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Comment on Book

“Empowering Knowledge and Innovation. Challenges for the Arab Countries”

by Omar Bizri & Mouin Hamze

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TEODORO MIANO

Professor, University of Bari Aldo Moro, Italy

NICOLA LAMADDALENA

Adjunct Director, CIHEAM Bari, Italy

This is a rather unique book in more ways than one. For, on the one hand it updates so much information regarding scientific, research, technological development and innovation institutions and their activities in the Arab countries, which, incidentally, lag behind many other countries with similar income levels in terms of research publications and industrial patents. However, on the other hand, and unlike so many other books of its genre, it lends a good deal of attention to crucial issues that impede the region’s progress in various domains of science technology and innovation, including the need to invigorate higher education and improve gender parity within concerned institutions and policy making bodies.

Having established the policy groundwork upon which scientific, technological and innovation activities are based, the book delves into detailed analysis they have undertaken with particular attention to emerging areas, including artificial intelligence, new materials, biotechnology and genetic engineering.

At the very outset, the book highlights the importance of inclusive and sustainable socioeconomic development, which requires the adoption of sound policies all around, with particular attention to science, technology and innovation as well as the achievement of basic needs for all citizens with water and food security at the very forefront.

As to food security the book’s authors estimate that the Arab food gap expanded from \$18 billion in 2005 to about \$29 billion in 2010 and \$34 billion in 2014. This is due to factors that include population growth estimated at around 1.92% per year against 1.11% for the world at large. Additionally, the Arab countries face continuous deterioration in natural resources, with frequent droughts, rising temperatures, and seawater infiltration of groundwater systems. Political turmoil and civil strife in many Arab countries over the past ten

years and the resulting rural migration into urban areas are also considered as contributing to diminished food security.

With regard to water security, they indicate that the average annual per capita freshwater supply in 22 Arab countries declined over the past ten years, from around 990 to less than 800 cubic meters, which incidentally is about one tenth of the world's average. If Mauritania, Iraq, Sudan and Lebanon are excluded, the average annual per capita freshwater rate drops to less than 500 cubic meters per year, and in 9 countries it is now below 200 cubic meters, which means that about 40% of the Arab population already lives in conditions of absolute water poverty.

The book rightly acknowledges that recent years witnessed the launch of initiatives at the regional and local levels aimed at improving water availability for a variety of uses. An Arab Ministerial Council for Water established by the League of Arab States in 2008 issuing a Water Security Strategy for the Arab Region covering the years 2010-2030. Additionally, a unified water strategy was launched by the GCC covering the years 2016-2035. However, they also remark that to achieve lasting water security would require urgent and comprehensive interventions through national water strategies and vigorous regional cooperation targeting the acquisition of related scientific and technological knowledge as well as effective tools. Only then would it be possible to attain integrated resource management as well as the adoption of rational groundwater extraction, wastewater management and improved irrigation systems within the agricultural sector.

Education in the Arab countries

The book takes a look at education in the Arab countries and arrives at the conclusion that these countries are outperformed by many others around the world and that there is a strong need to reform and improve the quality of education in general and that regarding earlier stages of education, in particular. Thus, the authors quote findings of the 2018 exercise conducted by the Organisation for Economic Cooperation and Development (OECD) aimed at examining and ranking educational performance across several countries around the world, namely, the Programme for International Student's Assessment (PISA). The fact that according to this exercise six Arab countries covered, namely Jordan, Lebanon, Morocco, Qatar, Saudi Arabia and the United Arab Emirates, generally known for relatively well-developed educational systems ranked below average scores for OECD countries as well as their closest neighbours, namely, Cyprus, Israel, Turkey and Malta for reading, science and maths.

With special reference to higher education, the authors underline the fact that the Arab region, like so many others, witnessed a deluge of private higher educational establishments over the past two decades. In many ways, and particularly with regard to the proliferation of profit-seeking institutions of higher education, an issue facing many Arab countries now is how to ascertain that private ventures maintain standards that ensure quality outcomes, furthering moves towards inclusive and sustainable development. It makes sense that only limited progress may be made by higher educational systems, when previous educational stages suffer serious discrepancies.

