

Is policy effective for developing innovation in the MENA region?

Queries based on empirical material at the level of firms and the State

Rigas Arvanitis, IRD

rigas.arvanitis@ird.fr

Abstract

Most policies oriented towards technological development have been thought of in a top-down fashion and by focusing on the policy offer or the technology offer coming from the public research organizations and universities. Incentive schemes and promotion of technology have been of less interest to companies and generally the business sector seems to respond indirectly to incentives into technological development. Empirical evidence, nonetheless, is scarce and mostly based at the macro-economic level, making impossible any analysis at the micro and regional level corresponding to the setting-up of an innovation system.

The work presented here will be based on an extensive review of policies aimed at technological development in businesses and the economy in Maghreb and Machreq Mediterranean countries. It will rely on the work undertaken by policy-makers in the Euro-Mediterranean policy-exchange platform MIRA (of which the author has been one of its proposers). Finally, the author will confront this empirical material with a more theoretical appraisal aimed at understanding the governance and incentive patterns in the region.

Introduction

Monitoring policies is a relatively new concept. In science and technology policy most policies have been designed within a conceptual linear model where Research and development precedes application and diffusion. Nonetheless, as innovation gradually became the focus of attention, the linear model has been challenged. We used to think of this relation as linear, with the development of productive innovations and new technologies following a temporal sequence that begins in research activities, continues through a phase of product development which then leads to the potential production and marketing of innovative goods. In this linear model science precedes technology, which in turn precedes innovation. The model has been profoundly challenged and an alternative interactive model has been proposed, based on the idea that the relations between knowledge production and the end-users (be they in the markets or elsewhere) are more important than they were. At each step of the process of innovation, outcomes are uncertain. Central to the success of innovation is the continuous interaction between marketing and the invention of new designs. Innovation may rely on new uses of an old technique, it may come from research results or it may emerge from technological problems that need to be solved. All of these at some point need an interaction with users in the knowledge process. R&D needs continuous feedback from productive areas. The way a new idea or a new artifact will be received has a long-term effect on its further form and uses.

The implications for research are important as soon as we take into account this non-linear model of innovation. R&D appears as a complex activity, basically relying on frequent interactions between research, technology, and markets. S&T policy must therefore enhance this continuous interaction between those who conceive and those who use the technologies. Policies that promote innovation rely less on the support of scientific institutions and more toward supporting the creation of linkages between different actors, different constituencies, and thus use different tools than the ones used in order to describe and monitor science and technology policies (Arvanitis 2003). As science and technological innovation become close endeavours, the approach to policy making on transfers of technology from research environments (laboratories and research institutions) to productive environments (enterprises) became the focus of attention.

Governance issues also appeared on the forefront, mainly because actors involved are no more the sole public sector but a variety of actors: enterprises, intermediate organizations such as associations, consultancy firms, technical institutes and NGOs.

When focusing on the Middle-East and Northern Africa region (MENA), science and technology policies have received a renewed interest because of a profound change in the relations these economies are experiencing with the European Union and with emerging economies, mostly China, that impose a strong pressure on competitiveness; secondly, when observing science and technology policies, we find a need to modify the institutional set-up of the scientific activities: a growing population of universities has appeared, and most of the research is done within universities. In other words, it is not an internal economic need or a desire to evolve towards a “knowledge economy” that has triggered reforms in the MENA countries as science and technology is concerned: it is these external economic pressures and the growing university population. Governance issues were thus in the very center of attention of policy-makers although in most cases, as we will note in the following pages, the responses were less aching at structural changes in the policy-making structures but rather focused on specific measures that were thought to be relevant for the promotion of research and of innovation. (Arvanitis, M’Henni, *et al.* 2010)

Still, innovation policies have been developed and sustained quite firmly in the last years by some governments, for example in Algeria, Egypt, Turkey, Morocco and Tunisia. Other countries in the Mediterranean region have also promoted specific schemes and measures for innovation (Jordan, Lebanon, and, to a lesser degree, Syria). In the last ten years, this effort has benefited of the so-called “Barcelona process” (EU-Med cooperation) and the policies have often been supported by the cooperation between the EU and the Mediterranean countries; even though the overall Barcelona process has not necessarily been very successful, research and technological development have been a prolific area of co-operation and institutional developments. A large array of measures have also been devised that aim at the catching-up of industries and the funding of innovation activities in companies (Pasimeni, Boisard, *et al.* 2007).

