THE IMPACT OF THE AGGLOMERATION GROWTH ON SPATIAL CONCENTRATION IN BAGHDAD

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THE IMPACT OF THE AGGLOMERATION GROWTH ON SPATIAL CONCENTRATION IN BAGHDAD

By

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PERTUMBUHAN AGLOMERASI INDUSTRI KE ATAS KONSENTRASI RUANG DI BAGHDAD

ABSTRAK

Pertumbuhan aglomerat industri dan tumpuan /pemusatan ruang merupakan ciri utama di kebanyakan ibu negara di dunia: Baghdad adalah satu daripadanya. Banyak faktor yang mendorong berlakunya pertumbuhan aglomerat dan tumpuan / pemusatan ruang. Penyelidikan ini bertujuan mengkaji hubung jalin di antara pertumbuhan aglomerat industri dan faktor utama, serta impak pertumbuhan terhadap pertambahan tumpuan / pemusatan ruang dan pembangunan bandar di Baghdad. Data diperoleh daripada Kementerian Perancangan Iraq bagi tempoh 2000-2009. Data yang dikumpul mencakupi tujuh kategori industri, yang dikelaskan serta diadaptasi oleh Kementerian Perancangan. Empat teori utama yang relevan dengan penyetempatan industry diaplikasikan: kos terendah, analisis kawasan pasaran, pemaksimuman keuntungan dan kos terendah bagi pengguna. Setiap teori mengabaikan atau tidak mengambil kira sesetengah faktor lokasi, sebaliknya memberi tumpuan terhadap faktor lain. Ahli teori mengambil kira hanya faktor yang diberi tumpuan dan mengelaskan mereka sebagai faktor penting dalam penyetempatan industri. Hakikatnya, semua faktor penyetempatan yang terkandung di dalam keempat-empat teori ini, adalah penting dalam penyetempatan industri. Dalam erti kata lain, tiada teori komprehensif bagi penyetempatan industri. Hal ini juga menggariskan bahawa perlunya suatu kajian empirikal dijalankan bagi setiap kes aglomerat di kawasan masing-masing, tanpa bersandarkan situasi yang sama di negara lain, dalam usaha menilai situasi aglomerat negara. Justeru, matlamat kajian ini adalah untuk mengenal pasti faktor yang boleh mempengaruhi pertumbuhan aglomerat industri dan tumpuan / pemusatan ruang di Baghdad; untuk mengkaji

impak faktor utama terhadap trend serta saiz tumpuan / pemusatan ruang bagi semua kategori industri dalam usaha menentukan ruang industri yang sesuai bagi tempoh 2000-2009; dan juga untuk mengkaji impak pertumbuhan aglomerat industri terhadap perkembangan ruang dalam usaha menentukan tahap pertumbuhan aglomerat industri yang boleh diterima bagi tahun 2009. Dari segi kepentingan serta ketersediaannya, analisis ini memberi tumpuan terhadap empat faktor utama berikut: pekerjaan, bilangan kilang, upah dan nilai tambah. Kajian ini menggunakan pendekatan pertumbuhan sebenar, kuota lokasi, analisis anjakan saham, analisis pekerjaan pelbagai dan satu set petunjuk yang baru. Dapatan kajian menunjukkan bahawa Baghdad merupakan aglomerat industri terbesar di Iraq, yang mewakili 1% daripada keseluruhan kawasan di Iraq. Secara tidak ketara, keempat-empat faktor utama di atas memberi kesan terhadap pertumbuhan aglomerat industri di Baghdad. Kategori industri seperti pakaian, makanan, produk kertas dan logam mencatatkan peningkatan dalam saiz dan trend tumpuan / pemusatan, penyetempatan yang lebih sesuai bagi tempoh 2000-2009, serta tahap pertumbuhan aglomerat yang boleh diterima bagi 2009. Sebaliknya, industri minyak, kimia, batu-bata dan simen, mencatatkan pengurangan dalam saiz dan trend pemusatan / tumpuan, penyetempatan yang tidak sesuai bagi tempoh 2000-2009 dan tahap pertumbuhan aglomerat yang tidak boleh diterima bagi tahun 2009