Overall, many Arab countries suffer a lack of educational opportunities within their higher education systems, while some continue to witness lack of demand for higher education in the first place. Reasons for this latter observation is inadequate enrolment

in secondary education and the narrow prospects that secondary education offers its entrants, compared to developed and some developing countries. Available data indicate a disruption in the distribution of students and graduates across various specializations, reaching critical proportions in disciplines that are intended to train educators in general, which threatens even further deterioration in the quality of within various stages education. The same is true in view of the small number of specialists holding a PhD in various fields, while it is on their shoulders that the burden for enhancing the quality of education and research activities often rests.

The authors point out that, it would simply be impossible to overcome the obstacles facing inclusive and sustainable development, which requires the generation and adaptation of knowledge in a wide spectrum of specialisations based on graduate programs that lack meaningful research content. The authors furthermore pose the goal that enrolment rates for postgraduate studies that include conducting scientific research within disciplines linked to attaining sustainable development goals should always exceed 20% of the total of the population of higher education students. Additionally, realising knowledge-based economies requires critical masses of higher competencies in all fields of science and technology, with particular accent on specialists in branches of information and communications technologies. The percentage of PhD holders in many developed countries represents an average of 1.3% of all age groups, while enrolment rates in all stages of higher education exceed 50%, around 10% of whom are postgraduate, with at least 2-3% doctoral candidates, actively engaged in basic and applied research within various branches of knowledge. On that basis, the authors call upon policy makers in the Arab countries to attain similar standards in order to effectively attain their sustainable goals and create the knowledge economies and societies they all seem anxious to achieve.

Human and financial resources dedicated to research and development activities

In relation to human and financial resources dedicated to R&D activities in the Arab countries, the book underscores the fact that both these resources are generally below the world's average. Several tables with most recent figures clearly indicate that resources dedicated to R&D activities in the Arab countries fall below what some of their closest neighbours, namely Cyprus, Iran, Israel, Malta and Turkey have managed to dedicate over the recent past. Thus, the average number of researchers per million of the population within the Arab countries is around 770, while the corresponding figure for their five closest neighbouring countries, namely Cyprus, Iran, Israel, Malta and Turkey, exceeds 2,700, per million. In effect, the Arab countries' average is a little over half the world's average, which amounts to around 1,480 per million. The proportion of human resources dedicated to R&D in some Arab countries with substantial incomes, such as Oman and Iraq, falls much lower, down to 16 and 7%, respectively, of the world's average. An even more negative picture is observed in relation to numbers of technicians per million of the population in the Arab countries, with the Arab average close to one fifth of their abovementioned neighbours' average, and around 12% of the corresponding figure for the OECD countries.

With regard to funding R&D, and despite increased R&D spending by several Arab countries, average spending by the entire group of Arab countries taken altogether is put at 0.46% of their GDP values. This is considerably less than what is allocated by their clos-

est neighbours, which is estimated at around 1.4% of GDP. Additionally, while no recent figures are available for R&D expenditure for the entire world or specific country groups, figures going back to the period 2005-2014 put average R&D spending for the entire world at 2 of their collective GDP values.

Government funding accounts for an average of around 60% of R&D expenditure in the Arab countries. However, wide variation in such spending is observed between one country and another. Thus, public resources constitute nearly 100% in some countries, such as Iraq, while they go as low as 25% in the case of Morocco, for instance. Higher education institutions and business enterprises provide comparable but rather small average percentages of R&D expenditure in the Arab countries taken altogether.

In relation to research output, the book finds that both the volume and quality of research publications by the Arab countries as monitored by a specialised database were inferior to three of their closest neighbours, namely Iran, Israel and Turkey. Thus, while the Arab countries' rankings fell below that of Egypt's, which significantly ranked 39th worldwide, those of their three neighbours exceeded the 25th rank.

With regard to promoting innovation in general, the book relates that Arab strategies aimed at promoting innovation in enterprises as well as in other domains appear to lack focus on tackling some of the most acute development challenges, such as creation of widespread employment and poverty reduction. Indeed, several initiatives intended to promote innovation appear to offer opportunities for multinational technology firms to establish national and regional offices, with benefits channelled towards elite segments of society. Little is done in order to resolve long-standing problems facing sectors in dire need for innovative inputs, including agriculture, which employs the vast majority of impoverished populations in Arab countries such as Iraq, Sudan, Morocco, among others.