Additionally, international organisations, bilateral donors and NGOs have participated in the need of the countries to transform their development models from low-cost into knowledge-based production: the EU, the OECD, UNESCO, UNIDO and ALECSO are only a few examples to name. Finally, the World Bank has actively promoted the policies in favour of knowledge and innovation, mainly through its KNA-MENA initiative (Reiffers & Aubert 2002). A specific emphasis was put by funding agencies and governments in the development of techno-parks and industrial clusters (Saint Laurent 2005). This policy shift toward

innovation (rather than solely research support) was basically done through measures promoting innovation in the public sector and contacts between the public sector and the productive companies in many forms: engineering networks, promotion of technology transfer units, fiscal measures, promotion of start-ups and venture-capital funding. Finally, at varied degrees, all the MENA countries were profoundly affected by the EU, and in some areas like for instance biotechnology, intellectual property rights, or public health, by the USA (Le Chalony & Moisseron 2010). The EU has served as an example by its own promotion of innovation and instruments set-up to measure it (such as the European Innovation Scoreboard which is based on the innovation surveys).

The institutional framework

The historical conformation of science in the region explains a variable peculiar mix of institutions in each country. The ESTIME project (Arvanitis 2007) as well as the UNESCO Meta-study of science and technology systems (Mouton & Waast 2007) indicate a typology of national research systems which opposes centralised to decentralised systems. Nonetheless, the overall impression is of a rather large and growing dispersion of research in a great number of institutions. This has to do with growth itself of the research system, but also because of a greater role played by universities, and a wider importance of technological activities.

It should be mentioned, that the national coordination bodies in charge of providing appropriate governance for science have been created rather late as compared to other continents. In the more centralized countries (Tunisia, Algeria), Ministries or State secretariats were created, following the French Model or an Eastern European model (Egypt). In more decentralized countries, Science Councils were usually preferred (Jordan, Lebanon). The Egyptian and Syrian research systems have been evolving more profoundly and rapidly in the very recent past (since 2007 for Egypt, and 2008 for Syria).

A major new ingredient in the research systems have been funding agencies at the national level or programmes –usually depending on a Ministry of a national Council -- functioning as funding agencies. Funding by projects on calls for offer was unusual in the MENA countries in research. It is now becoming the norm (Arvanitis 2007).

Academies of science have played a minor role in the region, whereas they have been an essential ingredient in Europe, the USA and Latin America. In some countries an effort is made to reactivate them as real ‘parliaments of science’ and not mere honorific institutions. In Lebanon, the Lebanese Association for science that has been only very recently been re-animated). Its main activity consists in publishing the Lebanese Science Journal and has received support of the National Council for this. Morocco has recently promoted the creation of a Science Academy modelled not after the American AAAS but the French Académie des Sciences, an elite institution of renowned and recognised persons. It is a quasi-public institution with public funding and independent status. In Egypt, because of its former strong political relations with USSR in the fifties and sixties, the model of governance was based on the State Academy. It is only recently, since 2007, that the system has been revamped in Egypt, creating a funding agency and enhancing the Ministry of research. The Academy in Egypt still exists nominatively and acts as a think tank for the government on science issues. Disciplinary associations, although they exist throughout the Mediterranean, are usually of little activity except in some specific areas (for example Public Health, business, geophysics, ...), where one encounters a strong scientific regional activity. These regional or disciplinary

associations for science constitute the living proof of scientific organisations that are independent from the activities of the State. They usually are based on voluntary activity of researchers themselves. In the social sciences, most associations are national and the Arab associations for example in sociology or philosophy have had little impact. One should note the particular interest in history of science where one finds a large variety of researchers and some strong research institutions.

These semi-autonomous organizations should be active in developing international scientific collaborations. But because of their weakness in the MENA region, scientific co-operations have usually been managed by the Councils or Ministries, at the State level, in a very centralised manner. Practically, scientific collaborations rely on the performing institutions (universities, labs or public research institutions). Universities usually have the legal authority to sign agreements, which they do indeed, but in the Mediterranean countries,, the national governmental authorities seem to take precedence in terms of habits. We find in the governance of the research systems, this duality between co-operation and collaboration in all countries, including European Union member countries and MENA countries. Moreover, the EU has been imposing a scheme of more centralised partnerships: the Mediterranean Partner countries, that is countries having signed an agreement with the EU, have been taking in charge more strategically the co-operations with the EU going beyond the usual very general political agreements.