THE IMPACT OF THE AGGLOMERATION GROWTH ON SPATIAL CONCENTRATION IN BAGHDAD

ABSTRACT

The industrial agglomeration growth and spatial concentration have characterized the majority of the capitals in the world; Baghdad is one of them. There are many factors driving the agglomeration growth and spatial concentration. This research attempts to determine the relationship between the industrial agglomeration growth and the main indicators and the impact of growth on increasing spatial concentration and urban development in Baghdad. The data were collected from the Iraqi Planning Ministry for the period 2000-2009. The data include seven industrial categories classified and adapted by the Planning Ministry. Four main theories relevant to industrial localization: least cost, market area analysis, profit maximization and least cost for consumer were critiqued. Each theory neglected some location factors and focused on other factors. The theoreticians considered only the focused factors and classified them as the most important in industrial localization. In fact, all the localization factors in the four theories are important in industrial localization. This means there is no comprehensive theory for industrial localization. This underlines the need for empirical studies for each agglomeration case in its area, without relying on similar situations in other countries to assess the agglomeration national situation. Hence, the aims of this study are to identify the factors affect industrial agglomeration growth and spatial concentration in Baghdad, to examine the impact of the main factors on spatial concentration trend and size for all the industrial categories in order to determine the more spatially appropriate industries for the period 2000-2009, and also to examine the impact of the industrial agglomeration growth on the current spatial development in order to determine the acceptable growth

levels of the industrial agglomeration in 2009. The analysis focused on Employment, Number of factories, Wages and Added Value as main four factors for their importance and availability. This study utilized actual growth approach, location quotient, shift share analysis, employment multiplier analysis and a new set of indicators. The findings indicated that Baghdad occupies the largest industrial agglomeration in Iraq even though it represents 1% of Iraq's total area. The main four factors affect the industrial agglomeration growth in Baghdad unambiguously. The industrial categories: clothes, food, paper and metal products recorded increases in the size and trend of concentration, more appropriate localization for the period 2000-2009 and acceptable levels of agglomeration growth for 2009. However, for oil, chemical, bricks and cement industries, they recorded a decrease in the size and trend of concentration, inappropriate localization for the period 2000-2009 and unacceptable levels of agglomeration growth for 2009.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

The issue of agglomeration economies has remained the most prominent at the urban and regional level, especially in major cities such as capitals and ports. Furthermore, from its notable marker a problem of industrial agglomeration growth and spatial concentration, and this growth is continuing without interruption. The empirical agglomeration economies literature is concerned with this issue whereby the recent studies have confirmed that the agglomeration economies and industrial concentration are reflections to urbanization and localization effects. Moreover, localization literature diagnosed four main factors that affect agglomeration growth, economic factors, social factors, physical factors and spatial government policies.

The purpose of this chapter is to give an introduction to the problem of industrial agglomeration growth and spatial concentration with reference to the impact of the main factors on agglomeration growth, how to solve this problem, and the suitable methods. This is to help answer the research questions and to achieve the research objectives. In order to identify the main factors drive and affect industrial agglomeration growth, therefore, this research will focus on four important factors and available: employment, the number of factories, wages and added value, for seven industrial categories as classified by the Iraqi Planning Ministry, for the period 2000-2009.

1.2 Industrial Agglomeration and Spatial Concentration: An Overview

Weber was the pioneer in studying the economics of urban industrial agglomeration; he has shown the benefits of this economic agglomeration, which listed as third factor after transportation and the urban settling (Greenhut, 1956). This was achieved due to the availability of transport networks and communications and skilled labor supply in certain areas of major cities compared with other urban and rural areas. The major cities have a great importance in attracting different industrial activities and to concentrate on certain locations internal and adjacent to these cities. There is no doubt, this increasing industrial concentration in major cities generated the regional disparity which known in developing countries (Williamson, 1965).

This regional disparity between different economic locations within the same city and between urban and rural areas or between regions played a major role in the industrial concentration. After the urban industrial agglomerations grow and prosper by different economies, these economies in turn attract more organizers to move their industrial activities to settle within the influence areas of agglomeration. Accordingly, the urban economies often make the major cities are more suitable for localization of industrial agglomeration (Hoshiar, 2006).

