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University Cooperation and Employment

by

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University Cooperation and Employment

by

A. B. Zahlan*

Introduction

Higher education, knowledge and human capital are critical resources in cultural and economic change. They make the difference between poverty and well-being. The effective management of these resources is central to securing the desired output from these activities. The AlmaLaurea process, designed to provide the management, makes evident the complexity of the issues that need to be addressed. Through these tools a society is enabled to implement sound educational and developmental policies and practices.

The AlmaLaurea process focuses on students, human capital, universities and enterprise. The interest in these categories arise from the dominant role that science and technology play in the life of industrial nations. The complexity of science, and its high rate of change, imposes a considerable challenge on all countries wishing to move forward in their development.

Arab governments devote substantial proportions of their budgets to finance education. I emphasize in my paper that the current problems facing the Arab countries is not in a shortage of human capital but rather in their ability to manage the productive deployment of this capital.

The AlmaLaurea process deals with statistics on the processes of education and employment. Most, if not all, of Arab countries devote limited attention to data collection and data management. The data and statistics that are generated through the application of the AlmaLaurea process provide essential tools for managing the complex relationships between educational and economic processes.

What I thought I can usefully present in my paper are some reflections about the relative place of the Arab countries amongst Third World countries in the domain of science and human capital. What I would like to show is that educating people does not, by itself, enable a society to obtain the hoped for benefits from the educational process. I will also propose some possible explanations of the difficulties met by Arab societies.

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I will first present a sketch of development during the past 60 years followed by a comparison of the Arab countries with China, India and others. What I hope to demonstrate is that producing the human capital alone does not automatically lead to the desired results. Unless investments in human capital and scientific research are incorporated in a supportive political economy the consequences of these efforts and investments are limited.

The processes discussed in this conference concerning quality control, management of the educational processes, management of the interface between the educational process and employment are all critical to the Arab countries. Inadequate attention is devoted to these activities.

The monetary cost of the activities described by the papers presented at this Conference is trivial in comparison with what is already expended on the educational process. Yet these basic efforts contribute immeasurably to the culture and economy of a country and increase considerably the benefits derived from their educational systems.

A society is better served the more it knows about the state of its culture, the quality and activities of its creative citizens, the strength and weakness of its science and technology. Such knowledge is dynamic and consistently changing.

The Process of Development

Different regions of the world have encountered different challenges in their development processes. I will try to highlight the variety of unique factors that have impacted on the Arab countries.

The Arab countries have been through difficult and trying times. I will show that they suffered greatly and for a long time. The past few centuries did not prepare them for the industrial revolution and its requirements. All of these considerations have influenced their ability to benefit from their efforts in the educational field.

Most students of social and economic change look no further than the present and recent past. Yet recent research has demonstrated that societies are influenced by past experience that may have taken place as far back as 1000 BC.[1] I subscribe to the view that all societies are influenced by their cultural and political inheritance both positively and negatively. This is why I bring up events and social and political events that occurred centuries ago but left a strong influence on the political economy of the Arab countries.

If we look back only to 1950, when the Arab countries began to secure their independence, we find that they responded with energy to the educational requirements of independence. In 1950 there were 10 universities in the Arab countries for a population of the order of 60 million. One of these universities was al-Azhar in Cairo, probably the oldest university in existence. The others where relatively new organizations founded during the 19th and early 20th century. When I went to university in 1949 there were an estimated 30,000 Arab university graduates. I have no accurate number for the current population of Arab university graduates; the number may be of the order of 15 to 20 million in a population of some 330 million.

During the past 60 years there has been considerable expansion in the number of universities and the number of university graduates. Between 1998 and 2008 Arab governments increased their appropriations to higher education from $3.77 billion to $16.26 billion. Enrolment expanded from 2.45 million to 6.62 million students.[2] There are (in 2011) probably more than 440 universities in the Arab countries. The process of expansion continues. There is a tremendous quest for education by students, their families and most governments are supportive of this urge.

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[1] See, for example, Diego Comin, William Easterly, and Erick Gonc, "Was the wealth of Nations Determined in 1000 BC.?", *American Economic Journal: Macroeconomics*, **2** (July 2010): 65-97

[2] In fact the sums are larger because these figures do not include the figures for Algeria, Libya and Qatar. See *Statistical Report: Arab Regional Conference on Higher Education*, Cairo, 31 May 2009, UNESCO Regional Bureau for Arab States, Beirut.

Though Arab governments provide increasing facilities in higher education they are not paying adequate attention to the quality of higher education and to the management and incorporation of the outcome into the economy.

