
Shandong	79.17	33%
Hebei	32.15	13%

Table 10 Automobile production distribution of the Bohai Sea Rim area in 2008
Figure from: China Auto Industry Yearbook (2009).

According to table 10, the total output in the Bohai Sea Rim area in 2008 was 2,423,000 units, Beijing and Shandong almost had the same Percentage, 32% and 33% respectively. Tianjin with a production of 538,000 ranked the third among the other three regions.

4.5.4 Automotive Industrial Cluster in the Northeast Area

Heilongjiang, Jilin and Liaoning these three provinces are collectively referred to as the Northeast area. The First Automotive Work, one of the three auto giants (the other two are Second Automotive Works and Shanghai Automotive Works) among China is located in Changchun, Jilin province. In Harbin, Heilongjiang Province, it has one of the best known independent R&D (Research and Development) automobile companies-Hafei Automotive Group as well as six private small scaled auto manufacturers. While in Liaoning province, German BMW (Bavarian Motor Works) and Brilliance Automotive Company has together set up the joint venture Brilliance BMW. In the components manufacturing aspects, northeast area has numerous powerful auto parts enterprises. For example, in Jilin there are Fawer FAW, Koyo FAW and Tokico FAW etc. In the table 11, we can find that the total number of

automobile enterprises in the northeast area is 106, where Liaoning has the most companies.

In terms of automobile research and personnel training, northeast area is also in a leading position. The School of Automotive Engineering in Jilin University has made a great contribution on scientific researches and provided thousands of qualified people to the automotive industry. Considered as the "industrial cradle" of new China, northeast region is prominent in steel, energy, chemicals, heavy machinery, shipbuilding, aircraft, military and other major industrial fields. Long industry development history has provided advantages for establishing automotive industrial clusters in the northeast area.

Region	**Number of enterprises**
Northeast Area	**106**
Liaoning	61
Jilin	19
Heilongjiang	26

Table 11 Automobile enterprises distribution of the Northeast area in 2008
Figure from: China Auto Industry Yearbook (2009).

4.5.4.1 Automobile Production Distribution of the Northeast Area in 2008

Unit：10 thousand

Region	Total Output	Proportional share of the region
Northeast Area	144.53	100%
Liaoning	34.2	24%
Jilin	86.13	59%
Heilongjiang	24.2	17%

Table 12 Automobile production distribution of the Northeast area in 2008
Figure from: China Auto Industry Yearbook (2009).

From the statistics in the above table we can see that the majority of the production was clustered in Jilin which accounted for 59% of the total output, whereas the number for Liaoning and Heilongjiang was similar, 342,000 and 242,000 respectively.

4.5.5 Automotive Industrial Cluster in Central Area

Wuhan is the center of China's inland market, being one of the most remarkable automobile cities; many famous automotive corporations have chosen their position there. Dongfen Automobile Company is a good example. Nissan Automotive Company and Honda Automotive Company have also invested there. Apart from these powerful vehicle manufacturing companies, the central area also has a great number of auto parts corporations, such as Hubei Valeo Automotive Lights Company, Hubei Valeo Automotive Air Conditioning and Xiangfan Dongfeng Peugeot Citroen Automobile Parts Factory etc. In terms of research and personnel training, institutions like Wuhan University, Hubei Automotive Engineering College and Huazhong University of Science and Technology have contributed a lot to the automotive industry. From the table below, we can find the total number of enterprises in Wuhan, Hubei province was 77 in the year 2008, which held a proportion of more than 40% of the total enterprises (189). It is not difficult to see that the automotive industry in the central area has gradually clustered in Hubei (Wuhan).

Region	**Number of enterprises**
Central Area	**189**
Hubei	**77**
Henan	48
Jiangxi	14
Hunan	28
Shanxi	22

Table 13 Automobile enterprises distribution of the Central area in 2008
Figure from: China Auto Industry Yearbook (2009).

4.5.5.1 Automobile Production distribution of the Central Area

Unit：10 thousand

Region	Total Output	Proportional share of the region
Central Area	122.53	100%
Hubei	84.93	69%
Henan	7.9	6%
Jiangxi	21.16	7%
Hunan	13.95	8%
Shanxi	27.4	9%

Table 14 Automobile production distribution of the Central area in 2008
Figure from: China Auto Industry Yearbook (2009).

Based on the statistics in table 14, production of the central area is mainly gathered in Hubei, 69% of the total output. As to the rest four regions, namely Henan, Jiangxi, Hunan and Shanxi the production of them are relatively small. Therefore, table again proved that automotive industry in the central area is mainly clustered in Hubei.

4.5.6 Automotive Industrial Clusters in Southwest Area

Chongqing is the location of Chang'an Automotive Group which is the largest mini car production enterprise in China. Subsidiaries of Chang'an Automotive Group such as Chang'an Suzuki Motor Company and Chang'an Ford Motor Company are also gathered in the southwest area. Business vehicle manufacturers like Chongqing Qingling Automobile Company and Chongqing Hongyan Automotive companies have chosen to set up their factories in Chongqing. In the northern part of Chongqing, many new automotive plants are now under construction. Moreover, a great deal of auto parts companies can also be

discovered in this area. The total number of the automobile enterprises in the southwest was 81 in 2008, from the table below it is clear that Chongqing with 41 corporations was the best cluster place for the automotive industry in the southwest area.