There are still high levels of industrial activity in big cities because there is main reason for this. This is because of the large inequality in the spatial distribution of the transport infrastructure linking urban areas (Somik, et al., 2004). Indeed, if the localization and urbanization economies work without arousing countervailing forces, the industrial concentration will tend to continue without interruption (Yokkaichi and Keijiro, 2000).

Metropolitan cities have extensive labor market with diverse skills, and this is one of the features that encourage industrial agglomeration in the urban environment (Ryosuke, 2007). Hence, heterogeneity in general works as a centripetal force (Fujita and Krugman, 1995).

The long-term effects of the agglomeration economies, the negative influences from congestion outweigh the agglomeration economies (Eiji and Inyong, 2007). Congestion or greater input competition in high-density areas could cause firms to locate in more rural areas (Jeffrey and Catherine, 2005). Transportation infrastructures still play a decisive role in site location (Yoshiyuki et al, 2008). The firm location is not determined only by the infrastructures but also in a regional cluster, by networking among actors it is the key (Steinle and Schiele, 2002).

An industrial cluster is defined as a geographic cooperative group that includes suppliers, consumers, peripheral industries, governments, and supporting institutions such as universities (Porter, 2000). As the urban industrial agglomeration has advantages, there are also disadvantages, diseconomies such as wages, rents, the cost of congestion and pollution (Ludwig and Neer, 2008). To locate sustainable industrial agglomerations, it depends on availability and quality of natural resources, quality of the infrastructures, and specific zones that are the most suitable to locate an industrial area (Fernadndez and Ruiz, 2008). Whilst, nowadays proximity to markets, communication, infrastructures and manpower availability are still the main factors of industrial location selection (Crozet, 2005; Amiti, 2005; Leitham, 2000; Forslid et al., 2002; Mori & Nishikimi, 2002).

An application of concepts is the development of the sustainable industrial areas, which try to increase their economic efficiency and minimize their negative impacts (Kapur and Graedel, 2004). The diversified regions are more attractive than the specialized regions and the firms may also benefit from their locations in the areas where the mass or density of economic activity is high (Devereux et al., 2007).

Large population size, geographical advantage such as close proximity to big ports, or favorite industrial policies to the region attracts more manufacturing firms (Mei, 2004). There is a significant role to the agricultural sector in the process of agglomeration of economic activity between the regions of the developing countries because still, supplies unskilled workers (Pierre and Dao-Zhi, 2005).

There are many studies conducted to assess agglomeration, and the significant impact of urbanization economies on location decisions in different countries (Devereux et al., 2007; Yukichi and Keijiro, 2000). City size measured by metropolitan population and industry size measured by industry added value (Ronald, 1998). Structural differences in the labor force and in the manufacturing sector may produce different patterns of industrial concentration (Picard and Zeng, 2005). An inverse relation is expected between a lower bound for concentration and market size, only as long as set-up costs for the industry are exogenously determined (Mita and Harry, 2000). Industrial concentration is a clear feature of all capitals in the world and it is clear feature of the economic and spatial imbalance (Emil, 1998). The capitals have a high density of population; this high density generates a huge demand for goods and services.

That is, the population high density attracts more manufacturers in each industry. In other words, the geographic concentration of industries varies with the distribution of population (Ben and Yi 2009). The agglomeration growth and spatial concentration if found to be a general phenomenon. Having strong implications for an economic policy entails a special kind of efficiency-equity trade-off whereby policy makers may be forced to choose between supporting lagging regions and promoting growth at the national level (Martin, 1999).

The primate cities still remain as important capital cities in the developing countries and are fast growing despite many attempts to reduce their growth (Abdul Ghani, 2000).The problem is in the absence of an appropriate locational policy, excessive concentration in very large cities (Arup, 1999). Structural differences in the labor force and in the manufacturing sector may produce different patterns of industrial concentration (Picard and Zeng, 2005). Therefore, city size is measured by metropolitan population and industry size is measured by industry added value (Ronald, 1998). Economies of scale are a major source of concentration (Ravi, 1999). The economic activities tend to concentrate in a small number of places (typically in cities), and agglomeration economies are one force behind this concentration (Gonzalo, 2005).

