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Industrial Diversification of Taoyuan County for Aerotroplis Development

Student: Pei-Di Lee

Advisor: Hsiao-Lan Liu

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Abstract

This paper studies the industrial structure and degree of industrial diversification of Taoyuan County since 1986 to examine if Taoyuan Aerotroplis will meet one of the successful key factors of industrial diversification. It begins with a discussion of strategic analysis on critical factors of Taoyuan International Airport and finds out one of the important factors of successful aerotroplis lies in industrial diversification. This research is conducted by adopting quantitative approach and applying coefficient of industry diversity to value the degree. The Location Quotients (LQs) ratios are applied as well, providing a way to examine the specialization of economic activity in Taoyuan County.

The finding reveals that the industrial structure of Taoyuan County is secondary industry from 1986 to 1991. After 1991, the tertiary industry grows enormously and now it trends to service-oriented market. Also, industrial diversification of Taoyuan County is toward positive and high degree of diversity in industry since 1986. Taoyuan County has a relatively higher concentration of employment in manufacturing than Taiwan since 1986. Health Care Services industry, Water Supply and Remediation Services industry and Transportation, Storage and Communication industry are industries which increase concentration of employment in Taoyuan County. This research suggests that the authority concerned could make use of the positive condition of diversity in industry to accelerate industrial cluster in development of aerotroplis that strengthen the competitiveness of Taoyuan Airport and attract more cargo and passengers traffic. Further research is suggested by enlarging the areas such as Taipei County development axis or Hsinchu County, by broadening the sample of the industry scope and classification systems to subsectors, industry group or industry and by comparing the industrial diversification of Taoyuan Aerotroplis with that of the other countries which succeeds in aerotroplis models.

Keywords: Taoyuan Aerotroplis, industrial diversification, location quotient

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Chapter 1 Introduction

1.1 Motivation

With global competition and rapid economic development, airports play a role not only in air transportation but also in linkage with country's overall economic development. Airports in 21st century are experiencing a new and distinct evolutionary stage. With the airport itself serving as region-wide multi-modal transportation and commercial nexus, strings and clusters of airport-lined business parks, information and communications technology complexes, retail, hotel, industrial parks and logistics parks are along airport up to 20 miles outward. This more dispersed airport-linked development is giving rise to a new urban-form-the 'Aerotroplis'[1].

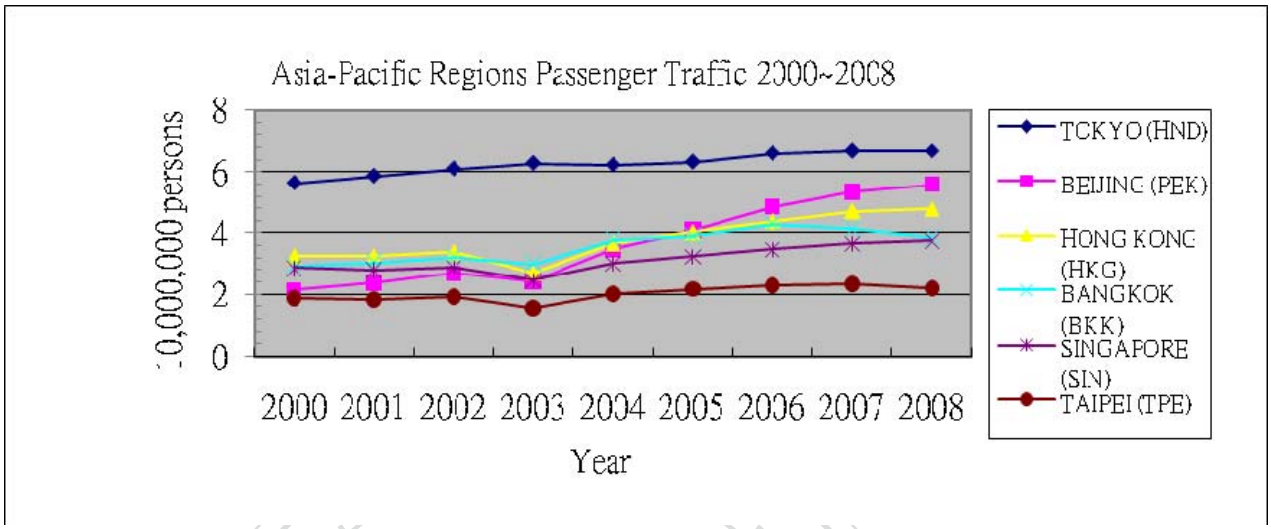
Taoyuan International Airport can look forward to becoming an important node in the global network to trigger potential market of China and economic opportunity to other countries. Taoyuan International Airport could be the key role of cross-strait economic development and could become the new core of global economic activity. Internally, Taoyuan International Airport will tightly connect many core areas with different sizes and functions and use transportation and information to achieve close linkage. Externally, Taoyuan International Airport, which is privilege with the shortest average airway distance to the major cities in Asia Pacific regions, is the center of northeast Asia and Southeast Asia aviation circles.

However, due to the Taiwan's political dilemma and facing China's rapid growth in recent year, the passengers and cargo traffic of Taoyuan International

[1] John D. Kasarda (2008), "The Evolution of Airport Cities and Aerotroplis", *Airport Cities* (London: Insight Media)

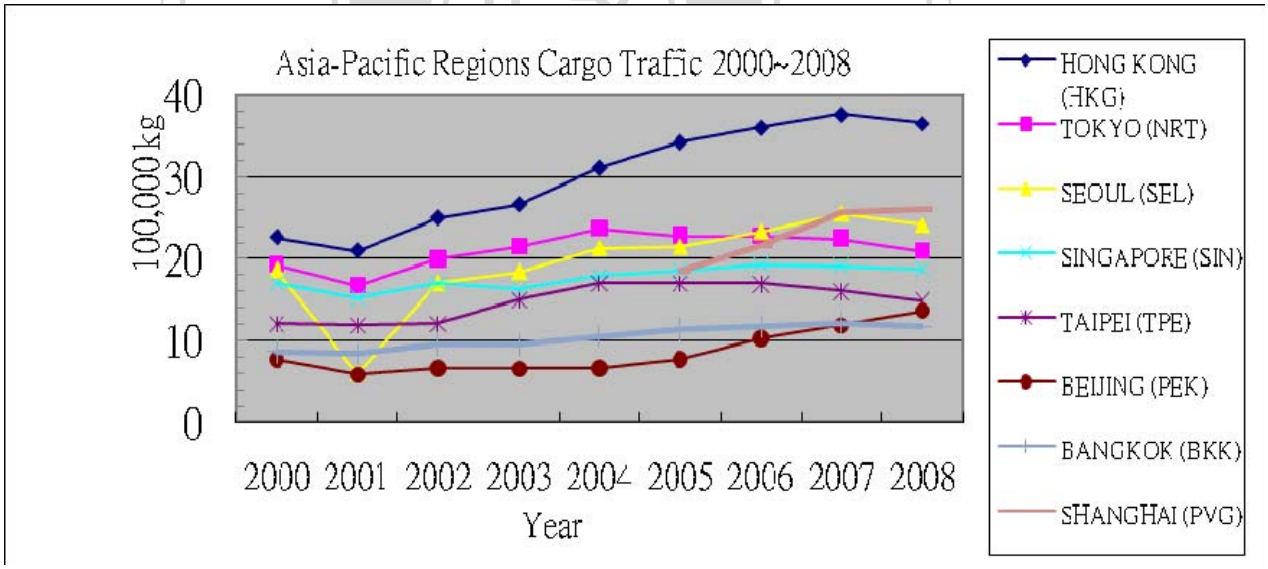
Airport has dropped within ten years in Asia-Pacific regions. (Figures 1 & 2)

Figure 1: Asia-Pacific Regions Passenger Traffic 2000~2008



Source: Airports Council International，Worldwide Airport Traffic Report，1996~2008

Figure 2: Asia-Pacific Regions Cargo Traffic 2000~2008



Source: Airports Council International，Worldwide Airport Traffic Report，1996~2008

In order to strengthen global competition and boost Taiwan's national competiveness, the Executive Yuan and Taoyuan County Government are implementing the Taoyuan Aerotroplis Plan, hoping to renovate and expand Taoyuan

International Airport. Taoyuan Aerotroplis development plan is the flagship plan among the "i-Taiwan 12 projects" of President Ma's administration and the government plans to invest NT$1.2 trillion in various development programs to increase Taiwan's competitiveness. Besides, the Legislative Yuan passed the "Statute for the Development of International Airport Park" on January 12, 2009.

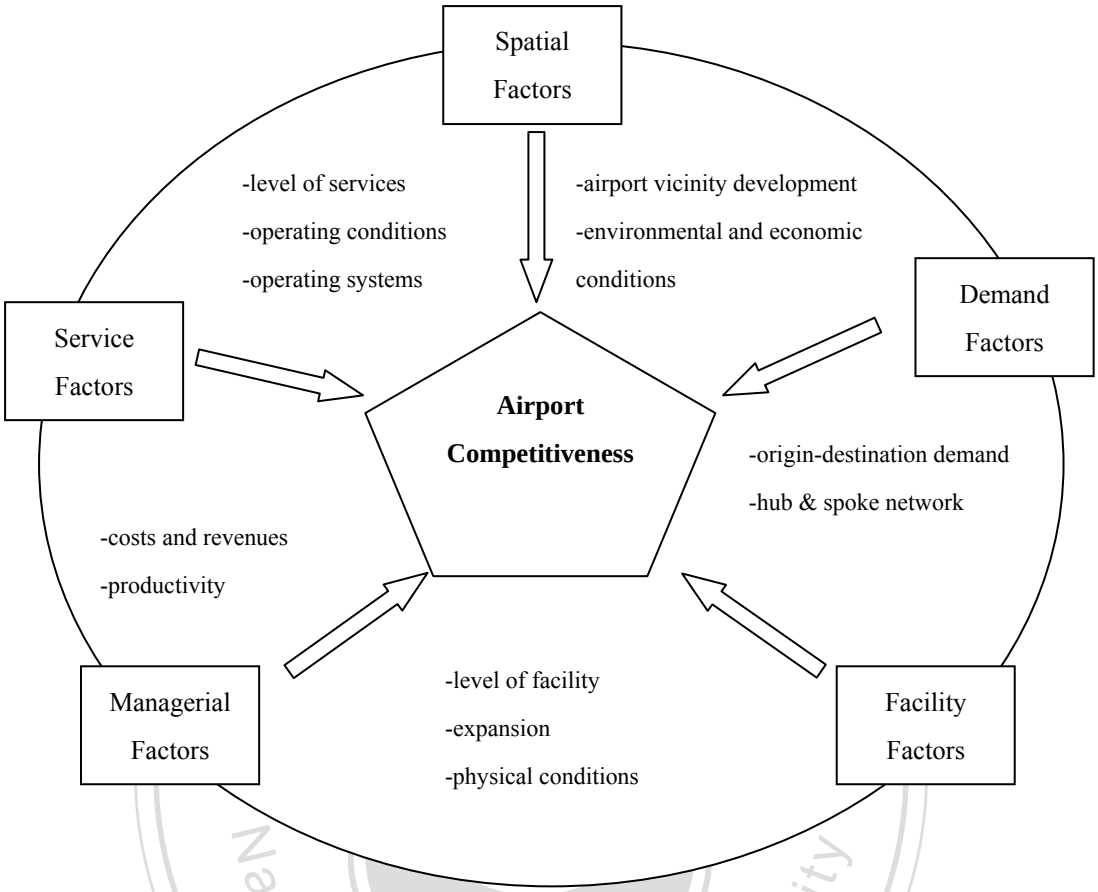
With this background it is clear that knowing the strong relationship between the airport and peripheral areas could find the ways to strengthen airport competiveness that could attract more cargo or passenger activities. Park indicates the competitive advantage of airport seems to depend on " five core factors" that may related to passenger and cargo activities[2]. (Figure 3)

- Spatial factors: The level of regional development around the airport, such as international trade zones, logistics and convention centers, aviation-related industrial complexes and other facilities.
- Facility factors: The level of airport facilities and expandability of facilities at existing airports to increase capacity.
- Demand factors: The level of origin-destination demand and that of transit and transfer traffic volumes for hub and spoke network development.
- Service factors: Consist of the level of service to users, types of airport operations and levels of charges.
- Managerial factor: Economical consideration such as airport operation cost, productivity, and revenue structure.