Region	**Number of enterprises**
Southwest Area	**81**
Chongqing	41
Sichuan	37
Yunnan	3

Table 15 Automobile enterprises distribution of the Southwest area in 2008
Figure from: China Auto Industry Yearbook (2009).

4.5.6.1 Automobile Production Distribution of the Southwest Area

Unit: 10 thousand

Region	Total Output	Proportional share of the region
Southwest area	137.54	100%
Chongqing	109.17	79%
Sichuan	20.34	15%
Yunnan	8.03	6%

Table 16 Automobile production distribution of the Southwest area in 2008
Figure from: China Auto Industry Yearbook (2009).

Production of automobiles in the southwest area in 2008 was 1,375,400, according to table 16 there were big differences between each regions within this area. Chongqing with an output of

1,091,700 units generated almost the total output of the southwest area. On the contrast, Sichuan and Yunnan together accounted for around 20% of the total production.

4.5.7 Automobile Enterprises Distribution of China and Automobile Production distribution of China

Here I also give the Automobile enterprises distribution and production distribution in China, from the two tables below we can see that the central area had the largest number of automobile corporations, however in terms of production it was not competitive as Bohai Sea Rim area which ranked the first among the six cluster regions in the year 2008.

Region	Number of enterprises	Region	Number of enterprises	Region	Number of enterprises
China	**824**				
Yangtze River Delta Area	**137**	**Pearl River Delta Area**	**142**	**Bohai Sea Rim Area**	**169**
Shanghai	23	Guangdong	110	Beijing	52
Jiangsu	34	Guangxi	12	Tianjin	24
Zhejiang	36	Fujian	20	Shandong	28
Anhui	44			Hebei	65
Northeast Area	**106**	**Central Area**	**189**	**Southwest Area**	**81**
Liaoning	61	Hubei	77	Chongqing	41

Jilin	19	Henan	48	Sichuan	37
Heilongjiang	26	Jiangxi	14	Yunnan	3
		Shanxi	28		
		Hunan	22		

Table 17 Automobile Enterprises Distribution of China

Figure from: China Auto Industry Yearbook (2009).

Unit: 10 thousand

Region	Total Output	Proportional share of China
China	1059.2	100%
Yangtze River Delta Area	195.91	18%
Pearl River Delta Area	169.22	16%
Bohai Sea Rim Area	242.3	23%
Northeast Area	144.53	14%
Central Area	122.53	12%
Southwest Area	137.54	13%
Total output of the above six areas	1059.2	96%

Table 18 Automobile Production distribution of China

Figure from: China Auto Industry Yearbook (2009).

4.6 The Study of Japanese Automotive Industrial Clusters

Japan's automotive industry is in the forefront of the world automotive industry. Its success is inseparable from the cluster based production mode. In 1953, Japan's automobile production was less than 50,000 units. However, since the late 1950s, Japanese automobile industry has

experienced a rapid development, in 1961 Japan's production surpassed Italy's, in 1964 it passed France, in 1966 it caught up with the United Kingdom and in the year 1970 as overwhelming the former West Germany, Japan was considered as the second largest automobile production country in the world. Apart from these, in 1980 the production of Japanese automobile exceeded 10 million, reaching 11.042 million, for the first time surpassed the United States (8.01 million) and became the largest automobile manufacturer. The table below shows the annual production and increase rate of Japan's automobile industry. The secret of Japan's automotive industry's rapid development and strong competitive advantage was the implementing of cluster development strategies. Toyota Motor Corporation is one of the most outstanding automobile manufacturers in Japan and is in a leading position in terms of carrying out automotive industrial cluster. Thus, in this study we choose it as the representative of Japanese automobile companies and explore its successful development experience.

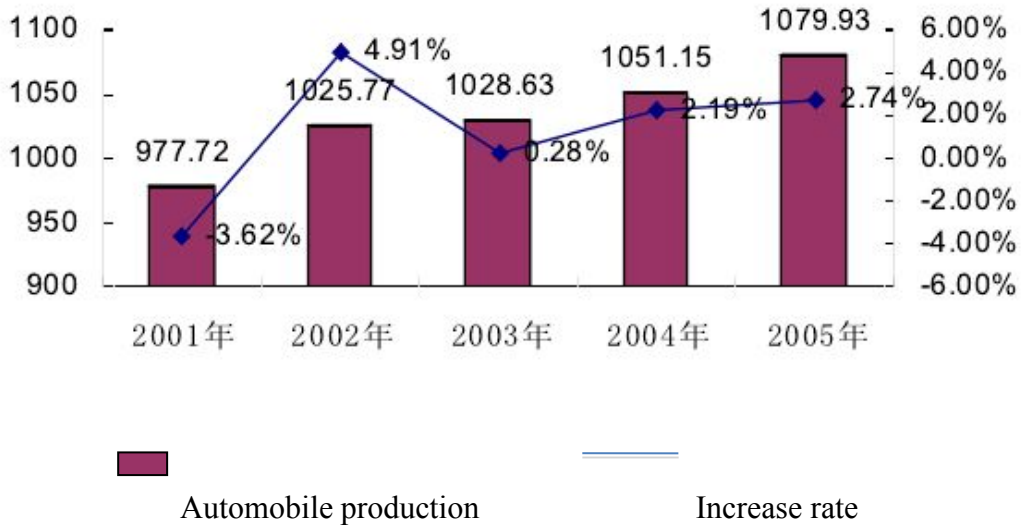

Figure 3 increase of Japan's total automobile output
Figure from: China Auto Yearbook (2006).