The main implication according to all previous studies mentioned above (Ravi, 1999; Leitham, 2000; Forslid, 2002; Mori, 2002; Kapur, 2004; Crozet, 2005; Amiti, 2005; Hoshiar, 2006; Devereux et al., 2007; Ryosuke, 2007), there are many factors affect industrial agglomeration growth and spatial concentration; however, the economic factor is dominant.

1.3 Statement of the Problem

The recent empirical agglomeration economies literature is concerned with the main issue of the agglomeration economies and industrial concentration as they are reflections to urbanization and localization effects. Development plans still provide a partial interest in the spatial dimension, in particular the issue of manufacturing and industrial agglomeration in developing countries. This has contributed to the inconformity problem between the sectoral components and locational components of the industrial structure (Hoshiar, 2006). Hence, the issue of agglomeration economics remains problematic at the urban and regional levels, especially in major cities such as capitals and ports. This creates problems related to industrial agglomeration growth and spatial concentration.

According to a number of studies (Emil, 1998; Martin, 1999; Abdul Ghani, 2000; Yukichi and Keijiro, 2000; Hoshiar, 2006; Devereux et al., 2007; Ryosuke, 2007; Ben and Yi, 2009), the validity of main conclusion of Statement of the Problem is Industrial Agglomeration Growth and Spatial Concentration. This is based on three premises which will be discussed below.

First, the agglomeration economies are represented by industrial agglomeration whereby this agglomeration is a reflection to the urbanization and localization in the urban environment. Second, the main factors affect industrial agglomeration growths and spatial concentrations in the urban environment are: economic, social, and physical factors and government policies, where each factor consists of a set of sub-factors. Third, the industrial concentration is a distinct feature of all the capitals in the

world and it also is a distinct feature of the economic and spatial imbalance. Agglomeration and spatial concentration constitute general phenomenon if they exist together. Moreover, if the localization and urbanization economies work without arousing countervailing forces, the industrial concentration will tend to continue without interruption.

1.4 Research Questions: This research will include three questions.

1. What are the main factors that drive and affect industrial agglomeration growth and spatial concentration in Baghdad?

2. What is the impact of the main factors on spatial concentration for the seven industrial categories in Baghdad?

3. What is the impact of industrial agglomeration growth on spatial development in Baghdad?

1.5 Research Objectives: This research will include three objectives.

1. To identify the economic indicators that affect industrial agglomeration growth and spatial concentration in Baghdad.

2. To examine the impact of the main factors on spatial concentration trend and size for the seven industrial categories in order to determine the more appropriate industries for localization in Baghdad.

3. To evaluate the impact of industrial agglomeration growth on spatial development in order to determine the acceptable growth levels of industrial agglomeration for the seven industrial categories in Baghdad.

When urban industrial agglomerations grow and prosper through different economies, such as preferential policies and other policies, these economies in turn will attract more organizers to move their industrial activities to settle within the influence areas of agglomeration. The capitals and ports have attracted investment, not only because of the preferential policies, but also due to their geographical proximity to big export ports, services, markets, connections and information, would further encourage industrial concentration and regional disparity.

There are many studies (Emil, 1998; Ronald, 1998; Edward, 2001; Chyau & Linda, 2001; Mita & Harry, 2000; Mei, 2004; Jeffrey & Catherine, 2005; Eiji & Inyong ,2007; Johannes and Gabor, 2009; Ronald, 1998) conducted to assess the agglomeration and the impact of urbanization economies on location decisions in different countries. However, these studies focused on the economic dimension even in the spatial assessment of the agglomeration. Spatial agglomeration is acceptable as long as there is an economic profit or does not reach to the diseconomies.

The purpose of this study is to analyze the impact of main factors together on industrial agglomeration growth and spatial concentration in Baghdad. It is clear that location theories and previous studies have emphasized explicitly the role of economic factor in the selection and growth process of the industrial agglomeration, but neglected the spatial factor although both factors are important. It is also clear that previous studies have not emphasized explicitly the role of location factors to determine trend and size of spatial concentration to determine the more appropriate industries for localization and about the acceptable levels of agglomeration growth spatially and economically.