During the past two decades there has been a considerable diversification of types of universities established in Arab countries. These varied from public universities, private money-making universities, and establishing the first graduate school in the Arab world in 2010 in Saudi Arabia. In between these extremes one finds a wide variety of universities established by foreign institutions in collaboration with Arab governments.

Such diversity, to be effective, should be accompanied with a considerable range of statistical services and associations to fully integrate the services and products of these organizations into the labor market. Most unfortunately, this has not been the case.

For example, we have no idea where past graduates are located, what jobs they hold, and how are their occupations related to their education. There is no data on: the economics of university graduates; or the brain drain despite the considerable proportion of Arabs with MDs and PhDs who brain drain. Then we find a lack of public interest in the factors causing the brain drain and how the brain drain is related to the system of education. In fact, there is little concern in the issues and factors that are of direct relevance to establishing national educational policies.

In the industrial sphere the Arab world is empowered by around 1.5 million graduate engineers increasing at an estimated rate of more than 100,000 engineers a year. Yet, there is virtually no significant industrialization. The basic infrastructure to produce gas and petroleum is based on imported machinery and services. Similarly, the equipment for the phosphate and petrochemical industries are imported with little effort made to acquire the technology. What is even more astonishing the servicing, repair and maintenance, of much of these industries is also mostly imported.

The large number of civil engineers graduated from Arab universities combined with an enormous internal market for all types of construction services has not led to the development of a world class construction industry. The considerable Arab construction industry depends on a large number of international consulting and contracting firms. It also imports millions of expatriate workers when the region suffers from severe unemployment, in excess of 15 to 20% of its youth. Some 80% of construction materials utilized are also imported although the region possess all the raw materials to establish a local construction materials industries. Thus, the construction industry that normally serves as the locomotive of the economy is associated, in many countries, with a low or negative multiplier factor.

The failure to benefit from the enormous internal markets for engineering services is the result of national policies that favor technological dependence on foreign suppliers. The adoption of policies of technological dependence undermines the rational use of available human capital.

The inability to develop serious research activity in the Arab countries has prevented the growth of national graduate schools of standing. Thus, large numbers [in excess of 150,00 annually] of Arab students study abroad in OECD countries; these students pursue, mostly, post-graduate education.

Pursuing graduate education internationally in moderate measures is a good thing. However, countries that lack well established graduate schools fail to integrate their research programs with national issued and challenges.

There are also an estimated 200,000 PhD graduates from universities in OECD countries. The brain drain from this category of graduates is very high; it probably exceeds 60%. There are also substantial numbers of PhD graduates from national universities. In fat we have no idea where the Arab research talent is located and what issues it is addressing.

Human capital does not convert itself automatically into useful economic services and products. Considerable investments in higher education go to waste because the political economy has resisted establishing suitable engines for converting knowledge into useful output. At present, a combination of high youth unemployment, under-employment and the brain drain are the main

beneficiaries of the system of Arab higher education. The fundamental reason for this behavior is the prevailing political economy - which is the cause of the unrest that we see around the Arab countries.

It is necessary to repeat that the problem faced by the Arab countries has little to do with the production of human capital and a lot to do with the political culture and the ruling elites. The obsession with power and greed for money of this class has dominated the political culture. The legacy of the colonial, and pre-colonial, periods have played a considerable role in creating the current political culture.

The research output of the Arab countries published in international refereed periodicals[3] increased (sixty-fold in 43 years) from 465 publications in 1967 to 29,725 in 2010. There are considerable differences in the research output amongst the Arab countries. The leading three countries are Egypt, Saudi Arabia and Tunisia. Roughly half the Arab countries support some R&D activity.

The leading regions in scientific output are the GCC countries; the Maghreb (Algeria, Morocco and Tunisia) and Egypt. These three regions have roughly equal research outputs with Egypt in second or third place. The population of the Maghreb countries was 77.3 million, Egypt 83 million and the GCC 37.9 million in 2009. The GCC countries lead in per capita output.

The research output is the product of less than 10% of faculty members who hold a doctorate degree. In most countries the universities are the main source of research publications. Tunisia is a rare exception where non-academic R&D organizations contribute about half the output.

In general 90% of university professors holding a PhD degree are not engaged in scientific research and therefore they are pursuing professional suicide. The high rate of advances in all scientific fields is such that any scientist not engaged in research, or at least supported by an active scientific community, will find himself, in no time, lagging behind.

If adequate increases in R&D funding were to be provided the three leading regions mentioned above should be able to increase their output ten fold or more over the next decade. Changes in economic policies should yield considerable economic returns. However, it is unlikely that existing governments will change current policies.