Obviously, the level of regional development around airport has strong impact on airport's passenger and cargo traffic.

[2] Yongha Park (2003) , "An analysis for the competitive strength of Asia major airport", Journal of *Air Transport Management*, p353.

Figure 3: The Structure of Airport Competitive Advantages



Source: Yongha Park (2003),"An analysis for the competitive strength of Asia major airport", Journal of Air *Transport Management*, p354.

Furthermore, according to Figures 1 & 2, the airport of passenger and cargo traffic ranked top one are Tokyo International Airport and Hong Kong International Airport. The Beijing Capital International Airport has continuously being grown in passenger traffic since 2003 and Shanghai Pudong International Airport has increased sharply in cargo traffic since 2005. These airports have some common feathers of spatial factors underpinning the growth and success. (Table 1)

Also, studying the strategic analysis on critical factors of development of Taoyuan International Airport is of importance. Zhen studied the development trajectory of the relevant airport cities (i.e., Hong Kong, Singapore, Schiphol, and

Incheon), summarizing the development models and features of the successful construction and facility, liberalization in trade, regularization in laws, accessibility in environments, internationalization in operation and privatization in airport management.[3]

According to Zhen's research, it is a fact that industrial diversification is one of the key factors of developing a successful aerotroplis. This arouses my interests for further research and would like to know more the condition of industrial diversification in Taoyuan Aerotroplis and its peripheral areas. It leads to my research questions.

[3] Zhen,Xin Hua (2009), *Strategic Analysis on Critical Factors of Airport City Development: A case study of Taoyuan International airport*. MA Thesis, National Taiwan University of Science and Technology, Graduate Institution of Technology Management

Table 1: The Strategy of Development of Main Airports in Asia-Pacific

International Airport	Tokyo	Beijing Capital	Hong Kong	Shanghai Puding
Position	-gateway to Japan for domestic lines -international line for Shanghai ,Seoul Hong Kong and Beijing only	-center of aviation economy -international gateway of China	-gateway of China and cargo hub in southeast Asia	-international gateway of China -hub of Asia-Pacific regions -node of international airlines
Spatial development	-a bridge or cross harbor tunnel between Bayshore Route and 大師橋（だいしはし）will be built to connect the airport -airport related facility will be set in Kawasaki-shi	-20 km outward -100 square kilometers -eight functional zones	-70-acre south commercial district[4] - 28-acre east commercial district (an office park) -110-acre north commercial district known as SkyCity[5]	-18 square kilometers -7 functional regions
Features of Development	-three terminals (terminal 1&2 for domestic lines only and terminal 3 for lines to Beijing , Seoul, and Shanghai)	-express customs clearance(大通關) -special trade Zone (綜合保稅區)	-free trade zone -24 hours customs clearance –no customs' restrictions for cargos load, storage, pack, or transit	-trade center composed of business center and city together -free trade zone -clear function of Shanghai Puding Airport for international lines and Shanghai HongQiao Airport for domestic lines

[4] This is composed of logistics facilities including Tradeport Hong Kong Ltd.,HACTL's Super Terminal 1,the 2 million sq. ft. Asia Air Freight Terminal, and a 1.4 million sq. ft. mixed-use freight-forwarding warehousing and office complex.

[5] SkyCity is a multipurpose commercial complex connected to the passenger terminal and the airport express train station and connect through high-speed turbo jet ferries to the Pearl River Delta in southern coastal China

Source: John D. Kasarda (2008),"The Evolution of Airport Cities and Aerotroplis", *Airport Cities*, London: Insight Media, p.18
http://www.shanghaiairport.com/ http://www.bcia.com.cn/
http://www.tokyo-airport-bldg.co.jp/
http://www.hongkongairport.com/chi/index.html

1.2 Research Questions

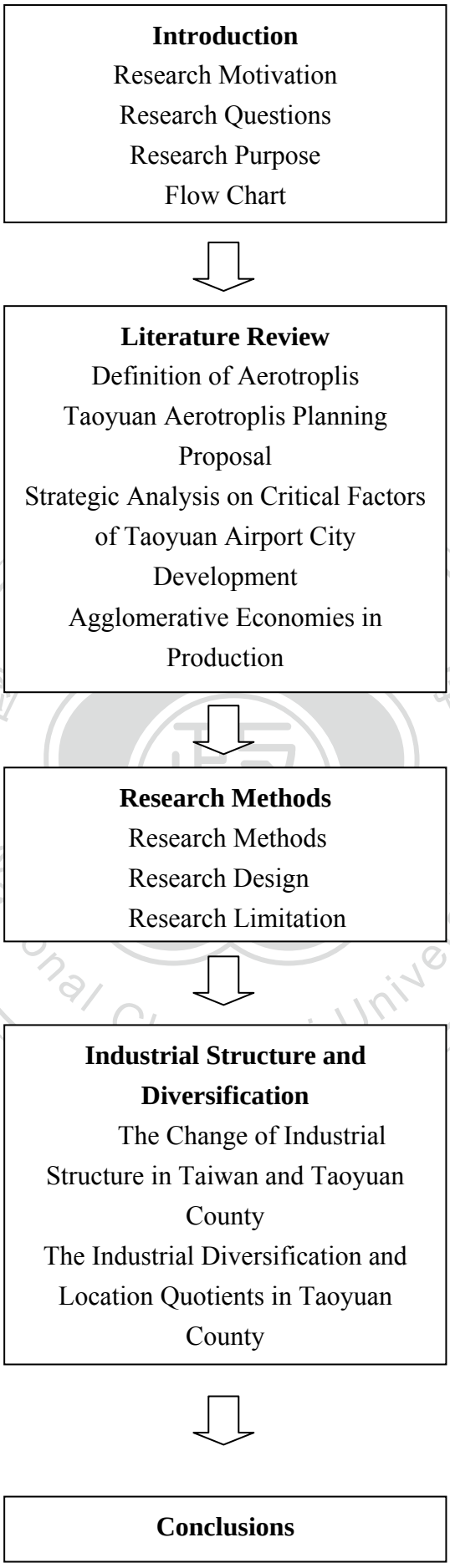
- What is the industrial structure and change of industrial structure in Taoyuan County that could help the development of spatial factor for a successful Aerotroplis?
- How much structural industrial diversification is there around Taoyuan Airport and its peripheral areas to support the airport's competitiveness spatially?
- Does Taoyuan County provide the condition of the industrial cluster, which emphasizes the role of geographical proximity in facilitating the formation and maintenance linkages between companies so that it could help the successful development of Aerotroplis?

1.3 Purpose

The purposes of the study are in the following.

1. To understand the condition of industrial structure and degree of industrial diversification in Taoyuan Aerotroplis and its peripheral areas since 1986
2. To understand whether the Taoyuan Aerotroplis Plan meet one of the successful key factors of industrial diversification
3. To present practical and workable suggestions to authority concerned that Taiwan could strengthen airport competitiveness and aviation economy

1.4 Flow Chart



Chapter 2 Literature Review

2.1. Definition of Aerotroplis

NASA researcher, Conway defines Aerotroplis is the airport and its peripheral areas being a multi-function nodes which encompasses aviation transportation, logistics, trade, shopping and touring.[6]

The New York Time nominated the “aerotroplis”as one of the “ideas of 2006”. The term “Aerotroplis”, literally “airport city”, has been popularized by the American academic, Dr. John Kasarda, to explain the fact that the airports are much more than they used to be. Kasarda indicates that airports will shape business location and urban development in the 21st century as much as highways did in the 20th century, railroad in the 19th and seaports in the 18th. The airports have become key nodes in global production and enterprise systems which offer them connectivity efficiently. They are also powerful engines of local economic development, attracting aviation-linked businesses of all types to their environs.[7] (Figure 3)

As more and more aviation-oriented businesses are being drawn to airport cities and along transportation corridors radiating from them, a new urban form is emerging—the Aerotroplis—stretching up to 20 miles (30 kilometers) outward from some airports.[8]

Amsterdam Airport Schiphol Group (2004、2008),which is the most prominent example of a successful AirportCity, illustrates that an AirportCity is a dynamic environment integrating and enhancing people and businesses, logistics and shopping,

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[6] Conway M. (1980) , *The Airport City: Development Concepts for the 21st Century*, Conway Data, Georgia

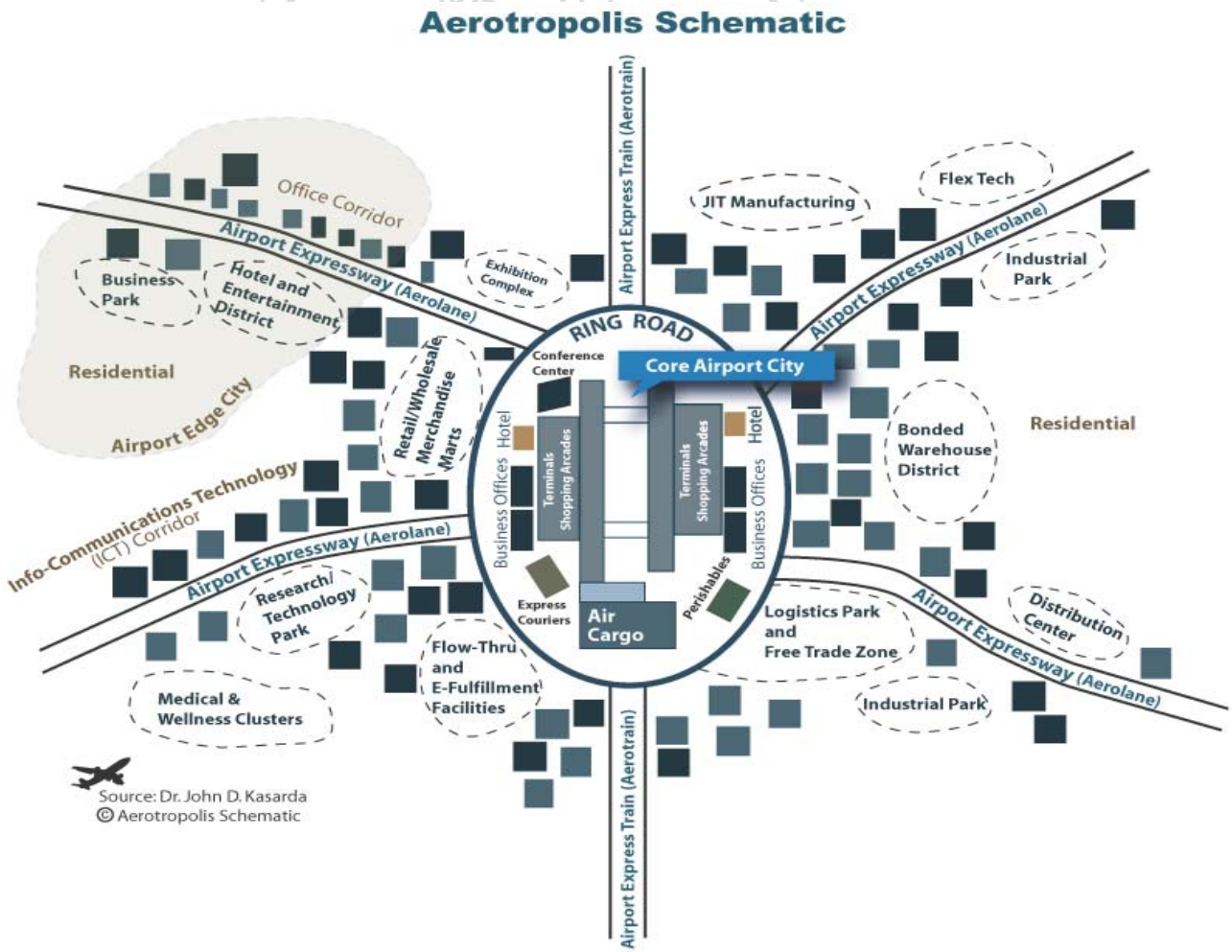
[7] John D. Kasarda (2009) , ”Airport Cities”, *Urban Land* , April, p.58.