This research, therefore, attempts to fill this gap in the agglomeration economies literature in two ways. Firstly, this can be made by contributing to the understanding of the role of location factors to determine trend and size of spatial concentration for the industrial categories in order to determine the more appropriate industries for localization in Baghdad. Secondly, this can also be achieved by contributing to knowledge about the acceptable levels of agglomeration growth spatially and economically for localization in Baghdad.

Consequently, it is expected that this study will contribute to knowledge and understanding of the main factors of localization process and their relationships with the industrial agglomeration growth and spatial concentration in metropolitan areas, and within this context in developing country, i.e. Iraq.

1.6 Scope of the Study

To achieve the purpose stated above, the study will first review the relevant theories and concepts of industrial localization, industrial agglomeration growth and spatial concentration with reference to the impact of localization factors, main factors and their role in industrial agglomeration growth and spatial concentration in metropolitan regions to form the basis for the conceptual framework of the study. It will then discuss some empirical studies to provide some background to the industrial agglomeration and concentration problems which necessitate identifying and examining the agglomeration and spatial concentration in Baghdad. The main focus of the study to analyze the impact of the main factors: Employment, Factories, Wages and Added Value on the agglomeration growth and spatial concentration for the manufacturing sector which includes seven industrial categories classified in Iraqi

Planning Ministry: Manufacture of food, drinks and tobacco, and Manufacture of clothing, leather, yarn and fabric, and Manufacture of paper and wood, and Manufacture of chemical and oil refining, and Manufacture of construction materials, cement, bricks, and Manufacture of metal products, machinery and equipment, and Other manufactures, (all handmade ones).

This will be done by examining industrial agglomeration growth, Actual Growth of Employment, Factories, Wages and Added Value in Baghdad for the period 2000-2009. Using a new set of indicators, this is considered as a set of leading indicators. This set includes four types: Indicators of actual growth, indicators of relative distribution of agglomeration refer to Baghdad and other provinces. Indicators of relative importance refer to industrial categories which are agglomerated in Baghdad in 2009. Aggregate indicators refer to all the indicators involve relative importance of employment, number of factories, wages and added value.

The set of indicators are further explained listed below.

First set: Indicators of actual growth of employment, factories, wages and added value.

Second set: Indicators of relative distribution of employment, factories, wages and added value

Third set: Indicators of relative Importance of employment, factories, wages and added value

Fourth set: Aggregate indicators of the relative importance of employment, factories, wages and added value

This study also involves the impact of the main factors on agglomeration growth and spatial concentration by using Location Quotient, Shift Share Analysis to find the indicators of trend and size change of Employment, Factories, Wages and Added Value to determine the more appropriate industries for localization in Bagdad for the period 2000-2009.

The indicators of trend and size change are further explained listed below.

First set: Indicators of trend and size change of employment, number of factories, wages and added value

Second set: Aggregate indicators of trend and size change of employment, number of factories, wages and added value

Third set: National Growth Indicator of employment (N2), Deviating Indicator of industrial categories growth (D) from national growth rate (N2), Indicator of structural change, actual growth (R), Potential growth rate (N)

Fourth set: Impact of industrial structure (M), Regional contribution (S), Indicator of relative change (R-N) and Economic Efficiency Indicator (EEI)

Then, the study will examine the impact of the industrial agglomeration growth on the current spatial development by using Location Quotients and Employment Multiplier Analysis in order to determine the acceptable growth levels of the industrial agglomeration in Baghdad in 2009.

Finally, the study will analyze the implications of the findings of the industrial agglomeration growth to improve the current and futuristic conditions in Baghdad.

1.7 Methodology

To answer the research questions and to achieve the objectives of the research, this study will broadly analyze the industrial agglomeration growth under the impact of the main factors: employment, number of factories, wages and added value. This study will also utilize reliable methods, actual growth evidence, Location Quotient, Shift Share Analysis, and Employment Multiplier with using a new set of indicators, indicators of relative distribution, indicators of relative importance, aggregate indicators of the relative importance and the indicators of trend and size change of concentration (See section 1.6).

1.8 Organization of the Study

This thesis is divided into seven chapters; the organization of the chapters is shown in Figure 1.1.

Chapter One outlines the research problem, research questions, research objectives, purpose, scope, methodology and organization of the study.