According to Ohno (1979), the success of Toyota Motor Corporation lies in its automotive industrial clusters. Because clusters can generate agglomeration effects and improve enterprises' innovation ability, therefore it is of great significance to explore the factors which contribute to the development of Toyota automotive industrial clusters. Generally, the factors can be summarized into the following three aspects:

The first aspect is Toyota Motor Corporation's leading role. Japan's Toyota City is one of the most well known automotive industrial clusters among the world; it utilizes an axis-wheel development model. With a large number of small and medium sized enterprises around it, Toyota Corporation is considered as the axis enterprise in the cluster. Because of the key position of the axis enterprise, Toyota Corporation plays an essential role in promoting the development of the whole cluster as well as related enterprises.

The second aspect is the localization connection. Generally, there two types of connection. The first one is organizational connection and the second one is geographic connection. The organizational connection of Toyota automotive industry is mainly based on the contract system which refers to the vertical transaction link between large enterprises and SMEs (small and medium sized enterprises). Because of its hierarchy form, the contract system can be vividly compared to pyramid. Large enterprises are on the top of the pyramid, on contrast, SMEs are locating at the foot. According to the scale and operating capacity, enterprises are divided into several hierarchical levels and relationship between each level's enterprises is contracting link. Through this contracting link, Toyota Motor Corporation and the related companies has formed a vertical enterprises series within which not only do enterprises cooperate with each other, there are also competition between them. The cooperation between enterprises is mainly shown in two levels: the first level is the dependency between large enterprise and SMEs. On the one hand, the SMEs are the important component of Toyota Motor Corporation's production, thus Toyota is strongly dependent on them. On the other hand, because Toyota Motor Corporation often gives contracting enterprises assist on personnel training, technical guidance and operation management etc; therefore the dependency of the contracting enterprises is relatively high. The second level is the dependency between SMEs. Based on the mutual profits and the contracting link within Toyota automotive industrial cluster, the reliance between each small and medium sized enterprise is strengthened. Whereas, the competition between enterprises is hierarchical which means enterprises mainly compete with the companies coming from its own level. For example, Toyota Motor Corporation as the axis company does not compete with its low-level contracting enterprises, but it compete fiercely with large automobile companies such as Honda Motor Company and Nissan Motor Company. And usually this kind of competition will be passed to the small and medium sized contractual enterprises, which means in order to get more order from Toyota, the low-level contractual enterprises has to compete with each

other not only on product quality, delivery time, but also on price. This is the main form of competition between small and medium sized enterprises in the Toyota automotive industrial cluster.

The third aspect is Toyota automotive industry's social enbeddedness. The development of industrial clusters depends not only on economic factors, but also on the social and cultural factors. In the early stage of Toyota automotive industrial cluster's formation, because of Toyota city's specific population, geographical location and kinship relationship, a set of code of conduct was easily carried out. Under the guidance this code of conduct, the degree of mutual trust within the cluster has been greatly improved. Moreover, the trade and non-trade, formal and informal links between different enterprises has also been strengthened, which further promotes the establishment of the social network for the whole cluster (Zhang, 2005).

4.6.1 The Enlightenment from Japan's Automotive Industrial clusters

Toyota Automotive industrial cluster's development lies in the three aspects we discussed above. From its development, we can find out the general factors which a successful cluster should posses. (1) Toyota automotive industrial cluster is composed with Toyota Motor Corporation and a large number of its contracting enterprises. Its production is based on an axis wheel production system which is a typical mode for industrial clusters' development. (2) Relations between enterprises within the cluster are flexible and dynamic. Not only do the corporations within the cluster cooperate with each other, but they also compete intensively. (3) Specialization among enterprises within the cluster is obvious. Toyota only operates key parts production and vehicles assemble. The majority of its contracting enterprises coming from different levels generate primary or secondary components production. (4) Toyota automotive industrial cluster has a unique local cultural characteristic which include loyalty, trust and intimacy. (5) The existence of a large number of enterprises and institutions, which help to speed up the development of Toyota automotive industrial cluster.

4.7 Summary of the Empirical Part

The present state of China's automotive industrial clusters was inseparable from its own historical evolution. In order to establish a successful automotive industry cluster some prerequisites are asked. Moreover, when the conditions for setting up an automotive industrial cluster are improved, the cluster may also be upgrade. Right now, China has already formulated six automotive industrial clusters regions namely Yangtze River delta area, Pearl River Delta area, Bohai Sea Rim, Central area, Northeast area. Moreover, Successful examples from the worldwide can also help the Chinese automotive industry to speed up its cluster development.

5 Analysis

5.1 Structure of Analysis

The analytical part will base on the data collection of empirical part. Theories and models in the theoretical part will mainly be used to analyze and interpret the empirical findings.

The first section presents that why China need to develop automotive industrial clusters. In the second section, major problems that China has met during the development of the automotive industrial clusters are depicted. Approaches to deal with the existing problems and to further promote the development of China's automotive industrial clusters are presented in the last section.