The agreements signed between the EU and the partner countries form a complex web of political and diplomatic relations. Project ASBIMED (Rodríguez-Clemente, Arvanitis, *et al.* 2008) has tried to review all the bilateral cooperation programmes in the Mediterranean region. It was clear from the results that most of these programmes between Europe and the Med countries were “based on spontaneous proposals by the stakeholders, which in their large majority come from academia” (ASBIMED Final synthesis report, 2007, p. 12). Moreover, ASBIMED found little if no correlation between the number of bi-lateral cooperation programmes and co-publications. The authors speculate on the reasons for this lack of correlations that it comes from the very formulation of the cooperation agreements. In most cases, cooperation agreements are quite large in scope and particular researchers included under these schemes of collaboration do not necessarily report under one unique heading.

International scientific collaborations have been fuelling the research system, to a varying degree that still cannot be evaluated as such.¹ To begin with the research systems in all these countries does not depend in terms of inputs on the funding provided from external funds, since most research is funded by domestic national public budgets. In their survey of the research laboratories in Morocco Gaillard & Gaillard (2009) show, for example, that the influence of international scientific collaborations has been very profound and in ways that go far beyond the State. Again this influence has been very different in the various countries. For most Maghreb countries, their historical linkage to France has been initially very strong and it has modelled the research collaborations. Morocco has had the strongest ties in research collaborations with France and Europe. Other foreign funding sources have appeared to be rather marginal in Morocco (Kleiche & Waast 2008)) Tunisia has followed a similar part but somehow a more diversified number of collaborations mainly in the bio-medical sciences (M'Henni, Ben Othman, *et al.* 2007).

¹ Figures on the European Union research framework programmes show a rather low participation of Arab countries. See bibliometric leaflets on the ESTIME website as well as the « Arab Knowledge report 2009 » chapter 5.

Worldwide, national scientific communities were both the outcome of these researchers associations and academies and the strengthening of the state; science thus became a symbolic institution in the hands of powerful social and political patrons, mostly tied to some national project, incarnation of progress and development (Gaillard, Krishna, *et al.* 1997). In the MENA countries, this has been very differently managed, for historical reasons.

Science in the MENA countries has less relied on this kind of institutions generated by researchers themselves and more on institutionalization of specific universities or public research institutions, even when research has a long historical record. Lebanon, Syria and Egypt have had the oldest teaching and academic institutions: The Syrian Protestant College was the first university in the region, established in 1866, by American protestant missionaries and became the American University of Beirut in 1920; the Catholic Jesuits founded the Université Saint-Joseph in Beirut in 1875. The American University of Cairo was funded by Americans in 1919 under the British-ruled Protectorate and can be considered the first established university. The University of Damascus was funded in 1903, under ottoman rule. Public universities are rather rare in the Middle Eastern countries where private higher education is the rule rather than the exception. The complex history of the late nineteen's and early twentieth century in the region left little room for the establishment of public universities. The large Cairo University was funded in 1925, after independence (1922). The Lebanese University, unique public university in Lebanon, was funded in 1953 in an effort to democratize higher education. Most public universities in the Middle-Eastern countries, as well as in Egypt, were the product of a strong policy to train highly qualified personnel linked to the State and its "developmental" orientation.

In the Maghreb countries, only Algeria had a university under French colonial rule, the University of Algiers funded in 1909. It was after independence, in 1959, that Tunisia funded its first university in Tunis and Morocco in Rabat funded the Mohamed V University. Under French rule some research institutes existed: The Institut de Carthage (Tunisia) in 1893, mainly in anthropology and the Laboratoire d'Hygiène was funded in Morocco in 1914 as well as the first Institut Pasteur in Tangiers and one in Casablanca some years after. Other professional technical institutions were funded but mainly for the French technical personnel and keeping "muslims", as were called Maghreb inhabitants, far away from them (Arvanitis 2007; Waast & Gaillard 2002) .

Thus, even though the colonial past has not affected in the same way all the countries, a fact is common to all: public research institutions and large universities are the product of independence, not of "colonial science" and they all relate to a political process that has been geared by the formation of the young independent States. The colonial rule itself has very little affected the institutionalisation of science, contrary to what happened in Asia, or Latin America. At the independence, practically all institutions needed to be created or re-created. In the very few cases where such institutes existed before independence (in the three French-speaking countries mainly in agriculture and anthropology), they have had a hard time reconverting to the missions of an independent state. Thus most, if not all, research institutions are not only the product of post-colonial history; they are also products of a political national project (Kleiche 2003; Siino 2003; Waast & Gaillard 2002).