Chapter Two reviews the literature on the relevant theories and concepts on industrial localization. It also reviews some of the empirical evidence of the impact of the driving factors: Economic factors, Social factors, Physical factors and Spatial Government Policies on industrial agglomeration growth and spatial concentration to form a conceptual framework for the study.

Chapter Three presents the methodology which includes defining the research topic, the study community, type of data, type of method, data collection and data analysis.

Chapters Four, **Five** and **Six** lay the foundations of the study by discussing the research methodology and the case study area.

Chapter Four discusses the impact of the driving factors: Employment, Number of Factories, Wages and Added Value on the industrial agglomeration growth and spatial concentration for seven industrial categories in Baghdad. This will be done by examining the industrial agglomeration growth, using Actual Growth Method, indicators of relative distribution of agglomeration and indicators of relative importance of agglomeration in examining growth of Employment, Number of Factories, Wages and Added Value in Baghdad and other provinces for the period 2000-2009.

Chapter Five examines the trend and size change of spatial concentration by using Location Quotient, Shift Share Analysis, and indicators of trend and size change of Employment, Number of Factories, Wages and Added value. That is, to examine the impact of agglomeration growth on spatial concentration in order to determine the more appropriate industries for localization in Baghdad for period 2000-2009.

Chapter Six discusses and examines the impact of the industrial agglomeration growth on spatial development by determining the acceptable growth levels of industrial agglomeration and spatial concentration in Baghdad in 2009, using Location Quotients and Employment Multiplier Analysis for the seven industrial categories classified by the Iraqi Planning Ministry.

Chapter Seven summarizes the findings of the study related to the industrial agglomeration growth and spatial concentration, more appropriate industries for localization, the acceptable growth levels of industrial agglomeration in Baghdad. Also, includes recommendations with respect to future spatial development and industrial localization in Baghdad. As well as suggested further researches related to this study which have not yet been investigated for future research.

The following chapter, Chapter Two, discusses the literature review,industrial location: theories and concepts, least cost approach, market area analysis approach, the profit maximization approach, least cost for consumer, theoretical localization factors, definitions of industrial agglomeration and concentration, agglomeration growth, spatial concentration, concentration measurement, concentration ratio (CR), concentration ratio (CR), herfindahl-hirschman index (HHI), location quotient (LQ), industrial driving forces of agglomeration growth, economic factors, social factors, physical factors, government policies, agglomeration economies and diseconomies, and finally acceptable and unacceptable agglomeration growth.