5.2 The Reasons of Developing Automotive Industrial Clusters

5.2.1 Clusters Provide Enterprises with Efficient Access to Resources

Cluster based strategy theory points out that industries with long industrial chain, numerous of complementary links and complicated manufacture mode are more likely to exploit the advantages of geographic agglomeration. Automotive industry with all these features is a good case. There are many related enterprises and institutions on the automotive industry chain, for instance it has a large number of automobile parts suppliers from the upstream enterprises; Service providers from the downstream corporations as well as substitute manufacturers and basic infrastructure suppliers from horizontal or other side on the industrial chain. All these companies gather together in a particular region, which make it more convenient to get a variety of resources from each other. China is a large country, distance between cities range from around 100km to 3000km, therefore, without going far away to cooperate and find resources, enterprises within a cluster gain benefits both from time saving and cost saving.

5.2.2 Clusters Foster Specialization

Cluster economy is advantageous to improve the degree of specialization. This effect is generally manifested in macro and micro aspects. From the macro aspect, a cluster is competitiveness in terms of making a brand for the automotive industry and producing high quality products with fewer costs, because usually a cluster stresses more focus and efforts on the entire industry's development. Enterprises within an automotive industrial cluster may meet more requirements for their specialized production. On the contrary, an enterprise without being a member of any clusters may have fewer requirements and pay less attention to the specialization. From the micro aspect, in order to improve the production efficiency, enterprises within an automotive industrial cluster generate specialization, which means different enterprises mainly focus on its production parts. In other words, a successful automobile industrial cluster usually have a well developed division system which include a variety of enterprise such as upstream and downstream corporations, rather than one enterprise operates all the production of the final products.

5.2.3 Clusters Strengthen Social Cooperation

Automotive industrial cluster strengthens the information exchange and cooperation between upstream and downstream enterprises on the industrial value chain. Through sharing technology and other resources, corporations within an automotive industrial cluster can take advantage of the technological innovation and the spillover effects of the invisible resources. Moreover, encouraging cooperation both between different corporations and people will help to promote researches on automotive products. Furthermore, automotive systems and synchronous development project can also be improved, which make it possible for making full use of limited capital and shortening the development cycle.

5.2.4 Clusters Encourage Learning Effect

According to Yan (2008), with the acceleration of total production, corporations within a cluster can reduce its average production costs, even under the premise of unchanged production scale. This is because cluster and single enterprise has different learning effect,

within a cluster enterprises can gain benefits from the agglomeration effect, which means information and technology can easily transformed within a cluster. Moreover, because of the frequent cooperation and competition, companies have more motivation to learn new techniques as well as new production methods, in order to catch up with the development of the whole cluster. However, a single company may have no access to the learning resources and less motivation to learn. Suppose that in the initial stage of production, enterprise within a cluster and single enterprise has the same average costs, with the increase of output, there will be big differences in their long-term average cost. Below is a figure showing this difference. LAC_1 and LAC_2 is the long term average cost for the enterprises inside and outside the cluster.

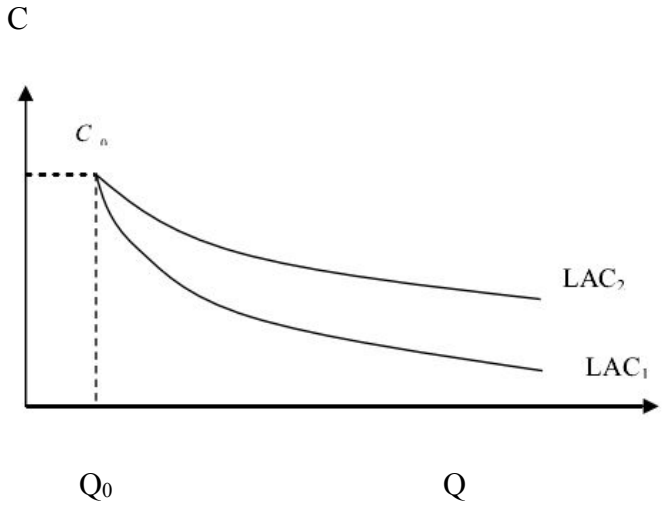

Figure 4 the different learning effect for the enterprises inside and outside the cluster

5.3 Major Existing Problems for the Development of China's Automotive Industrial Clusters

Although the China has some advantages in developing its automotive industrial clusters, it still meets some challenges. This sub-chapter will explore them one by one.

5.3.1 Production Subject has Non-clustered Feature

Generally, the main automobile production subjects in China are joint venture enterprises. Because of its large domestic market, China has attracted almost all the worldwide

automobile giants to set up their plants there. For instance, in the Yangtze River delta area, investment from multinational companies includes Volkswagen Group, General Motor Company, Ford Motor Company, Hyundai Motor Company and Fiat Motor Company. However, such a large number of joint ventures and cooperative objects cause the complexity of the technical system inside the automobile industrial cluster. Due to the various technical systems, different vehicle manufacturers may have different automobile part suppliers which come from the same technical system. This extremely reduces the ability of a single enterprise in promoting the development of its related corporations. Moreover, the capability of the automotive industrial agglomeration is decreased and the advantages of an automotive industrial cluster are not given full play. This situation of the automotive industrial cluster may also lead to the following problems:

(1) Over reliance on core techniques coming from foreign countries. Currently, Chinese medium and heavy laden steams as well as truck production have reached the world class scale. However, due to the short development history and lacking of adequate techniques, the production of passenger vehicle is left behind compared with the world famous automotive companies. Although, China has brought in a large number of advanced techniques from the world wide, which help the automotive industry to reach the world level, the production of key automobile parts which requires high techniques is mainly controlled by foreign companies. Core techniques of the Chinese automotive industry have obvious exogenous characteristics.

