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#2014-030

**Challenges and opportunities for transition to knowledge-based economy in
Arab Gulf countries**

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UNU-MERIT Working Papers

ISSN 1871-9872

**Maastricht Economic and social Research Institute on Innovation and Technology,
UNU-MERIT**

**Maastricht Graduate School of Governance
MGSOG**

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ABSTRACT

This paper uses the descriptive and comparative approaches and uses the OECD (1996) definition of knowledge-based economy, the World Bank Knowledge Index and Knowledge Economy Index and other indicators to examine progress and challenges in transition to knowledge-based economies in Arab Gulf countries. We fill the gap in the Gulf literature and present more comprehensive analysis of progress and challenges impedes transition to knowledge-based economies in Arab Gulf countries. Our findings support the first hypothesis concerning relative progress in transition to knowledge-based economies in Arab Gulf countries. Our results corroborate the second hypothesis that transition to knowledge-based economies faces several challenges in Arab Gulf countries. Our findings support the third hypothesis concerning variation in transition to knowledge based economies across Arab Gulf countries. Therefore, it is essential for Arab Gulf countries to implement sound and coherent policies to enhance transition to knowledge based economy in Arab Gulf countries.

Keywords: Knowledge, knowledge index, knowledge-based economy, Arab Gulf countries

JEL classification: O10, O11, O30

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Challenges and Opportunities for transition to Knowledge-Based Economy in Arab Gulf Countries

1. INTRODUCTION

This paper aims to assess the progress in transition to knowledge-based economies in Arab Gulf countries and to discuss the potential opportunities and challenges Arab Gulf countries faced in the transition to knowledge-based economies.² This paper addresses the following questions: how important is the progress in the transition to knowledge-based economies in Arab Gulf countries? What are the major challenges hindering the transition to knowledge-based economies in Arab Gulf countries? What are the major opportunities and policy instruments to facilitate the transition to knowledge-based economies in Arab Gulf countries?

We examine three hypotheses, the first hypothesis concerning the relative progress in the transition to knowledge-based economies in Arab Gulf countries. We examine the second hypothesis that the transition to knowledge-based economies faces several challenges in Arab Gulf countries and coincides with substantial knowledge gap compared to other world regions. This hypothesis implies that Arab Gulf countries have manifestly lagged far behind other world regions in terms of indicators required for the transition to knowledge-based economy. We examine the third hypothesis concerning the variation in transition to knowledge based economies across Arab Gulf countries.

We fill the gap in Arab Gulf literature by presenting a more comprehensive analysis to improve understanding of the progress in transition to knowledge-based economies in Arab Gulf countries using recent data and provide recent study compared to few earlier studies on the knowledge economy in the Arab region (Nour, 2011). Different from earlier studies in the Arab literature (cf. UNDP-AHDR, 2003; UNDP-MBRF-Arab Knowledge Report, 2009; 2010-2011; Nour, 2010; 2011; 2012; 2013) that examine the incidence and existence of knowledge and transfer of knowledge, an interesting element in our analysis is that we investigate the recent progress in transition to knowledge-based economies in Arab Gulf countries compared to other world regions and we examine both opportunities and challenges to transition to knowledge based economies in Arab Gulf countries. We believe that this topic seems quite consistent with the widely used standard classification of Gulf countries according to their reliance on natural resources, and also seems sound since the transition to knowledge-based economies are often linked to both the resources directly devoted to knowledge development and also to the whole economic structure that supports knowledge development. Therefore, analysis of progress,

² The Arab Gulf countries region is composed of six countries, including Bahrain, Kuwait, Oman Qatar, Saudi Arabia, and United Arab Emirates.

challenges and opportunities for transition to knowledge-based economy in Arab Gulf countries is both relevant and important in view of the well-known stylized facts concerning the structure of the Gulf economies, which implies that the Gulf economies are classified as natural resources-oil-based economies (rent-seeking economies), rather than knowledge based economies. Since these issues are not adequately discussed in the Gulf literature, we fill the gap in the Gulf literature by explaining the relative progress, challenges, opportunities and the observed knowledge gap within Gulf countries. As the Gulf countries show considerable differences from the other Arab countries, mainly, concerning some indicators such as structure and size of the economy, level of income and structure of labour market, it might be useful to examine them separately. Hence, we provide a more specific analysis that focuses only on Arab Gulf countries. Moreover, we support the efforts aim to enhance the knowledge-based economies in Arab Gulf countries.

Regarding research method, we use the descriptive and comparative methods of analysis. We use the OECD (1996) framework and definition of a knowledge-based economy"- economies which are directly based on production, distribution and use of knowledge and information. Also we use the World Bank framework and definition of Knowledge Index (KI) and Knowledge Economy Index (KEI) and KEI four pillars related to the knowledge economy - economic incentive and institutional regime, education and human resources, the innovation system and Information and Communication Technology (ICT) pillars.

The rest of this paper is organized as follows: Section 2 presents the conceptual framework and literature review. Section 3 shows the general socio-economic characteristics of Arab Gulf countries. Section 4 explains the progress in transition to knowledge-based economies over the period (1995-2013) in the Arab Gulf countries. Section 5 discusses the major challenges and opportunities in transition to knowledge-based economies in Arab Gulf countries. Finally, Section 6 provides the conclusions and policy recommendations.

2. CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

In the recent years the world economy is witnessing a fundamental structural change driven by globalization and ICT leading to a new economic system characterizing by increasing importance of knowledge. Hence, knowledge creation, accumulation and acceleration is intensified the pace of scientific and technological progress and has been at the heart of economic growth literature. The definition of knowledge in the literature is based on the distinction between codified and tacit knowledge (Dasgupta and David, 1994), and embodied flows (knowledge incorporated in to machinery and equipment) and disembodied flows of knowledge (the use of knowledge transmitted via education systems, scientific and technical literature, consultancy, movement of personnel). Often investment in knowledge refers to public spending on education, training, R&D and ICT.

Drucker (1998) argues that “*knowledge has become the key economic resource and the dominant—and perhaps the only—source of competitive advantage*”. Powell and Snellman (2004) define the knowledge economy as production and services based on knowledge-intensive activities that contribute to an accelerated pace of technical and scientific advance, as well as rapid obsolescence. The key component of a knowledge economy is a greater reliance on intellectual capabilities than on physical inputs or natural resources.³ David and Foray (2001) discuss knowledge-based communities as agents of economic change, they find that knowledge-based activities emerge when people, supported by information and communication technologies, interact in concerted efforts to co-produce (i.e. create and exchange) new knowledge, new information and communication technologies are intensively used to codify and transmit the new knowledge. Therefore, a knowledge intensive community is one wherein a large proportion of members are involved in the production [and] reproduction of knowledge. According to OECD (1996) the term “*knowledge-based economy*” results from a fuller recognition of the role of knowledge and technology in economic growth. Knowledge, as embodied in human beings (as “*human capital*”) and in technology, has always been central to economic development. OECD (1996) discusses “*knowledge-based economies*” – economies which are directly based on the production, distribution and use of knowledge and information. The OECD economies are increasingly based on knowledge and information and are more strongly dependent on the production, distribution and use of knowledge than ever before. Indeed, it is estimated that more than 50 per cent of Gross Domestic Product (GDP) in the major OECD economies is now knowledge-based. This is reflected in the trend in OECD economies towards growth in high-technology investments, high-technology industries, more highly-skilled labour and associated productivity gains.⁴

The conceptual framework discussed in the international literature, implies the distinction between knowledge-based economies and resource-based economies. According to OECD (1996) knowledge-based economies- are economies which are directly based on production, distribution and use of knowledge and information, with important role of information, technology and learning in economic performance (cf. OECD, 1996). While a resource-based economy is the economy of a country whose gross national product or gross domestic product to a large extent comes from natural resources (e.g. oil and gas). Gorzelak (2001) defines a framework of knowledge-based economy based on the distinction between the old paradigm (resource driven economies) and the new paradigm (knowledge driven economies). Gorzelak (2001) argues that applying the concepts of the knowledge economy to urban management suggests the need for a paradigm shift from resource driven urban economies to knowledge driven urban economies (see Figure 1).

³ See Powell and Snellman (2004), p. 199.

⁴ See OECD (1996), pp. 3, 7, 9, 18-19.

Figure 1- Knowledge Economy as an Agent of Change in Cities

Old Paradigm Resource driven economies	New Paradigm Knowledge driven economies
Quantitative factors Labor Raw materials Premises Bulk transportation Energy	Qualitative factors Qualifications Research and development Local suppliers Reliable infrastructure Good living conditions
Subsidization Tax allowances Grants and direct subsidies Low user charges and rents	Entrepreneurial Friendly and stable policy environment Effective and honest promotion Competitive attraction of capital, innovation and qualified labour

Source: Adapted from Gorzelak (2001).

The World Bank uses Knowledge Index (KI) and Knowledge Economy Index (KEI) to compare knowledge across the world countries. According to the World Bank, KI measures a country's ability to generate, adopt and diffuse knowledge. KI indicates overall potential of knowledge development in a given country. KEI takes into account whether the environment is conducive for knowledge to be used effectively for economic development. It is an aggregate index that represents the overall level of development of a country or region towards the Knowledge Economy.⁵ According to the World Bank (2011) the term Knowledge Economy has been coined to reflect this increased importance of knowledge. Framework for a Knowledge-based Economy consisting of four pillars help countries articulate strategies for their transition to a knowledge economy: economic incentives regime, education and human resources, the innovation system and information and communication technology (ICT). Making effective use of knowledge in any country requires developing appropriate policies, institutions, investments and coordination across the four functional areas.⁶ According to OECD (1996) government policies, particularly those relating to science and technology, industry and education, will need a new emphasis in knowledge-based economies. Need for recognition of the central role of the firm, the importance of national systems and the requirements for infrastructures and incentives which encourage investments in research and training. Among the priorities, special emphasis should be given to enhancing knowledge diffusion, upgrading human capital and promoting organizational change. Governments can provide the conditions and enabling infrastructures for these changes through appropriate financial, competition, information and other policies.⁷

The literature indicates the experience of transition to knowledge based economy in some countries. For instance, Suh and Chen (2007) examine Korea's transition toward knowledge economy and indicate that Korea has emerged as a knowledge economy powerhouse in a very

⁵ The KEI is calculated based on the average of the normalized performance scores of a country or region on all four pillars related to the knowledge economy - economic incentive and institutional regime, education and human resources, the innovation system and ICT. The Economic incentive and institutional regime pillar includes tariff and nontariff barriers, regulatory quality and rule of law. The education and human resources pillar includes average years of schooling, secondary enrollment and tertiary enrollment. The innovation system pillar includes royalty and license fees payments and receipts, patent applications granted by the US Patent and Trademark Office and scientific and technical journal articles. Information and Communication Technology (ICT) pillar includes fixed telephones, mobile and internet users. Methodologically, the KI is the simple average of the normalized the key variables in three Knowledge Economy pillars – education and human resources, the innovation system and information and communication technology (ICT). For the purposes of calculating KI and KEI, each pillar is represented by three key variables, see (www.worldbank.org): See the World Bank- KEI, 2012: <http://siteresources.worldbank.org/INTUNIKAM/Images/KEIindex.jpg>.

