

**Employment Trends and Geographical Shifts in Manufacturing
Industry in Saudi Arabia: A Macro Level Approach**

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إتجاهات العمل والتغيرات الجغرافية لقطاع الصناعات التحويلية في المملكة العربية السعودية: باستخدام النموذج الكلي

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ملخص الدراسة:

يهدف هذا البحث إلى دراسة وتحليل للتغيرات الهيكلية والجغرافية التي طرأت على قطاع الصناعات التحويلية في مختلف مناطق المملكة العربية السعودية والأسباب التي أدت إلى هذه التغيرات. فمن خلال التحليل الدقيق لمجموعات البيانات الثانوية المقدمة من مصلحة الإحصاءات العامة والمعلومات، تم تقديم صورة واضحة عن قطاع الصناعات التحويلية من حيث نمو العمالة والتغيرات الهيكلية والجغرافية التي طرأت على هذا القطاع خلال العقدين الماضيين، بالإضافة إلى الدور الذي يلعبه هذا القطاع في الاقتصاد السعودي. فالسياسات والاستراتيجيات التنموية التي قامت بها الحكومة السعودية لتعزيز هذا القطاع ورفع القدرة التنافسية للمنتجات الوطنية غير النفطية على المستوى المحلي والعالمي كان لها الأثر الإيجابي على التحولات الهيكلية والجغرافية لهذا القطاع في المملكة.

ABSTRACT

This paper investigates the recent change in manufacturing industry across Saudi regions in terms of employment growth, geographical shifts and the cause of changes. Through careful analysis of publicly available datasets, this research paper presents a clear picture of the current manufacturing industry, as well as growth, structural and spatial changes that have occurred over the last two decades and, at the same time, underlining the fundamental drivers of changes in Saudi manufacturing industry. The efforts carried out by the Saudi government through adapting and implementing different development policies and strategies aiming at strengthening the manufacturing sector and raising the competitiveness of national non-oil products locally and globally have had, to greater extent, remarkable effects on the manufacturing structure and employment growth throughout the Saudi regional system.

Keywords: Manufacturing Industry, Location Quotients, Shift-Share Analysis, Employment Trends, Geographical Shifts, Saudi Arabian regions.

I- Introduction

Within the last two decades, the Saudi development policies aimed to expand and diversify the country economic base away from dependency on the production and export of crude oil as the main source of national income. The focus is given to the manufacturing sector as the “driving engine” of industrial base development of Saudi economy. The objective behind this focus is to enhance the national productivity and competitiveness and, at the same time, speed up the diversification process of the national economy (MOP, 2000: 59-60). The manufacturing sector in Saudi Arabia is a major producing sector in the economy. It consists of three main sub-sectors. The first is the petrochemical subsector which constitutes the basis of the country's industrial development. Most petrochemical industries production is attributed to SABIC (Saudi Arabia Basic Industries Company). The oil refining is the second sub-sector. It includes all incorporated industries into Saudi ARAMCO, which undertakes all refining and marketing activities within the country. Lastly, the transforming industries sub-sector includes all other manufacturing industries (Al-Kaswani&Al-Dakhil, 1999). This research paper will focus on the third type of manufacturing sector (i.e. other manufacturing sector). This is because the other manufacturing sector had the highest contribution to the Saudi Gross Domestic Product (GDP) during the last decade, and it constitutes 62% in 1999 and about 65% in 2009 of total manufacturing contribution (see Table 1).

Data on manufacturing employment were obtained directly from Central Department of Statistics and Information (CDSI) database. The data were available in electronic form, allowing more efficient analysis. The goal of this research paper is to approach manufacturing sector from a macro perspective through an analysis of manufacturing employment trends at regional levels across Saudi Arabia during the period of 1991 and 2011. However, this paper addresses three main questions:

- 1- In terms of employment, has the manufacturing industry experienced growth or decline, and at what magnitude?
- 2- In terms of geographical location, has the geography of manufacturing industry changed, and if so, in what direction?
- 3- What factors (if any) underline observed employment growth and geographical shifts?

Table 1: Contribution of Manufacturing Sector to GDP (at constant 1999 prices)

Sector	Value Added (SR billions)		Average Annual Growth Rate (%)	Share in GDP (%)	
	1999*	2009**		1999	2009
Oil Refining	18.0	23.9	2.9	3.0	2.8
Petrochemicals	6.0	14.2	9	1.0	1.7
Other Manufacturing	38.8	70.4	6.1	6.4	8.2
Total Manufacturing	62.8	108.5	5.6	10.4	12.7

Source:

*Ministry of Economic and Planning, Seven National Development Plan – Table 1.1, Page 4.