(2) The automobile industrial value chain is fragmented and incompleted. Automobile enterprises in China, especially the car corporations are dominant by joint ventures. Therefore, there exist a variety of multinational techniques on the automotive industrial value chain. Due to the different sources, there are obstacles in sharing and spreading industrial techniques. Enterprises with the same position on the automotive industrial value chain also have difficult in interaction between each other as well as sharing industrial information. At the recent stage, Chinese automotive industry has techniques coming from the United State, South Korean, Japan as well as China itself. However, these techniques are not well compatible to each other. Take Chinese techniques and Japanese techniques as an example, firstly, the supplier of these two technique systems have little in common, in addition to automotive glass, aluminum

wheels and a few other products, basically the complementary system is completely different. Secondly, for the Sino-Japanese joint venture automobile companies, due to the different technique system, they primarily choose the Japanese corporations rather than Chinese companies as their suppliers. This fragmentation phenomenon of the technique system greatly limits the formation of the automotive industrial agglomeration.

5.3.2 Lacking of Cooperation between Enterprises

From the geographical distribution aspect, China's auto industry is merely showing the production concentration feature. Production concentration is the sate when related enterprises gather together in one specific area, however, cooperation between them is relatively limited; on the contrast competition is extremely severe. But, for a successful automotive industrial cluster, a very close relationship between different corporations is highly needed. Enterprises within a cluster should generate specialization rather than one company operates all the production process. Chinese automotive industry is experiencing the above problems, take Shanghai FAW as an example, the two joint ventures: Volkswagen and GM, due to their own complementary system and techniques standards, there is nearly no cooperation between them. Lacking of interaction between different companies reduces the competitiveness of the automotive industrial cluster.

5.3.3 Industrial Scale is small

At present, China has the largest number of automobile companies in the world; however, in terms of scale the majority of them are small enterprises. According to the China Automotive Yearbook (2006), in the year of 2005, there were 117 vehicle manufacturers among China, but only 13 of them generated an annual production above 100 thousands units. A universal phenomenon in the Chinese automotive industry is that China's automobile enterprises including joint ventures, regardless of their size, all have a large number of auto parts suppliers. For example, Shanghai FAW has 43 automobile parts manufacturers, Tianjin Automotive Group has 52. But the scales of these enterprises are relatively small. Because China's automotive industry has been in an almost closed market environment for a long time and enterprise are used to utilize high price to dilute the pressure of the high cost, thus many

small scaled corporations can exit in the Chinese automotive industry. However, this situation greatly reduces the capability of the whole industrial cluster.

5.4 Approaches of Development of China's Automotive Industrial Clusters

5.4.1 Improve the Automotive Industrial Cluster's Intermediary Service System

The intermediary service system of the automotive industry is composed of a variety of professional service institutions. For example, information services agencies, personnel training institutions, management and technique consulting institutions as well as financing services institutions, Law Firms, Patent Offices and quality Certification Centers etc. Intermediary service system of China's automobile industrial cluster is not well developed, especially the management consulting and technique consulting institutions. Therefore, in order to better provide service to the automotive industrial clusters, the central government should make effort to bring in the lacking intermediary service organizations. Moreover, supervision on these institutions should not be overlooked.

5.4.2 Strengthen the Technique Innovation of the Automotive Industrial Clusters

It is not difficult to understand that technique innovation boosts the development of the automotive industrial cluster to a large extend. With the institutional arrangement which encourages enterprises to take advantage of new technologies and to carry out technological innovation constantly, a great number of advanced techniques will be produced; therefore the technological level of a cluster can be greatly improved. On the contrary, with an institutional arrangement which suppresses innovation spirit and innovation activities, enterprises can only generate low level repeated construction. Moreover, the speed of technique innovation is extremely slow. Chinese automotive industrial clusters are experiencing the above problem; thus, in order to improve the competitiveness of the Chinese automotive industrial cluster, it is of great significance to establish a technological innovation system.

5.4.3 Encourage Automotive Industrial Clusters to Join the Global Value Chain

The automotive industrial clusters in China should strengthen its connection with the external environment. If enterprises within a cluster can join the global value chain and participate in the producer-lead or customer-lead multinational production as well as distribution activities, they will get access to a much broader market. Moreover, innovation on production and management techniques can also be improved. Therefore, according to the actual situation, the Chinese government should guide the automobile corporations to participate in the international competition. Basically, this guidance can be illustrated in two aspects. On the one hand, the central government should consciously make efforts to attract more multinational automobile companies and auto part manufacturers to invest on the Chinese automotive industrial clusters. On the other hand, enterprises within the cluster should be encouraged to step into the world market. Apart from these, Chinese government should create a fair competition environment for the automotive enterprises and assist them to solve the problems meet during the "going out" procedure.