But overall, science has been both marginal and rather concentrated in some unique institutions. Still today, this explains the strong variations of number of publications in many countries: they are the *expression of a small number of institutions*. To give an example, nearly 50% of the scientific publications in Lebanon, the more decentralized country in the

Mediterranean, rely on one institution (Gaillard 2010). This very high concentration of the research activity is typical of countries with a small scientific community. And, it should be stressed that the science and technology policies derived from this institutional set-up have been mainly geared toward public research rather than innovation or even technological development (with very few exceptions, as is in Tunisia, Hsaini 2007, technical institutes were rather rare and with a limited scope of action). When research happened outside universities, or public research institutions, it was in the hands of research centres related to some large public corporations (See the cases of Algeria, Morocco and Syria, for example: Khelifaoui 2006)

Moreover, even though the effort has been to consolidate academic and research institutions in the last two decades, budgets were low, and usually were not a specific item in the public budget of the State (with the exception for a short period, of Morocco and since practically ten years in Tunisia).

Table 1. Estimated figures on Expenditures on R&D as a percentage of GDP

Country	1998*	2001*	2004*	2006**
Algeria	0.16	0.27	0.21	--
Egypt	0.20	0.19	--	0.2
Jordan	0.38	--	0.34 (2003)	0.34
Lebanon		--	0.22 (2006)	0.22
Morocco	0.32	0.71	0.80	0.75
Palestine	--	--	(half million USD research fund to be released)	--
Syria	--	--	--	--
Tunisia	0.43	0.53	1.00	1.3

Source: * 1998-2004: Country reports, ESTIME project. Most figures come from national sources. ** 2006 Data were given in the Arab Knowledge report, 2009, page 193). Egypt data from COMSTECH, the Arab League. Other countries come for either the World Bank database, Knowledge Assessment Methodology, 2008, or the Unesco Institute of Statistics (Montréal). Lebanon: ESTIME estimate.

Tunisia boasts a 1.3%M of GDP and is an exception (M'Henni, Ben Othman, *et al.* 2007). In fact, this country has made a real effort in reinforcing science and technology since many years (Siino 1999; Siino 2003). More importantly, Tunisia has created a national evaluation system of its laboratories, research teams and projects, organized on a national level, with a periodical review of activities (usually every 4 years). Morocco engaged in a profound revision of its system and a call for the creation of academic research entities inside the universities is on-going. Algeria since 1999 created a national law on research which launched a five year plan to develop research based on national programmes, managed at the national level, and including all those research units interested by the topic of the research programme on a voluntary basis. The same five-year scheme has been renewed more recently in Algeria, with a massive plan to support technological development and innovation.

Jordan and Lebanon are apparently witnessing a rather less direct role for the State. The financial contribution of the State has been low. Scientific production is limited to some well known universities that still maintain their dominance in a burgeoning environment of newly created academic institutions. Egypt, a case by itself, has been embarked in a slow but massive reform of its research system in order to face the overcrowding of its universities, and tries to evolve from a centralised system of large public research institutes to a more flexible institutional framework. The reform is poorly documented but has been very actively executed; the novelty of the situation makes any attempt of evaluating the possible changed impossible at that point.

Research in all these countries has depended upon the dialectic between the State, some large institutions devoted to research activities, mainly universities, and individual researchers. The State, in practically all the cases, has been promoting “research for growth” or “research for development” which in most cases coincides with the objective assigned to higher education of providing the State with highly trained professionals (engineers, doctors, high administrative cadres). Research was thus summoned to be applied and in some cases specific research institutes were created oriented towards a mission (agriculture, health, technical development). Universities, for many well known reasons, have tried to promote research but the main driving force has been the incredible growth of the demand for training of always more students. It was thus difficult to prioritize research and the research teams inside universities have always appeared as if by miracle. The main driving force has rather been individual researchers, in particular in the academic setting. They have had an immense role in shaping the system, mainly because as very well trained personnel, mostly in foreign countries (in Europe and more rarely in the USA and Canada). These people have rapidly secured high positions in the political and academic structures and they have had sufficient prestige to strongly influence policies and orientations. All these forces behind the promotion of innovation have been rather at odds with the promotion of innovation, setting what we labelled a real governance issue (Arvanitis, et al., 2010).

If we put aside an individual fluidity between the academic world and the productive world, mainly in the form of consultancies, universities have been quite isolated from the rest of the economy and efforts made to institutionally link them to enterprises have usually had little success. Individuals once again have played a significant role in that they engage in active relations with specific enterprises. But more institutionalized relations between academia and the companies seem difficult to sustain. Nonetheless, it should be noted that the major concern of policy makers in the region has been towards promoting applied research, technological development and innovation.