**Ministry of Economic and Planning, Ninth National Development Plan – Table 4.2, Page 68.

The administrative classification of Saudi Arabia divides the Kingdom into five large regions: Western, Eastern, Northern, Southern, and Central region. During the fifth development plan period (1990-1995), however, these five former planning regions were replaced as spatial references for planning by the 13 regions, namely, Riyadh, Makkah, Al-Madinah, Qassim, Eastern Region, Jizan, Najran, Aseer, Baha, Hail, Tabouk, Northern Region, and Al-Jouf. These regions differ in many economic, demographic, and geographic factors such as the economic development level, population size, land area, etc. (MOP, 1995: 370). These 13 regions will be employed in this study as the spatial analysis unit.

To this end, the paper is organized as follows: section two describes the trends in manufacturing employment across Saudi regions. Section three describes the geographical shifts of manufacturing industry at the regional level. The last section provides the main findings and conclusions with underlining some factors that have allowed and compelled these changes. Throughout, methods and limitations of both data and analysis techniques are discussed.

II- Employment Trends in Manufacturing Industry

The data in Table 2 show that manufacturing employment at the national level grew by 77.1% with compound annual growth rate (CAGR) of 2.9% during the 1991 to 2011 period. By comparison, the national economy grew by 102.2% (3.6% CAGR) over the same 20-year period. Over this period of time, Northern and Najran regions grew by an outstanding 330.7% (7.6% CAGR) and 234.9% (6.2% CAGR) respectively. These two regions exceeded the national growth rate by more than 234% and 157% respectively. Four other regions (Qassim, Riyadh, Jazan and Eastern Region) also reported growth rate above the national average. These regions tended to exceed the national average by more than 58%, 55%, 53% and 7% respectively. However, the remaining regions (Al-Madinah, Aseer, Hail, Makkah, Tabuk, Al-Jouf and Baha) reported growth rate below the national average. These regions represented an employment gain ranging from 64.4% as in the case of Al-Madinah Region to 1.2% as in the case of Baha Region.

Table 2: Growth in Manufacturing Industry, 1991 to 2011

Region	Manufacturing Employment		year-20 Growth Rate	CAGR
	1991	2011		
Riyadh	111,220	257,743	%131.7	%4.3
Makkah	126,077	153,919	%22.1	%1.0
Al-Madinah	20,277	33,333	%64.4	%2.5
Qassim	14,119	33,174	%135.0	%4.4
Eastern Region	85,356	157,107	%84.1	%3.1
Aseer	13,894	17,971	%29.3	%1.3
Tabuk	4,638	5,549	%19.6	%0.9
Hail	4,818	6,007	%24.7	%1.1
Northern region	1,984	8,546	%330.7	%7.6
Jazan	6,248	14,408	%130.6	%4.3
Najran	3,163	10,592	%234.9	%6.2
Baha	2,892	2,927	%1.2	%0.1
Al-Jouf	2,996	3,155	%5.3	%0.3
Total (Manufacturing(397,682	704,431	%77.1	%2.9
National Economy (all sectoral employment)	4,914,405	9,935,534	%102.2	%3.6

Source: Ministry of Economic and Planning, CDSI – Statistical Reports, 1991& 2011 – calculated by authors.

Of the many analytical tools which can be used to compare economic activity in one area against the same economic activity in another, location quotients are perhaps among the more popular metrics (Rupasingha and Patrick, 2009; Blakely and Bradshaw, 2002; Siegel et al, 1995; Ben-David, 1991; Malizia, 1990; Hoover and Giarratani, 1985; Isard, 1976). In this research paper, location quotients (LQ) represent the relative concentrations of manufacturing employment in each of the Saudi 13 regions. Values over 1.0 indicate that a region enjoys a competitive advantage in manufacturing, while values less than 1.0 indicate the opposite. Location quotients are calculated using the equation below.

$$LQ = \frac{e_j^t / e_{Tj}^t}{E_n^t / E_{Tn}^t}$$

Where:

e_j^t = Number of workers employed in manufacturing industry in region j at time t

e_{Tj}^t = Total employment in region j at time t

E_n^t = Number of workers employed in manufacturing in the nation at time t
 E_{Tn}^t = Total national employment at time t

Table 3 shows that the Northern region has experienced the highest strengthening of competitive advantage in manufacturing industry, growing from a location quotient of 0.5 to 1.3. Location quotient in Najran region grew by more than 50%, and two additional regions (Riyadh and Qassim) grew by at least 25%. On the opposite end of the spectrum, location quotients in six Saudi regions (Makkah, Tabuk, Aseer, Hail, Baha and Al-Jouf) fell by more than 25%.