5.4.4 Establish a Well-Developed Cooperation and Division of Labor System

The success of an automotive industrial cluster is strongly dependent on a sound cooperation and division of labor system. For the reason, that it can help the cluster members to maintain a balance between competition and cooperation. Toyota Motor Corporation is a good example; its success lies in the establishment of a cooperation and division of labor system. Therefore, the government in China should use economic methods to make cluster based strategies. Establishing a specialized market is a good way to boost the development of the automotive industrial clusters in China. Usually, the specialized market can be categorized into two types: (1) vehicle transaction market; (2) intermediate products, raw materials, components and production equipment transaction market. The establishment of the vehicle transaction market will help to promote the specialization among vehicle manufacturers and automobile sales companies within the cluster. While the building the automobile parts transaction market will strengthen manufacturing enterprises' specialization. Moreover, the barriers for enterprises to enter and exit the automotive parts market can also be reduced.

5.5 Summary

Until now, we could conclude that, "How can industrial clusters boost the development of China's automotive industry?" or in other words, "why China need to develop automotive industrial clusters". The reasons are as follows: First, automotive industrial clusters provide enterprises with efficient access to resources. Within a cluster, enterprises can easily share and take advantage of a variety of resources. Second, automotive industrial clusters foster specialization, corporations with different locations on the industrial value chain generate their production more efficiently. Third, clusters strengthen social cooperation, without going far away; enterprise within a cluster can better communicate and cooperate with each other. Forth, clusters encourage learning effect, the learning effect of a single corporation within and outside a cluster are different. Because of the agglomeration effect, the enterprise inside of a cluster can learn more effectively. Apart from these, in this chapter, challenges that exist in the Chinese automotive industrial clusters are also explored. Moreover, approaches to solve the existing problems and further develop the automotive industrial clusters in China have been studied as well.

6 Conclusion

6.1 Summary of the Study

The subject I have chosen for this thesis is: **China's Automotive Industry Development from the Perspective of Industrial Clusters.**

The purpose of the thesis is to explore how industrial clusters can promote the development of China's automobile industry. What challenges has been meeting by Chinese auto industry and what approaches that the Chinese automotive industry should carry out are also discussed in this thesis.

Since the thesis is concerned with discussing the development of China's automotive industry from the point of view of industrial clusters, therefore, we must have a general idea on the history of Chinese automobile industry as well as the prerequisites for establishing an automotive industrial cluster.

Based on the theoretical framework chosen, in the theoretical part, the thesis mainly chose the theories from three aspects: Theory on Automobile, Theory on Clusters and Theory on Value Chain. The theory of Automobile describes that an automobile is a wheeled motor vehicle which is used for transporting passengers as well as carrying its own engine or motor. An automotive industry, on the other hand is an industry which consists of a variety of companies and organizations. The characteristics of an automotive industry are as follows: First, it has economies of scale features. Second, it is a capital intensive industry. Third, it is a traditional technology intensive industry. Forth, it is with high connection and fifth, the automotive industry can create a large number of jobs. The theory of Clusters says that a cluster is also a special economy agglomeration. Porter (1998) describes a cluster is a critical mass of companies in a particular location, whether it is a country, a state or region, or even a city. Clusters take varying forms depending on their depth and sophistication, but most include a group of companies, suppliers of specialized inputs, components, machinery, services and firms in related industries. Theory on Value Chain tells us that a value chain is the internal processes or activities a company performs to design, produce, and market, deliver and support its products.

In the empirical part, first the paper introduces the history of China's automotive industry which includes four development phases: the central control and planning phase, the proliferation phase, concentration phase and the recent phase. China's automotive industry started in 1950s, since then it has experienced a rapid development, especially after China's accession into the WTO. At present, China is a competitiveness country in terms of automobile manufacture. Second, the thesis illustrates the prerequisites for establishing and developing the Chinese automotive industrial clusters both from the external and internal perspectives. From the external point of view, abundant capital is needed, because automobile industry is a capital intensive industry. Moreover, because of the mass production and high barriers to enter into the industry, automobile enterprises should have economies of scale. On the other hand, from the internal point of view, in order to build the automotive industrial clusters, advanced technology as well as a sound industrial network is needed. Third, the paper generates a measuring, though analyzing and calculating on a great deal of data and figures, it demonstrates that China has mature and successful automotive industrial clusters. Forth, based on the measuring, the thesis describes the current situation of the Chinese automotive industrial clusters. Generally, the automobile industrial clusters are concentrated in the following six areas: Yangtze River delta area, Pearl River Delta area, Bohai Sea Rim, Central area, Northeast area. And in the final part, the researcher explores the development Japanese automotive industrial clusters, through studying the outstanding example- Toyota automotive industrial cluster, we can find out the shortcomings exist in the Chinese automotive industry and gain successful experience for establishing automobile industrial clusters.

In analysis part, the paper answers the questions presented in the introduction part. Combing theories and China's automotive industrial clusters' real situation, the paper first depicts the reasons for developing automotive industrial clusters in China, such as automotive industrial clusters provide enterprises with efficient access to resources; automotive industrial clusters foster specialization; clusters strengthen social cooperation and clusters encourage learning effect. Second, the thesis gives a clear picture about what problems China's automotive industry has met during its process of establishing clusters. Major problems can be summarized as follows: (1) Production subject has non-clustered feature. (2) Lacking of cooperation between enterprises. (3) Industrial scale is small.