Some of the reasons why research at universities is of critical importance are that:

- It determines the quality and relevance of university professors;
- It enhances academic standards;
- It provide access of a country to advances in science;
- It enables a better understanding of the socio-economic implications of advances in science;
- It provides more effective communication with the international scientific community.

It is well known that advanced education is highly specialized. A scholar in history or literature will know little about science and a scientist will know next to nothing about politics and money. It is generally taken for granted that the political culture and the enabling infrastructure fills in these gaps. The Arab countries suffer from the scientific illiteracy of the political elites and the near absence of scientific societies capable of playing a serious public role.

Throughout my years in higher education I did not learn much about money or politics. When I started teaching Physics in 1956 one of my students at the American University of Beirut was arrested for his political activities. He was a member of a banned political party. When he returned to class I scolded him for wasting his time on politics. He replied that Aristotle said all things begin with politics. It took me many years to learn that he was correct. But alas recognizing the importance of politics does not make one understand its relationships to development any better.

The importance of the enabling environment is specially important because scientists left to their own devices are unable to navigate politics and finance. They need those in the know to provide the services needed to enable them to perform their magic.

[3] See ISI and/or SCOPUS as sources for such information.

My current interest is in the domain of science policy. I am particularly concerned with how countries employ and deploy human capital and science. The interfaces between science, the economy and government are most sensitive to the political economy of a country. The reason is that in the application of science, quality control, the law and financial services play a determining role. Every transaction involving science involves these additional inputs. Corrupt practices and lack of firm regulations reduce the value of economic policies.

Political leaders are called upon to bridge the gap between the capabilities that exist in the country and those needed to build its future. Such leaders need to be supported by scientific and technological capabilities embodied in scientific associations. The seriousness and scale of research activity in the country determines the quality of such scientific associations. Needless to say, freedom of association, is essential to enable the formation of such associations. Few, if any, of the Arab countries enjoy freedom of association. The combination of limited research activity [and hence qualified scientists] and the perennial application of emergency laws have limited the formation of credible associations.

Under "Employability and Mobility of Bachelor Graduates in Italy" the AL process is concerned with aspects of transactions that underpin the interface between education and the economy. This is a complex interface and involves a range of issues. Obviously, the character of the interface, depends on political conditions in a country. Members of the EU are far ahead of the Arab world in managing these processes since they all enjoy freedom of association and devote considerable resources to supporting R&D at home and also joint R&D with fellow members of the EU.

I was delighted to see that the recent Tunisian and Egyptian revolutions focus on corruption, freedom of association, politics and employment. One of the statements issued by the Egyptian Tahrir Committees called for increasing support to R&D. Assuming a successful completion of these two revolutions (and possibly others) and the attainment of their declared objectives one can expect the entry of these countries into the industrial age within the next decade.

Tunisia should be capable of making serious improvements in the relationships between its R&D and its industrial and agricultural sectors. According to recent World Economic Forum Reports for 2009 and 2010, Tunisia should be capable of crossing the barriers between developing and industrializing countries in the near future. With some luck and lots of hard work Tunisia could become, around 2020, the first Arab and African Tiger. The adoption of the AL process should make a significant contribution to facilitating this transition. Tunisia may be able to adopt a supportive political economy and its human capital may begin to be taken more seriously.

Needless to say, Egypt could also become a Tiger. But according to available data it will take longer than Tunisia to make the crossing. The crushing bureaucracy and inefficiencies of the Egyptian economy is its main obstacle to progress. Once its political economy is freed from corruption, and subservience to foreign powers, there will be hope for the Egyptian economy.

It is likely that some of the remaining Arab countries could follow once Tunisia and Egypt show the road forward. Many of the Arab countries are at the tipping point: an intelligent development of the political economy and the adoption of straightforward technology policies could accelerate their rate of transformation.

The first most pressing, and most difficult problem, facing Arab countries is overcoming their current political cultures. This is a formidable challenge. The second most pressing problem facing them is rationalizing the relationships of universities and R&D to economic activity. The instruments available to Arab societies in these domains are still weak and limited.

The data and ideas that I am discussing are based on a study that I have just completed.[4] The study is concerned with the complex relationships between scientific activity, technology policies, history of the region, and the prevailing political economy. I will focus on those parts of the study that

[4] A.B. Zahlan, *Science and Sovereignty: Prospects for the Arab Countries*, Arabic edition is being serialized in *Al-Mustaqbal Al-Arabi* during 2011 by the Centre for Arab Unity Studies; English publication to follow.

overlap with universities, cooperation and employment. My main finding in this study is simple: the reason for the sustained underdevelopment of the Arab countries has nothing to do with a shortage of human capital or research activity but a lot to do with its political economy and history.