Table 3: Location Quotients in Manufacturing Employment · 1991 and 2011

Region	Location Quotients		Direction of Move
	1991	2011	
Riyadh	1.0	1.3	(+)
Makkah	1.1	0.9	(-)
Al-Madinah	1.0	0.8	(-)
Qassim	0.9	1.1	(+)
Eastern region	1.2	1.4	(+)
Aseer	0.6	0.4	(-)
Tabuk	0.4	0.3	(-)
Hail	0.6	0.4	(-)
Northern region	0.5	1.3	(+)
Jazan	0.5	0.6	(+)
Najran	0.6	1.0	(+)
Baha	0.6	0.3	(-)
Al-Jouf	0.6	0.3	(-)

Location quotients are useful metrics for comparing performance across areas, and can be used to express change over time. They suffer, however, from what may be termed as the “base problem”. Because they are ratios of ratios, shifts in the bases (total local employment and total national employment) impact location quotients as much as shifts in industry-specific employment at the local and national levels. In order to overcome this obstacle, a shift-share analysis was conducted using the same CDSI data that was used to calculate the location quotients.

Shift-share analyses break growth/decline into three components: a national share component (NS), an industry mix component (IM), and a local factors (LF) component (Rupasingha and Patrick, 2009; Andreoli and Goodchild, 2008; Ben-David, 1991; Malizia, 1990). The national share component is the amount of growth/decline in employment that a region would experience if the industry grew at a rate equal to the rate of growth of the national economy. The industry mix component is the amount of local industry growth that can be attributed to industry

growth at the national level less than the growth rate of the national economy. The local factors component is the residual local growth which is not accounted for by the national share and industry mix components. These identities can be expressed mathematically as follows:

$$\text{Observed Change} = \text{NS} + \text{IM} + \text{LF}$$

Shift-share components can be expressed in absolute or relative terms. In either form of expression, a local factors component equal to '0' indicates that local employment in the observed industry grew at a rate equal to national industry growth. A negative LF component indicates that the rate of change of local industry employment was less than the rate of change of national industry employment (i.e. the local region *lost* competitive advantage), while a positive LF component indicates that the rate of change of local industry employment was greater than the rate of change of national industry employment (i.e. the local region *gained* competitive advantage).

Table 4: Local Factor Components of Shift-Share Analysis of Manufacturing Employment by Region, 1991 - 2011.

Region	LF Component	
	Percent	Absolute
LF > 0%		
Northern Region	%253.6	5,032
Najran	%157.7	4,989
Qassim	%57.8	8,164
Riyadh	%54.6	60,734
Jazan	%53.5	3,341
Easteern Region	%6.9	5,912
LF < 0%		
Madinah	%12.7-	2,585-
Aseer	%47.8-	6,640-
Hail	%52.5-	2,527-
Makkah	%55.1-	69,407-
Tabuk	%57.5-	2,666-
Jouf	%71.8-	2,152-
Baha	%75.9-	2,196-

Table 4 above shows that among the Saudi regions, the Northern Region ranked top in terms of LF percentage change. Local advantage in the Northern

Region added 5,032 manufacturing jobs in addition to the 1,530 jobs which would have had regional manufacturing industry simply grown at the national rate. This was followed by Najran Region which added 4,989 jobs in addition to the 2,440 jobs which would have been added if Najran regional manufacturing industry had grown at the national average. In absolute terms, however, Riyadh Region added more than 60,000 manufacturing jobs, followed by Qassim and Eastern Regions each added more than 6000 manufacturing jobs on the top of the amount which would be expected to be added if manufacturing industry in these regions grown at a rate commensurate with the national rate.

III- Geographical Shifts

The maps shown in Figures 1 and 2 reflect the information shown in the location quotients table above (Table 4). These maps highlight the concentration of the most competitive regions in terms of manufacturing industry. In 1991, only two regions, —Makkah and the Eastern Region, – are in the highest category – where location quotients range from 1.11 to 1.40. These two regions were located in the Eastern Part of Saudi Arabia as in the case of the Eastern Region and in the Western Part as in the case of Makkah Region. Three regions – Riyadh, Qassim and Madinah – are neutral (0.81 to 1.10). At the opposite end of the spectrum sits three regions– Northern, Tabuk and Jazan – are in the lowest category with location quotients range from 0.20 to 0.50. By 2011, rapid growth and geographic restructuring had taken place. Three regions – Riyadh, Eastern and Northern region – are in the highest category. Makkah, Qassim and Najran are neural, and five regions (Tabuk, Hail, Al-Jouf, Baha and Aseer) are in the lowest category.

In order to identify which Saudi regions enjoy a competitive advantage, and which have advanced their competitive position over the period of analysis, both location quotients and local factor values needs to be plotted together (Figure 3). By plotting location quotients on the *x-axis* and local factors values on the *y-axis*, four possible quadrants can be identified:

- 1- Quadrant I: Regions located in quadrant I are the “high performers.” These regions enjoy a competitive advantage and their advantage has been increasing.
- 2- Quadrant II: Regions in quadrant II are currently at a competitive disadvantage, but have gained advantage.
- 3- Quadrant III: Regions in quadrant III are at a competitive disadvantage and have lost ground.
- 4- Quadrant IV: Regions in quadrant IV currently enjoy a competitive advantage but their competitive position is slipping.