[8] John D. Kasarda (2008) , ”The Evolution of Airport Cities and Aerotroplis”, *Airport Cities* , London: Insight Media, p.13.

information and entertainment. This efficient, multi-modal hub for air, rail and road transport is a seamless link in the travel process.[9]

Taoyuan Country Government (2009) defines the Aerotroplis is a new type of urban form, and consists of a cluster of aviation-intensive or aviation-related industries. An Aerotroplis contains various activities and infrastructure, such as retail and shopping centers, light industry parks, office and research parks, special districts, foreign trade zones, leisure and conference facilities, and residential development enhancing the competitiveness of Aerotroplis firms.

Figure 4: Aerotorplis Schematic



Source: Dr. John D Kasarda Aerotroplis Schematic

[9] Schiphol Amsterdam Airport < http://www.schiphol.nl/>

2.2 Taoyuan Aerotroplis

2.2.1 Taoyuan Aerotroplis Planning Proposal

“Taoyuan Aerotropolis” is one of the "i-Taiwan 12 Projects" proposed by President Ma Ying-jeou and is expected to achieve the following objectives:

- To generate over one trillion NTD business investments
- To generate annual output value of more than six hundred billion
- To create up to 80,000 jobs

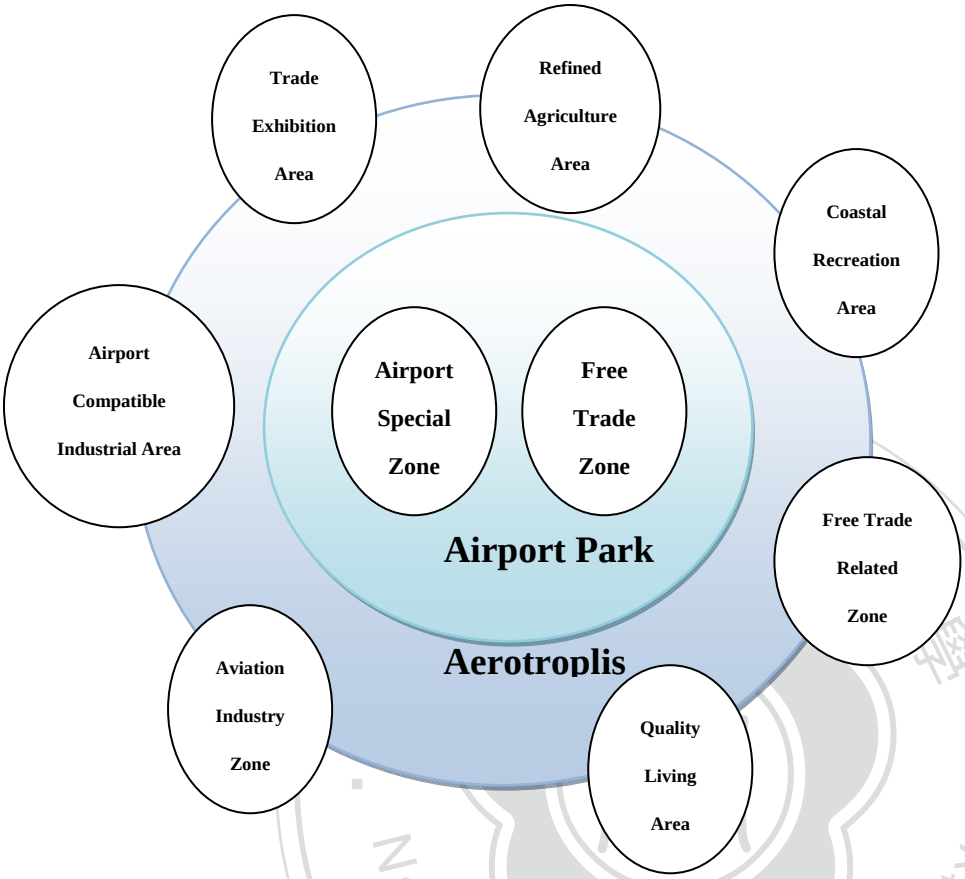
Spatial Layout of Industry

The Taoyuan Aerotroplis will be centered on the airport, which have air transportation, aircraft maintenance, and logistics space, and the outer of it contains the basic aviation industries and strategic non-basic industries needed to support Aerotroplis development.

Land Use Conception

The Aerotroplis as a whole will consist of the two development rings of the “Airport Park” and “Aerotroplis”. The inner ring is Taoyuan International Airport Park as “yolk” and the outer ring is Taoyuan Aerotroplis as “egg white”. The inner ring consisting of the Airport Special Zone and Free Trade Zone will contain land needed for the operation of the airport and the development of directly-connected dependent industries. The outer ring surrounds the Airport Park, serves to support the Airport Park, meets relevant industrial development needs, and provides trade, recreation and lodging services. This ring includes Free Trade Related Industrial Zone, Airport-Compatible Industrial Area, Trade Exhibition Area, Coastal Recreation Area, Quality Living Area, Aviation Industry Area and Refined Agriculture Development Area. (Figure 5)

Figure 5: Spatial Layout of Industry



Source: Taoyuan County Government (2009)

Planning Proposal

According to the conceptual development plans for the Taoyuan Aerotroplis, the land within the Aerotroplis will be divided into eight functional zones. (Table 2)

Table 2: Functional Zones in the Taoyuan Aerotroplis

Function Zone		**Area (ha)**	**Content**
Airport Special Zone		1,655	Includes current airport (1,223 hectares), planned third runway and third concourse, ground services, air freight and storage industry, aircraft maintenance industry, airport transportation, parking, car rental, and air catering kitchens,etc.
Free Trade	Free Trade Zone	95	Construction of bonded warehouses, trading

Related Industrial Area	Free Trade Related Zone	195	centers, and logistics centers, ect. Recruiting of automated cargo transport and storage firms, freight forwarding firms, customs clearance firms, express delivery firms, processing, manufacturing, distribution, shipping, supporting channel logistics, notarization, and real-time value-added industries and free trade services, etc.
Aviation Industry Area		750	Establishment of an aviation training center. Acquisition of aviation-related industries including maintenance and repair services, aviation technology manufacturing, aviation training firms, air freight logistics, air catering kitchens, and service firms.
Airport-Compatible Industrial Area		1,385	Recruiting of aviation research and technology firms, professional R&D and training firms, education and training firms, aviation service firms, aviation exercise and leisure firms, precision machinery firms, advanced technology firms, car rentals, parking rentals, and air catering kitchens.
Trade Exhibition Area		490	Construction of an international convention center, and recruiting of commercial offices, hotels, shopping centers, recreational facilities, commercial consulting services, information service facilities, and international financial firms, etc.
Coastal Recreation Area		360	Taking Jhuwei Fishing Harbor as a center, establishment of a tourist pier and fisheries extension center. Recruiting of tourist hotels, conference facilities, vacation residences, shopping streets, thematic restaurants, hydrotherapy and fitness facilities, and indoor aquatic recreation facilities, etc.
Refined Agriculture Development Area		525	Construction of an agricultural product trade and auction center and sales center. Recruiting of organic growers, floriculture firms, agricultural value-added firms, agriculture recreational firms, ecological farms, and guest houses, etc.

Quality Living Area	685	Provides a superior residential environment. Acquisition of airport staff housing (with hotel-style management), shopping centers and restaurants, leisure and sports facilities, medical facilities, entertainment facility, and schools, etc.
Total	6,150	

Source: Taoyuan County Government (2009)

2.2.2 Strategic Analysis on Critical Factors of Taoyuan International Airport

Zhen analyzes the development trajectory of the relevant airport cities and summarizes the development models and characteristics of a successful globalized airport city. He concludes the critical factors of airport city development by grounded theory and provides suggestions and strategies for authority's reference. The critical factors are in the following. [10] (Table 3)

Table 3: Strategic Analysis on Critical Factors of Taoyuan Airport Development

1. Industrial Diversification	Accelerate the clustering of industry 、support the differential industry、promote the high valued-added services to upgrade the quality in service and have good impression of the airport
2. Well Construction and Facility	Set up the precise role of Aerotroplis and have good industrial development plans、upgrade construction of software and perfect the facility
3. Liberalization in Trade	Enlarge the operation of free trade zone and provide efficient environment of trade and preferential tax system
4. Regularization in laws	Special laws for airport management and

[10] Zhen,Xin Hua (2009), *Strategic Analysis on Critical Factors of Airport City Development: A case study of Taoyuan International airport*. MA Thesis, National Taiwan University of Science and Technology, Graduate Institution of Technology Management

	provide favorable conditions for industrial development
5. Accessibility in environment	Promote more nodes for direct flights and air-sea transportation、make customs process efficient and accessible by building up unified system for industry's consulting
6. Internationalization in operation	Internationalize the airport to attract more airlines being here as headquarters
7. Privatization in airport management	Privatize the management of airport by Aerotroplis development group 、tend towards flexible operation strategy and profit-orientated management

Source: Zhen,Xin Hua (2009), *Strategic Analysis on Critical Factors of Airport City Development: A case study of Taoyuan International airport*. MA Thesis, National Taiwan University of Science and Technology, Graduate Institution of Technology Management

2.3 Agglomerative Economies in Production

Individuals are not self-sufficient so cities exist. O'Sullivan indicates that comparative advantages make trade between regions more advantageous and interregional trade causes the development of market city. Internal scale economies in production allow factors to produce good more efficiently than individuals and the production of goods in factories cause the development of industrial cities. Agglomerative economies in production and marketing cause firms to cluster in cities and this cluster causes the development of large cities.[11] Obviously, if a firm locating to another firm, firm can produce at a lower cost , which is positive externality in production : the production of a particular firm decrease a the production of other firms increases.