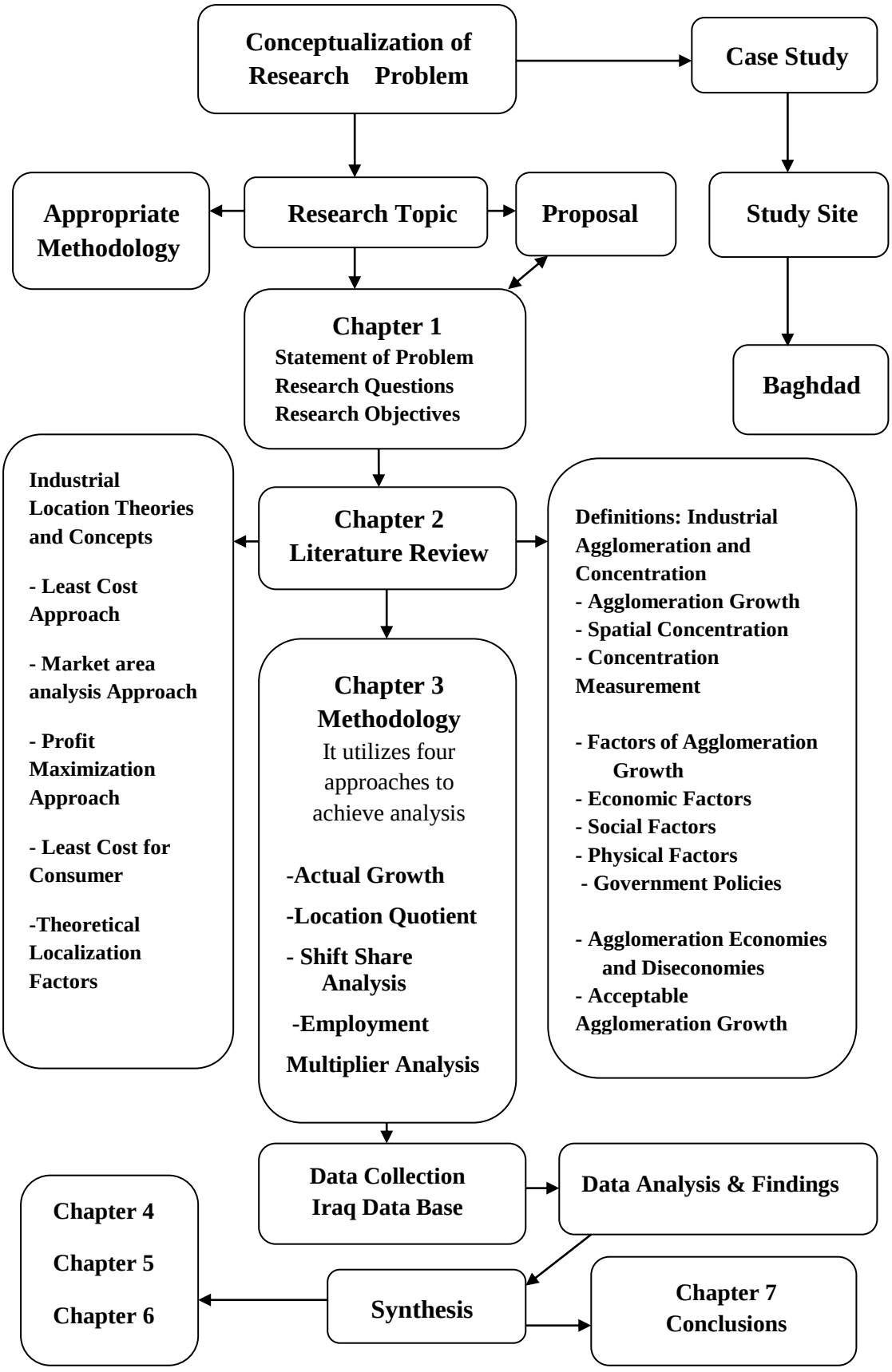

Figure 1.1: Structure of the Thesis

CHAPTER TWO

RESEARCH LITERATURE REVIEW

2.1 Introduction

One of the most important problems of major cities is the excessive growth of industrial agglomeration in capitals especially. Major cities are acting as an attraction center for industrial agglomeration growth and concentration. Moreover, the concentration will continue to increase without interruption, due to absence of brakes to deter the spatial concentration to continue under impact of driving forces. Major cities need to reasonable criterion as an index to identify the current growth, and to decide, if this growth is acceptable or unacceptable for all industries in agglomeration. Therefore, by this index can be said, the agglomeration growth is an acceptable or unacceptable regardless of diseconomies or increase of economic profits. Mostly, from the economic perspective as long as the agglomeration did not reach to diseconomies, therefore, can be allowed to grow the agglomeration, due to profitability of the agglomeration. Despite, there is not an evidence or argument to accept or reject the agglomeration growth spatially.

The agglomeration economies which formulated by the location theories diagnosed many factors for localization, such as labor, market, raw materials and other. The recent empirical studies of agglomeration economies indicated to the main factors, which affect industrial agglomeration growth and spatial concentration, such as economic, social, physical factors and spatial policies. The relationship between the localization factors and industrial agglomeration growth and spatial concentration is discussed in this chapter. Hence, this chapter includes three parts. The first part

includes the location theories and concepts, Least-cost, Market area analysis, Profit maximization, Least-cost for the consumer and theoretical localization factors.

The second part includes definitions, empirical evidence about agglomeration growth, spatial concentration and concentration measurement. Driving forces are explored in the literature, which affect industrial agglomeration growth and spatial concentration, economic, social, physical factors and spatial government policy. The third part discusses the agglomeration economies and diseconomies as economic indicators do not reflect the spatial dimension for localization. It discusses also the acceptable level of agglomeration growth to judge on a current growth, if it is an acceptable or unacceptable. The answer from the empirical literature and theoretical, there is no standard level as an index; therefore, this study is an attempt to explore the gap in this issue and to contribute to fill this gap and to contribute also in knowledge in this field.