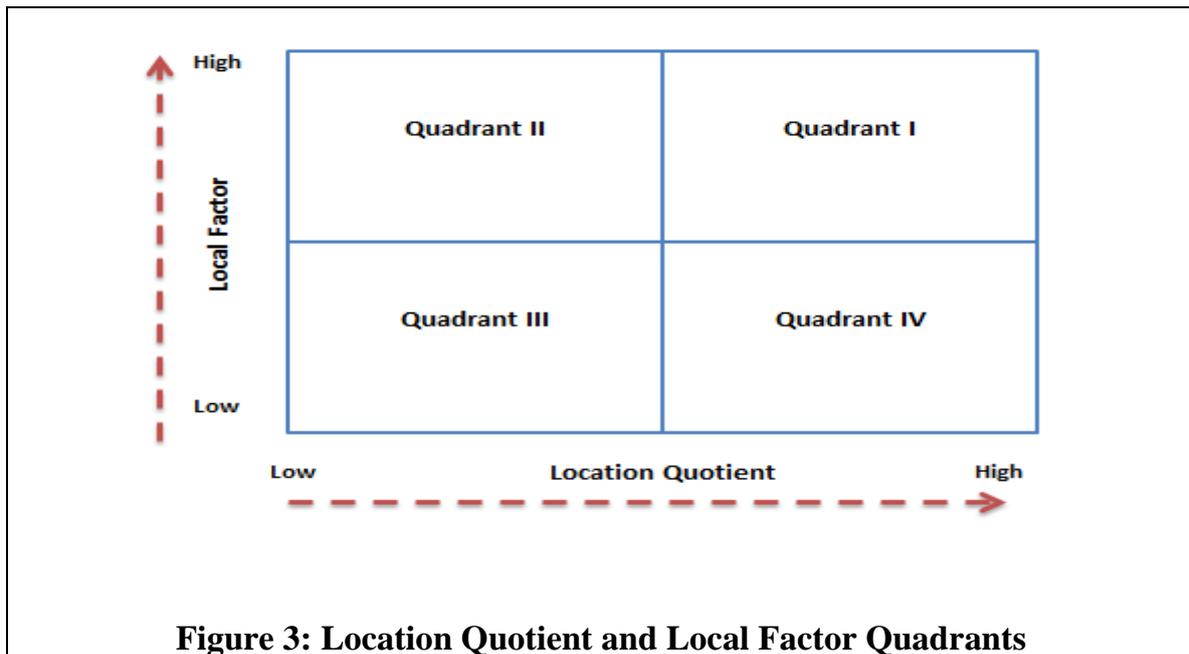


Figure 3: Location Quotient and Local Factor Quadrants

Figure 4 shows that four regions (Northern, Riyadh, Qassim and Eastern region) located in quadrant I – high performers regions. These regions states enjoy a competitive advantage and their advantage has been increasing. With a location quotient of 0.99, Najran falls just short of being a high performer, despite the fact that manufacturing employment grew more quickly in Najran than in any other region (with the exception of Northern region). At the opposite end of the spectrum sits seven regions – Tabuk, Aseer, Al-Jouf, Baha, Hail, Makkah – and to a lesser extent, Madinah Region.

Figure 5 shows a similar comparison as the one above, only now location quotients were calculated using 1991 data. If theories of regional specialization hold true, one would expect a strong *positive* correlation between location quotients and local factors values because regions with a competitive advantage should find it easier to increase their advantage. The correlation coefficient between location quotients (1991) and local factors components is very weak but positive relationship ($r = 0.015$). Regions with high location quotients were likely to have higher local factors components than 'less competitive' regions.