Also, the lack of integration of the public research units with the companies has been repeatedly mentioned in all policy documents to be the main issue in the setting up of an innovation policy in the Mediterranean.² By reading the policy documents, and interviewing policy officials, ‘innovation’ is understood as a way to promote the integration of academia with companies. What lies behind this objectives are concerns others than scientific; economic, demographic, social concerns are mentioned: increasing unemployment that affects the students with higher diplomas, brain-drain, growing weight of a rapidly increasing population of students; modernisation of enterprises; attraction of foreign investment; development of non-traditional and new economic sectors such as services and new agro-

² See ESCWA (2001; 2005; 2007). See also Country reports, ESTIME website www.estimate.ird.fr. Also : Arab Knowledge Report (2009)

industries; instrumentation of a strategy aimed at depending less on low labour costs and natural resources and more on knowledge.

The EU reference

As mentioned in the introduction, the relations between the EU and MENA countries has been very strong and gets closer in science and technology than in other areas. Through the Barcelona process, and later the Neighbourhood policy, the EU has gradually instilled not only money but also a certain way of doing policy in this domain.

Let us mention that since 2007, the more general policy framework of Euro-Med co-operation is defined by the so-called “Cairo Declaration” (See Box 1). The association agreements, the European Neighbourhood Policy, the action plans and Union for the Mediterranean documents all define a agenda that might not be so new, but has the advantage of being explicit. Moreover on the side of the EU, the principal financial instrument of cooperation has been is the European Neighbourhood Policy Instrument (ENPI), with almost €12 billion for the period 2007-2013. Additionally to the seventh Framework Program, the European Commission has assigned substantial funding through the structural programmes (defined in the Regional Strategy Paper (2007-2013) and Regional Indicative Programme (2007-2010) for the Euro-Mediterranean Partnership). The Regional Indicative Programme is complemented by the Cross-Border Cooperation (CBC) Programme for the Mediterranean Sea basin. Funding for the Cross-Border Cooperation programmes comes not only from the ENPI but also from the European Regional Development Fund (ERDF). The funding available for 2007-10 is € 583 million, of which € 275 million from ENPI, and € 308 million from ERDF.

Box 1 Objectives of the Cairo Declaration (June 2007)

A. In Higher Education:

Creating a Euromed Higher Education Area:

1. Approximating the Euromed Higher Education Systems;
2. Promotion of a Permanent Euromed University Forum;
3. Promoting Educational Innovation and Information and Communication Technologies (ICT);
4. Promoting *mobility* through exchanges of higher education students, teachers, researchers and administrators;
5. Enhancing participation in the *Erasmus Mundus External Cooperation Window*.

B. In Research and Innovation:

Towards the creation of a Euromed Research Area:

1. Modernizing Science and Technology, R&D policies in the Mediterranean Partner Countries;
2. Supporting Institutional Capacity Building, including human and research infrastructure development;
3. Enhancing the participation of the Mediterranean Partner Countries in the Framework Programmes while taking into account their particular needs, as well as areas of mutual interest and benefit between EU and Mediterranean Partner Countries;
4. Promoting innovation in the Mediterranean Partner Countries and enhancing exploitation of the RTD outputs by society and industry;
5. Favouring mobility of researchers;
6. Enhancing participation of the Mediterranean Partner Countries in the "People" Specific Programme of FP7.

Thus the Euro-Mediterranean policy context is now framed by the signature of this inter-ministerial agreement known as Cairo Declaration³ between EU and partner countries. It has included a series of policy objectives and serve the purpose of a framework for the assessment exercise. This inter-Ministerial is by itself the outcome of a conscious effort made on all the Mediterranean shores to define a common policy, after the creation of the Moco.

This acronym designs “The Monitoring Committee (MoCo) for the Euro-Mediterranean Cooperation in RTD” which was set up by the European Council (Barcelona Declaration – 27/28 November 1995). The task of the Monitoring Committee is to promote the development of a Euro-Mediterranean Space for Science and Technology, and thereby to support the sustainable development of the whole region in view of the creation of an “area of shared prosperity” (Barcelona Declaration, Economic and Financial Partnership’s goal).