The conception of agglomeration was firstly introduced by Alfred Weber in

[11] O'Sullivan Arthur (1996), *Urban Economics*, Richard D. Irwin, a Times Mirror Higher Education Group,Inc. company, p.15

1909. Weber is interested in discovering the operation of general factors as influence manufacturing industries and these general factors are two kinds: those which are primary causes of the regional distribution of industry (regional factors) and those which are secondary causes for a redistribution of industry (agglomerating and deglomerating factors), being themselves effects of those regional factors. Weber deductively finds two general regional factors of cost: transportation costs and labor costs.[12]

Moreover, an agglomerative factor is an "advantage" or a cheapening of production or marketing which results from the fact that the production is carried on to some considerable extent at one place, while a deglomerative factor is a cheapening of production which results from the decentralization of production. The agglomerative advantages are two types as follows.[13]

A. The concentration of industry through the simple *enlargement of plants*

Every large plant with a rounded our organization represents necessarily a local concentration as compared with production scattered in small workshops over the neighborhood. The economic advantages of large-scale production as compared with small-scale production are effective local factors of agglomeration.

B. Social agglomeration

Whether an industry will agglomerate because of only the tendency to concentration through extension of plant, or whether it will come under the influence of a further tendency to concentration, depends upon the extent of the advantages resulting from close local association of *several* plants. The

[12] Weber Alfred (1909), *Theory of the Location of Industries*, Chicago:The University of Chicago Press, p.xxii

[13] Weber Alfred (1909), *Theory of the Location of Industries*, Chicago:The University of Chicago Press, p.127

local aggregation of several plants simply carries farther the advantages of the large plant, and hence that the factors of agglomeration which create higher stage of social agglomeration will be the same as those which created the large-scale plants.

However, Weber's agreements fall on the agglomeration of the same industry. Hoover expands Weber's agreement and indicates that it combines three quite distinct influences upon local production cost:[14]

A. **Large-Scale economies** within a firm, consequent upon the enlargement of the firm's scale of production at one point.
B. **Localization economies** for all the firms in a single industry at a single location, consequent upon the enlargement of the total output of that industry at that location
C. **Urbanization economies** for all firms in all industries at a single location, consequent upon the enlargement of the total economic size (population, income, output, or wealth) of that location, for all industries taken together.

O'Sullivan[15] points out that the large industrial city develops because of agglomerative economies in production, which consists of localization economies and urbanization economy. Localization economies occur if the production cost of firms in particular industry decrease as the total output of the industry increases and occur for three principal reasons: scale economies in the production of intermediate-inputs, labor-market economies, and communication economies. Urbanization economies occur for the same reasons as localization economies but differ from in two ways. First, urbanization economies result from the scale of the entire urban economy, not

[14] Hoover, E.M., (1937), *Location Theory and Shoe and Leather Industries*, Cambridge: Harvard University Press.
[15] O'Sullivan Arthur (1996), *Urban Economics*, Richard D. Irwin, a Times Mirror Higher Education Group,Inc. company, p.24-28

simple the scale of a particular industry. Second, urbanization economies generate benefits for firms throughout the city, not just firms in a particular industry.

Jakobsen and Onsage indicate that the traditional locational theory, using a firm perspective, emphasized a set of locational advantages for the metropolitan areas: a comprehensive supply of specialized service, the possibility of face to face contact with important business partners, the location of important financial and political institutions, a pool of labor with a higher education and prestige of being in a metropolitan area.[16]

To summarizes that there are two kinds of agglomeration economies as follows.

A. Same industry gathering and developing together in the same area create the scale of economy that decreases the cost of production and increases the benefits.
B. Due to the relationship between input and output or provide different choice in services and knowledge spillover, different industries gathering and developing together in the same area create more benefits.

[16] Stig-Erik and Jakobsen Knut Onsager (2005)," Head office location-Agglomeration, clusters or flow nodes?", *Urban Studies*, 42:9

Chapter 3 Research Methods

3.1 Research Methods

This research will be conducted by applying quantitative approaches. Quantitative data will rely on the collection of second-hand sources. These sources primarily come from industry, commerce and service census since 1986, conducted by Directorate-General of Budget, Accounting and Statistics. The purpose of the quantitative research is to know the industrial structure and diversification in Taoyuan County. The research will also be conducted through the collection and review of academic journals, books, and newspapers.

3.2 Research Design

Jacobs (1984) suggests that knowledge spillovers are mostly derived among industries, and that the ease with which ideas flow in cities also helps innovation. [17]Also, the geographical diversity of proximate industries rather than specialization encourages innovation and growth. Therefore, the coefficient to value the degree of industry diversity as follows.

$$SC_I = \left[\sum_{j=1}^{n} \left| Lij/Li. - L.j/L.. \right| \right] /2$$

SC_I stands for the coefficient of industrial diversity in the particular region (i)

L_{ij} stands for the number of persons engaged in j industry in the particular region (i)

$L_{i.}$ stands for the total number of persons engaged in the particular region (i)

[17] Jacobs J (1984), *Cities and the wealth of nations: Principles of economic life.*, Random House, New York

L.j stands for the number of persons engaged in j industry in the whole country

L.. stands for the total number of persons engaged in the whole country

According the above, if the outcome figure of SCI is close to 1, it presents the low degree of industrial diversity. Similarly, if the value is closed to 0, it presents the high degree of industrial diversity.

Furthermore, in order to study the industrial cluster and agglomeration, the location quotient ratio is applied. O'Donoghue, Dan and Geleave, Bill indicates that Porter's definition of the industrial cluster consist of two core elements. One is aspatial and related to the functional dimension, which is composed of interconnected companies and associated institutions linked by commonalities and complementarities. The other element is related to the industrial agglomeration, which emphasizes the role of geographical proximity in facilitating the formation and maintenance of vertical and horizontal linkages between companies within a cluster.[18] The most popular measure used to spatially delimit agglomeration is the location quotients (LQs). The location Quotients (LQs) are ratios that provide a convenient way to examine the specialization of economic activity in a region. The LQs typically measure the ratio between the local and national percentage of employment calculated as follows.

$$LQ = \frac{Lij \ / Li.}{L.j \ / L..}$$

It is a commonly used measure intended to help analysts compare a region's level of industry concentration relative to a larger geographic unit such as the state or

[18] O'Donoghue, Dan and Geleave, Bill (2004), *A Note on Methods for Measuring Industrial Agglomeratin*, Regional Studies, 8:4,419-427

the nation as a whole. The larger geographic area is referred to as the base area. The interpretation of LQ is in the following.

1. If LQ>1, this indicates a relative concentration of the activity in a particular area, compared to the region as a whole.

2. If LQ =1, the area has a share of the activity in accordance with its share of the base.

3. If LQ<1, the area has less of a share of the activity than is more generally, or regionally, found.

3.3 Research Limitation of Data Source

Due to the limitation of time and available sources, this research limitation lies in the quantitative samples. The industry scope and classification system of this census is according to the "Census Program" approved and proclaimed by Executive Yuan, on basis of "Standard Industrial Classification. The main industry sector cover subsectors, industry group and industry. Take the "Standard Industrial Classification (the 8th revision)" for example, mining and Quarrying Sector cover 3 subsectors, 3 industry groups and 3industries and Manufacturing Sector cover 27 subsectors, 88 industry groups and 212 industries. This research applies the quantitative samples for main industry sectors only. Besides, some of the sources are out of reach. The Council for Economic Planning and Development could provide only the data of Urban and Regional Development Statistics for industrial distribution of employed person in Taoyuan County since 2001.

Chapter 4 Industrial Structure and Diversification

Cities exist because individuals are not self-sufficient. Due to government's policy, planning or industrial structure, different types of cities exist. In this chapter, we firstly understand the change of industrial structure of Taiwan and Taoyuan County and then further illustrate the degree of industrial diversification and location quotients of Taoyuan County that indicate the region's level of industry concentration.

4.1 The Change of Industrial Structure in Taiwan

Taiwan economic development is from primary-oriented and secondary-oriented market to tertiary-oriented market, which is quite similar to some of the developed countries. This section will firstly illustrate the change of Taiwan's GDP in industrial sectors that explain the change of Taiwan industrial structure and secondly present the industrial distribution of persons employed.

A. Gross Domestic Product in Taiwan

The GDP of primary industry[19] accounts for between 4% and 1% during 1986 to 1996 and GDP of secondary industry[20] is estimated about 39% to 27%. The GDP of tertiary industry[21] reaches 55% to 70%. In 2001, the tertiary industry reaches 70.3% of Taiwan's GDP. (Table 4 & Figure 6)

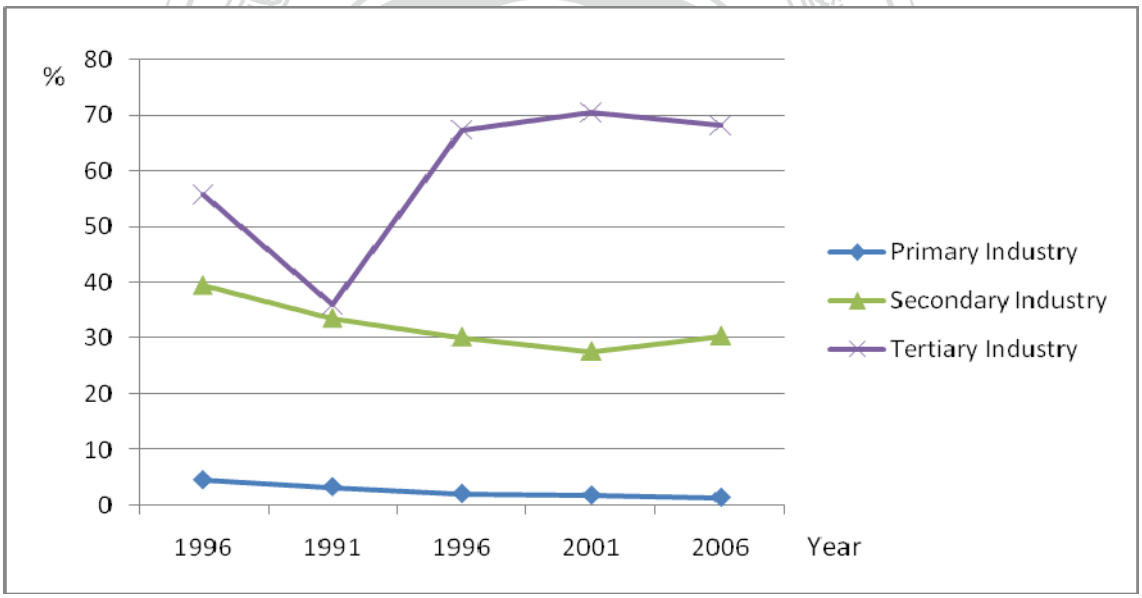
[19] Primary industry is composed of agricultural, forestry, fishery, and husbandry.
[20] Secondary industry consists of mining and quarrying, manufacturing, electricity and gas supply, water supply and remediation services, construction .
[21] Tertiary industry contains wholesale and retail trade, transportation and storage, accommodation and food services, information and communication, financial and insurance, real estate, professional, scientific and technical services, support services, education, human health and social work services, art, entertainment and recreation and other services.