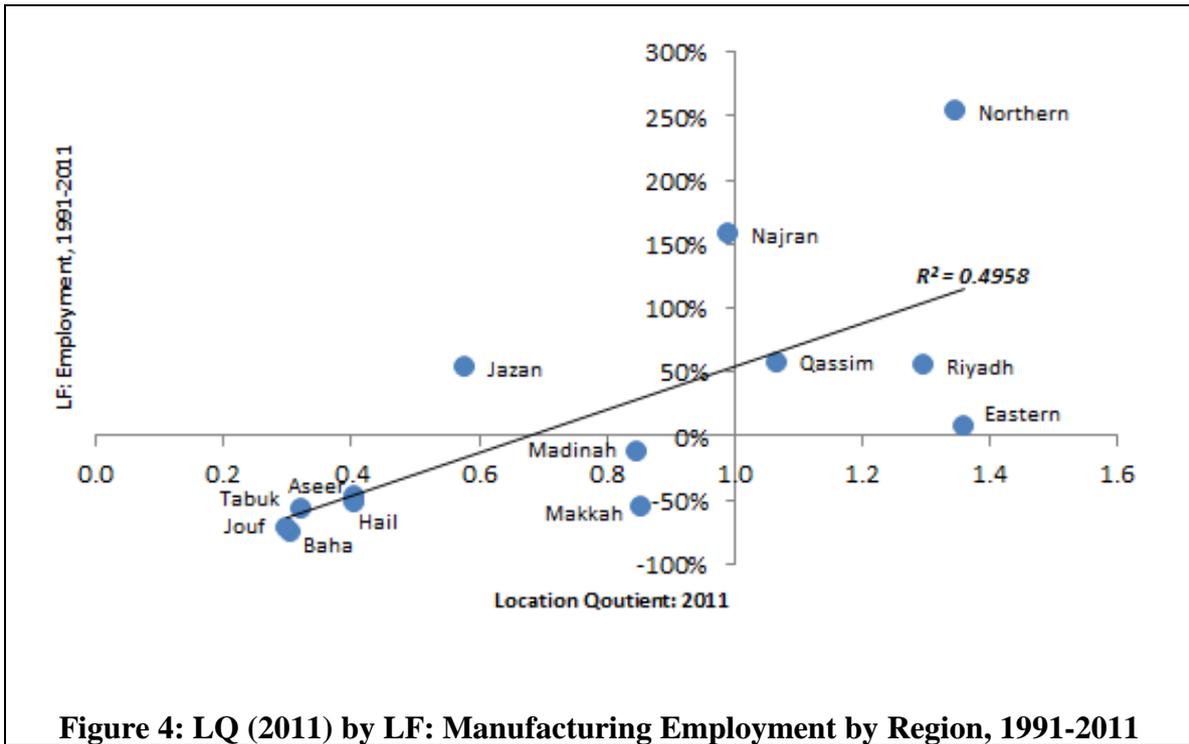


Figure 4: LQ (2011) by LF: Manufacturing