Converting human capital and investments into marketable outputs is necessary in order for a society to benefit from its human resources. The possibility of successfully undertaking such a blending of different resources is determined by the national political economy. The output of this process of integration may be defined as "contracting institutions" as discussed by Acemoglo & Johnson[5].

Studies of the political economy of the Arab world[6] have clearly attributed their under-development to prevailing corruption and lack of freedom. I have tried to show, in various studies over the past 40 years, that the technology policies adopted by Arab countries consolidated their dependence and denied them the benefits of their investments. Corruption and prevailing financial procedures sustain technological dependence and abort the possibility of securing socio-economic benefits from human capital and investments.

Very briefly, the high dependence on imported technology services by international consulting and contracting firms without a determined effort to acquire know-how deepens dependence and minimizes the multiplier factor associated with investment. Developing countries have successfully sought to benefit from the expertise of international firms through joint venturing by adopting a learning mode.

The processes essential to promote creativity, innovation and the application of science and technology depend on collective behavior of enabled national human resources. Without freedom of association it is more difficult to benefit from national scientific capabilities. Scientific societies are essential to the formation and functioning of national scientific communities as well as for international collaboration.

The absence of freedom of association combined with the miserable level of support (in the range of 0.2% of GNP) awarded for research has undermined the formation of competent national scientific societies. We know that scientific cooperation takes place in many different ways: through universities, scientific societies, normal economic relations as expressed in the daily activities of workers and entrepreneurs. In all cases effective communication depends on the existence of active, independent and high quality professional societies. But this is precisely what is not "allowed" by the prevailing political economy.

Since the earliest times countries sought progress of sorts. Industrialization ushered dramatic economic change. Unless the political economy is supportive of the culture of industrial development it is unlikely that a society can benefit from its own capabilities in science. The benefits of investment and science are lost if society does not adopt appropriate self-reliant technology policies.

Knowledge is universal and is capable of flowing across international and inter-cultural borders. Knowledge is readily available to those capable of securing it. There are however many *self-imposed* constraints limiting the capacity of a society to organize to access and apply knowledge.

Once a government supports the establishment of the necessary and sufficient facilities for the acquisition and application of knowledge obstacles rapidly vanish. This enabling package includes legal, financial, political, managerial measures

The level of international cooperation by individual Arab scientists is the same or slightly higher than that of Chinese scientists in China.[7] The number of joint research publications between Arab

[5] Daron Acemoglu and Simon Johnson, "Unbundling Institutions", *Journal of Political Economy,* 2005, volume 113, pp.949-995.

[6] Clement M. Henry and Robert Springborg, *Globalization and the Politics of Development in the Middle East*, Cambridge University Press, 2001.

[7] See my forthcoming book on *Science and Sovereignty.*

and OECD scientists has increased from: 1064 in 1990 (22% of total output); to 1437 in 1995 (24% of total output); 2324 in 2000 (23 % of total output); and 4385 in 2005 (27% of total output).
Some 33% of Arab research output is the result of some form of international collaboration. Arab scientists also cooperate with:

- each other to a modest extent,
- other Third world countries including India, China and Malaysia, Latin America.

In the types of cooperation underway the Arab scientist does not constitute an integral part of national and/or regional organizations through which the increase of his knowledge can flow to his society. In fact each collaborating Arab scientist often stands alone disconnected from his society, economy and regional science. In an industrial society scientists are anchored in their scientific societies, industry, research communities. The weakness of scientific organizations in Arab countries naturally limits the flow of knowledge between scientists and their society.
Employment is dependent on the skills and knowledge of scientists, workers and entrepreneurs. To prosper entrepreneurs need a clement, enabling and supportive infrastructure. To date no Arab country sought to provide a suitably enabling infrastructure.
Some Arab governments fund generously the parachuting of foreign organizations into their territories. However, these are fundamentally disconnected from the host country and their scientific and technological impact remains marginal.

A Quick Review of Comparative Conditions

Social sciences are different from the natural sciences where experiments settle questions. The only way to determine the standing of nations is through comparative studies.
I will now show that Arab countries compare favorably with Tiger countries in terms of absolute numbers of university enrollment and even in per capita scientific publications despite the fact that their expenditure on R&D is miserably poor *all prior to take-off by Tiger nations such as China and India*.

Table 1. Study Abroad and at Home for Selected Countries

	Study Abroad		Population	Study Abroad	Study at home	
Country	1999	1999 Corrected	(1997, m.)	Per million	Enrolment In Higher Education	Per million
ARAB	111,854	120,602	253.4	476	3,168,445	12,474
CHINA	95,899	106,036	1,227.0	86	7,364,000	6,002
INDIA	48,348	52,932	962.0	55	9,834,000	10,223

Source: Compiled from UNESCO statistics and others. The second column contains UNESCO data. The third column was obtained through the complementing of UNESCO data with EU statistics. (2004)

We can see from Table 1 that on a per capita basis the Arab countries have done well in comparison with China and India. These two countries are accepted as a good example of successful take off.