The key role of the MoCo is to monitor and stimulate the Euro-Mediterranean Cooperation in Research, Technology and Development, in the wider process of opening up the European Research Area to the Mediterranean. The MoCo identifies issues of regional importance on the basis of the common interest; it acts as a forum for exchange of information and of views on RTD policy in the Mediterranean Region; it promotes the coordination of national S&T policies between its members and the EU; it monitors RTD policies developments and S&T programs and activities in the Region and proposes action plans to extend the European Research Area (ERA) to the whole region. Members of the Committee are high-level officials representing the Ministers responsible for RTD from the member states of the European Union and from the MPCs. The Committee is chaired by the representative of the country holding the Presidency of the European Union and operates in collaboration with the European Commission, which, until 2007, ensured the secretariat and coordinating role. Since then it is project MIRA, a coordination action funded by the International Cooperation activities (‘INCO’) of the Commission included in the budget of the 7th Framework Programme that acts as secretariat of the MoCo.

MoCo has been asking to monitor the research activities and to establish a sort of permanent impact measurement of the RTD activities under EU funding realized in co-operation with Mediterranean partner countries. This gave birth to a project of establishing an observatory for Scientific and technological co-operation activities. This project is also included in the MIRA project (See MIRA White Paper on co-operation indicators, 2011)

The MoCo, and the MIRA project, which now acts as its permanent negotiation platform, has been actively involved in the definition of the activities dedicated to the cooperation with the MPCs since the 6th Framework Programme for RTD. It has extended the “traditional” international cooperation activities, by overviewing the definition of thematic priorities, and the establishment of “National Contact Points” which are responsible for promoting project drafting in the Mediterranean countries. It has also defined innovation-oriented activities in order to facilitate the creation of a “Euro-Mediterranean Innovation Space” (EMIS). (Pasimeni, Boisard, *et al.* 2007)

This whole process described above forms a reference for evaluating and monitoring the research and innovation activities. It relies not only on voluntary and policy analysis. It also relies on an extensive evaluation of what can be defined as a permanent inter-connection

³ “Toward a Euro-Mediterranean Higher Education & Research Area” (June 2007).

between the European Union and the Mediterranean countries in favour of research and technology.

There are, as has been reminded above, many strands of support schemes between the EU and these countries. Of particular interest is the success of the catching-up activities oriented toward SMEs. The success of the Tunisian programme of modernization of industry (*Programme de Mise à Niveau des entreprises*) has reached more than half of Tunisian enterprises with a global amount of 2 billion Euros (Bennaceur, Ben Youssef, *et al.* 2007). In part this success is related to the creation of specific, flexible and autonomous structures (companies or offices depending on the cases) that implemented this programme. In other words, the programme implemented a series of intermediate organisations that helped companies or to say with other words, intermediate organizations that reach business and link technology to firms. Even a rather pessimistic –but quite realistic– assessment of the Barcelona Process (Moisseron 2005), underlines the success of this particular effort.

These various policy initiatives have permitted to draft common policy objectives as can be read in the Cairo Declaration. But they also have created a reference for the Mediterranean countries, and at the same time a need for assessment and impact evaluation. The policies promoting innovation enter under this same perspective: all countries have at some point expressed the need not only to define the actual policies in a more concerted way, but also to implement some assessment and monitoring tool.

Some aspects of the innovation policies in the Mediterranean countries

We do not intend here to review the innovation policies all around the Mediterranean basin. We have reviewed the policies in some detail for the case of Morocco and Tunisia (Arvanitis & M'henni 2010). We have also been directly involved in the process to define the assessment tools of these policies in the EMIS initiative (Arvanitis 2009). In order to monitor these policies --a need clearly expressed, as mentioned above, by both the European and the MENA countries-- one needs an organized overview of the innovation policies. We will limit ourselves to mention here some characteristics of these, based on a survey of research and innovation policies either realized under our supervision in the ESTIME project⁴ (of which the author was coordinator) or other studies (Khelfaoui 2004; Khelfaoui 2006; Khelfaoui 2006) (Djeflat 2002) published in the region.

Box 2: Morocco innovation policy

Structures of coordination for innovation:

- Inter-ministerial Standing Committee for technological development and scientific research
- Poles of competences: multi-field scientific research networks allowing to federate national competences in priority fields for the development and to create a synergy and a complementarity between teams of research working in the same field. There are currently 16 poles of competence
- Network of Industrial Engineering (NIE): composed by researchers, scholars and engineers in industrial engineering. The missions of the NIE is to accompany companies in improving their productivity, the training of entrepreneurs and executives of companies to the techniques of industrial engineering, the development of courses specialized in industrial engineering,

⁴ A complete list of documents can be found on the ESTIME website. The final report contains the list of reports that were prepared for each country.

management training and participation of the executives of companies in a better diffusion of the methods of industrial engineering

- The Moroccan Incubation Network. Federates the public and private operators working in the field of the valorisation of research and innovation. Its role is to accompany and support the creation of innovative viable companies, through incubation and swarming. The network can support feasibility studies financially and help with the realization of the adopted projects.
- Moroccan Network of Technological Diffusion. It gathers competences from general practitioners as well as specialists in faculties, schools of engineers, higher schools of technologies, technical centres and regional delegations of the Ministry of Industry. It accompanies the Moroccan companies in their development projects and offering solutions for expertise and financing.
- Bilateral conventions between government departments

Measures for the promotion of research and development and new technologies in Morocco:

- Provision for R&D which consists in deducing from taxes R&D activities;
- Fund of Investments Promotion deals with the costs related to infrastructures for investment projects in technology transfers.