Employment by Region, 1991-2011

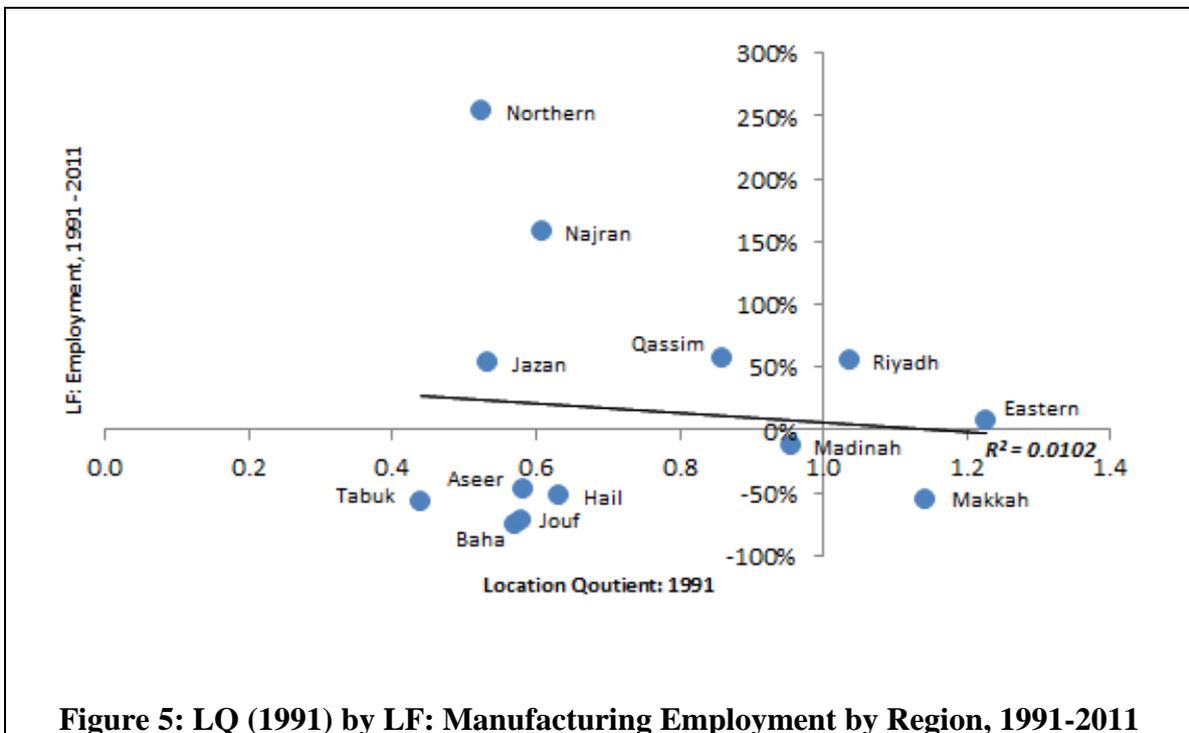