Finally the paper gives a detailed description of the approaches China used to push its development of the automotive industrial clusters, such as improve the automotive industrial cluster's intermediary service system; strengthen the technique innovation of the automotive industrial cluster; encourage the automotive industrial cluster to join the global value chain and establish a well developed cooperation and division of labor system.

6.2 Limitation of the Study

To any research, limitation exists. It is an inevitable feature of study because of limitation of the researcher and situation changes along the time (Song, 2012). Thus, in this study it also has limitation:

Firstly, limitation comes from the access to sufficient data of research topic. For example, there is no specific data of the automotive industry employment ever since 2002; therefore, in this paper researcher has to use the data of manufacture industry employment. This no doubt will make the results different from the realities.

Secondly, automotive industry is a pillar industry in the world. In this paper, I only choose Toyota Motor Company as the representative of the automotive industrial clusters to compare with the ones in China. Although Toyota Motor Company is a significant example, we could have more data on other automotive industrial clusters from the worldwide. Therefore, this paper also has limitation in terms of international dimension.

Thirdly, we could improve the methodological approach of the thesis. For example, secondary data was chosen as the main research method of the paper, even though they are official published, there is still subjectivity. Thus, it is not difficult for us to find out that every method has its own advantages and disadvantages.

6.3 Proposals for Further Research

According to the above limitations, the proposals for further research can be suggested as follows:

First, the suggestion for further study is to solve the issues of lacking of adequate data from the international dimension. Therefore, researchers should pay more attention to the automotive industrial clusters from the rest of world and make comparison with them; this will give the researcher a clear picture of the global automotive industrial clusters' situation and assist them to carry out the research.

Second, researchers could go to an automotive industrial cluster area and interview several companies in the same clusters within the region. This will assist researchers to get the first hand data, and allow them to gain a deeper insight into the study.

Reference

Best, M. (2001). The New Competitive Advantage, Oxford University Press, Oxford.

Burns, R.B. (2000). Introduction to Research Methods. London: SAGE.

Churchill, G.A. & Iacobucci,D. (2005). Marketing Research Methodological Foundation. Thomas Cooperation, USA.

Churchill, G.A. (1999). Marketing Research: Methodological Foundations, 7th ed., Dryden Press, Fort Worth, TX.

China Statistical Yearbook (2011- 2013) editions, China Statistics Press, Beijing. In Chinese.

China Auto Industry Yearbook (2001-2010) editions, "China Auto Industry Yearbook"Journal Club, Beijing. In Chinese.

David L.B. & Mark S.H. (2002), Advantages and Disadvantages Of Targeting Industry Clusters, Research Report 05-2002-03 May.

Deming, W.E. (1982). Out of the Crisis, pp. 287-289. Cambridge, MA: Massachusetts Institute of Technology, Center for Advanced Engineering Study.

Deng, D.F. (2010). The research on determining factors of automobile industry cluster in China, Master thesis, Huazhong University of Science and Technology. In Chinese.

Fu, J.J. (2003). Technical Economics frontier issues [M] Beijing: Economic Science Press, 2003. In Chinese.

Gereffi, G. and Korzeniewicz, M. (Eds) (1994) Commodity Chains and Global Capitalism, Praeger Publishers, Westport, CT.

Gall, M., Gall, J., & Borg, W. (2003). Educational Research. Boston: Pearson Education, Inc.

Guo, K.S. (2003). The Leading role of automotive industry in the economic development (J), The study of economic problems, 2003(9). In Chinese.

Gao, P. (2002). "A tune-up for China's Auto Industry", McKinsey Quarterly, Vol. 1, pp.144–155.

Holloway, I. (1997). Basic Concepts for Qualitative Research. Oxford. Blackwell Science.

Hoover, E.M. (1936). The Measurement of Industrial Location. Review of Economics and Statistics 18, 162-171

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm hose time has come. Educational Researcher , 33 (7), 14-26. Retrieved on February 9, 2008 from SAGE.

Krugman, P. (1991), Geography and trade, London: MITPress/Leuven UP, p.142 .

Ketels, C.H.M. (2003). The Development of the cluster concept – present experiences and further developments, Prepared for NRW conference on clusters, Duisburg, Germany, 5 Dec 2003.

Ketels, C.H.M. and Olga, M.(2008). From clusters to cluster-based economic Development, Int. J. Technological Learning, Innovation and Development, Vol. 1, No. 3, 2008 pp.378.

Kim, S (1996). Expansion of Markets and the Geographic Concentration of Industry. Quarterly Journal of Economics, Vol.110, No.4, 889-908.

Kaplan. B. & Duchon. D. (1998). Combining Qualitative and Quantitative Methods: A Case Study. MIS Quarterly, Vol. 12, No.4 571-586

Krugman, P. (1991). Geography and Trade, Cambridge, Massachusetts: MIT Press.

Lu, R. (2008). Chinese Special Economic Zones as Clusters A Case Study of Shenzhen's Modern Service Clusters, Master thesis, Bodø Graduate School of Business.

Lei,R.Q. & Chen, J.X. (2004). Research on network mechanism of industrial clusters [J], Science and scientific technic management. In Chinese.

Luo, J.X., Oliver, N., & Holweg, M. (2009). The past, present and future of China's automotive industry: a value chain perspective, Int. J. Technological Learning, Innovation and Development, Vol. X, No. Y, 2009.

Li, Y. (2004). Industrial Economics, Second Edition, China Renmin University Press, Beijing, 2004.