Measures to increase technology transfers:

- Structures within the universities whose principal missions are the conciliation between needs for the company and competences offered in universities and valorisation of their research results.
- Networks cited above;
- EUREKA network: Morocco is an associate member of the EUREKA European network (34 countries), whose objective is to support innovative projects.
- Programs of bi-lateral international cooperation, in particular the program of Scientific, Technological and Industrial partnership with the Midi Pyrénées region in France.

Most of the measures in the region, try to link research, science, and universities to the productive sector. Policy documents insist upon the need for more contacts between academia and the productive sector. This is not specific to MENA countries. But, in most cases these measures were taken in the early 2000s when a gradual change of orientation has been taking place, from S&T capacity building policies to more explicit research and innovation-oriented activities took place. Earlier examples of explicit innovation policies were rather limited: but until the mid-2000s, there was a mismatch between the discourse promoted by the OECD on “national systems of innovation” and the actual situation of the MENA countries.⁵ An emblematic example of such mismatch was the report issued on the “innovation system” of Jordan by an external audit team funded by Canadian IDRC (Mullin, Abeledo, *et al.* 2002). The consultants who prepared this very well structured report after a good review of the science policies of the country were in fact struggling against their preconceived framework of analysis on the innovation systems and the actual situation in the country. Most of recommendations were rather oriented toward governance issues of the science policy and the role of the science council. In the same vain, Hocine Khefaoui maintained that, at the end of 90s, “on paper”, Algeria had all the elements that should constitute such an innovation system but not the system itself. His interpretation was that policies were caught in the cross-fire of politics (Khefaoui 2006). Strangely, the “innovation systems” analysis proposed by OECD at that time didn’t seem sufficient, or useful, or wasn’t audible in the context of MENA countries. At stakes is probably the model itself of “systems of innovation” as it was

⁵ Something similar happened in Europe in the early 1980s.

conceived in Europe or for more industrialized countries.⁶ This is why we proposed to talk about the construction of a “world of innovation” rather than a system of innovation. Nevertheless, it is certain that most of these countries adopted many innovation-oriented policies, and not just the discourse on innovation, but lacked not only previous experience but also an analytical framework.

The first visible initiatives were in most cases the promotion of technoparks. Tunisia was a forerunner in the region with the El Ghazala technopole in Tunis, mainly oriented toward new information and communication technologies. Morocco set-up its Technopark in Casablanca, Egypt its Smart Village close to Cairo and in Lebanon the University of Saint-Joseph created the Berytech. These are remarkable in their orientation toward new information technologies, focussing on rather small start-ups, acting as incubators of new businesses, and are relating some training facility (university or engineering school) with enterprises. These technopoles or technoparks have been successful in housing many new small technology-oriented companies. Nonetheless, some assessments tend to doubt the efficiency of the linkage between universities and the universities or engineering schools and departments included in the technoparks (Mezouaghi 2006).

Additionally, we can mention a series of frequently mentioned policies in the promotion of innovation policies around the Mediterranean:

- Technology Transfer Units in universities and engineering schools
- Funding Issues including venture capital, credit schemes, etc...
- Engineering Networks
- Promotion of intermediate technical centers
- business associations related to innovation and technological development.

Venture capital and business and entrepreneurship measures have been adopted in most MENA countries to a varying degree. Recently (December 2010) Jordan concluded a programme for business incubators. Tunisia has set-up a rather exhaustive policy for the promotion of venture capital, not so successful as expected.

Finally it is rather important to note that the issues pertaining to innovation are closely related to the industrial policy. From this point of view, clusters of industries have been sustained, either in traditional sectors or in more advanced technological areas. Again, this choice is related to the success of cluster-based industrial policy in Europe and Asia (OECD 2007).