Promoting a science-friendly culture in the Arab countries

The book is one of very few that seems to have taken active interest in a report published by the Wellcome Foundation in 2018, intended to underscore the need to pay greater attention to creating a culture conducive to science, technology and innovation. The Wellcome Foundation's report included the results of an opinion survey aimed at measuring the confidence that populations in quite a few countries had in science and scientists. The report also attempted to gauge scientific knowledge possessed by respondents as well as their position when contradictions arise between religious beliefs and scientific findings. The results of the survey present a rather unflattering view of scientific culture in the Arab countries. Thus, smaller percentages of respondents from the Arab countries appeared to know much about science, or attempt to gain scientific information. Smaller percentages of respondents had trust in scientists or thought that scientists benefited them. Additionally, some stark differences of opinion were manifested with regard to possible contradictions between religious beliefs and scientific knowledge. Incidentally, the latter issue was not presented within opinion surveys undertaken in all of the Gulf Arab countries, with the exception of the United Arab Emirates.

With the need for promoting a science-friendly culture in mind the authors call for more effective roles by the media in general and that disseminated by science and technology institutions in particular. Both the public and specialised media will have to exercise roles

on a number of fronts, uppermost among which is the need to highlight and investigate issues relevant to human development that are directly linked to scientific and technological inputs as well as support endogenous scientific research and technological activities as well as promoting STI cooperation, both regionally and internationally.

Among issues that would drastically help in promoting a viable science-friendly culture within Arab societies, the authors underscore the importance of using the Arabic language in educating youth in various scientific domains while improving their skills in languages that constitute main vehicles for the exchange of scientific and technological information. With this in mind, digital media are expected to play prominent roles, especially is guided by astute initiatives that guard linguistic values while disseminating reliable and useful knowledge.

Gender equality

No less important for promoting better research standards in disseminating a scientific culture and moving towards knowledge societies are issues linked to women's participation in the creation and implementation of scientific and technological knowledge and stimulating innovation. This as the authors state is especially important in societies where females have suffered marginalization through the ages, while they have in several Arab countries assumed notable improvements in relation to enrolment in higher education.

As the authors emphasise, formulating and implementing regional and national strategy to enhance women's participation in scientific innovative and technological projects, and to promote fresh thinking with regard to attaining inclusive and sustainable goals.

In order to achieve tangible results within a reasonable length of time, the book calls for changing established norms with regard to women's participation in scientific, research, technological advancement and higher education must begin with reconstructing prevailing stereotypes concerning females and their roles within society. Moreover, while changing established norms may not take place overnight, allowing current patterns of discrimination against women occupying top positions in academic as well as research establishments to continue unabated would undermine efforts aimed at achieving tangible sustainable development goals.

Promoting Arab and international cooperation

The book calls for intensive cooperation between higher education policy-makers and practitioners in the Arab countries as an urgent necessity. Exchanging experiences may constitute one aspect of such cooperation while sharing resources and expertise would be another area of immense promise.

Additionally, the book's authors adopt views that strongly favour continued and improved cooperation between Arab universities and their counterparts around the world. Such cooperation ought to allow intensive training of qualified graduates, enhancing their countries' abilities to meet a global future fraught with challenges on many fronts.

For such cooperation to produce viable outcomes, alliances and partnerships are needed with particular emphasis on shared access to resourceful regional and international networks on the Internet, so that the benefits of available educational courses and auxiliary material are spread as widely as possible.

Concluding remarks

One of the main theses of the book relates to the Arab countries' inadequate focus on STI capacity building with view to tackling strategic challenges, provide employment for the Arab countries' youthful populations and alleviate poverty. This is claimed as main reason for conflicts, political turmoil and poor economic performance that has gone on for too long.

As the authors remark, creating viable STI capabilities may not proceed in the shadow of prevailing rentier systems, that engender limited incentives for the masses; while the import of the latest STI equipment and expertise is prioritised, instead of developing the necessary national capabilities.

On the other hand, the authors stress that sound policies, judicious implementation strategies, as well as an atmosphere that allows academic freedom, open expression and free debate ought to allow Arab STI systems to upgrade, and effectively contribute to inclusive and sustainable development.

About the authors

Omar Bizri is a senior consultant specialising in science, technology and innovation (STI) policies, targeting sustainable development and poverty reduction in the Middle East and North Africa.

Mouïñ Hamzé is an expert and advisor for scientific research, development and innovation.

*Arabic & English versions of the book are available on IKitab & Amazon