⁶ See the World bank (2011) "Knowledge for Development" accessed January 23, 2013.

⁷ See OECD (1996), pp. 3, 7, 9, 18-19.

short period of time. Korea had achieved this knowledge-based growth by investing heavily in education and training, boosting innovation through intensive research and development, developing a modern and accessible information infrastructure, all coupled with a stable economic [growth since the 1960s] and conducive institutional regime that enabled the knowledge-related investments to flourish. Due to this, Korea has ably made its transition to a knowledge economy that uses knowledge as the key engine of growth. Korea successful knowledge-based development experience offers many valuable lessons for developing economies. Kuznetsov and Dahlman (2008) examine Mexico's transition to a knowledge-based economy, indicating the importance of education, institutional reform creating an environment conducive to innovation.⁸

3. GENERAL SOCIO-ECONOMIC CHARACTERISTICS OF THE ARAB GULF COUNTRIES

Based on the above framework and before examining the challenges impede the knowledge based economies in Gulf countries, in this section it is useful to begin with the general socio-economic characteristics of Gulf countries. Table 1 shows the general socio-economic and development characteristics of Gulf countries and world regions as measured by (economic growth (GNI per capita), life expectancy, mean years of schooling, literacy rate and gross enrolment ratios. In general, the Gulf countries are characterized by a small population (except Saudi Arabia) and a high GDP/GNI per capita. Table 1 illustrates that the Gulf countries exhibit higher standards of economic development and growth indicators (as measured by GNI per capita and human development index (HDI)). Moreover, according to the World Bank classification all Gulf countries rank as high income countries- see Table 1 below. Moreover, the UNDP human development indicators show that the average GDP per capita in all the Gulf countries is higher than the average for Arab countries generally and the world average. Among the Gulf countries, Qatar, the United Arab Emirates, Kuwait and Bahrain show relatively good performance economically and in terms of human development indicators compared to Saudi Arabia and Oman, GDP per capita income being highest in Qatar (PPP US\$ 87 478 in 2012) and lowest in Saudi Arabia (PPP US\$ 11 474). (see Figure 2). At the international level, the Gulf countries have strategic importance in the global economy because the region holds 40 per cent of world oil supplies (Devlin, 1998) and therefore affects the trends of oil supply and market.⁹ This implies oil based-economies and the higher reliance of Gulf countries on oil rents and international oil markets. Oil revenues facilitate progress in GDP and HDI (see Figures 2-3). By regional standard, Arab Gulf countries have maintained their positions as the strongest Arab economies. Arab Gulf

⁸ See Suh and Chen (2007), Accessed June 15, 2013. See also Kuznetsov and Dahlman (2008), Accessed June 15, 2013.

⁹ Fasano and Iqbal (2003) indicate that the Gulf region accounts for about 45 per cent of the world's proven oil reserves and 25 per cent of crude oil exports (Saudi Arabia is the largest oil exporter). The region possesses at least 17 per cent of the proven global natural gas reserves (Qatar has become the fourth-largest exporter of liquefied natural gas). See also Nour (2011) pp. 392-393.

countries (total population 45.9 million people) representing around 12.85 per cent of the Arab population, and contributes with 46.85 per cent of the total Arab GDP and (see Figure 4-5).

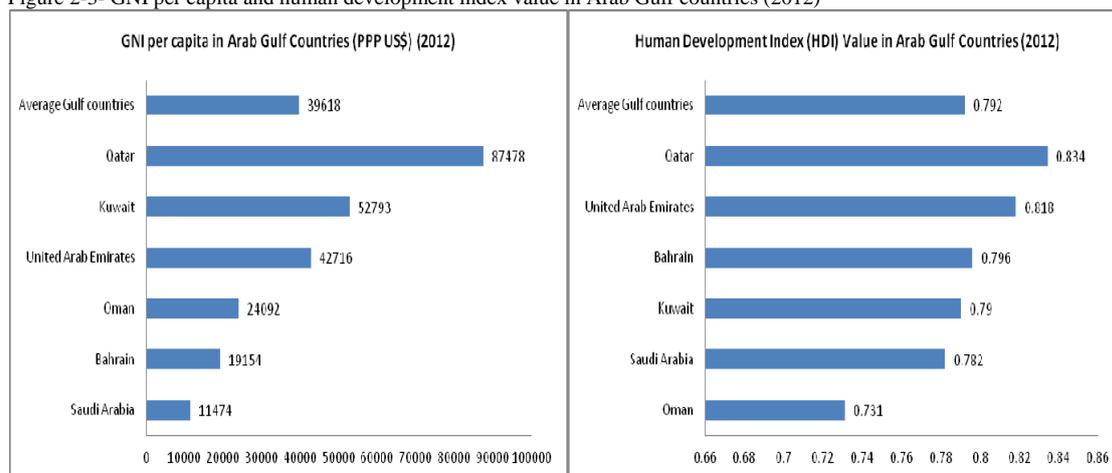
Table 1- General socio-economic characteristics of Arab Gulf countries compared to world regions (2002-2012)

	Population Total (millions)	GNI per capita (PPP ² US\$)	Human Development Index (HDI) Value	Life expectancy at birth (years)	Mean years of schooling (years)	Expected years of schooling (years)	Adult literacy rate (% ages 15 and older)	Gross enrolment ratio			
								Population with at least secondary education	Primary (%)	Secondary (%)	Tertiary (%)
	2012	2012	2012	2012	2010	2011	2005–2010	2010	2002–2011	2002–2011	2002–2011
Gulf countries											
Saudi Arabia	28.7	11,474	0.782	73.6	10.6	14	86.6	54.6	106	101	36.8
United Arab Emirates	8.1	42,716	0.818	76.7	8.9	12	90	64.3	104	92	22.5
Bahrain	1.4	19,154	0.796	75.2	9.4	13.4	91.9	78	107	103	..
Oman	2.9	24,092	0.731	73.2	5.5	13.5	86.6	53.9	105	100	24.5
Qatar	1.9	87,478	0.834	78.5	7.3	12.2	96.3	63.4	103	94	10
Kuwait	2.9	52,793	0.79	74.7	6.1	14.2	93.9	48.9	106	101	21.9
Average Gulf countries (45.9) ¹		39618	0.792	75.3	8.0	13.2	90.9	60.5	105.2	98.5	23.1
Human Development Index groups											
Very high human development	1,134.30	33,391	0.905	80.1	11.5	16.3	..	85.9	104.2	100.4	75.8
High human development	1,039.20	11,501	0.758	73.4	8.8	13.9	92.7	64.2	110.5	91	48.7
Medium human development	3,520.50	5,428	0.64	69.9	6.3	11.4	82.3	50.5	113.4	70.7	22.1
Low human development	1,280.70	1,633	0.466	59.1	4.2	8.5	60.8	25.2	98.2	37.4	6.8
Regions											
Arab States	357.3	8,317	0.652	71	6	10.6	74.5	38.4	97.7	71.1	24.1
East Asia and the Pacific	1,991.40	6,874	0.683	72.7	7.2	11.8	93.8	..	111	78.8	26.1
Europe and Central Asia	481.6	12,243	0.771	71.5	10.4	13.7	98.1	83.5	99.9	91.2	57.5
Latin America and the Caribbean	597.7	10,300	0.741	74.7	7.8	13.7	91.3	50.4	115.9	90.9	42.5
South Asia	1,753.00	3,343	0.558	66.2	4.7	10.2	62.8	39.2	113.6	57.6	15.7
Sub-Saharan	852.5	2,010	0.475	54.9	4.7	9.3	63	29.7	100.3	40.3	6.2
Least developed countries	870.4	1,385	0.449	59.5	3.7	8.5	60.7	..	101.8	36	6.6
World	7,052.10	10,184	0.694	70.1	7.5	11.6	81.3	57.7	107.9	71.2	28.7

Source: UNDP Human Development Report (2013), pp. 146-147, 173, 196-197.

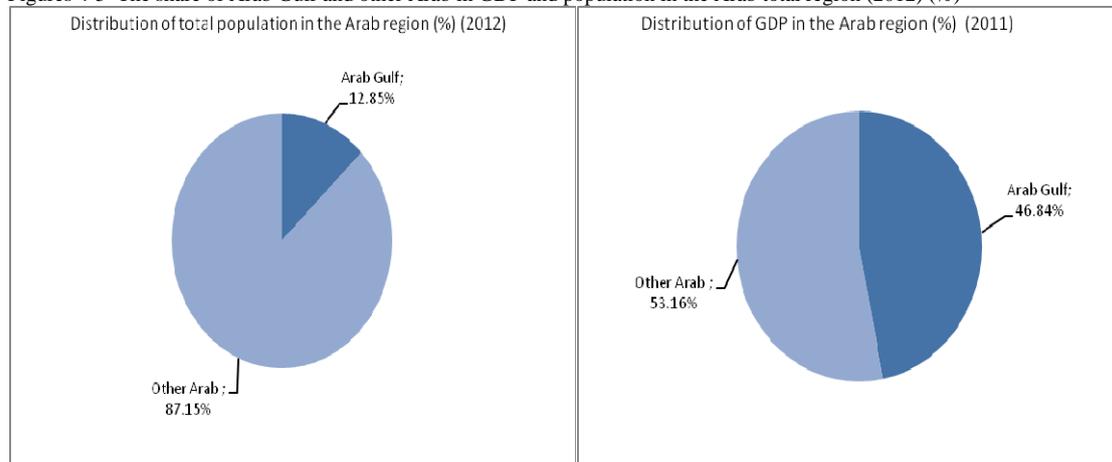
Note: (1) amount refers to total Gulf countries; (2) PPP refers to purchasing power parity

Figure 2-3- GNI per capita and human development index value in Arab Gulf countries (2012)



Sources: Adapted from (1) IMF (2013) and (2) UNDP-HDR (2013)

Figures 4-5–The share of Arab Gulf and other Arab in GDP and population in the Arab total region (2012) (%)



Source: Adapted from UNDP-HDR (2013)

4. DEVELOPMENT OF KNOWLEDGE BASED ECONOMY IN ARAB GULF COUNTRIES

Based on the above background, and in view of recent interest in Arab Gulf countries to accelerate transition to knowledge economies, it is interesting and relevant to examine development of knowledge based economy in Arab Gulf countries. This section discusses the research question and hypothesis concerning progress in transition to knowledge-based economies in Arab Gulf countries using the World Bank knowledge index and knowledge economy index and the OECD (1996) definition of a knowledge-based economy.

Generally, the performance and progress of Arab Gulf countries in transition to knowledge-based economies appears from the World Bank Knowledge Index (KI) and Knowledge economy index (KEI) over the period (1995-2012). Knowledge economy index reflects the change in performance of Arab Gulf countries on all four pillars related to knowledge economy - economic incentive and institutional regime, education and human resources indicators, innovation system and ICT (see Table 2 and Figures 6-13).

The performance of Arab Gulf countries regarding Knowledge index (KI) implies that in 2012 the United Arab Emirates (7.09) ranked at the top in the Arab Gulf countries, followed by Bahrain (6.98), Saudi Arabia (6.05), Oman (5.87), Qatar (5.5) and Kuwait (5.15) respectively. The average performance of Arab Gulf countries (6.11) is above the Arab countries (4.21) and Middle East and North Africa region (4.51), but below North America (8.7), and Europe and Central Asia (7.64). The trend of the performance regarding Knowledge index (KI) implies that in 2012 compared to 2000 the score value shows slight improvement in the average of Arab Gulf countries (0.59) and in the United Arab Emirates (1.53), Saudi Arabia (1.38), Oman (1.34) and Bahrain (0.32), but it shows slight deterioration in Qatar (-0.31) and Kuwait (-0.73).

The performance concerning the Knowledge economy index (KEI) implies that the United Arab Emirates (6.94) ranked at the top in Arab Gulf countries, followed by Bahrain (6.9), Oman (6.14), Saudi Arabia (5.96), Qatar (5.84) and Kuwait (5.33) respectively. The average performance of Arab Gulf countries (6.19) is above Arab countries (4.17), Middle East and North Africa region (4.74), the World (5.12), Latin America (5.15), East Asia and the Pacific (5.32), but below North America (8.8), and Europe and Central Asia (7.47). The trend of the performance regarding Knowledge economy index implies that in 2012 compared to 2000 the score value shows slight improvement in the average of Gulf countries (0.36) and in Saudi Arabia (1.36), United Arab Emirates (0.89), Oman (0.86) and Bahrain (0.05), but it shows slight deterioration in Qatar (-0.17) and Kuwait (-0.38).

The performance regarding the economic incentive regime and institutional system pillar implies that Oman (6.96), ranked at the top in the Arab Gulf countries, followed by Qatar (6.87), Bahrain (6.69), the United Arab Emirates (6.5), Kuwait (5.86) and Saudi Arabia (5.68)

respectively. The average performance of Arab Gulf countries (6.43) is above the Arab countries (4.30), Middle East and North Africa region (5.41), the World (5.45), Latin America (4.66) and East Asia and the Pacific (5.75), but below North America (9.11), and Europe and Central Asia (6.95). The trend of the performance regarding economic incentive regime pillar implies that in 2012 compared to 2000 the score value shows slight improvement in both Saudi Arabia (1.28) and Qatar (0.23), but shows slight deterioration in the average of Gulf countries (-0.32) and in Oman (-0.55), Bahrain (-0.76), the United Arab Emirates (-1.01), and Kuwait (-1.14).

The performance concerning innovation system pillar, implies that the United Arab Emirates (6.6) ranked at the top in Arab Gulf countries, followed by Qatar (6.42), Oman (5.88), Kuwait (5.22), Bahrain (4.61) and Saudi Arabia (4.14) respectively. The average performance of Gulf countries (5.48) is above only the Arab countries (3.98), but below North America (9.45), Europe and Central Asia (8.28), and even below Middle East and North Africa region (6.14), the World (7.72), Latin America (5.80), East Asia and the Pacific (7.43). The trend of the performance regarding innovation pillar implies that in 2012 compared to 2000 the score value shows slight improvement in the average of Gulf countries (0.47) and in the United Arab Emirates (2.28), Oman (1.63) and Qatar (0.91), but shows slight deterioration in Saudi Arabia (-0.1), Kuwait (-0.16) and Bahrain (-1.76).

The performance regarding the education and human resources indicators pillar implies that Bahrain (6.78) ranked at the top in Gulf countries, followed by United Arab Emirates (5.8), Saudi Arabia (5.65), Oman (5.23), Kuwait (3.7) and Qatar (3.41) respectively. The average performance of Gulf countries (5.10) is above the average for Arab countries (3.72), Middle East and North Africa region (3.48), the World (3.72) and East Asia and the Pacific (3.94), but below North America (8.13), Europe and Central Asia (7.13) and Latin America (5.11). The trend of the performance regarding education pillar implies that in 2012 compared to 2000 the score value shows slight improvement in average Gulf countries (0.22), in Saudi Arabia, (1.37), United Arab Emirates (1.36), Oman (1.01), and Bahrain (0.44), but shows slight deterioration in both Qatar (-1.44) and Kuwait (-1.47).

The performance concerning the ICT pillar implies that Bahrain (9.54) ranked at the top in Arab Gulf countries, followed by United Arab Emirates (8.88), Saudi Arabia (8.37), Qatar (6.65), Kuwait (6.53) and Oman (6.49) respectively. The average performance of Arab Gulf countries (7.74) is above the average for Arab countries (4.83), Middle East and North Africa region (3.92), the World (3.58), Latin America (5.02), East Asia and the Pacific (4.14), and even Europe and Central Asia (7.5), but below only North America (8.51). The trend of the performance regarding ICT pillar implies that in 2012 compared to 2000 the score value shows slight improvement in the average of Gulf countries (1.08) and in Saudi Arabia (2.88), Bahrain

(2.28), Oman (1.37), and the United Arab Emirates (0.96), but shows slight deterioration in both Qatar (-0.4) and Kuwait (-0.56).

By regional standard, according to the World Bank the Knowledge Index the regional performance in terms of KI and KEI implies that the United Arab Emirates (UAE) is ranked at the top in the Gulf and Arab region and at 42nd globally, followed by Bahrain, which is ranked at the second place in the Gulf and Arab region and at 43 globally, followed by Oman, which is ranked at the third place in the Gulf and Arab region and is ranked 47th globally, followed by Saudi Arabia, which is ranked at the fourth place in the Gulf and Arab region, and is ranked 50th globally, followed by Qatar which is ranked at the fifth place in the Gulf and Arab region, and is ranked 54th globally, and finally Kuwait, which is ranked at the sixth place in the Gulf and Arab region, and is ranked 64th globally respectively (see Table 2 and Figures 6-13). The trend in terms of performance as measured by ranking of countries over the period (2000-2012) implies slight improvement in three Arab Gulf countries, namely: Saudi Arabia (26), Oman (18), and the UAE (6) respectively, while, slight deterioration is reported in other three Arab Gulf countries, namely, Bahrain (-2), Qatar (-5) and Kuwait (-18) respectively.

The UAE is ranked at the top in Arab Gulf countries in terms of knowledge index and knowledge economy and innovation system pillar, Bahrain is ranked at the top in Arab Gulf countries in terms of education and human resources indicators pillar, and ICT pillar, and Oman is ranked at the top in Arab Gulf countries in terms of economic incentives and institutional system pillar (see Table 2 and Figures 6-13). These indicators imply that the relative improved progress was achieved by the Arab Gulf oil economies compared to other Arab countries and economies in the Arab region.

The World Bank (2012) puts Saudi Arabia at the top of the economies with large improvements and reversals. It confirms that *"of the 146 economies included in the KAM, Saudi Arabia made the most progress since 2000. With a KEI of 5.95, it climbed 26 positions to rank 50th in the 2012 KEI. Significant improvements in gross secondary enrolment rates have led to Saudi Arabia's education pillar leaping an impressive 30 spots to 58th place. In addition, the rapid growth in telephone, computer, and Internet penetrations has led to a substantial strengthening of its ICT pillar ([Table 3])"*. Moreover, the World Bank (2012) indicates that *"with significant improvements in the innovation, education, and ICT pillars, Oman has jumped 18 spots in the KEI rankings, to 47th place, which is the second largest improvement. Of the four pillars, the innovation pillar improved most because of a rapid increase in the number of patents registered. Significant progress in telephone, computer, and Internet penetrations has also led to a 19-spot climb in the ICT pillar to 55th position in 2012."* In addition, concerning progress in the ICT pillar, the World Bank (2012) indicates that *"soaring 39 positions in its ICT pillar ranking; Bahrain has risen impressively from 40th in 2000 to 1st position. Its number of Internet users per*

1,000 populations has grown more than tenfold, rising from 60 in 2000 to 820 in the most recent year. Its telephone and computer penetrations are also remarkably high, increasing from 580 to 2,290, and 150 to 750, respectively between 2000 and the most recent year."¹⁰

Table – 2- Knowledge index and Knowledge Economy index in Saudi Arabia and world regions (2000-2012)

Country	Change in rank from 1995 and from 2000		Rank		The Knowledge index (KI)		The Knowledge Economy index (KEI)		Economic Incentive Regime		Innovation		Education		ICT	
	2000	2012	2000	2012	2000	2012	2000	2012	2000	2012	2000	2012	2000	2012	2000	2012
Arab countries																
United Arab Emirates	-2	6	48	42	5.56	7.09	6.05	6.94	7.51	6.5	4.32	6.6	4.44	5.8	7.92	8.88
Bahrain	-5	-2	41	43	6.66	6.98	6.85	6.9	7.45	6.69	6.37	4.61	6.34	6.78	7.26	9.54
Oman	0	18	65	47	4.53	5.87	5.28	6.14	7.51	6.96	4.25	5.88	4.22	5.23	5.12	6.49
Saudi Arabia	2	26	76	50	4.67	6.05	4.6	5.96	4.4	5.68	4.24	4.14	4.28	5.65	5.49	8.37
Qatar	5	-5	49	54	5.81	5.5	6.01	5.84	6.64	6.87	5.51	6.42	4.85	3.41	7.05	6.65
Kuwait	11	-18	46	64	5.88	5.15	6.16	5.33	7	5.86	5.38	5.22	5.17	3.7	7.09	6.53
Average Gulf countries	1.83	4.17	54.17	50	5.52	6.11	5.83	6.19	6.75	6.43	5.01	5.48	4.88	5.10	6.66	7.74
Regions																
Arab region																
North America	1	0	1	1	4.14	4.21	4.12	4.17	4.21	4.30	3.93	3.98	3.69	3.72	4.73	4.83
Europe and Central Asia	3	0	2	2	7.84	7.64	7.56	7.47	6.72	6.95	8.38	8.28	7.38	7.13	7.78	7.5
East Asia and the Pacific	-1	1	4	3	5.69	5.17	5.79	5.32	6.07	5.75	7.43	7.43	3.68	3.94	5.98	4.14
Latin America	1	1	5	4	5.67	5.31	5.54	5.15	5.14	4.66	6.14	5.8	5.07	5.11	5.8	5.02
World	-2	-2	3	5	6.06	5.01	5.95	5.12	5.61	5.45	7.75	7.72	3.89	3.72	6.53	3.58
Middle East and North Africa	1	0	6	6	5.07	4.51	5.16	4.74	5.41	5.41	6.44	6.14	3.8	3.48	4.97	3.92
South Asia	-4	1	8	7	2.7	2.77	2.98	2.84	3.79	3.05	3.56	4.23	2.22	2.17	2.33	1.9
Africa	1	-1	7	8	3	2.43	3.04	2.55	3.13	2.91	3.95	3.95	1.7	1.44	3.36	1.9

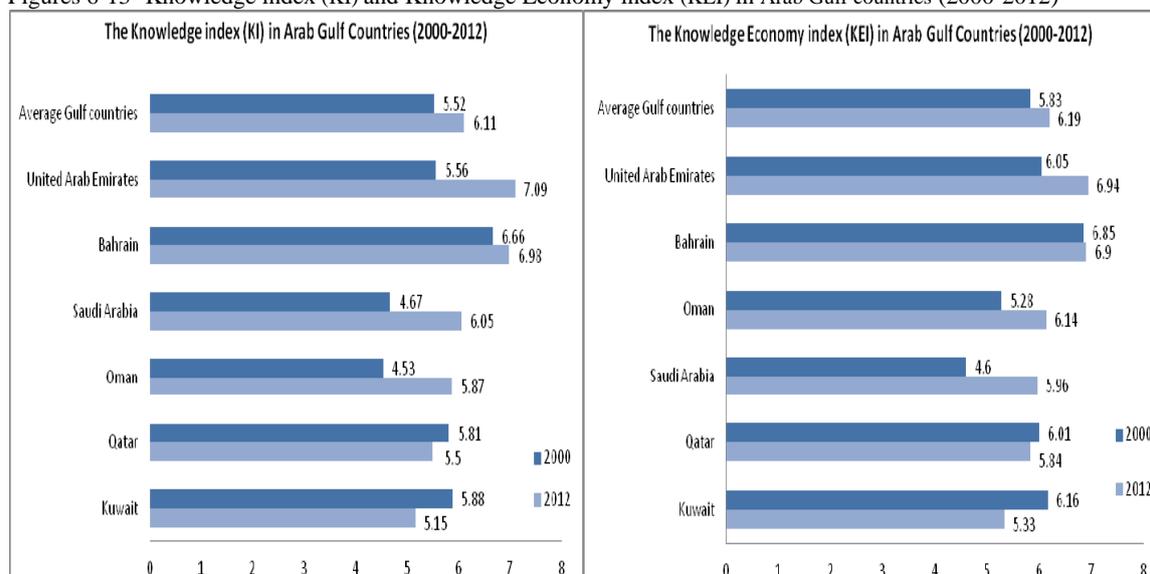
Source: The World Bank (2012).

Table 3 - Improvements in KEI Rankings – Top 10 Countries

Country/Economy	KEI Rank Change	KEI 2012 Rank	KEI 2012	EIR Rank Change	EIR 2012 Rank	Innovation Rank Change	Innovation 2012 Rank	Education Rank Change	Education 2012 Rank	ICT Rank Change	ICT 2012 Rank
Saudi Arabia	26	50	5.96	17	60	0	84	30	58	45	21
Oman	18	47	6.14	-9	44	26	57	15	74	19	55
Macedonia, FYR	16	57	5.65	34	59	10	69	-12	78	17	48
Azerbaijan	15	79	4.56	24	103	14	89	8	53	26	78
Albania	14	82	4.53	50	71	8	101	-16	83	37	72
Algeria	14	96	3.79	23	115	6	99	21	71	21	89
Rwanda	14	127	1.83	45	95	10	134	2	137	3	143
Belarus	11	59	5.59	21	114	5	60	-1	33	20	47
Romania	9	44	6.82	20	40	10	53	19	29	5	59
Russian Federation	9	55	5.78	15	117	11	40	-17	44	19	44

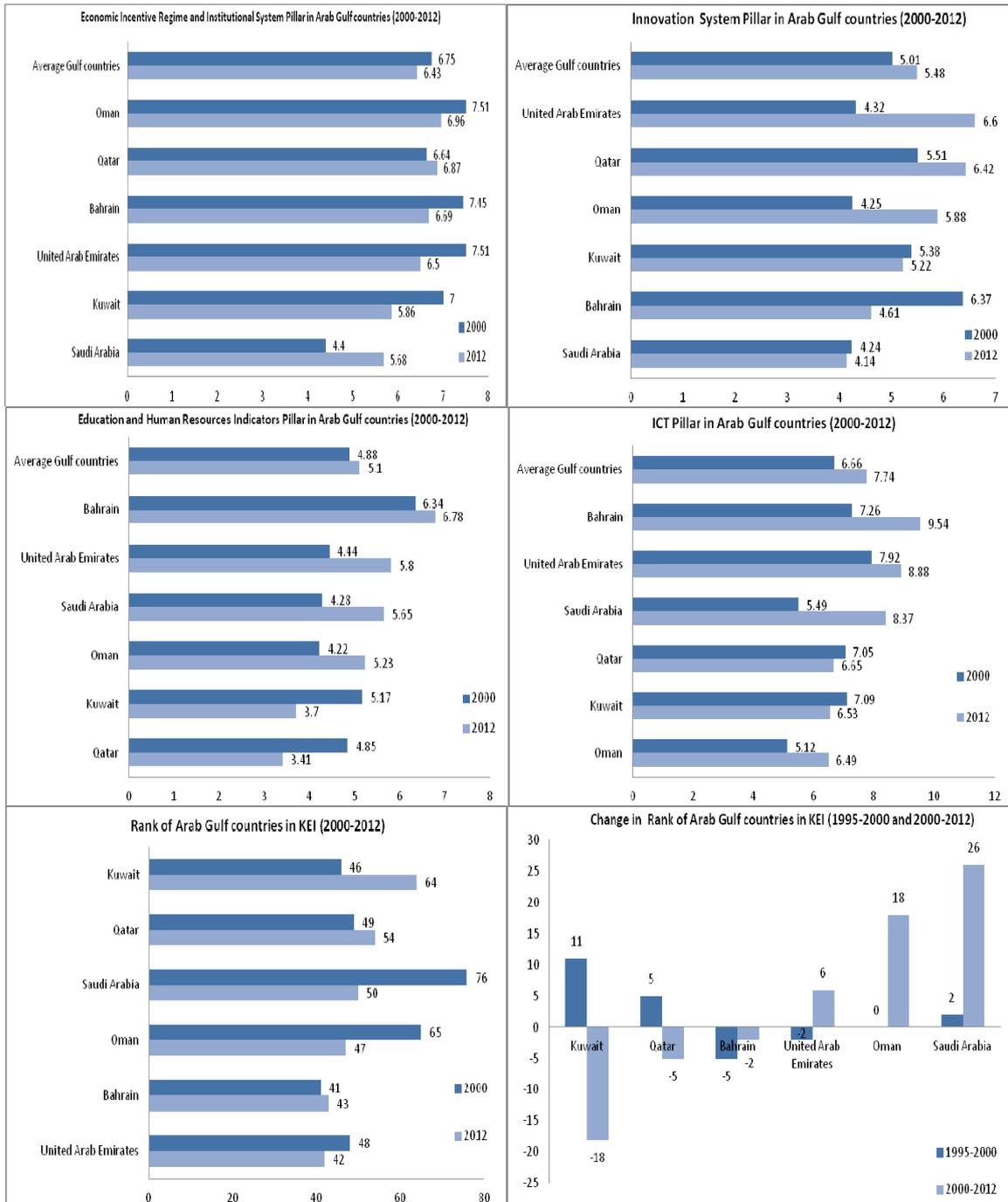
Source: KAM 2012. Reconstructed from the KAM's "KEI and KI indexes" mode (www.worldbank.org/kam)¹¹

Figures 6-13- Knowledge index (KI) and Knowledge Economy index (KEI) in Arab Gulf countries (2000-2012)



¹⁰ See Knowledge Economy Index (KEI) 2012 Rankings: The World Bank's Knowledge Assessment Methodology (KAM: www.worldbank.org/kam): <http://siteresources.worldbank.org/INTUNIKAM/Resources/2012.pdf>, accessed February 2014.

¹¹ See Knowledge Economy Index (KEI) 2012 Rankings: The World Bank's Knowledge Assessment Methodology (KAM: www.worldbank.org/kam): <http://siteresources.worldbank.org/INTUNIKAM/Resources/2012.pdf>, p.7. February 2014.



Source: Adapted from the World Bank (2012), Nour (2013a, b)

The weak performance and deterioration in terms of innovation in Arab Gulf countries that appears from the performance in the World Bank KI and KEI, as explained above, also appears from the performance in terms of Global Innovation Index (GII) issued by INSEAD (2012-2013). Mainly, that appears in score value and ranking of global indicators of innovation related to knowledge in Arab Gulf countries compared to other world countries, which implies that the score value and rank of some Arab Gulf countries deteriorated and for other improved by both international and regional standards over the period (2012-2013). For instance, in the

International Standard Classification the performance and place of Arab Gulf countries in GII ranking over the period (2012-2013) implies that the United Arab Emirates is ranked at the top in the Arab and Gulf regions and is ranked (38) globally, followed by Saudi Arabia that ranked (42) globally, Qatar that ranked (43) globally, Kuwait that ranked (50) globally, Bahrain that ranked (67) globally, and then Oman that ranked (80) globally. The trend of the performance regarding GII ranking implies that in 2013 compared to 2012 the ranking shows slight improvement in both Saudi Arabia (6) and Kuwait (5), but shows slight deterioration in the United Arab Emirates (-1), Qatar (-10), Bahrain (-26) and Oman (-33) (see Table 4 and Figures 14-22). The poor performance in innovation also appears from the poor progress in terms of score value of GII. For instance, the performance of Arab Gulf countries regarding GII score value implies that in 2013 the United Arab Emirates (41.9) ranked at the top in the Arab Gulf countries, followed by Saudi Arabia (41.2), Qatar (41), Kuwait (40), Bahrain (36.1) and Oman (33.3) respectively. The trend of the performance regarding GII implies that in 2013 compared to 2012 the score value shows slight improvement in both Kuwait (2.8) and Saudi Arabia (1.9), but shows slight deterioration in the United Arab Emirates (-2.5) and Qatar (-4.5), Bahrain (-5), Oman (-6.2), and average of Gulf countries (-2.25).

The performance of Arab Gulf countries concerning innovation input sub-index implies that in 2013 the United Arab Emirates (53.99) ranked at the top in the Arab Gulf countries, followed by Qatar (47.84), Saudi Arabia (45.89), Bahrain (44.53), Oman (43.28), and Kuwait (39.48) respectively, the average for Gulf countries (45.84). The trend of the performance regarding innovation efficiency index implies that in 2013 compared to 2012 the score value shows slight deterioration in average of Gulf countries (-4.0) and in all Arab Gulf countries, the United Arab Emirates (-1.2), Kuwait (-2.5), Saudi Arabia (-3.3), Oman (-3.6), Qatar (-6.3), and Bahrain (-6.9).

The performance of Arab Gulf countries concerning innovation output sub-index implies that in 2013 Kuwait (40.56) ranked at the top in the Arab Gulf countries, followed by Saudi Arabia (36.52), Qatar (34.17), the United Arab Emirates (29.76), Bahrain (27.74) and Oman (23.22) respectively, the average Gulf countries (32.00). The trend of the performance regarding innovation efficiency index implies that in 2013 compared to 2012 the score value shows slight improvement in both Kuwait (8.2), and Saudi Arabia (7.1), but shows slight deterioration in the average of Gulf countries (-0.5), Qatar (-2.7), Bahrain (-3.1), the United Arab Emirates (-3.8), and Oman (-8.9).

The performance of Arab Gulf countries concerning innovation efficiency index implies that in 2013 Kuwait (1) ranked at the top in the Arab Gulf countries, followed by Saudi Arabia (0.8), Qatar (0.7), the United Arab Emirates (0.6), Bahrain (0.6) and Oman (0.5) respectively, the average Gulf countries (0.7). The trend of the performance regarding innovation efficiency index

implies that in 2013 compared to 2012 the score value shows slight improvement in both Kuwait (0.2) and Saudi Arabia (0.2), and average of Gulf countries (0.03), but shows slight deterioration in Oman (-0.2), and remain the same in the United Arab Emirates, Bahrain and Qatar. The performance in the top Kuwait is twice the performance in the bottom Bahrain.

Global Innovation Index Report (2013) shows that *"Four of the six countries of the Gulf Cooperation Council (GCC) come next: the United Arab Emirates (38th) and Saudi Arabia (42nd) both surpass Qatar (43rd), which came 1st in the region in 2012, while Kuwait (50th) surpasses both Bahrain (67th) and Oman (80th, down from 47th in 2012). With per capita incomes ranging from PPP\$25,722 (Saudi Arabia) to PPP\$102,768 (Qatar), most GCC economies achieve rankings that are below those of their peers in GDP per capita (Saudi Arabia to a minor extent), a feature common to most resource-rich economies. Although GCC countries appeared all together in a block right after Israel and Cyprus in 2012, the regional rankings are now more dispersed: Bahrain comes behind Armenia (59th) and Jordan (61st). Oman comes behind Turkey (68th), Tunisia (70th), Georgia (73rd), and Lebanon (75th). Oman, Algeria, Kuwait, the United Arab Emirates, Bahrain, Yemen, the Syrian Arab Republic, Azerbaijan, Egypt, and Lebanon show below-par performances compared to their income levels."*¹²

The GII reports (2009-2013) show the performance of Arab Gulf countries concerning some indicators related to knowledge absorption, creation, impact and diffusion. The use of GII reports (2009-2013) and application of the OECD (1996) definition of knowledge-based economies- economies which are directly based on production, distribution and use of knowledge and information, also imply slight improvement in the performance concerning progress in transition to knowledge-based economy in Arab Gulf countries that appears from slight improvement in knowledge creation, knowledge diffusion and knowledge impact (see Table 4). Mainly, the trend over the period (2011-2013) implies that the performance of Arab Gulf countries has improved in some indicators, but has deteriorated in other indicators (see Table 4 and Figures 14-22).

The performance of Arab Gulf countries regarding knowledge absorption implies that in 2013 Saudi Arabia (26.8) ranked at the top in the Arab Gulf countries, followed by the United Arab Emirates (20.7), Bahrain (18), Oman (11.7), Qatar (10) and Kuwait (9.9) respectively, average Gulf countries (16.2). The trend of the performance regarding knowledge absorption implies that in 2013 compared to 2012 the score value shows great deterioration in all Arab Gulf countries: Bahrain (-10.1), the United Arab Emirates (-14.1), Saudi Arabia (-14.2), Kuwait (-23.2), Oman (-24.5), and Qatar (-55.0) respectively and average Gulf countries (-23.5). The performance in the top Saudi Arabia is twice (2.7) times the performance in the bottom Kuwait.

¹² See the Global Innovation Index Report (2013), p. 32.

The performance of Arab Gulf countries concerning knowledge creation implies that in 2013 Saudi Arabia (10.2) ranked at the top in the Arab Gulf countries, followed by United Arab Emirates (7.2), Kuwait (7.1), Qatar (5.4), Oman (4.6) and Bahrain (2.6) respectively, average Gulf countries (6.18). The trend of the performance regarding knowledge creation implies that in 2013 compared to 2012 the score value shows slight improvement in Saudi Arabia (7.5), Qatar (3.9) and Kuwait (2.0), but shows slight deterioration in Bahrain (-16.7), Oman (-18.2), and the United Arab Emirates (-21.0), and average of Gulf countries (-7.1). The performance in the top Saudi Arabia is near to four times (3.92) the performance in the bottom Bahrain.

The performance of Arab Gulf countries regarding knowledge impact implies that in 2013 Qatar (45.4) ranked at the top in the Arab Gulf countries, followed by Saudi Arabia (38.6), Kuwait (32.6), Oman (29), Bahrain (27.7) and the United Arab Emirates (25.9), respectively, the average Gulf countries (33.20). The trend of the performance regarding knowledge impact implies that in 2013 compared to 2012 the score value shows slight improvement in both Kuwait (14.2) and Saudi Arabia (13.2), but shows slight deterioration in the United Arab Emirates (-1.8), Oman (-3.0), Bahrain (-12.0), Qatar (-28.8), and average of Gulf countries (-3.0). The performance in the top Qatar is near to twice (1.75) the performance in the bottom the United Arab Emirates.

The performance of Arab Gulf countries concerning knowledge diffusion implies that in 2013 Kuwait (75.6) ranked at the top in the Arab Gulf countries, followed by Bahrain (36.2), Oman (19), Saudi Arabia (18.3), Qatar (1.5) and the United Arab Emirates (0.4) respectively, the average Gulf countries (25.17). The trend of the performance regarding knowledge diffusion implies that in 2013 compared to 2012 the score value shows slight improvement in Bahrain (12.9), Kuwait (3.1), Qatar (1.5), Saudi Arabia (0.4) and the United Arab Emirates (0.1), but shows slight deterioration in Oman (-6.8), and average of Gulf countries (-2.8). The performance in the top Kuwait is 189 times the performance in the bottom the United Arab Emirates.

Moreover, the performance regarding innovation linkages implies that the United Arab Emirates is ranked at the top, followed by Qatar, Bahrain and Saudi Arabia respectively. Furthermore, the performance concerning the university/industry collaboration implies that Qatar is ranked at the top, followed by Saudi Arabia, UAE, and Oman respectively.

Therefore, our findings in this section implies relative progress to knowledge-based economy in Arab Gulf countries that appears from slight improvement in innovation efficiency index, knowledge creation index, knowledge impact index, knowledge diffusion index, this slight improvement was reduced by the observed deterioration in terms of both GII and knowledge absorption index. This implies that to improve the performance and transition to knowledge economy, it is essential for Arab Gulf countries to strengthen and improve the performance of GII and knowledge absorption index.

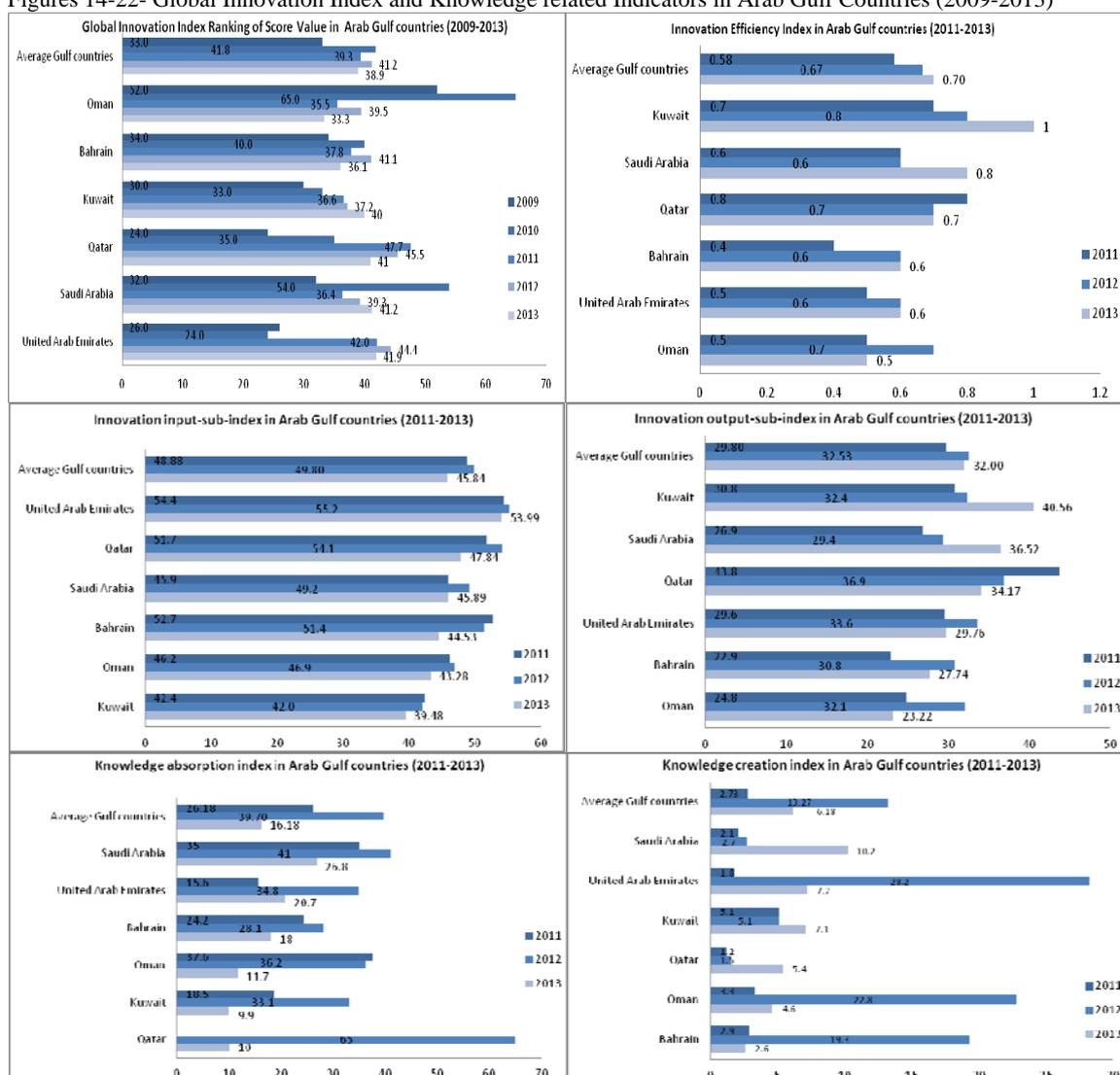
Table - 4- Global Innovation Index, knowledge indicators, capacity for innovation and localization of technology index and technological infrastructure rankings Arab Gulf countries (2009-2013)

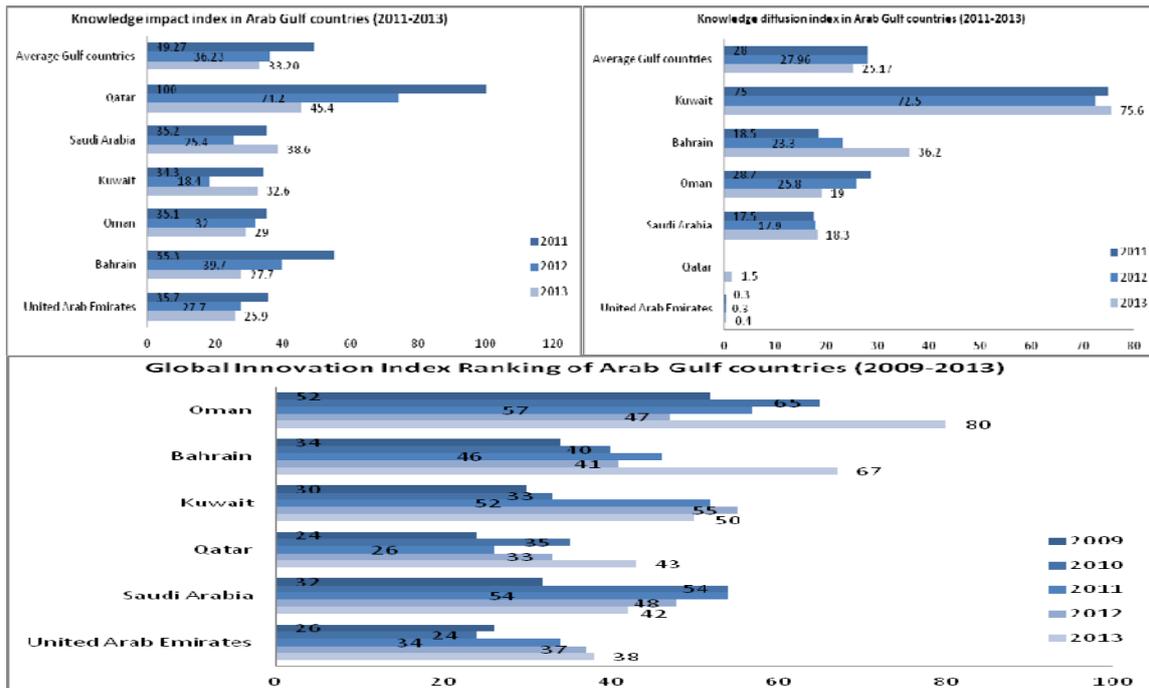
Gulf countries	Global Innovation Index ⁽¹⁾					Innovation Efficiency Index ⁽¹⁾			Knowledge absorption ⁽¹⁾			Knowledge creation ⁽¹⁾			Knowledge impact ⁽¹⁾			Knowledge diffusion ⁽¹⁾		
	2009	2010	2011	2012	2013	2011	2012	2013	2011	2012	2013	2011	2012	2013	2011	2012	2013	2011	2012	2013
Qatar	24.0	35.0	47.7	45.5	41	0.8	0.7	0.7	65	10	1.2	1.5	5.4	100.0	74.2	45.4				1.5
United Arab Emirates	26.0	24.0	42.0	44.4	41.9	0.5	0.6	0.6	15.6	34.8	20.7	1.8	28.2	7.2	35.7	27.7	25.9	0.3	0.3	0.4
Bahrain	34.0	40.0	37.8	41.1	36.1	0.4	0.6	0.6	24.2	28.1	18	2.9	19.3	2.6	55.3	39.7	27.7	18.5	23.3	36.2
Oman	52.0	65.0	35.5	39.5	33.3	0.5	0.7	0.5	37.6	36.2	11.7	3.3	22.8	4.6	35.1	32.0	29.0	28.7	25.8	19
Saudi Arabia	32.0	54.0	36.4	39.3	41.2	0.6	0.6	0.8	35.0	41.0	26.8	2.1	2.7	10.2	35.2	25.4	38.6	17.5	17.9	18.3
Kuwait	30.0	33.0	36.6	37.2	40	0.7	0.8	1	18.5	33.1	9.9	5.1	7.1	34.3	18.4	32.6	75.0	72.5	75.6	
Average Gulf countries	33.0	41.8	39.3	41.2	38.9	0.58	0.67	0.7	26.1	39.7	16.2	2.73	13.2	6.2	49.27	36.23	34.0	28.0	27.96	25.2

Gulf countries	Capacity for innovation and localization of technology Index ⁽²⁾		Technological infrastructure Index ⁽²⁾		Human capital Index ⁽²⁾	
	2009	2012	2009	2012	2009	2012
Qatar		0.42		0.24		0.56
United Arab Emirates		0.16		0.21		0.59
Bahrain		0.23		0.16		0.50
Oman		0.31		0.25		0.24
Saudi Arabia		0.27		0.24		0.41
Kuwait		0.01		0.12		0.51
Average Gulf countries		0.23		0.20		0.47
Average Arab countries		0.25		0.19		0.36
Average comparable countries		0.41		0.38		0.52

Sources: (1) Global Innovation Index Reports (2009, 2010, 2011, 2012, 2013), (2) Arab Planning Institute (2009, 2012)

Figures 14-22- Global Innovation Index and Knowledge related Indicators in Arab Gulf Countries (2009-2013)





Sources: Adapted from The Global Innovation Index (GII) Reports (2009, 2010, 2011, 2012).

Finally, the performance in terms of capacity for innovation and localization of technology, technological infrastructure and human capital also reflect the progress to knowledge-based economies in Arab Gulf countries. For instance, the performance in terms of capacity for innovation and localization of technology index implies slight improvement in United Arab Emirates and Kuwait, while, slight deterioration is reported in Oman, Saudi Arabia, Bahrain, Qatar, Gulf countries (from 0.23 in 2009 to 0.20 in 2012) and Arab countries (from 0.25 in 2009 to 0.19 in 2012). The performance in terms of technological infrastructure indicators implies slight improvement in Oman, United Arab Emirates, Saudi Arabia, Bahrain, Gulf countries (from 0.47 in 2009 to 0.49 in 2012), and Arab countries (from 0.36 in 2009 to 0.37 in 2012), while, slight deterioration is reported in Kuwait and Qatar. The performance in terms of human capital indicators implies slight deterioration in Oman, United Arab Emirates, Kuwait, Saudi Arabia, Bahrain, Qatar, Arab Gulf countries (from 0.59 in 2009 to 0.57 in 2012) compared to stagnation for Arab countries (0.48 in 2009 and 2012) (see Table 4). This implies slight progress to knowledge-based economy in Arab Gulf countries that appears from slight improvement in technological infrastructure, this slight improvement was reduced by the observed deterioration in terms of both capacity for innovation, localization of technology and human capital. This implies that to improve the performance and transition to knowledge economy, it is essential for Arab Gulf countries to strengthen and improve capacity for innovation, localization of technology and human capital.

Hence, our results in this section support the first hypothesis concerning relative progress in transition to knowledge-based economy in Arab Gulf countries and third hypothesis regarding variation in transition to knowledge based economies in Arab Gulf countries.

5.1 CHALLENGES OF AND OPPORTUNITIES FOR TRANSITION TO THE KNOWLEDGE-BASED ECONOMIES IN ARAB GULF COUNTRIES

The literature confirms the economic importance of knowledge and transition to knowledge-based economy for sustainable development. This implies the importance of addressing the challenges and difficulties facing the transition to knowledge-based economies in Arab Gulf countries. Therefore, apart from the above assessment, this section explains that the transition to the knowledge-based economies in Arab Gulf countries is impeded by several social, economic, institutional and organizational obstacles and impediments.

From social and cultural perspectives, the transition to the knowledge-based economies in the Arab region is seriously impeded by the lack of cultural and social awareness about the importance of social and cultural factors for supporting the transition to the knowledge-based economies in Arab Gulf countries. Moreover, few studies in Arab and Gulf literature (cf Nour, 2005c, 2011, 2013) imply that the lack of enabling and supportive culture and social factors is probably affected by the prevailing culture and social context and also the prevailing demographic structure, mainly, the high incidence and prevalence of foreign population and workers in the Gulf countries that probably affected the prevalence of the knowledge society in the Gulf countries. Nour (2005) finds that the transfer of knowledge within society at large is probably hindered by the imbalanced structure of population and labour market. Mainly due to the excessive share of foreign workers with different nationalities, cultures, languages, etc. that probably hindered their sufficient integration and interaction with local workers and local population.

From economic perspective, since the structure of the Gulf economies is related to oil, it will be useful to explain the role of oil in creating opportunities and challenging the transition to knowledge based-economies in these countries. From economic perspective, the transition to knowledge-based economies in Arab Gulf countries is probably seriously impeded by the prevalence of the rent-seeking economic structure, mainly; the economic structure that is characterized by the rent seeking economies hampers the transition to knowledge-based economies in Arab Gulf countries. The stylized facts in the literature confirm that oil provides a significant contribution for developing the economies and social welfare in Arab Gulf countries; in particular, it leads to higher per capita income. Oil provides opportunity and challenge for transition to knowledge based economy in Arab Gulf countries. Concerning the challenge, the

heavy reliance on oil in Arab Gulf countries implies challenge for transition to knowledge based economy. Similar to typically rent-seeking and oil-based (natural resources-based) economies; the transition to knowledge-based economies in Arab Gulf countries is impeded by the prevalence of the oil based economic structure. Notably, the rent-seeking and oil-based economy implies heavy reliance of the economy on natural resources (oil and natural gas), rather than knowledge resources. This challenge of weak knowledge based economies in the Arab region is well documented in the Arab literature (cf. UNDP-AHDR, 2002; 2003; 2009; UNDP-MBRF-Arab Knowledge Report, 2009; 2010; Nour, 2010; 2013). The dominance of rent-seeking economic structure and oil-based economies in the Arab region implies great risk and uncertainty because the heavy reliance on production and export of oil implies dependence on a single, decreasing, exhaustible and non-renewable economic resource. This impedes the creation of enabling economic environment for transition to knowledge-based economy that depends on knowledge, which is an abundant and renewable economic resource that can be easily diffuse and accumulate to prevent the diminishing returns to scale and ensure the increasing returns and dynamic growth in the economy. So Arab Gulf countries face the challenge to utilize current oil revenues to build the economy on new and renewable sources of income, to facilitate transition and shift from the oil-based economy to knowledge-based economy and sustainable development in Arab Gulf countries.

Moreover, from economic perspective, Arab Gulf countries face economic challenge for allocation of the economic resources to different priorities, including, commit to the priority of transition to knowledge-based economy. The incidence of unemployment, mainly, youth unemployment in Arab Gulf countries will intensify the competition for public financial resources to be allocated amongst economic growth, human and social development issues (education, training, and youth employment), creating jobs, and supporting of knowledge institutions. Creating jobs for the growing Gulf population of working age is a top priority for the governments in Arab Gulf countries. Arab Gulf countries governments face the challenge to allocate government funds to different priorities: employment and knowledge.

From economic perspective, in view of the fact that the public sector across Arab Gulf countries is still dominant, this may hinder transition to knowledge based economies, so the Arab Gulf countries face the challenge to reinforce the role private sector plays to facilitate transition to knowledge-based economies in Arab Gulf countries.

From economic and institutional perspectives, the transition to knowledge-based economies in Arab Gulf countries is seriously impeded by poor national systems of innovation and weak capacity for innovation required for the transition to knowledge-based economies in Arab Gulf countries. Mainly, due to the lack of sound and systemic institutions, the weak institutions related to knowledge production (poor education and training institutions and

scientific research and development), little human and financial resources for S&T, lack of coherent policy to prioritize spending on R&D, resulted in insufficient spending on R&D and scientific research in Arab Gulf countries, as Arab Gulf countries is similar to other Arab countries do not spend more than 0.2 per cent of the annual GDP on research areas (see Table 5). In addition to the lack of R&D culture and lack of research and development centres, poor involvement of the private sector in research and development efforts, lack of cooperation between research centres and private sector, and lack of cooperation between Arab Gulf research centres and international research centres and limited efforts on technology transfer, localization and adaptation to fit the local needs, none of the Arab countries offered adequate and efficient national innovation systems (cf. Nour (2013c). The poor Arab systems of innovation can be attributed to many obstacles, mainly; the Arab system of innovation is hampered by major constraints. For instance, UNDP-AHDR (2003) indicates that the low spending on R&D, the relatively small number of qualified knowledge workers and number of scientists and engineers working in R&D and number of students enrolling in scientific disciplines in higher education, poor institutional support and a political and social context inimical to the development and promotion of science in the Arab states.¹³ Moreover, similar, to typically less developed countries the regional systems of innovation in the Arab region is inhibited by the deficient socio-economic infrastructure, weaker institutional frameworks, low levels of interaction, weak formal institutional, legal and regulatory frameworks, low levels of interaction among firms, as well as among different type of organizations (e.g. firms, universities, technology service providers) and the limited number of innovative enterprises cf. Nour (2013c). In addition the lack of human resources appears from the lack of researchers and lack of technical and engineering workers capable to maximize the acquisition, absorption localization and utilization of technological knowledge (see Table 4). The lack of human resources is attributed to poor educational systems, and the skills gap due to mismatch between the educational systems outcomes and job and labour market requirements. Transition to knowledge based economies in the Arab Gulf countries is extremely impeded by the poor quality of education and the high incidence of skill gap and mismatch between attained and required education (cf. UNDP-AHDR, 2002; 2003; 2009). Particularly, the impediment factors related to higher education and training are linked to low quality of the educational system, low tertiary education enrolment rate (gross tertiary enrolment rate), weak local availability of specialized research and training services and poor extent of staff training in most Arab countries. The literature shows the problem of skills gap and its impact in firm performance and marginal progress towards knowledge-based development over the last decade in the Arab region. For instance, Schwalje, (2011 a; b) find that a disconnect between the skills developed in Arab skills formation systems and those required by private sector employers

¹³ See United Nations Development Programme (UNDP)-Arab Human Development Report (AHDR) (2003). pp. 5-6, 109-113.

relegates Arab businesses to contesting lower-skilled, non-knowledge intensive industries which has stalled knowledge-based development in the region. (cf. Schwalje, 2011 a; b; Arab Knowledge Report, 2009).

From technological perspective, the transition to the knowledge-based economies in the Arab Gulf countries region is seriously impeded by poor capacity for innovation and weak technological infrastructure required for transition to the knowledge-based economies in Arab countries compared to advanced world countries (see Table 4). Despite, the relative progress in the diffusion of information technology indicators compared to other knowledge indicators, however, the challenge arises about the effective utilization of information technology for supporting the transition to knowledge-based economies in Arab Gulf countries.

From entrepreneurship perspective, the transition to the knowledge-based economies in the Arab Gulf countries is seriously impeded by the weak role of entrepreneurship and the limited contribution by the private sector and the lack of cooperation between scientific research centres in universities and production sectors (industrial and agricultural sector). An important challenge facing the transition to the knowledge-based economies is related to the existence of gap between scientific research outputs and production sectors that help consumption and marketing of scientific research outputs.