Table 4: Industrial Distribution and Structure of Taiwan's GDP

Year	1986		1991		1996		2001		2006	
	GDP	%	GDP	%	GDP	%	GDP	%	GDP	%
Primary Industry	178,275	4.64	195,208	3.38	195,217	2.14	182,826	1.85	179,008	1.45
Secondary Industry	1,519,314	39.51	1,939,640	33.61	2,443,990	30.22	2,724,049	27.62	3,769,094	30.43
Tertiary Industry	2,147,326	55.85	3,636,644	36.01	5,448,861	67.37	6,955,308	70.53	8,438,697	68.13

Source: Directorate-General of Budget, Accounting and Statistics, Executive Yuan

Figure 6: Industrial Distribution and Structure of Taiwan's GDP



Source: Directorate-General of Budget, Accounting and Statistics, Executive Yuan

In addition, the decline of Taiwan's primary industry is observed easily. The GDP of primary industry in 2006 is less than 1.5%. The GDP of secondary industry is continuously dropped since 1986. Finally, the tertiary industry has replaced the primary and secondary industry, which is the general phenomenon in developed counties. (Table 5)

Table 5: Industrial Distribution and Structure of Taiwan's and Other Countries' GDP, 2006

Country	Primary Industry		Secondary Industry		Tertiary Industry	
	Percentage of total GDP	Percentage of persons engaged	Percentage of total GDP	Percentage of persons engaged	Percentage of total GDP	Percentage of persons engaged
Taiwan	1.7	5.14	25.2	36.8	73.2	58
U.S.A	1.2	1.5	20.2	20.8	78.6	77.7
Japan	1.5	4.2	30	27.6	68.5	68.2
Germany	0.8	2.2	28.2	29.6	72	68.2

Source: Directorate-General of Budget, Accounting and Statistics, Executive Yuan

B. Industrial Distribution of the Persons Engaged in Taiwan[22]

The tertiary industry in Taiwan now is the main concentration. The Table 6 illustrates that the employed persons engaging in primary industry have dropped since 1986 and so does secondary industry. In 2001, the employed persons engaging in secondary industry dropped in 36%. However, it is clear that the employed persons engaging in the tertiary industry have increased since 1986 and reached to 58.5% in 2006.

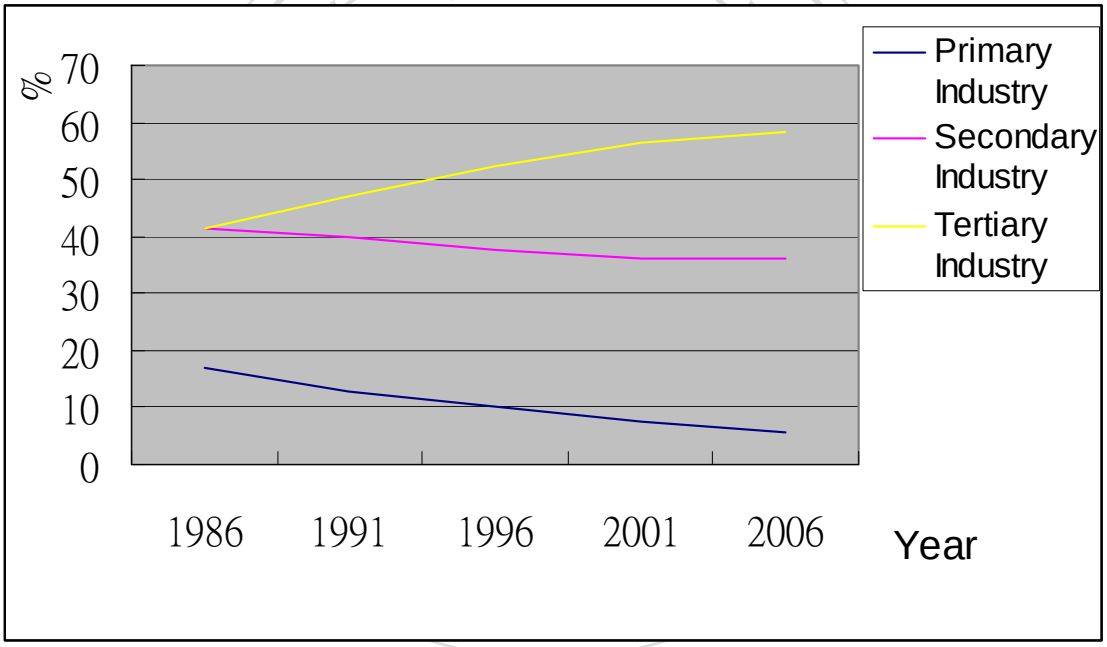
[22] The data of number of persons engaged is applied which refers to the on-the-job employees with salary in the end of year (including foreign employees and the students of industrial cooperation), and self-employed persons without fixed salary and non-compensation dependent worker (referring to capital owner and dependents engaged without fixed salary who work over 15 hours weekly in December of the year) It excludes the directors, supervisors, and consultants who receive honorarium only, but do not join management operation actually according to the definition in Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C., Taiwan.

Table 6: Industrial Distribution of Employment (%)

Year	1986	1991	1996	2001	2006
Primary Industry	17.03	12.95	10.1	7.5	5.5
Secondary Industry	41.47	39.93	37.5	36	36
Tertiary Industry	41.5	47.12	52.4	56.5	58.5

Source: Urban and Regional Development Statistics, Council for Economic Planning and Development, Executive Yuan

Figure 7: Industrial Distribution of Persons Engaged (%)



Source: Urban and Regional Development Statistics, Council for Economic Planning and Development, Executive Yuan

4.2 The Change of Industrial Structure in Taoyuan County

The major industries in Taoyuan County lie in secondary and tertiary industry as well. Table 7 and Figure 8 revel that the persons engaged in primary industry has continuously decreased since 1991. It is 12,000 persons engaging in primary industry in 2008 and the growth rate of it is 1.37% in 2008. The Secondary industry has increased since 1991. It reaches 259 thousand persons and increases to 355 thousand persons. There is no remarkable increase between 1995 and 1996. After 1997, the growth rate is between 2.1% and 7.2%. The negative growth appears in 2001 and 2002. As for the tertiary industry, the person engaging in the tertiary industry grows steadily. The persons engaging in tertiary industry is from 216,000 in 1991 to 449,000 in 2008

The growth rate of tertiary industry is positive since 1991 except 2008 because of the financial crisis. It is clear that secondary-oriented and tertiary-oriented industries are concentrated. However, due to global economic recession within recent years and offshore migration of industry, the growth rate increases slowly. Also, after 2002, the persons engaging in tertiary industry is more than that of secondary industry. In 2008, the tertiary industry is the concentration in Taoyuan County.

Table 7: Industrial Distribution of Employed Persons in Taoyuan County

Year	Total (1,000 persons)	Growth Rate	Primary Industry (1,000 persons)	Growth Rate	Secondary Industry (1,000 persons)	Growth Rate	Tertiary Industry (1,000 persons)	Growth Rate
1991	517	1%	41	7.93%	259	-7.80%	216	10.80%
1992	530	2.51%	46	8.68%	265	2.32%	219	1.39%
1993	562	6.04%	37	6.58%	281	6.04%	244	11.42%
1994	593	5.52%	33	5.56%	300	6.76%	259	6.15%
1995	612	3.20%	34	5.56%	306	2.00%	272	5.02%
1996	620	1.31%	30	4.84%	306	0.00%	285	4.78%
1997	644	3.87%	28	4.35%	328	7.19%	287	0.70%
1998	668	3.73%	24	3.59%	335	2.13%	308	7.32%
1999	686	2.69%	23	3.35%	347	3.58%	316	2.60%
2000	718	4.66%	23	3.20%	364	4.90%	331	4.75%
2001	725	0.97%	24	3.31%	357	-1.92%	344	3.93%
2002	736	1.52%	19	2.58%	355	-0.56%	362	5.23%
2003	751	2.04%	15	2.00%	363	2.25%	373	3.04%
2004	781	3.99%	16	2.05%	370	1.93%	395	5.90%
2005	811	3.84%	17	2.10%	375	1.35%	420	6.33%
2006	841	3.70%	15	1.78%	390	4.00%	437	4.05%
2007	858	2.02%	11	1.28%	419	7.44%	428	-2.06%
2008	874	1.86%	12	1.37%	414	-1.19%	449	4.91%

Source: Urban and Regional Development Statistics 2001~2009, Council for Economic Planning and Development

Figure 8: The Growth Rate of Taoyuan's Industry

Source: Urban and Regional Development Statistics 2001~2009, Council for Economic Planning and Development

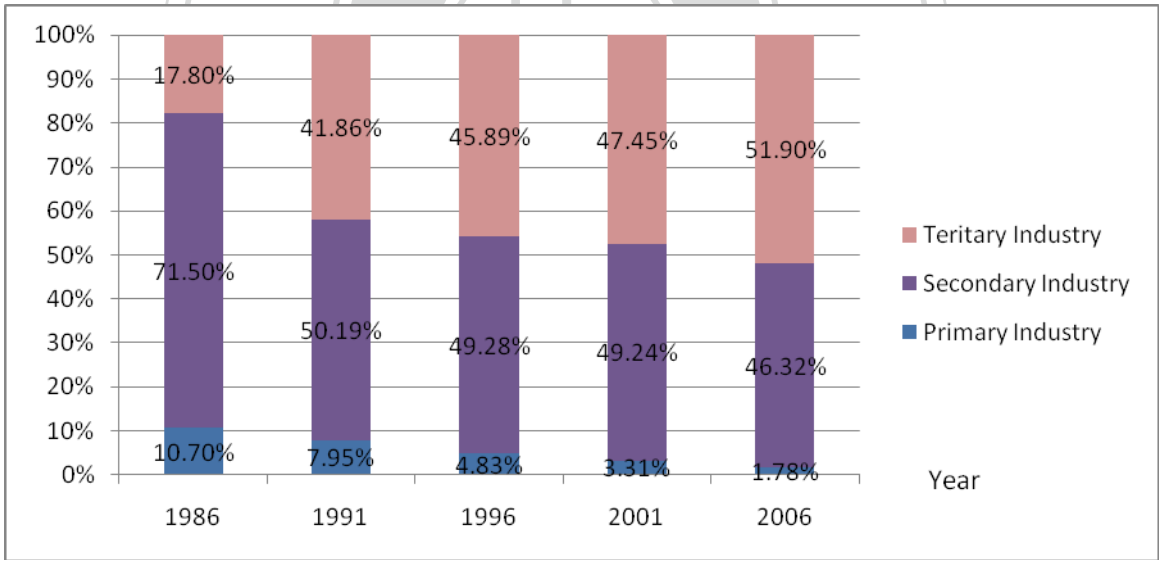
Furthermore, as far as the industrial structure of the engaged persons shown in Table 8 and Figure 9, we've known that the persons engaged in secondary industry is up to 71.5% but it decreases in 1991. Most of the persons engaged in secondary and tertiary industry since 1996. In 2006, there are over 50% persons engage in tertiary industry.