Table 2. Number of HSP in OECD Countries, 1999

Country	Expatriates	HSP %	HSP, Number
Arab World	**4,462,391**	**22**	**967,548**
China	**1,928,199**	**51.9**	**1,000,735**
India	**1,649,711**	**39.6**	**653,286**

Source: Table II.A2.6, SOPEMI 2004, Trends in International Migration Annual Report, OECD, 2004. HSP= Highly Skilled Personnel.

The next thing we need to do is to compare the quality of these graduates. I argue, that in the absence of something better, the brain drain can be used to compare countries. We find (Table 2) that the Arab countries have been losing their human capital at a high rate through the brain drain.
We note that the number of Arab emigrants of all levels of education is equal to the sum of Chinese and Indians. In other words, their per capita rates are some 8 times larger than the rate for China.
The Arab world exports large numbers of MD's, engineers and substantial proportion of their PhD graduates from OECD universities. I estimate that 66% of Arab MD graduates brain drain to Europe and North America. The performance, in leading OECD countries, of Arab brain drainees in the sciences, banking, industry, medicine, engineering and science implies a good level of education. There are many ways of rating Arab brain drainees. For example, the citation data base published by the Institute of Scientific Information (ISI) compiles under Science Watch top ranking scientists by field. Here the criteria is the number of publications, number of citations and impact of these publications. For example, the list of the top 100 chemists in the world contain two Arab scientists -- both brain drainees to the US -- Omar Yaghi number 2 in the list and Mustafa el-Sayyed no. 17. The first born in Jordan the second born in Egypt. A study of the *Financial Times over* a year provides suitable materials to compare the cited outstanding business persons in different fields. One finds a reasonable showing of Arab business men, industrialists, bankers, etc.. compared to other developing countries. What I am trying to show is that though the educational systems of the Arab countries may be poor in quality it is not preventing competent persons to emerge. Thus the major obstacles facing the region is not the educational system -- which needs serious improvement -- but rather the political economy which disables qualified persons from making their contributions to their country.
Table 3 compares the Arab World research output with that of industrial, Tiger and developing countries. It shows the huge R&D gap between developing and industrial countries.
Table 4 converts selected data in Table 3 into research output per million inhabitant. Please note the enormous gap between industrial, developing and Tiger countries.
There are considerable differences in R&D activities amongst the Arab countries. Egypt is a leading producer of scientific research; GCC countries are the leading countries on a per capita basis; the leading three Arab countries are Egypt, Saudi Arabia and Tunisia. These three countries are competing for first and second position in terms of output. Tunisia and Saudi Arabia are racing each other neck and neck.

Table 7: International Comparisons of Scientific Output of selected Countries, 1990-2007

Years	1990	1990	1995	1995	2000	2000	2005	2005	2007	2007
Country	Population	Scientific output	Population	Scientific output	Population	Scientific output	Population	Scientific output	Population	Scientific Output
Arab World	218	5,589	249	6,652	278	8,501	310	13,052	341	15,194
China	1,134	8,998	1,205	16,866	1,260	46,245	1,304	159,046	1,321	204,160
India	834	12,418	935	13,156	1,015	23,454	1,094	36,576	1,129	46,409
Brazil	152	3,113	161	5,285	165	13,695	186	22,666	190	30,606
S.Korea	45	1,775	46	5,285	47	16,732	48	33,811	49	42,449
Australia	17	12,555	18	15,842	19	25,598	20	38,021	20	44,870
Spain	39	11,291	39	16,406	40	27,916	43	42,369	48	49,230
Sweden	8	9,955	8	12,164	9	17,799	9	22,308	9	23,458
Switzerland	6	8,422	7	10,558	7	16,699	7	22,966	7	25,091
France	57	36,109	58	48,296	58	58,984	61	71,686	64	95,252
Israel	4	6,780	5	8,507	6	12,447	7	15,261	7	16,293
Nigeria	545	1,268	109	731	124	1,206	141	2,107	146	3,435

Scientific output: based on scopus

Statistics based on the percentage of growth that shows in Population Statistics History Website
Source: http://www.geohive.com/charts/population2.aspx for Brazil, China, India, Nigeria, South Korea
http://www.popline.org/docs/1444/066861.html Australia
http://www.nationmaster.com/graph/peo_pop-people-population&date.1990