2.2 Industrial Location: Theories and Concepts

The spatial aspects of economic theory have been developed through time in spatial price theory and location theory. Location theory has at least four historical roots. Thunen developed the general framework for the economic analysis of Location Theory (Thunen, 1875; Isard, 1956). He was primarily concerned with the aggregate analysis of agricultural location. He utilized the "least-cost" approach to location. Of the early theorists, Launhardt, whose work appeared in 1885, provided the most significant contributions (Laundhardt, 188; Miller, 1977). Launhardt explained the differences in the location of industry by variations in cost and demand factors at alternative locations. He demonstrated the importance of transportation costs. Weber

developed a comprehensive theory in 1909 for the location of manufacturing activities (Weber, 1929; Isard, 1956). Three determinants or factors are considered: transportation costs, labor costs, and what Weber referred to as agglomeration forces. Many location studies use the Weberian theory to better understand the decision making process (Tellier, 1995).

The comprehensive analysis of any research problem requires a theoretical background, which will include theories, solutions and concepts. This section has interested to present the pioneers ideas in this field, Weber, Hoover, Losch, Smith and Isard. Location theories have discussed the reasons and factors of industrial localization i.e., factors of industrial agglomeration.

2.2.1 Least Cost Approach

These include the opinions known as the minimum cost, which has interested in optimum location to get least possible cost of production among alternatives of available location. This approach is based on the following assumption; the targeted production cost is considered the main factor to select the best location and stability the market demand (market size). Among the most prominent theorists of this approach are Von Thunen, Launhardt and Alfred Weber. Weber is considered the pioneer of the approach, although, his theory in 1909 was based on the ideas of the German economic Launhardt who had predated him twenty years. Weber explained, the businessman will choose the location in area which has the least cost of the location (Emil, 1998).

Weber built his model and put the assumptions of his model to make it more simplified. Study area is determined previously and homogeneous climate, the consumers of production concentrated in the clear centers, with a full competition on the location, which has contact with a non-specific market (unlimited demand). He relied on several assumptions to develop his theory structure (Shawkat, 2005) as follow:

i. Existence an isolated region has climatic conditions are similar.
ii. The scarcity of raw materials and energy and the disparity of distribution by region.
iii. Inequality of the spatial distribution of the labor force and concentrated in certain areas (a limited of labor supply).
iv. Non-homogeneity in the distribution of the population (consumers).
v. The existence of conditions of full competition and ease to access of market places

It is clear from Weber's assumptions his theory was opposite of Thunen's theory, which assumed that the location given and required to determine type of production. While Weber's theory started from the fact that the industrial branch (industrial activity) given and required to determine the optimum location for this industrial branch (Hamem, 1991).

Weber believed that three factors affect to determinate of industrial location are the cost of transport, employment cost and the agglomeration, because agglomeration economies are typically motivated in terms of the impacts of clustering on production costs (O'Sullivan, 2007). Weber also created a kind of relationship

between weight of products and the weight of the raw materials called index of raw materials and identified by the following relationship:

$$\frac{\text{The weight of raw material}}{\text{The weight of products}} = \text{Index of raw materials (M1)}$$

Weber explained that industries with high value index of raw materials specifically more than one, will be attracting to the sources of raw materials, so as to reduce the cost of transporting raw materials to industrial location. While it was less than one, will be look for location approximated to market because the high cost of transporting products or the high cost of transporting of the final production of manufactured goods.

Where the labor cost savings greater than the additional transport costs will be in the interest of the industry when they signed in the province of cheap labor. Similarly, the industry can be moved from the cheaper work location and optimal transport both to agglomeration location, if possible, to achieve cost economies through the third group (agglomeration or called economies of scale (Shawkat, 2005). Weber (1909) translated these concepts in his model, which is called Weber's model or (Location Triangle or Weber's Triangle) to determine the industries location that require more than one raw material in the manufacturing process.

Weber since published his theory in his book (Theory of industry location) in 1909, and since this book was translated into English in 1929, this book was faced by criticism as follows: