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Samia Satti Osman Mohamed Nour¹
King Abdulaziz University, Kingdom of Saudi Arabia

Challenges and opportunities for transition to a knowledge-based economy in the Arab region

¹ **Dr Samia Satti Osman Mohamed Nour** Associate Professor of Economics, Economics Department, Faculty of Economics and Administration, King Abdulaziz University, Jeddah, KINGDOM OF SAUDI ARABIA, Email: samiasatti@yahoo.com; samia_satti@hotmail.com

*Transition to a knowledge-based
economy in the Arab region*

Challenges and opportunities for transition to a knowledge-based economy in the Arab region

Abstract

Purpose This paper aims to examine the challenges and opportunities for the transition to a knowledge-based economy in the Arab region.

Methodology Both descriptive and comparative approaches are used, together with the framework and definition of “knowledge-based economy” often used in the international literature to examine the challenges and opportunities for a transition to a knowledge-based economy in the Arab region.

Findings The findings support the hypothesis concerning the challenges and opportunities for transition to a knowledge-based economy in the Arab region. This transition is seriously impeded by several political, social, economic, institutional and organisational obstacles and impediments. Overcoming the major challenges hindering the transition to knowledge-based economies will involve changing the economic structure by shifting from (rent-seeking) natural resources-based (oil) economies to knowledge-based economies in the Arab region.

Originality/value This paper is valuable because it fills the gap in the Arab literature by presenting a more comprehensive analysis and investigating the challenges and opportunities for the transition, which previous literature has failed to adequately discuss. Moreover, the paper supports the efforts aimed at enhancing knowledge-based economies in the Arab region. The findings imply that it is essential for the Arab region to overcome challenges by implementing sound strategies for their transition to knowledge economies and improving and enhancing appropriate investments in human capital, effective institutions, relevant technologies and innovative and competitive enterprises to facilitate such a transition.

Keywords Knowledge, Knowledge-based economy, Challenges, Arab region

Paper type Research paper

JEL classification O10, O11, O30

Introduction and background

This paper aims to discuss the potential opportunities and challenges the Arab region faces in the transition to knowledge-based economies ⁱ. Two questions are addressed: 1. What are the major challenges hindering the transition towards knowledge-based economies in the Arab region? 2. What are the major opportunities for transition towards knowledge-based economies in the Arab region?

We examine the hypothesis that the transition to knowledge-based economies faces several challenges in the Arab region and coincides with a substantial knowledge gap compared to other world regions. This hypothesis implies that the Arab region has manifestly lagged far behind other world regions in terms of indicators required for the transition to a knowledge-based economy.

We fill the gap in the Arab literature by presenting a more comprehensive analysis to improve understanding of the potential opportunities and challenges for the transition to a knowledge-based economy in the Arab region. In contrast to earlier studies in the Arab literature (Nour, 2010; 2011a; 2012a; 2013a; 2014) which examine the incidence, existence and development of knowledge and its transference, an interesting element in our analysis is that we investigate the potential opportunities and challenges for the transition to knowledge-based economies in the Arab region. We believe that this topic seems quite consistent with the

well-known stylised facts and widely used standard classification of Arab countries according to their reliance on natural resources. This topic seems sound since transitions towards 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. We fill the gap in the Arab literature by explaining the potential opportunities and challenges for transition to a knowledge economy. Moreover, we support the efforts aimed at utilising opportunities and overcoming challenges in enhancing knowledge-based economies in the Arab region.

This paper uses descriptive and comparative methods of analysis based on the framework and definition of a knowledge-based economy often used in the international literature to examine the challenges and opportunities for the transition to a knowledge-based economy in the Arab region.

The rest of this paper is organised as follows: the next section presents the conceptual framework and literature review, which is followed by an overview of the general socio-economic characteristics of the Arab region. The major challenges and opportunities in transition to knowledge-based economies in the Arab region will then be discussed, and finally, conclusions and policy recommendations will be outlined.

Conceptual framework and literature review

The conceptual framework discussed in the international literature implies a 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 an important role given to information, technology and learning in economic performance (cf. OECD, 1996). In contrast, 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 for a 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).

Figure 1. Knowledge economy as an agent of change in cities

Old Paradigm Resource-driven economies	New Paradigm Knowledge-driven economies
Quantitative factors Labour Raw materials Premises Bulk transportation Energy	Qualitative factors Qualifications Research and development Local suppliers Reliable infrastructure Good living conditions
Subsidisation 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

Sources: Adapted from Gorzelak (2001)

Moreover, the World Bank uses the Knowledge Index (KI) and the Knowledge Economy Index (KEI) to compare knowledge across the world's countries. According to the World Bank, the Knowledge Index (KI) measures a country's ability to generate, adopt and diffuse knowledge. This is an indication of the overall potential of knowledge development in a given country. Methodologically, the KI is the simple average of the normalised key variables in three Knowledge Economy pillars – education and human resources, the innovation system and information and communication technology (ICT). The Knowledge Economy Index (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. ⁱⁱ

Within this framework, the analysis of the factors facilitating and those hindering the transition to a knowledge-based economy have been an exciting and interesting recent research issue that has received increasing interest amongst economists. Few studies in the Arab literature show the weak knowledge-based economies in the Arab region (cf. UNDP-AHDR, 2003; UNDP-MBRF-Arab Knowledge Report, 2009; 2010–2011, Nour, 2010; 2013b, 2014). Analysis of the opportunities and challenges of the transition to knowledge-based economies is important in view of the well-known stylised fact concerning the economic structure, which implies that the majority of Arab (notably Gulf) economies are classified as (rent-seeking) natural resources-based (oil) economies, rather than knowledge-based economies. The lack of studies particularly examining the opportunities and challenges facing the transition to knowledge-based economies in the Arab region is the major

motivation behind this study. Therefore, it might be interesting in this paper to fill the gap in the Arab literature by examining such opportunities and challenges.

General socio-economic characteristics of the Arab region

Based on the above framework and before examining the opportunities and challenges involved in the transition to knowledge-based economies in the Arab region, in this section it is useful to begin with the general socio-economic characteristics of the Arab region. Table 1 shows the general socio-economic and development characteristics of the Arab region and world regions as measured by economic growth (GNI per capita), life expectancy, mean years of schooling, literacy rate and gross enrolment ratios. Table 1 illustrates the substantial gap between Arab and other world regions in terms of population, standard of economic development as measured by GNI per capita and human development index. In general, the Arab region is characterised by low standards of economic development together with high population numbers. According to the World Bank classification of economies, the majority of the Arab countries are classified among medium-income economies. In addition, according to the classification of the UNDP-HDI, the average GDP per capita for the Arab region is classified among the world medium-income group and is, on average, lower than for those of the other world regions. Furthermore, the other HDI components: average life expectancy, mean years of schooling, expected years of schooling, literacy rate and gross enrolment ratios for the Arab region on average, are lower than for those of other world countries. Moreover, the Arab region is

comparable to other developing countries and regions in terms of the widespread and high rates of both unemployment and poverty. These general socio-economic development characteristics of the Arab region have serious implications, as they impose challenges and impede the transition to knowledge-based economies.

Table 1. General socio-economic characteristics of the Arab region compared to other world regions (2012–2002)

Sources: UNDP Human Development Report (2013), pp. 197-196 ,173 ,147-146. PPP – Purchasing Power Parity

	Population Total (millions)	GNI per capita (PPP 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)	Population with at least secondary education	Gross enrolment ratio		
									2012	2010	2011
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

The challenges, opportunities and development of a knowledge-based economy in the Arab region

Based on the above background this section discusses the research questions and hypotheses concerning the challenges, opportunities and progress in the transition to knowledge-based economies in the Arab region. First we discuss the challenges; next we investigate the opportunities for the transition to knowledge-based economies in the Arab region using the OECD (1996) definition of a knowledge-based economy and the World Bank Knowledge Index and Knowledge Economy Index.

Challenges inherent in the transition to knowledge-based economies in the Arab region

The literature confirms the economic importance of knowledge and the transition to a knowledge-based economy for sustainable development. This highlights the importance of addressing the challenges and difficulties facing the transition to knowledge-based economies in the Arab region. This section therefore explains that such a transition is seriously impeded by several political, social, economic, institutional and organisational obstacles and impediments.

From a political perspective, the transition to knowledge-based economies in the Arab region is seriously impeded by political factors, such as the lack of freedom, lack of good governance and lack of political commitment and awareness of the economic importance of transitioning to a knowledge economy. Important challenges facing the transition to knowledge-based economies in the Arab countries comprise improving freedom, making good governance available and improving the awareness and commitment of Arab governments to prioritise the transition.

From social and cultural perspectives, the transition to 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.

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

From an economic perspective, the transition to knowledge-based econ-

omies in the Arab region is seriously impeded by the lack of supply and demand sides. From the demand perspective, the domestic demand and marketing for local knowledge products is seriously impeded by the lack of local demand for such products from the consumers sector and the producers sectors (industrial and agricultural sectors). From the supply perspective, the supply of local knowledge products and local production of knowledge is seriously impeded by the lack of economic, financial and human resources, and enabling environments. More specifically, the insufficient allocation of financial and human resources for building knowledge-based economies arises from a lack of funding, a lack of knowledge capital, a lack of investment and spending on knowledge, spending on education, R&D and scientific research, as the Arab countries do not spend more than 0.2% of their annual GDP on research areas (see Figure 2). In addition, the lack of human resources arises from the low enrolment in tertiary education, a lack of researchers and a lack of technical and engineering workers capable of maximising the acquisition, absorption, localisation and utilisation of technological knowledge (see Figure 3). The lack of human resources is attributed to poor educational systems, and the skills gap exists because of a mismatch between the educational systems outcomes and job and labour market requirements, and the brain drain and migration of high skilled young workers. The transition to knowledge-based economies in the Arab region is extremely impeded by the poor quality of education, the high incidence of a skills gap, the mismatch and the brain drain (cf. UNDP-AHDR, 2002; 2003; 2009). In particular, the impediment factors related to higher education and training are linked to the low quality of the educational system, low tertiary education enrollment rate (gross tertiary enrollment

rate), weak local availability of specialised research and training services and the poor extent of staff training in most Arab countries. The transition to knowledge-based economies in the Arab region is hampered not only by the poor quality of education, but also extremely impeded by the incidence of a skills gap and a mismatch between attained and required education. The literature shows the problem of the 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) found that a disconnect between the skills developed in Arab skills-formation systems and those required by private sector employers 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. Moreover, the World Bank (2008) found that "the MENA region education systems did not produce what the markets needed, and the markets were not sufficiently developed to absorb the educated labour force into the most efficient uses" (cf. the World Bank, 2011). Furthermore, the transition to knowledge-based economies in the Arab region is extremely impeded by the high incidence of brain drain. For instance, 45% of Arab students studying abroad do not return to their home countries; 34% of qualified medical doctors in Britain originate from the Arab countries, and the Arab region contributes 31% of the qualified migrants from developing countries to advanced Western countries, including 50% of medical doctors, 23% of engineers and 15% of scientists (cf. Zahlan, 2004). iii, iv

From an economic perspective, the transition to knowledge-based economies in the Arab region is seriously impeded by the competition for limited

economic resources, as the majority of Arab countries still face many economic and social problems, such as the fluctuation and instability of economic growth rates and high unemployment and poverty rates. These difficulties will most probably increase, in light of the effects of the Arab Spring, this means that most Arab governments still face several economic challenges hindering the allocation of the very limited economic resources to commit to the priority of the transition to a knowledge-based economy and commitment to institutional reform necessary to support the transition, and to achieve sustainable economic development in the region. The high incidence of youth unemployment and poverty in the Arab region will intensify the competition for limited financial resources to be allocated amongst economic growth, social development issues (youth unemployment and poverty) and reform of knowledge institutions. Arab governments face the challenge to strike the right balance when allocating government funds to different priorities. One important economic obstacle facing the transition to a knowledge-based economy is the limited contribution, lack of awareness and commitment of Arab financial institutions (banks, finance companies) to allocate financial resources to support the efforts of localisation of knowledge and the transition to knowledge-based economies, probably due to the absence of institutional frameworks and a clear and sound vision to organise cooperation between financial institutions and knowledge production institutions in the Arab region.

From an institutional perspective, the transition to knowledge-based economies in the Arab region is seriously impeded by poor national systems of innovation in the Arab countries. For instance, the lack of sound and systemic institutions, weak institutions

related to knowledge production (poor education and training institutions, scientific research and development, and information and communication technology) and the poor institutional incentives, lack of the required enabling environment (economic, institutional and legal systems, legislation and supporting institutions) in the Arab countries. In addition to the lack of research and development centres, there is poor involvement of the private sector in research and development efforts, a lack of cooperation between research centres and the private sector, and a lack of cooperation between Arab research centres and international research centres, together with a lack of infrastructure and limited efforts on technology transfer, localisation and adaptation to fit local needs. The transition to knowledge-based economies in the Arab region is seriously impeded by poor regional systems of innovation. For instance, Nour's (2013c) findings show the serious weaknesses of the regional systems of innovation in the Arab region compared with other world regions, and that none of the Arab countries offer adequate human and financial resources for S&T and efficient national innovation systems. The poor Arab systems of innovation can be attributed to many obstacles; chiefly, the Arab system of innovation is hampered by major constraints. For example, UNDP-AHDR (2003) indicated that the low spending on R&D, the relatively small number of qualified knowledge workers and scientists and engineers working in R&D and students enrolling in scientific disciplines in higher education, together with poor institutional support and a political and social context inimical to the development and promotion of science in the Arab states are all hampering factors. Moreover, in common with 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 organisations (e.g. universities, technology service providers) and the limited number of innovative enterprises.

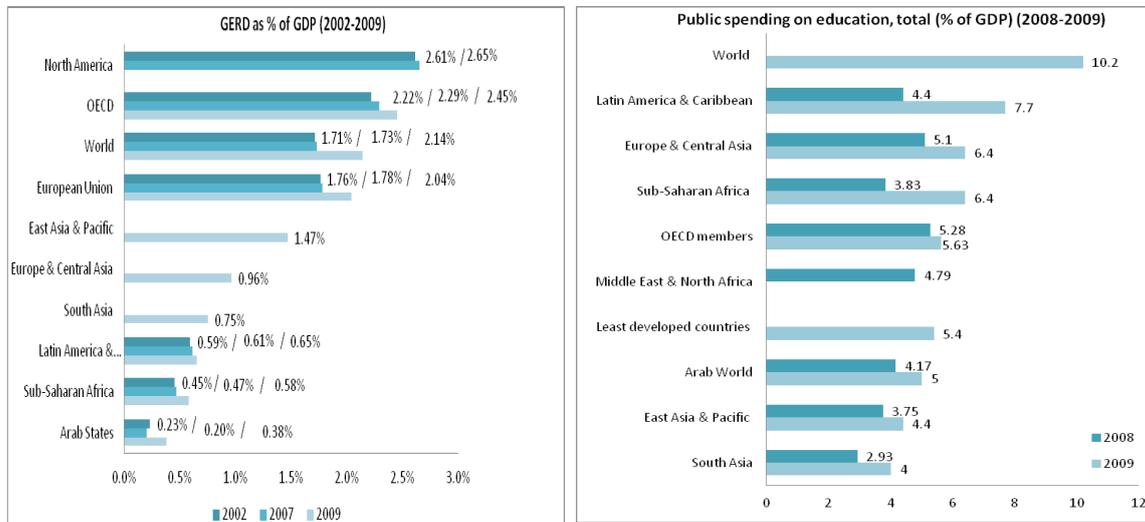
From a technological perspective, the transition to knowledge-based economies in the Arab region is seriously impeded by poor capacity for innovation and weak technological infrastructure, mainly in the information and communication technology infrastructure required for such transition compared to the other countries of the world (see Figure 3). Despite this, there has been relative progress in the diffusion of information technology indicators compared to other knowledge indicators; however, a question arises about the effective utilisation of information technology for supporting the transition to knowledge-based economies.

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

From a regional integration perspective, the integration of intra-regional efforts to enhance the transfer and localisation of knowledge and the transition to knowledge-based economies in the Arab region is seriously impeded by

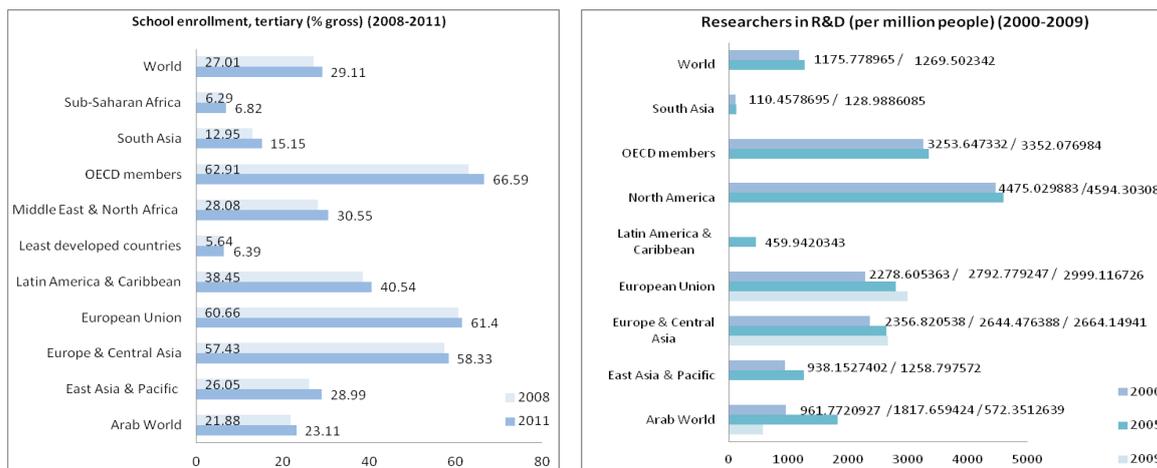
the observed knowledge gap, the lack of homogeneity and the difficulty of bridging the gap between Arab states. There are problems in adopting a unified strategy for transitioning to knowledge-based economies across the Arab states. This implies a variation in the capacity and therefore in programmes aimed at facilitating the transition to knowledge-based economies in the region.

Figure 2. Public spending on research and development (% of GDP) (2009–2002) and on education, total (% of GDP)



Sources: Adapted from (a) UNESCO Institute for Statistics (2012), (b) UNDP Human Development Report 2011, p. 165

Figure 3. School enrollment, tertiary (% gross) over the period (2011–2008) and researchers in R&D (per million people) (2009–2000)



Sources: Adapted from (a) UNESCO Institute for Statistics (2012), (b) UNDP Human Development Report 2011, p. 165

Opportunities and policies for transition to a knowledge-based economy in Arab countries

Apart from the challenges discussed above, it is hoped that the Arab Spring can provide many opportunities for boosting the transition to knowledge-based economies in the Arab region, providing the potential exists to begin a number of positive trends. The new spirit of positivity brought in

with the wave of change in Arab societies has the potential to promote a new social culture that should help to improve awareness and commitment to the appreciation of knowledge and to support efforts to enhance the transition to knowledge-based economies in the Arab region. Moreover, any newfound accountability could feasibly allow for the improvement in the good governance of knowledge institutions

(education, training, R&D, science and technology, ICT, etc.). A commitment to good regulation and legislation will build a basis for the 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 countries, and additionally with regional, global and international scientific institutions for the 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, transference and diffusion and the transition to knowledge-based economies in the Arab region. Finally, the promotion of more favourable environments, institutions and facilities to support the creation and transfer of knowledge would help to encourage the return of Arab scholars, experts, professional and highly skilled migrants able to help augment knowledge and reduce the brain drain in Arab countries and contribute to the transition to knowledge-based economies.

Based on the above findings, the transition to knowledge-based economies should be a top priority in the Arab region. Overcoming the major challenges hindering the transition to knowledge-based economies implies changing the economic structure by shifting from (rent-seeking) natural resources- (oil) based economies to knowledge-based economies in the Arab region. To facilitate this transition, the Arab countries need to articulate strategies for their transition to knowledge economies, build on their strengths and carefully plan appropriate investments in human capital, effective institutions, relevant technologies and innovative and competitive enterprises. The Arab 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; and effective information communication technologies. Coordination across these four pillars is vital. Recognition of the importance of entrepreneurship, the central role of the private sector and collaboration between public and private sectors to enhance the provision of infrastructure and incentives and encouragement of investment in research and training is paramount. Among the priorities, special emphasis should be given to enhancing knowledge diffusion, upgrading human capital, promoting organisational change and 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 a transition towards the knowledge economy 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 regimes in an environment conducive to the transition. Our findings in this section therefore support the hypothesis that the transition to knowledge-based economies faces several challenges in the Arab region.

Conclusion

In this paper we present an overview of the challenges and opportunities for the transition to knowledge-based economies in the Arab region, and we contribute to recently published research studies that aim to improve understanding of the opportunities and challenges of such a transition.

This paper employs both descriptive and comparative approaches and uses the OECD (1996) framework and definition of a knowledge-based economy and the World Bank framework and definition of the Knowledge Index (KI) and the Knowledge Economy Index (KEI) and other related knowledge indicators used in the literature to examine the challenges facing the transition to knowledge-based economies in the Arab region. We fill the gap in the Arab literature by presenting a more comprehensive analysis to improve understanding of the opportunities and challenges inherent in such a transition. In contrast to earlier studies in the Arab literature, an interesting element in our analysis is that we investigate the challenges to the transition to knowledge-based economies in the Arab region. Moreover, we support the efforts aimed at enhancing knowledge-based economies in the Arab region.

Our findings in this paper corroborate the hypothesis that the transition to knowledge-based economies faces several challenges in the Arab region.

Therefore, based on the above findings, the transition to knowledge-based economies should be a top priority in the Arab region. Overcoming the major challenges hindering the transition to knowledge-based economies involves changing the economic structure by shifting from (rent-seeking) natural resources- (oil) based economies to

knowledge-based economies in the Arab region. To facilitate the transition to knowledge-based economies, the Arab countries need to articulate strategies for their transition, build on their strengths and carefully plan appropriate investments in human capital, effective institutions, relevant technologies, and innovative and competitive enterprises. The Arab 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. Coordination across these four pillars is paramount. Key issues include recognition of the importance of entrepreneurship, the central role of the private sector and collaboration between public and private sectors to enhance the provision of infrastructure and incentives and encouragement of investment in research and training. Among these priorities, special emphasis should be given to enhancing knowledge diffusion, upgrading human capital, promoting organisational change and providing 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 the transition towards the knowledge economy by investing heavily in education and training, boosting innovation through intensive research and development, developing a modern and accessible information infrastructure, creating stable and enabled economic and institutional regimes and an environment conducive to this vital transition.

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End notes

i The Arab region is composed of twenty-two countries, including Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Mauritania, Morocco, Oman, Occupied Palestine Territories, Qatar, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates and Yemen.

ii The KEI is calculated based on the average of the normalised 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. The Information and Communication Technology (ICT) pillar includes fixed telephones, mobile and internet users. 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>

iii See Wes Schwalje (2011a) "Examining Global Skills Gaps: How Skills Gaps Impact Firm Performance in the Arab World", International Human Resources Conference and Exhibition Dubai, United Arab Emirates, January 2011 ,20-19, pp. 7-6 ,2. See also Wes Schwalje (2011b) "Knowledge-based Economic Development as a Unifying Vision in a Post-awakening Arab World", London School of Economics (LSE) Working Paper, Version 2.0, September 2011, p. 2. See the World Bank (2008) "MENA Development Report: The Road Not Traveled Education Reform in the Middle East and North Africa", pp. 3-2.

iv See Arab Knowledge Report (2009), p. 189.

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

About the authors

Dr Samia Satti Osman Mohamed Nour obtained her first degree (BSc Hons) and second degree (MSc) in Economics from the University of Khartoum (Sudan) in 1994 and 1999 respectively, and her doctorate (PhD) in Economics from the University of Maastricht (the Netherlands) in 2005. Currently, she is an affiliated researcher (and former Visiting Research Fellow and former PhD Fellow) at UNU-MERIT, School of Business and Economics, Maastricht University, the Netherlands. She is also currently an Associate Professor of Economics at the Department of Economics, Faculty of Economics and Administration, King Abdulaziz University, Kingdom of Saudi Arabia, and an Associate Professor of Economics at the Department of Economics, Faculty of Economic and Social Studies, Khartoum University, Sudan (on leave). She was a recipient of the Arab Fund for Economic and Social Development Distinguished Scholar Award and Post-Doctoral Fellowship, the Arab Fund for Economic and Social Development, Kuwait (October 2010–December 2011). She was a recipient of the University of Khartoum Scientific Excellence Award Prize in Humanities and Educational Studies (in the field of Economics) (February 2013). She has completed several research projects supported by several regional and international institutions. Dr Nour's main research interests are in the fields of Economics, Economics of Technical Change, Macroeconomics, Microeconomics, Development Economics, Sustainable Development, Endogenous Growth, Human Capital and Labour Economics, and Knowledge Economy. She has published several reports, discussion and working papers and has contributed to ten articles published in international refereed journals. She is the author of the book *Technological Change and Skill Development in Sudan*, (February 2013, Springer, Berlin, Heidelberg, Germany), she is also the author of the book *Technological Change and Skill Development in Arab Gulf Countries*, (Springer Series Contributions to Economics, (December 2013), Springer International Publishing, Switzerland).