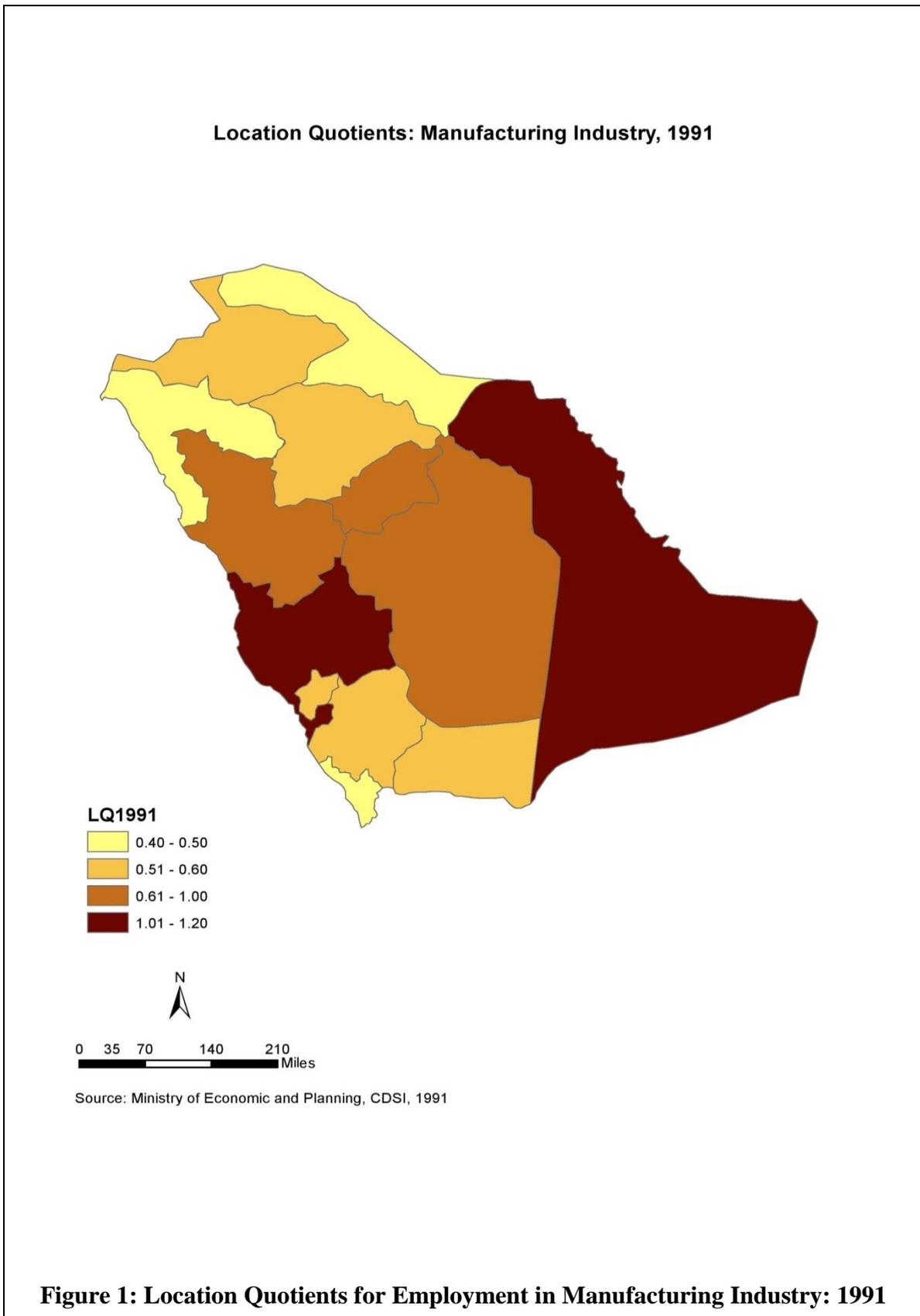
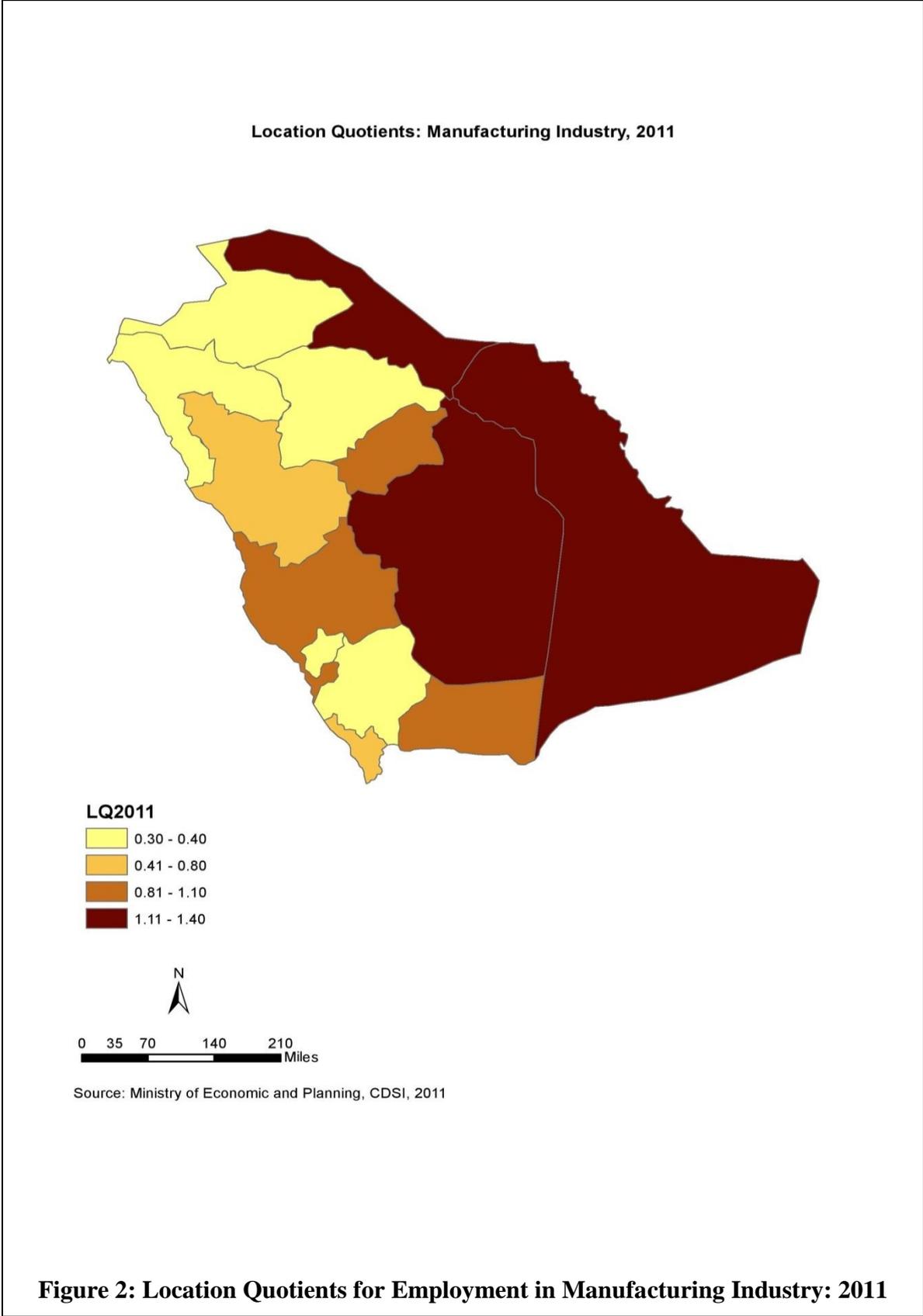