Table 8: 1986~2006 Industrial Structure of the Persons Engaged in Taoyuan County

Year	Primary Industry	Secondary Industry	Tertiary Industry
1986	10.70%	71.50%	17.80%
1991	7.95%	50.19%	41.86%
1996	4.83%	49.28%	45.89%
2001	3.31%	49.24%	47.45%
2006	1.78%	46.32%	51.90%

Source: Urban and Regional Development Statistics 2001~2009, Council for Economic Planning and Development

Figure 9: 1986~2006 Industrial Structure of the Persons Engaged in Taoyuan County



Source: Urban and Regional Development Statistics 2001~2009, Council for Economic Planning and Development

4.3 The Industrial Diversification and Location Quotients in Taoyuan County

Teece considers that diversification may be considered as a strategy in order to achieve economies of scope and diversification permits a more efficient use of the productive resource. There are some complementarities in production that can be used to reduce the global cost of production.[23] Furthermore, the location quotient (LQ) is a commonly used measure to help analysts compare a region's level of industry concentration relative to a larger geographic unit. We compare Taoyuan's level of industry concentration relative to Taiwan. The data of number of persons engaged is applied which refers to the on-the-job employees with salary in the end of year (including foreign employees and the students of industrial cooperation), and self-employed persons without fixed salary and non-compensation dependent worker (referring to capital owner and dependents engaged without fixed salary who work over 15 hours weekly in December of the year) It excludes the directors, supervisors, and consultants who receive honorarium only, but do not join management operation actually according to the definition in Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C., Taiwan. Taiwan is referred to as the base area. A location quotient of greater than one means that the local area has a relatively higher concentration of employment in a given industry than the base area, Taiwan. A location quotient equals to one means that the local area has the same proportion of employment in a given industry as Taiwan. A location quotient of less than one means that the area has a smaller proportion of employment in the industry than Taiwan. In this section, the coefficient of industrial diversification and location quotients from 1986 to 2006 will be presented respectively as follows.

[23] Teece, David (1980), "Economies of Scope and the Scope of the Enterprise", Journal of Economic Behavior and Organization, p.226

A. 1986

Table 9: Location Quotients, Taoyuan County, 1986

Standard Industrial Classification System (Rev.3, 1983)	Number of persons engaged in Taoyuan, end of 1986	Lij / Li.	Number of persons engaged in Taiwan, end of 1986	L.j / L..	LQs
1. Mining and Quarrying	770	0.00181	27,738	0.00537	0.33645
2. Manufacturing	319,973	0.75084	2,755,184	0.53343	1.40755
3. Electricity, gas and water	1,890	0.00443	40,791	0.00790	0.56156
4. Construction	18,700	0.04388	354,460	0.06863	0.6394
5. Commerce	41,711	0.09788	1,101,650	0.21329	0.45889
6. Transport, storage, communication	17,121	0.04018	336,805	0.06521	0.6161
7. Financing, Insurance, Real Estate and Business Service	8,392	0.01969	257,576	0.04987	0.39488
8. Social and Personal Service	17,599	0.04130	290,785	0.05630	0.73353
Sum	**426,156**		**5,164,989**		

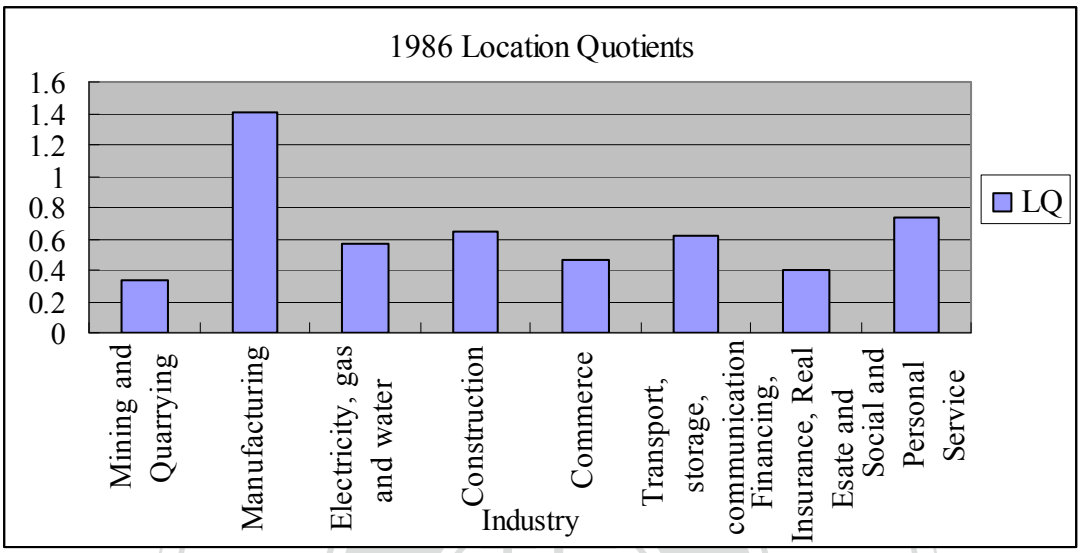
Source: 1986 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 1 General Report and Volume 15 Taoyuan Hsien of Taiwan

$$SCI\,(1986) = \left(\sum_{j=1}^{8} \left| Lij / Li. - L.j / L.. \right| \right) / 2 = 0.21740$$

In 1986, the industry scope and classification system of this census is according to the "Census Program" approved and proclaimed by Executive Yuan, on basis of "Standard Industrial Classification (the 3rd revision). The 8 sectors listed above

cover subsectors, industry groups and industries. The Table 8 reveals the sum of the persons engaged in Taoyuan and Taiwan are 426,156 and 5,164,989. The SCI (1986) presents 0.21740.

Figure 10: 1986 Location Quotients



Source: 1986 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 1 General Report and Volume 15 Taoyuan Hsien of Taiwan

Figure 10 depicts that manufacturing industry is more than one, which means that is more specialized than Taiwan of 1986. The total enterprise units of all industry in Taoyuan County in the end of 1986 are 32,329 which increase 23.63% than that in 1981.[24] The average growth rate of enterprise units in Taiwan is 19.98%. Obviously, the growth rate of enterprise units in Taoyuan County is 3.65% more. Besides, the annual total value of production of Taoyuan County in Secondary industry reaches 90.45% of annual total value of production of Taoyuan County, of which 88.16% attributes to manufacturing industry. The tertiary industry reaches 9.55% of annual total value of production of Taoyuan County. It is clear that the

[24] 1986 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 15 Taoyuan Hsien of Taiwan

proportion of secondary industry to tertiary industry lies in 9.5:1 in Toyuan, which is much more than that of the average in Taiwan's 3.3:1. Finally, the main four manufacturing industry consists of the electrical and electronic, textile industry, transport equipment and plastic product in Taoyuan in 1986. [25] Light and heavy industry develop at the same time.

B. 1991

Table 10: Location Quotients, Taoyuan County, 1991

Standard Industrial Classification System (Rev.6, 1991)	Number of persons engaged in Taoyuan, end of 1991	Lij / Li.	Number of persons engaged in Taiwan, end of 1991	L.j / L..	LQs
1. Mining and Quarrying	346	0.00072	16,293	0.00278	0.25891
2. Manufacturing	331,607	0.68934	2,666,638	0.45468	1.51609
3. Electricity , Gas and Water	1,960	0.00407	45,526	0.00776	0.52488
4. Construction	25,681	0.05339	453,952	0.07740	0.68971
5. Commerce	58,480	0.12157	1,432,527	0.24426	0.4977
6. Transport, Storage and Communication	21,608	0.04492	357,965	0.06104	0.73594
Finance, Insurance, and real estate	11,869	0.02467	298,944	0.05097	0.48405
7. Business Service	4,932	0.01025	155,702	0.02655	0.38618
8. Social and Personal Services	24,565	0.05107	437,265	0.07456	0.68492
Sum	**481,048**		**5,864,812**		

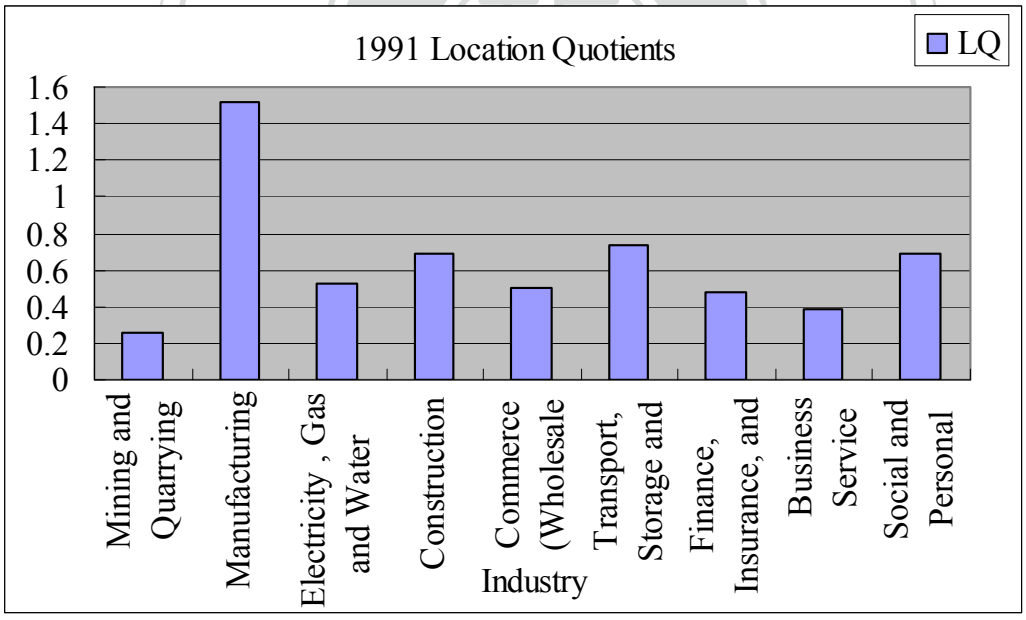
Source: 1991 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 1 General Report and Volume 16 Taoyuan Hsien of Taiwan

[25] 1986 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 15 Taoyuan Hsien of Taiwan

$$SCI\ (1991) = \left[\sum_{j=1}^{8} \left| Lij \ / Li.- L.j \ / L.. \right| \right] / 2 = 0.23466$$

In 1991, the industry scope and classification system of this census is according to the "Census Program" approved and proclaimed by Executive Yuan, on basis of "Standard Industrial Classification (the 6th revision). The 8 sectors listed above cover subsectors, industry groups and industries. The Table 10 reveals the sum of the persons engaged in Taoyuan County and Taiwan are 481,048 and 5,864,812. The SCI (1991) presents 0.23466.

Figure 11: 1991 Location Quotients



Source: 1991 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 1 General Report and Volume 16 Taoyuan Hsien of Taiwan

Figure 11 indicates that the manufacturing sector in Taoyuan County is more specialized than Taiwan of 1991. The total enterprise units of all industry in

Taoyuan County in the end of 1991 are 39,028 which increase 20.73% than that in 1986.[26] The average growth rate of enterprise units in Taiwan is 21.79%. Obviously, the growth rate of enterprise units in Taoyuan County is closed to that of Taiwan's. Besides, the annual total value of production of Taoyuan County in Secondary industry reaches 87.88% of annual total value of production of Taoyuan County, of which 84.23% attributes to manufacturing industry. The electrical and electronic account for 21.36% of annual total value of production in Taoyuan County followed by transportation equipment 13.4%, textile industry 11.97% and fabricated mental product 5.21%. As for the tertiary industry, it reaches 12.12% of annual total value of production of Taoyuan County. It is clear that the proportion of secondary industry to tertiary industry lies in 7.25:1 in Toyuan Country, which is much more than that of the average in Taiwan's 2.025:1. Obviously, secondary industry is emphasized in and the main four manufacturing industry consists of the electrical and electronic, textile industry, transport equipment and fabricated metal products in Taoyuan County in 1991.[27] Therefore, the development of heavy industry is concentrated.