Table 4: Number of Publications per Million Inhabitants

Country	1981	1985	1990	1995	2000	2005	2007
Arab world	11	15	25.6	26.7	30.6	42.2	44.7
China	1	3	7.9	14.0	36.7	121.9	154.4
India	17	15	14.9	14.1	23.1	33.4	41.1
Brazil	-	-	20.9	32.9	85.1	121.9	161.1
S. Korea	6	15	39.4	114.9	363.7	704.4	866.3
Nigeria	-	-	13.4	6.7	9.7	14.9	23.5

Sources: ISI and demographic data from UN sources

By examining the dynamics of R&D output of countries who took-off it appears that the inflection point after which rates of economic change accelerate is attained when the country publishes 25 research papers per million inhabitant per year.
Countries do not necessarily take-off when they reach this level of output. However, those that aspire to do so do take-off. Egypt, Saudi Arabia and Tunisia, for example, have passed this point but did not take off. This level of research provides a measure of the readiness of human capital; however, the country has also to adopt the appropriate technology policies and provide the enabling environment to be able to transform its human capital into economic output.

The keys to development

Thus, it is not human capital that induces socio-economic development; but rather the system relationships between human capital, science and enterprise. ***Unless a society has successfully integrated these three different types of resources they cannot fully benefit from them***. Human capital is of limited value unless it is provided with an enabling environment. This enabling environment has to integrate cultural, legal, and financial organizational features and facilitate their fruitful combination.
The fact that the AL process is concerned with employment of university graduates, as well as, potential employers is important. This concern contributes a positive thrust to the Bologna process. The interface between universities and enterprise is frequently neglected and this disables the formation of the critical relationships between enterprise, knowledge and the university. Such a shortcoming is fatal to the relationship of education to the economy.

To be able to perform their magic scientists and technologists depend totally on the political economy imposed by whosoever is in power. Scientists are generally ignorant of politics and not so well versed in financial matters. This makes them unable to manage the political economy. Any support provided by permanent organizations and institutions that promotes fruitful relationships between human capital and economic organizations should be helpful to economic development.
Arab countries were nearly all colonized and only recently acquired nominal independence. They have not been able to evolve a clement political economy to date. Furthermore, unlike any other region of the world the colonization of the Arab world was preceded by a devastating collapse of their economic system.

The Arab world is a peculiar region in more sense than one: unlike most other regions of the world there were no nation states; borders between regions were very fluid. What kept the population together was a massive system of trade and transport. The system of transport made it possible for people to circulate, trade and behave as if they were in one country. Yet, they were frequently fragmented into a dozen or more political entities. Somehow the impact of this fragmentation on culture and the economy was overcome by the efficient and powerful system of trade and transport.
Unlike other region of the world, the Arab trade and transport sectors were fully private enterprises. There were no roads to build - which is the normal way for the public sector to control transport. Furthermore, trade and transport were a major sectors of the economy. At the time the Arabs were fully self-sufficient: they bred the camels that were needed. Camels were also an important export item. Today, there is no automotive industry in the Arab countries, even spare parts are imported. All major urban centers sought to provide supporting services to transport services by building suitable storage places and areas to park the camel caravans.
It is well known that Prince Henry the Navigator (of Portugal) (1394-1460) promoted the development of transoceanic ship design with a view of projecting Portuguese naval power in the Indian Ocean. His main objective was to undermine Islamic security and power through the interruption of Arab trade with Asia. He did not make it; but in 1498 Vasco Da Gama made successfully the voyage. The Portuguese introduced piracy in the Arabian Sea in its effort to harass and terminate Arab-Islamic trade. Portugal did not possess the capacity to destroy Arab Asian trade.
One of the many advantages of these transoceanic ships was their ability to carry 40 to 180 guns compared to Arab and Venetian ships that barely carried one. Venice joined forces with Egypt in the battle of Diu to fight the Portuguese naval invasion of the Gulf. Venice and Egypt lost the battle. Britain, France and Holland were all watching. Early in the 17th century, they made their entry into Gulf waters. The rest is history: they invented the East India Companies which were endowed with sufficient capital to rapidly dominate trade with Asia.
One would have expected that the Arab countries would have invented a suitable response: such as learning how to design transoceanic ships with which to fight the intrusion of the hostile western navies and/or to adapt their trading systems to compete with the better capitalized western companies.
Surprisingly none of these obvious measures were taken. Probably the reason for this poor response to these severe challenges was a decline in creativity. Very briefly, subsequent to the adoption of the Mamluk system of rule during the 9th century, by the Caliph Al-Mu'tassim, the Arabs went into a state of decline, chaos and political surrealism. The degradation of the caliphate led to perpetual warfare between various Mamluks ruling various regions of the Islamic Empire. Thus between the 10th and 17th centuries the region was in a state of turmoil and decline. They were visited by numerous Crusades, Mongols, civil wars, the black death (when more than a third of the population died). Obviously, in this vast empire there were, at various times, areas that were undergoing a temporary upturn in their cultural and economic life.
The loss of Arab Asian Trade had widespread economic repercussions. There was a massive loss of employment in nomadic, agricultural and urban areas. More importantly the region experienced the

loss of inter-regional communication that had kept the Arab world culturally and economically united. Prince Henry had correctly assessed the situation.
By the middle of the 17th century the Arabs were buying their Asian supplies from European traders based in ports along the Mediterranean.
The Arabs in the desert were doubly engaged in this industry: in breeding the large number of camels needed for trade and in managing the caravans carrying these goods. Naturally, local transport was still needed to support internal trade.
They not only lost Asian trade but progressively lost the trade with Europe that was based on local production of sugar, paper, glass, beautiful brocades and textiles which adorn Renaissance paintings and others (e.g. coffee which became an important export item after 1500).
The loss of international trade was devastating because it provided a large proportion of the wealth generating activity of the Arabs. The Arabs were unable to invent a positive response, to retain a share of their markets. They had lost their creativity.
The technological shift in Europe during the 17th to 19th centuries was towards iron products and mechanical engineering. A prime invention was the use of fossil energy to replace animal muscle and wind as a source energy. Though the steam engine was discovered in Egypt 2000 years ago and the invention was known to Egyptians, Greeks, Romans and Arabs nobody did much with it. Then a miner in Britain used it to pump water out of flooded coal mines. However the steam engine of the time was of limited use because it was very inefficient and required enormous amounts of coal to operate it. It was Sadi Carnot, a young scientist at the newly founded Ecole Polytechnique in Paris, who sought to find out the determinants of its efficiency. In the process he discovered the science of thermodynamics and this lead to much higher engine efficiency.
By 1800 Europe had moved beyond the Renaissance and entered the first stage of industrial development. New mechanical devices and industries increased the value added per worker and brought about a much higher rate of economic growth. Adam Smith, recognized the significance of these advances, and was aware of the implications of these developments to political culture.
Naturally, these European developments increased the newly emerging technology gap. Whereas before 1500 the Arab world was more advanced than Europe by the 17th century the Arabs suddenly found themselves in decline.
The level and nature of the creativity that was now required, as well as the social and financial organizations to support such creativity, were of a novel type.
Most governments in the world are for economic development. Agriculture (invented around 10,000 BC) was already well established. It had been an important sector of the economy for some 10 millennia. Thus development in that context was well established in most countries.
However, industrial development calls for a special type of human capital; new skills and policies towards research, innovation and creativity. The rate of invention and change was now much greater than it was during the agricultural revolution. Furthermore, the scientific basis of change was much broader: new sciences were emerging and each new science leading to new technologies.
The political culture that was needed to enable human capital in the emerging industrial era had to be more liberal; it had to enable extensive human mobility, creativity and communication. Furthermore, industrial development was knowledge based in the sense that a small lump of iron could be transformed into a steam engine worth many times the value of the iron.
The industrial revolution made possible the enrichment of people out of thin air. Google, Facebook and Twitter make money by enabling others to advertise. Of course, fashion and jewelry are similar types of products. But the market for fashion and jewelry is more limited than a market that can employ the new devices being constantly invented by innovative persons.

The Industrial Revolution and after

What I would like to stress briefly below the divergent impact of change in Europe on the Arab world since 1600. Naturally, Europe derived enormous economic benefits from its scientific

advances. The Arab side was not only unable to acquire the new knowledge but also suffered as a consequence of the increasing technology gap with Europe.
After 1800 many things were happening in Europe. Scottish and English technicians were transforming old technologies. Most of the rests of Europe was awe struck by these inventions in textiles manufacturing, steam engines, railways, and others .
May be the first educational institution to be induced by the industrial revolution was the Ecole Polytechnique of France which was science based and empowered Napoleon. Sadi Carnot, who discovered Thermodynamics and the Physics of the steam engine, worked at this organization.
The Prussians, who were defeated by Napoleon at the battle of Jena in 1806, invented the graduate school and the Technical High Schools in response to the Polytechnique. Both the Ecole Polytechnique and the German graduate schools were research based. All of these organizations were different approaches to marrying science with human capital. Since 1800 a variety of organizations emerged to achieve similar purposes in different areas of technology.
All of these organizations depended on encouraging creativity, enabling cooperation amongst scientists, obtaining definitive products whether for use in warfare or for civilian society.
Clearly, technical change in Europe was propelling a revolution in education in both France and Germany. This revolution spread rapidly elsewhere. The diffusion of these innovations in higher education are still ongoing.

Development in Europe and Colonization
While Europeans were developing an industrial revolution the Arabs were being colonized and unable to understand the full implications of what was going on around them.
It was only after 1950 that Arab countries could begin to build schools to secure access to education and knowledge … even then the gap was so large that it took us decades to know the difference between development and industrial development. But Arab societies and governments have not yet realized the degree of freedom needed to enable science to take roots. The present revolutions springing around the Arab countries are searching for the political culture that has to prevail to sustain economic systems that can benefit from science. The resistance to social demands for freedom in many Arab countries is an indication of how difficult it is to make the transition to a political culture than can sustain an industrial economy.
Without such a revolution the Arab countries could continue to educate large numbers of graduates for the export market but their societies cannot benefit from this human capital.
What has been happening in Tunisia, Egypt and elsewhere indicates that people are waking up to secure their future. There is still a long way to go. The Arab countries have been busy setting up schools and universities for a long time. Though a lot of the infrastructure is in place most of it needs much revamping and improving.
The Arab and the Islamic world have a lot of young people below the age of 25. This is very good asset since youth are more creative and adaptable than older people. Clearly the Arab world has a lot to do before it can benefit from its resource of youth. The Bologna Process can help Arab countries to develop effective management systems to guide their planning and development.

The Future of Euro-Arab Relations
After World War II the Europeans did something very unusual: they made peace between themselves. They invented the EU and they are on their way to eradicating wars on European soil. It is time that similar concepts be adopted in Euro-Arab relations.
Are there activities that are mutually beneficial and useful to both sides? It does not require much research to see that more creative relationships between Europe and the Arab world could yield considerable benefits to both sides. Each side has a lot to offer.

I think that universities can provide informal meeting places were possibilities may be explored informally and researched. The development of mutually beneficial relationships should be important to both parties.
Potential areas of extensive cooperation arise in the agricultural, industrial, educational, financial domains. There is a great deal that is simple to do; yet there is also a great deal that would require extensive advanced research.

Concluding Remarks

Developing countries aspire to pursue policies that will lead them to overcoming under development. But for a developing country to benefit from the experience of other countries is not a simple matter. I stressed in my paper the fact that merely increasing human capital does not lead to accelerated development. To benefit from the experience of other countries calls for a serious understanding of the developmental constraints that a particular society is toiling under.
Investment in education and reforms of these systems have always presented themselves as critical enablers. Yet, despite much effort in expanding educational systems the Arab countries, have not succeeded in substantially accelerating the process of development. I have tried to present in my paper some possible explanations of this phenomena.
For a society to be able to mobilize its human capital it will need a culture of team work and be capable of extensive collective behavior. Successful development is the result of a balance between the individual and collective. Unfortunately, the political development of the Arab countries have severely curtailed the promotion of associative and collective behavior.
Arab countries, have suffered from the imposition of emergency laws for decades (these emergency laws were instituted during the colonial period), which have curtailed freedom of association. The absence of this freedom of association limits the formation of scientific societies and the development of team work. All forms of associations -such as unions, NGO's, clubs, political parties, local government - are severely curtailed.
Science and technology are also dependent on large organizations that provide facilities for undertaking extensive collective activities. The severe shortage of such organizations in Arab countries has militated their technological development. Needless to say, the performance of an organization is dependent on team work and collective behavior. One finds that activities that depend on independent personal initiative are less constrained than those based on team work and organizational behavior.
Industrial countries have been able to adopt liberal concepts of education that favor individualistic behavior but this was balanced by freedom of association and the support of the formation of a wide variety of associations and unions. Furthermore, long traditions of democratic governments, local municipal government, combined with military service in modern armies have resulted in strong attitudes towards team-work and collective behavior. In other words, industrial countries have in place a culture that promotes both individualistic and collective patterns of behavior. Needless to say, society needs both capabilities normally expressed by different persons.
The AlmaLaurea process does not aim to address such issues. The countries that invented the AL process have solved these problems a long time ago and they do not need to be concerned with these issues. However, the Arab countries still suffer from the imposition of emergency laws and the absence of a modicum of freedom means that the educational processes are severely handicapped. Any Arab country wishing to accelerate its rate of development will have to take explicit measures to overcome the severe shortcomings in collective behavior and the ability to form associations. Unless direct and conscious measures are taken to address such issue all efforts at improving and expanding the educational system will fall short of objective. Arab governments seeking developmental objectives can facilitate attaining these objectives through the adoption of measures that facilitate the formation of associations and promote team work

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