In addition to KI and KEI we examine the progress in tacit and codified sources of knowledge in Arab Gulf countries using the broad definition of knowledge found in the new growth literature that highlights both the tacit and codified components of knowledge (see Table 5). Mainly, we define tacit knowledge by the share of high skilled defined by the share of enrolment in tertiary education. We define codified knowledge by the embodied knowledge distributed in many indicators, including the share of spending on education and R&D as percentage of GDP. In addition, we use several variables related to knowledge such as patents, publications, cooperation – measured by joint publications, and schooling years – defined by mean years of schooling and expected years of schooling in Saudi Arabia. Table 5 below shows the importance of improving tacit and codified sources of knowledge in Arab Gulf countries (see Table 5).

Table 5 – Tacit and codified sources of Knowledge in the Gulf societies (1990-2011)

	Codified knowledge		Other indicators			Schooling		Tacit knowledge		FTER
	Share of public Spending as % of GDP	R&D education	Publications	Cooperation	Patents	Mean years of schooling	Expected years of schooling	High skilled (share of enrolment in tertiary education) (%)	Share of high (tertiary) educational attainment levels (% of the population aged 25 and above)	
	2000–2007 ^e	2006–2009 ^b	2008 ^c	2008 ^e	(1991-1999) ^g	2011 ^b	2011 ^b	2001–2010 ^b	2000–2007 ^c	1996 ^c
UAE	0.02	2.8	591	248	27	9.3	13.3	30.4		107
Kuwait	1.2	3.3	100	56	2	6.1	12.3	18.9	8.3	440
Bahrain	0.06	4.5	315	184	3	9.4	13.4	51.2	11.2	86
Oman	0.07	3	184	152	0	5.5	11.8	26.4		82
Qatar	0.06	2.5	1745	720	103	7.3	12	10.2	20.9	34
Saudi Arabia	0.5	5				7.8	13.7	32.8	14.9	846

Sources: (a) the World Bank (2012) World Development Indicators Database (2012) (b) UNDP Human Development Report (2011) (c) UNDP Human Development Report (2009) - pp. 199-200 (d) ESCWA/UNESCO (1998), (e) UNESCO estimates August (2010) and UNESCO (2012), (f) WITSA (2002), (g). US Patent and Trademark Office web site: www.uspto.gov.

5.2 OPPORTUNITIES AND POLICIES FOR TRANSITION TO KNOWLEDGE-BASED ECONOMIES IN ARAB GULF COUNTRIES

Apart from the challenges discussed above, it is also useful to explain the potential opportunities for transition to knowledge based-economies in Arab Gulf countries.

From economic perspective, since the structure of the Gulf economies is related to oil, it will be useful to explain the role of oil in creating opportunities for the transition to knowledge based-economies in these countries. From economic perspective, the stylized facts in the literature confirm that oil provides a significant contribution for developing the economies and social welfare in Arab Gulf countries; in particular, it leads to higher per capita income. Based on this fact, oil provides opportunity and challenge for transition to knowledge based economy in Arab Gulf countries. Concerning the opportunities, oil provides opportunity for transition to knowledge based economy, because the revenues from oil can be utilized to facilitate the transition to knowledge based economy in Arab Gulf countries, through increasing spending on education, R&D, ICT and knowledge creation, absorption and diffusion. Moreover, oil revenue can be utilized to facilitate the promotion of more favourable environments, institutions and facilities for supporting the creation and transfer of knowledge that would help to attract and encourage migration of high-skilled foreign and Arab migrants scholars, experts, professional to the Gulf countries and that would help to augment knowledge and increase brain gain in Arab Gulf countries and hence contribute to accelerate transition to knowledge-based economies in Arab Gulf countries.

From institutional perspective, a commitment to good regulations and legislation will build a basis for promotion of new partnerships to boost scientific cooperation between knowledge related institutions in the public and private sectors as well as new partnerships and scientific cooperation within and between Arab Gulf countries, and additionally with regional,

global and international scientific institutions for promotion of knowledge creation, transfer and diffusion in the near future. For example, this includes scientific cooperation between public and private universities and other productive sectors to enhance R&D, knowledge, creation, transfer and diffusion and transition to knowledge-based economies in Arab Gulf countries.

Based on the above findings, the transition to the knowledge-based economies should be a top priority in the Arab Gulf countries. Overcoming the major challenges hinder the transition to knowledge-based economies implies changing the economic structure, by shifting from a (rent seeking) natural resources (oil) based economies to the knowledge based economies in the Arab region. To facilitate the transition to knowledge-based economies, the Arab Gulf countries need to articulate strategies for their transition to the knowledge economies and build on their strengths and carefully plan appropriate investments in human capital, effective institutions, relevant technologies, and innovative and competitive enterprises. The Arab Gulf countries need to strengths investment in four knowledge index pillars: efficient economic and institutional regime and incentives; efficient education and human resources and adequate availability of educated and skilled population, an efficient science, technology and innovation system, effective information and communication technologies, and coordination across these four pillars. Recognition of the importance of entrepreneurship, the central role of the private sector and collaboration between public and private sectors for enhancing the provision of infrastructure and incentives and encouragement of investment in research and training. Among the priorities, special emphasis should be given, to enhancing knowledge diffusion, upgrading human capital, promoting organizational change and provision of enabling infrastructures through appropriate financial, competition, information and other policies. Learning from the experiences of other countries, e.g. Korea, Arab Gulf countries need to implement coherent strategies for transition to knowledge economies by investing heavily in education and training, boosting innovation through intensive research and development, developing a modern and accessible information infrastructure, and creating stable and enabled economic and institutional regime and environment conducive to transition to knowledge-based economies in Arab Gulf countries.

Therefore, our results in this section corroborate the second hypothesis that transition to knowledge-based economies faces several challenges in Arab Gulf countries. Our findings support the third hypothesis concerning the variation in transition to knowledge based economies in Arab Gulf countries.

5. CONCLUSIONS

This paper discusses the progress in transition to knowledge-based economies in Arab Gulf countries, and discusses the potential opportunities and challenges Arab Gulf countries faced in transition to knowledge-based economies.

As for the methodology, this paper uses recent secondary data obtained from different sources. It uses both descriptive and comparative approaches and uses the OECD definition of knowledge-based economy and the World Bank Knowledge Index (KI) and Knowledge Economy Index (KEI) and other indicators often used in the international literature to examine progress in transition to knowledge-based economies in Arab Gulf countries. This paper contributes to recently published research studies that aim to improve understanding of the progress and challenges in the transition to the knowledge based economies in the Arab region. This paper is valuable because it adds to the existing studies in the regional and international literature and it fills the gap in the Gulf literature by presenting a more comprehensive analysis and investigating recent progress in transition to knowledge-based economies in Arab Gulf countries. Different from earlier studies in the Arab literature, an interesting element in our analysis is that we investigate the recent progress in transition to knowledge-based economies in Arab Gulf countries and we examine the challenges to transition to knowledge based economies in Arab Gulf countries. Moreover, the results confirm the importance of supporting the efforts aimed at enhancing knowledge- based economies in Arab Gulf countries.

Our findings support the first hypothesis concerning the relative progress in transition to knowledge– based economies in Arab Gulf countries. Our results corroborate the second hypothesis that transition to knowledge-based economies faces several challenges in Arab Gulf countries and coincides with substantial knowledge gap compared to other world regions. Our findings support the third hypothesis concerning the variation in transition to knowledge based economies in Arab Gulf countries.

Our results imply that over the period (2000-2012) the progress to knowledge-based economy in Arab Gulf countries appears from slight improvement in terms of ranking, KI, KEI, ICT pillar, education pillar, economic incentive and institutional regime pillar, innovation efficiency index, knowledge creation index, knowledge impact index, knowledge diffusion index and technological infrastructure. This slight improvement was reduced by the observed deterioration in terms of innovation pillar, GII, knowledge absorption index, capacity for innovation, localization of technology and human capital. Finally, our results imply that from economic perspective, oil provides opportunity and challenges for transition to knowledge based economies in Arab Gulf countries.

Therefore, based on the above findings, the transition to the knowledge-based economies should be a top priority in the Arab Gulf countries. Overcoming the major challenges hinder the transition to knowledge-based economies implies changing the economic structure, by shifting from natural resources-oil-based economies (rent-seeking economies) to knowledge based economies in Arab Gulf countries. To facilitate the transition to knowledge-based economies, Arab Gulf countries need to articulate strategies for their transition to the knowledge economies

and build on their strengths and carefully plan appropriate investments in human capital, effective institutions, relevant technologies, and innovative and competitive enterprises. Arab Gulf countries need to strengthen investment in four knowledge index pillars: efficient economic and institutional regime and incentives; efficient education and human resources and adequate availability of educated and skilled population, an efficient science, technology and innovation system, effective information communication technologies, and coordination across these four pillars. Recognition of the importance of entrepreneurship, the central role of the private sector and collaboration between public and private sectors for enhancing the provision of infrastructure and incentives and encouragement of investment in research and training. In view of the fact that the public sector across Arab Gulf countries is still dominant, this may hinder transition to knowledge based economies, so the Arab Gulf countries face the challenge to reinforce the role private sector plays to facilitate transition to knowledge-based economies in Arab Gulf countries, by encouraging private sector participation and involvement in knowledge creation and diffusion. Among the priorities, special emphasis should be given, to enhancing knowledge diffusion, upgrading human capital, promoting organizational change and provision of enabling infrastructures through appropriate financial, competition, information and other policies. Learning from the experiences of other countries, e.g. Korea, the Arab countries need to implement coherent strategies for transition to knowledge – based economies by investing heavily in education and training, boosting innovation through intensive research and development, developing a modern and accessible information infrastructure, and creating stable and enabled economic and institutional regime and environment conducive to the transition to knowledge-based economies in the Arab region. Based on the findings the paper recommends that to improve transition to knowledge economy, it is essential for Arab Gulf countries to strengthen and improve KI and KEI by investing heavily in human capital, mainly, education and training, boosting innovation through intensive spending on research and development, improve innovation pillar, capacity for innovation, localization of technology, Global Innovation Index and knowledge absorption index.

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