[26] 1991 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 16 Taoyuan Hsien of Taiwan

[27] 1991 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 16 Taoyuan Hsien of Taiwan

C. 1996

Table 11: Location Quotients, Taoyuan County, 1996

Standard Industrial Classification System (Rev.6, 1996)	Number of persons engaged in Taoyuan, end of 1996	Lij / Li.	Number of persons engaged in Taiwan, end of 1996	L.j / L..	LQs
1. Mining and Quarrying	221	0.00039	12,914	0.00196	0.19748
2. Manufacturing	332,377	0.58228	2,475,734	0.37584	1.54926
3. Electricity, Gas and Water	1,721	0.00301	39,894	0.00606	0.49782
4. Construction	29,371	0.05145	540,160	0.08200	0.62747
5. Trade and eating-drinking places	104,300	0.18272	1,864,331	0.28302	0.64559
6. Transportation , Storage and Communication	32,869	0.05758	408,139	0.06196	0.92934
7. Finance, Insurance and real estate	20,483	0.03588	421,586	0.06400	0.56067
8. Business Service	12,202	0.02138	242,323	0.03679	0.58108
9. Social and personal Services	37,279	0.06531	582,091	0.08837	0.73905
Sum	**570,823**		**6,587,172**		

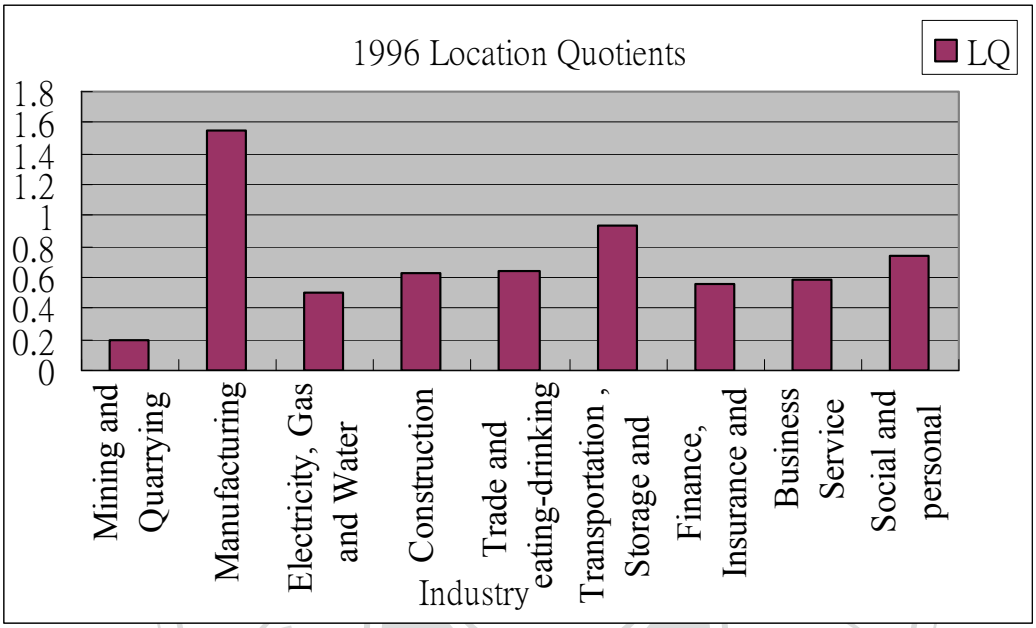
Source: 1996 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 1 General Report and Volume 16 Taoyuan Hsien of Taiwan

$$SCI\,(1996) = \left[\sum_{j=1}^{9} \left| Lij \,/\, Li. - L.j \,/\, L.. \right| \right] / 2 = 0.20644$$

In 1996, the industry scope and classification system of this census is on basis of "Standard Industrial Classification (the 6th revision), same with that of 1991. The 9 sectors listed above cover subsectors, industry groups and industries. The Table 11 reveals the sum of the persons engaged in Taoyuan County and Taiwan are

570,823 and 6,587,172. The sum of engaged persons in Taoyuan County and Taiwan increase 18.6% and 12.3% respectively, comparing to that of 1991. The SCI (1996) presents 0.20644.

Figure 12: 1996 Location Quotients



Source: 1996 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 1 General Report and Volume 16 Taoyuan Hsien of Taiwan

Figure 12 indicates that the manufacturing sector in Taoyuan is more specialized than Taiwan of 1996. The total enterprise units of all industry in Taoyuan County in the end of 1996 are 5,5047 which increase 41.41% than that in 1991.[28] The average growth rate of enterprise units in Taiwan is 17.05%. Obviously, the growth rate of enterprise units in Taoyuan County is more than that of Taiwan's. Besides, as far as the enterprise units of all industries, we observe that

[28] 1996 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 16 Taoyuan Hsien of Taiwan

trade and eating drinking places industry increase most up to 47.62%, followed by manufacturing industry 23.15% and social and personal services industry 10.74%. In term of industry sectors, the increase of enterprise units in secondary industry is 28.71% and that in tertiary industry is 71.29%. Obviously, enterprise units in tertiary industry develop rapidly in 1996. However, in 1996 most of the annual total value of production still attributes to secondary industry, which is proposed 79.22%. The tertiary industry is proposed 20.78% of annual total value of production. [29] Therefore, the secondary industry is presented and the tertiary industry grows continuously.

D. 2001

Table 12: Location Quotients, Taoyuan County, 2001

Standard Industrial Classification System (Rev.7, 2001)	Number of persons engaged in Taoyuan, end of 2001	Lij / Li.	Number of persons engaged in Taiwan, end of 2001	L.j / L..	LQs
1. Mining and Quarrying	204	0.00034	8,562	0.00128	0.26152
2. Manufacturing	335,238	0.55222	2,378,786	0.35700	1.54686
3. Electricity, Gas, and Water	1,435	0.00236	35,892	0.00539	0.43884
4. Construction	27,349	0.04505	460,544	0.06912	0.65181
5. Trade	118,322	0.19491	1,834,609	0.27533	0.70791
6. Accommodation and eating-drinking Places	16,640	0.02741	254,514	0.03820	0.71762
7. Transportation, Storage and Communication	34,232	0.05639	418,960	0.06288	0.89684

[29] 1996 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 16 Taoyuan Hsien of Taiwan

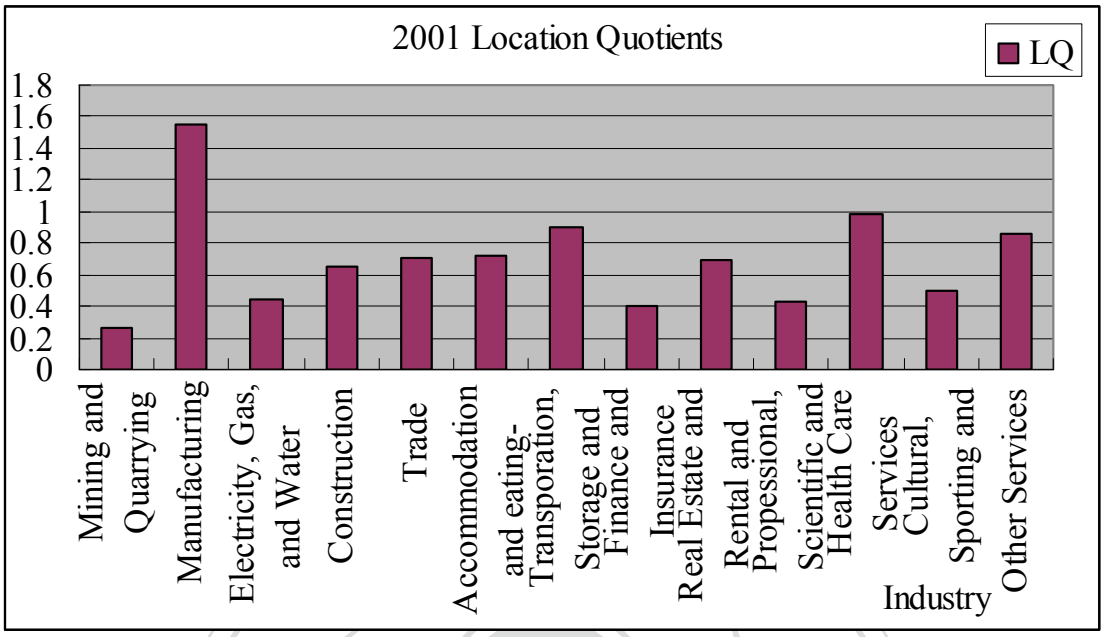
8. Finance and Insurance	13,812	0.02275	372,130	0.05585	0.4074
9. Real Estate and Rental and Leasing	5,397	0.00889	85,374	0.01281	0.69387
10. Professional, Scientific and Technical Services	7,567	0.01246	193,980	0.02911	0.42817
11. Health Care Services	19,698	0.03245	219,863	0.03300	0.98339
12. Cultural, Sporting and Recreational Services	5,598	0.00922	124,126	0.01863	0.49502
13. Other Service	21,578	0.03554	276,010	0.04142	0.8581
Sum	**607,070**		**6,663,350**		

Source: 2001 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 1 General Report and Volume 11 County and City

$$SCI\ (2001) = \left(\sum_{j=1}^{13} \left| Lij \ / Li.- L.j \ / L.. \right| \right) / 2 = 0.19523$$

In 2001, the industry scope and classification system of this census is on basis of "Standard Industrial Classification (the7th revision). The 13 sectors listed above cover subsectors, industry groups and industries. The Table 12 reveals the sum of the persons engaged in Taoyuan and Taiwan are 607,070 and 6,663,350. The sum of engaged persons in Taoyuan and Taiwan increase 6.3% and 1.16% respectively, comparing to that of 1996. The SCI (2001) presents 0.19523.

Figure 13: 2001 Location Quotients



Source: 2001 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), Volume 1 General Report and Volume 11 Country and City

As Figure 13 shown, manufacturing industry in Taoyuan is more specialized than Taiwan of 2001. Besides, the LQ of Health Care Services industry is 0.98339, which is closed to one, meaning it has the same proportion of employment in a given industry as the base area. The LQ of Transportation, storage and communicate lies in 0.8964. The two figures revels services sector is more emphasized.