Markusen, A.R. (1996). "Sticky Places in Slippery Space: A Typology of Industrial Districts", Economic Geography, Volume. 72, Issue 3(Jul.,1996), 293-313.

Macus, M. & Robey, D. (1988). Information Technology and Organizational Change Management Science, Vol. 34, No. 5, 583-598.

Mark Easterby-Smith, Richard Thorpe, Paul R. Jackson. (2008). Management Research 3rd Edition. SAGE Publications Ltd.

Maurice Godelier. (1972). Rationality and Irrationality in Economics, London : NLB, 1972.

Nachmias, D. & Nachmias, C. (1992). Research Methods in the Social Sciences. New York: St. Martin's OECD (Organisation for Economic Cooperation and Development) 1996, Benchmark.

Parsuraman, (1991). Marketing Research Wesley Publishing Company Inc, USA

Porter, M.E. (1985) Competitive Advantage, Ch. 1, pp 11-15. The Free Press. New York.

Porter, M.E. (1990) The Competitive Advantage of Nations, New York: Free Press.

Porter, M.E. (1998) On Competition, Boston: Harvard Business School.

Porter, M.E. (1998). Clusters and the New Economics of Competition, Harvard Business Review, 76(6),77-90.

Porter, M. E. (2000), Location, competition, and economic development: Local clusters in a economy, Economic Development Quarterly 14 (1): 15-34.

Porter, M.E., Institute for Strategy and Competitiveness (2008). Clusters, Innovation, and Competitiveness:New Findings and Implications for Policy, Harvard Business School.

Proctor, T. (2003). Essentials of Marketing Research. 3rd ed. Harlow, United Kingdom: Pearson Education Ltd.

Qian, P.F. (2003). Case study research: China's freshwater pearl industry development from the perspective of industrial clusters and global value chains [R], Development Research Center of the State Council. In Chinese.

Ratnesar, N. & Mackenzie, J. (2006). The quantitative-qualitative distinction and the null hypothesis significance testing procedure. Journal of Philosophy of Education, 40(4), 501-509. Retrieved on February 9, 2008 from Academic Search Premier.

Richard,W.J., Lommel, J,M. & Hartz. (2005). The Strategic Skills Initiative Research and Identification Guidebook. Indiana Workforce Development.

Skrtic, T. (1995). Disability and Democracy: Reconstructing (Special) Education for Postmodernity, Teachers College Press, New York,.

Saunders, M., Lewis, P. and Thornhill, A. (2006). Research Methods for Business Students. 4th ed. London, Great Britain: Pearson Professional Limited.

Smith, M.E., Richard T & Andy, L. (2002), Management Research.

Wei, F. (2007). How is IFRS/IAS Implemented in China. Master thesis, Bodø Graduate School of Business.

Wang, A., Liao, W.K. & Hein, A. P. (2012). Bigger, better, broader: A perspective on China's auto market in 2020. Copyright @ Mckinsey & Company. (www. mkinseychina.com).

Yin, R.K. (1989). Case Study Research, Newburry Park, California.

Yin, R. (1994). Case study research: Design and methods (2nd ed.). Beverly Hills, CA: Sage Publishing.

Yan, B.X. (2008). Studies on the theory and demonstration of China auto industrial clusters. PHD thesis, Shanghai Jiaotong University. In Chinese.

Zhang, Z.K. (2001). The business model of China's auto industry and national economic security [J], Economic Review, 2001 (5). In Chinese.

Zhang, L,L. (2005). Toyota automobile industry cluster development and its enlightenment [J], Automotive Research, March 2005. In Chinese.

Reference to Internet Documents

Worldwide automobile production through 2013. (without date). Downloaded 2 October 2013 from http://www.statista.com/statistics/262747/worldwide-automobile-production-since-2000/

China's automotive output hits 10 mln mark. October 2009. Downloaded 2 November 2013 from http://english.people.com.cn/90001/90776/90882/6789497.html

Definition of cluster in English. Download 10 November 2013 from http://www.oxforddictionaries.com/definition/english/cluster

Global Value Chains. Download 12 November 2013 from http://www.globalvaluechains.org/concepts.html

Value Chain. Download 12 November 2013 from http://www.slideshare.net/GAlNahla/value-chain-12133373

Automobile. Download 1 December 2013 from http://en.wikipedia.org/wiki/Automobile

Automotive industry. Download 1 December 2013 from http://en.wikipedia.org/wiki/Automotive_industry

Quantitative research. Download 3 March 2014 from http://en.wikipedia.org/wiki/Quantitative_research

Weinreich, N.K. (2006). Integrating Quantitative and Qualitative Methods in Social Marketing Research. © Weinreich Communications 2006. Download 6 March 2014 from http://www.social-marketing.com/research.html

Data collection. Download 3 March 2014 from http://en.wikipedia.org/wiki/Data_collection

Secondary data. Download 6 March 2014 from http://en.wikipedia.org/wiki/Secondary_data

Measurement & Evaluation. Download 10 March 2014 from http://dg-waymade.blogspot.no/2010/10/characterisitics-of-good-measuring.html

LOCATION QUOTIENT TECHNIQUE. Download 12 March 2014 from http://mailer.fsu.edu/~tchapin/garnet-tchapin/urp5261/topics/econbase/lq.htm