Figure 5: LQ (1991) by LF: Manufacturing Employment by Region, 1991-2011





IV- Conclusions and Recommendations

This research paper has attempted to investigate the recent change in manufacturing industry in Saudi Arabian 13 regions in terms of employment growth, geographical shifts and the cause of changes. Through careful analysis of publicly available datasets, this paper has been able to present a clear picture of the current manufacturing industry, as well as growth, structural and spatial changes that have occurred over the last two decades.

The above investigation reveals that all Saudi regions have witnessed an increase in their manufacturing job opportunities during the period of analysis. Five of these regions – Northern, Najran, Qassim, Jazan and Riyadh – witnessed a credible increase in manufacturing growth rate exceeding the manufacturing growth rate at both national level and the national economic growth rate as a whole. Of these five regions, the Northern Region is classified as having the highest ‘performance’ in terms of competitive advantage (i.e. high location quotient and local factor components), followed by Riyadh and Qassim Regions.

The rapid changes of manufacturing employment structure across Saudi regions were part of national trends, and it would have been unacceptable to ignore these fundamental drivers of change in the manufacturing industry. This rapid growth in manufacturing industry coincided with geographic restructuring in Saudi Arabia. Over the last two decades, geographical locations of manufacturing industry have been shifted from “west-east” to the “northern-east” of Saudi Arabia. However, the factors underlining these changes in both employment growth and geographical shifts in manufacturing industry can be listed as follows:

- 1- Worldwide, the manufacturing industry is rapidly changing due to efficiency improvements and sourcing changes motivated by competitive pressures and new logistics practices enabled by new technology and information management. Saudi Arabian manufacturing industry is no exception in this regard. The rapid improvement in infrastructure facilities such as public utilities and transportation networks as well as information and communication technology across Saudi regions is, indeed, one of the fundamental drivers of change in the manufacturing industry. According to the Seventh National Development Plan (2000-2005), average expenditure on infrastructure development during the first two National Development Plans reached almost 50 percent of the total actual expenditure of development agencies, exceeding average expenditure on the development of economic, human, social and health resources. During the Third National Development Plan (1980-1985), however, 41.1 percent of total actual expenditure of development agencies was directed towards the completion of infrastructure projects related to the producing sectors of economy (6th NDP, Ch. 1: 42-43).
- 2- The graduation shifts, made by Saudi government, from dependency ‘syndrome’ of oil and its related products as the main comparative advantage in the country to broad reliance on the competitive advantages inherent in the production base

of non-oil sectors. This shift to non-oil production base has been accelerated during the global financial and economic crises of 2008 (oil prices dropped from about \$147 a barrel in August 2008 to below \$40 in December). According to Ninth National Development Plan (2010-2014), in line with the objective of increasing the contribution of non-oil sectors to GDP, the Ninth Plan envisages an average annual growth rate of the oil sector of about 1.2%, leading to its contribution decreasing to about 19.6% by the end of the plan comparing with actual contribution of 23.7% under the Eighth Development Plan, which leads to reducing dependence on oil and, consequently, to accomplishing the strategic objective of diversifying the economic base. On the other hand, the Plan envisages an average annual growth rate of non-oil production sectors of about 6.3%, compared with an actual average annual growth rate of 4.7% under the Eighth Plan. In effect, contributions of these sectors to GDP increased from 71.7% in 1999 to 73.5% in 2004 and to about 77.1% in 2009, and it is expected to increase to about 81.3% in 2014 at the end of the Ninth Plan (9th NDP, Ch. 4: 67).

- 3- Dramatic increase in non-oil production investment by private sector during the last decade is also one of the fundamental drivers of change in the Saudi manufacturing industry. The annual growth rate of investments in non-oil sectors averaged about 5.6% during the last ten years, with total investments (gross fixed capital formation) increasing, in 1999 constant prices, from SR 111.2 billion in 1999 to SR 190.9 billion in 2009. About 84% of the investments were made by the private sector, whereas the public sector's share accounted for 16%.
- 4- The Saudi government played a critical role in developing the industrial base of the country, in accordance with the government's comprehensive economic development strategies aiming at expansion of production base and diversification of income sources. Since the establishment of Saudi Industrial Development Fund (SIDF) in 1974 along with the establishment of the Saudi Industrial Property Authority (Modon) in 2001, the industrial base in the Kingdom has witnessed wide expansion over the past four decades. The number of industrial cities increased from 3 industrial cities in 1974 to about 29 cities in 2011. The number of factories operating in these cities has increased from 198 factories in 1974 to 5,043 factories in 2011. Invested capital has also increased from SR 12 billion in 1974 to about SR 507 billion in 2011. At the same time, number of employees in these cities has increased from 34,000 in 1974 to 638,000 in 2011 (SIDF, 2012). This industrially-oriented focus on development of industrial cities along with the new six economic cities could be classified as the main driving forces of changes in Saudi Arabian manufacturing geographical locations. For example, during the last 16 years (1995 to 2011), the number of factories operating in Northern region increased by more than 300%, increasing from 5 factories in 1995 to 20 factories in 2011. Investment in the manufacturing sector has also increased by more than 1900%, up from about SR 13 billion in 1995 to more than 2483 billion in 2011 (Modon, 2012: 4).

- 5- Other driven factors such as population growth, labor skills, technology and knowledge capacities as well as human development, along with increased demand and competition of locally produced products in domestic and foreign markets, particularly after the accession of the Saudi Arabia to the World Trade Organization (WTO), also played a critical role as fundamental drivers of changes in the Saudi manufacturing industry.

To sum-up, the growth observed in the CDSI data is both a reflection of “real” growth driven by the factors listed above, and an increase in the number of establishments classified as manufacturing. It should also be noted that the efforts carried out by the Saudi government through adapting and implementing different development policies and strategies aiming at strengthening the manufacturing sector and raising the competitiveness of national non-oil products locally and globally have had, to a greater extent, remarkable effects on the manufacturing structure and employment growth throughout the Saudi regional system.

Further research studies on the impact of these changes on the economic system of Saudi Arabia among and within the 13 regions need to be investigated. Factors of change such as company to company relationships, personal communications, spatial development potentials, labor skills, and technology and knowledge capacities need to be investigated and examined. Supply chain management among industries as well as linkages of local and international firms also needs further investigation.

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