E. 2006

Table 13: Location Quotients, Taoyuan County, 2006

Standard Industrial Classification System (Rev.8, 2006)	Number of persons engaged in Taoyuan, end of 2006	Lij / Li.	Number of persons engaged in Taiwan, end of 2006	L.j / L..	LQs
1. Mining and Quarrying	121	0.00016	4,969	0.00066	0.2444
2. Manufacturing	412,590	0.54858	2,695,984	0.35709	1.53626
3. Electricity and Gas Supply	1,250	0.00166	32,147	0.00426	0.39033
4. Water Supply and Remediation Services	3,310	0.00440	27,809	0.00368	1.19484
5. Construction	36,852	0.04900	479,357	0.06349	0.77173
6. Wholesale and Retail Trade	133,888	0.17802	1,889,924	0.25032	0.71115
7. Transportation and Storage	36,127	0.04803	360,552	0.04776	1.00583
8. Accommodation and Food Services	22,932	0.03049	323,692	0.04287	0.71117
9. Information and Communication	5,530	0.00735	179,371	0.02376	0.30948
10. Financial and Insurance	15,145	0.02014	381,240	0.05050	0.39878
11. Real Estate	6,498	0.00864	83,932	0.01112	0.77717
12. Profession, Scientific and Technical Services	11,195	0.01488	179,356	0.02376	0.62657
13. Support Services	17,531	0.02331	262,978	0.03483	0.66919
14. Education	5,819	0.00774	80,980	0.01073	0.72133
15. Human Health and Social Work Services	26,962	0.03585	349,956	0.04635	0.77339

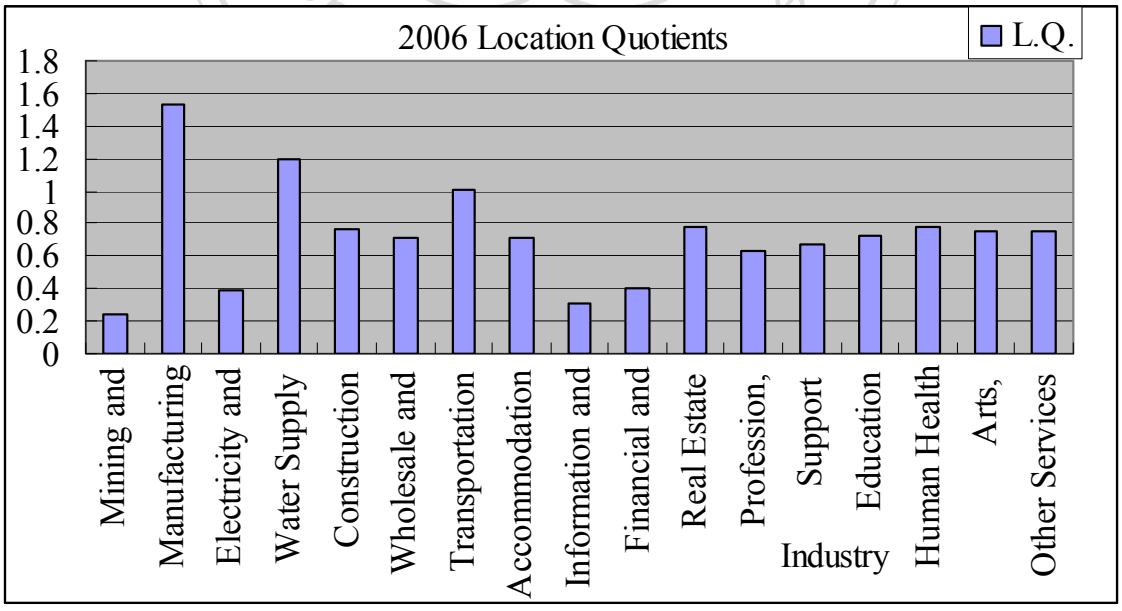
16. Arts, Entertainment and Recreation	5,176	0.00688	68,613	0.00909	0.75727
17. Other Services	11,181	0.01487	149,052	0.01974	0.75302
Sum	**752,107**		**7,549,912**	0.00066	0.2444

Source: 2006 Industry, Commerce and Service Census Taiwan-Fuchien Area, The Republic of China (Taiwan), 2006 Statistics Tables

$$SCI\ (2006) = \left[\sum_{j=1}^{17} \left| Lij \ / Li. - L.j \ / L.. \right| \right] / 2 = 0.19249$$

In 2006, the industry scope and classification system of this census is on basis of "Standard Industrial Classification (the8th revision). The 17 sectors listed above cover subsectors, industry groups and industries. The Table 12 reveals the sum of the persons engaged in Taoyuan County and Taiwan are 752,107 and 7,549,912. The sum of engaged persons in Taoyuan County and Taiwan increase 23.89 % and 13.31% respectively, comparing to that of 2001. The SCI (2006) presents 0.19249.

Figure 14: 2006 Location Quotients



Source: 2006 Industry, Commerce and Service Census Taiwan-Fuchien Area, The

Republic of China (Taiwan), 2006 Statistics Tables

Figure 14 indicates that the location quotient of manufacturing sector is more specialized than Taiwan. Besides, the LQ of Water Supply and Remediation Services is 1.19484 which means that it more specialized than Taiwan. Also, the LQ of the transportation and Storage industry is 1.00583, signify that both the region Taoyuan County and Taiwan have the same proportion of employment concentrated. The LQs of real estate, human health and social work services, construction, art, entertainment and recreation, other services, education, accommodation and food services, whole sale and retails trade are more than 0.7, which means more industrial diversity in Taoyuan County. The tertiary industry is more emphasized.

4.4 Results and Findings

Judging from the above, firstly we could conclude that the industrial structure of Taoyuan County lies in secondary industry from 1986 to 1991. After 1991, the tertiary industry grows enormously. With this background, it is clear that Taoyuan has stepped into the post-industrial society. Secondly, the value of coefficient of industrial diversification is positive since 1986 except the year 1991. The value of year 1991 is slightly more than that of 1986. Generally speaking, we could conclude the industrial diversification of Taoyuan County is toward positive and high degree of diversity in industry.

Thirdly, the location quotients indicate the specialization of economic activity in Taoyuan County since 1986. It is a truism that Taoyuan County has a relatively higher concentration of employment in manufacturing than Taiwan since 1986. In 2006, Water Supply and Remediation Services industry is another relatively higher concentration of employment in Taoyuan. Furthermore, Transport, Storage and Communication industry is continuously concentrated since 1986. In 1986, the LQ

of it is 0.6394 and it grows to 0.92934 and up to 1.00583 in 2006, which has the same proportion of employment as Taiwan. In addition, the LQs of construction industry were ranked top 3 in 1986 and 1991 but after 1996 the LQs of Social and personal Services and Transportation, and storage and Communication replace the ranking. Obviously, the services industry is more and more concentrated.

Fourthly, the LQs of mining and Quarrying industry since 1986 is less one, meaning Taoyuan County has a smaller proportion of employment in mining and quarrying industry than Taiwan. Also, the LQs of Mining and Quarrying industry is always the last one from 1986 to 2006. Finally, the LQs of real estate, human health and social work services, construction, art, entertainment and recreation, other services, education, accommodation and food services, whole sale and retails trade in 2006 are more than 0.7, which means more industrial diversity in Taoyuan County.

Chapter 5 Conclusions

5.1 Summary and Policy Implications

This research studies the industrial structure and change of industrial structure in Taoyuan County and how much structural industrial diversification is there around Taoyuan Airport and its peripheral areas since 1986. We could conclude and make some suggestions for reference.

The industrial structure of Taoyuan County is secondary industry from 1986 to 1991. After 1991, the tertiary industry grows enormously and now it trends to service-oriented market. In Taiwan study, the industrial structure is from agriculture to manufacturing. Taiwan has experienced the agriculture revolution of land reform in 1950s, outward-oriented trade policy in 1960s and 1970s and liberalization of trade control. The emergence of small and medium firms, which focused on export market, creates more job opportunity in manufacturing sector. Therefore, the industrial structure of Taoyuan County from 1986 to 1991 concentrates on secondary industry. Moreover, Rostow (1960) indicates revolutionary changes in agriculture productivity are an essential condition for successful take-off. The spectacular industrialization would not been possible without agriculture revolution. Therefore, after 1991, the tertiary industry grows and it steps to service-oriented market now.

As far as the industrial diversification of Taoyuan County is concerned, it is toward positive and high degree of diversity in industry since 1986. The industrial mix affects economic growth. We could expect the much higher degree of industrial diversity in the future that creates agglomerative economics and industrial cluster, which improves the city output level and economic grow. Obviously, Taoyuan

County provides good conditions potentially for industrial diversity so that it could help the success of the development of Aerotroplis.

Furthermore, Taoyuan County has a relatively higher concentration of employment in manufacturing than Taiwan since 1986. Health Care Services industry, Water Supply and Remediation Services industry and Transportation, Storage and Communication industry are industries which increase concentration of employment in Taoyuan. Also, Taoyuan County has a smaller proportion of employment in mining and quarrying industry than Taiwan.

This research suggests that the authority concerned could make use of the positive condition of diversity in industry to accelerate industrial cluster in Aerotroplis development. The industry of Transportation, Storage, Communication and Services could be more emphasized for the successful aerotroplis development. The transportation, storage and communication industry, consisting of not only land, railway, public rapid, bus, water, and air transportation but also supporting services such as customs clearance, shipping agency, freight transportation forwarding, housing and storage, have played important roles within twenty years in Taoyuan County. More employments engage in those industries. Hence, among the functional eight areas of Taoyuan Aerotroplis plan, without doubt, those industries could facilitate the growth of the free trade related zones, airport compatible industrial zone, and aviation industry zone. This study also suggest that more value-added industry could be introduced and the Taiwan Taoyuan Airport could provide multiple transit model such as air-bridge service to meet the market need and global trend in that the expansion of airport-centric commercial development is today's gateways leading growth. The better integrity of airport-centric commercial industries develops, the more cargo or passenger activities could attract. Hence, Taiwan could expect more successful possibility for development of Taoyuan Aerotroplis. In

addition, the level of regional development around the airport is of importance. The perspectives of Taoyuan Aerotroplis could act as a bridge to the world as part of the process of globalization by taking spatial advantages such as Taipei County development axis, Taipei technological gallery, Taipei Port, Taoyuan business and industrial harbor, and Hsinchu Science Park. Taoyuan Aerotroplis also could connect the development nearby and integrate the cultural features to strengthen our unique competitiveness

5.2 Further Research

I suggest that further research may be conducted by enlarging the areas such as Taipei County development axis or Hsinchu County. Taipei technological gallery developed by government exists in northern Taipei. It accelerates the development of Taiwan. Studying the industrial structure and degree of diversity in industry in these areas could understand the competitive advantages in spatial and the potential capacity of northern Taiwan for aerotroplis development. Besides, the industrial structure of Taoyuan County could be studied not only by engaged employments but also by GDP's distribution and output of productivity. This is another perspective to study the industrial structure and diversity in industry of Taoyuan County for aerotroplis development.

Moreover, the study of the industrial diversification of Taichung County and Kaohsiung County could be conducted. There will be more evidence to know the industrial diversification of Taoyuan County is relatively high or low in Taiwan and it could draw a comparison to see whether Taichung County or Kaohsiung County have better conditions for successful aerotroplis development as well as cargo or passengers attraction. Furthermore, as for further research of LQs of Taoyuan, it could be conducted by broadening the sample of the industry scope and classification systems to subsectors, industry group or industry. The more quantity in details may also get the more specific and valid illustration of the specialized industry. Finally, comparing the industrial diversification of Taoyuan Aerotroplis with that of the other countries which succeeds in Aerotroplis models such as Schipol in Amsterdam, Changi Airport in Singapore, Incheon International Airport in Korea could be researched further. From the comparison study, we may imitate the merits from other counties in order to upgrade our competitiveness of airports and Aerotroplis.

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