As an example, Box 2 presents the measures adopted in Morocco, the country which probably had the largest scope of different measures in favour of innovation in the region. In the last five years, MENA countries have developed a wealth of instruments and measures with the main aim of connecting businesses with public research centres and universities. Thus innovation has been very much related, in policy terms, to the development of *techno-economic and engineering networks*. *Networks* are mentioned as such in the policy documents, as an efficient means for promoting technology to businesses.

⁶ A recent PhD thesis reviewed extensively this inadequacy of the innovation systems approach to developing countries (López-Martínez 2006).

It might be necessary to insist on the fact that this emphasis on techno-economic networks is not the only possible solution for innovation policies. Other possible orientations could have been the development of businesses with a strong (public) investment component,⁷ a preferential policy towards international investors⁸, or the development of strong public technical centres. The “network” orientation has certainly the advantage of flexible arrangements; it fitted the thinking in terms of governance (Rhodes 1996). It is also strongly inspired on innovation policy concepts developed in France and more generally in Europe that have been applied to science and technology policy as well as strategic management of innovation and research (Callon, Larédo, *et al.* 1995). It has finally the additional characteristic of challenging the public research sector by asking it to establish linkages to the economy but without putting in danger the institutional and political position of academic institutions.

These policies aimed at promoting networks are too new to have received an impact evaluation. They merit our attention not only because they are new, but also because they are creating a whole set of new institutions and promote new players in the game. Basically what is at stakes is the creation of a whole set of new actors in between firms and public authorities, an issue that pertains to all public policy domains in MENA countries (Moissoneron 2009). Interestingly, this issue has persistently been associated to the EU policy in its collaboration with MENA countries (Labaronne & Ben Abdelkader 2008).

Innovation at the firm-level

Innovation activities are less well known and innovation surveys have been difficult to come by. Morocco, Tunisia, Turkey and more recently Egypt have completed innovation surveys. These show a rather surprisingly high degree of introduction of innovation (of course, at different degrees in each country and each industrial sector). There is large room for interpretation in the data that come out of innovation surveys (Bascavusoglu-Moreau 2009) but in general figures were low but rather higher than expected.⁹ The quite detailed comparison of 1999 to 2004 survey in Morocco brought this remarkable result that middle-sized companies are now a major player in R&D (Maghrabi 2006); it is also true of Tunisia, where SMEs of national capital are persistently more innovative than foreign-owned enterprises based in Tunisia (Gabsi, M'henni, *et al.* 2008).

Innovation and R&D are rarely formalized in the companies, either because it is not identified as such, or because there is no specific organizational unit that is in charge of innovative activities. This fundamental feature, not specific to these two countries, has been also confirmed through case studies and qualitative surveys in Morocco (Mellakh 2007). The qualitative survey showed a varied array of organizational forms that deal with technology within each company. Many projects that are innovative are realized by the production units, or the commercialization personnel. Some companies consider innovation as an essential item of their strategy and consider the company is an innovation by itself. Many consider innovation as important but are not investing either in R&D or in innovative projects. In most cases, the innovation comes from the market needs and linkages with foreign, but more often

⁷ Morocco has also tried this option, for example in the development plans of Tangiers.

⁸ This is an option suggested very strongly by the Economic Plan of Morocco called “Emergence” launched in 2006, based on an analysis that was asked by the Moroccan government to McKinsey consultants.

⁹ See our article on Tunisia and Morocco innovation surveys published in STS (Arvanitis & M'henni 2010)

from national clients. Of course this depends greatly upon the economic sectors and the industrial dynamic.

But not does only the quantity of innovation-related activities grow in these countries. Most impressive is the yet unevenly documented growth of what we have called the “*innovation world*” (Arvanitis 2005). By this concept we want to qualify all the institutions, especially intermediate-level organizations, which have been created in order to respond to the technological activities of firms such as public bodies devoted to the management of engineering networks, fiscal and credit incentives, promotion of Units of technology transfers, and the like. Many associations of engineers, scientists, business people, research centres, born of either private or public initiatives have appeared. A remarkable example is ‘R&D Maroc’ in Morocco, a quasi-NGO that groups managers from R&D units of all the country. A number of consultancy firms have appeared that manage technological innovation and cater for economic and technological information to industry. Most of these are engineering consultancy firms in specific fields (building, public works, environment) or sectors (energy, environment, ICT industry, electronics industry, telecommunications). Along the way some venture-capital firms have appeared, as financers of projects for creation of new companies, or projects linked to technology development, as well as companies managing portfolios of companies and venture-capital enterprises (financial participation in new-technology companies). The technological networks, as we already mentioned, have been actively promoted in all countries. Older industrial districts, not be confused with technoparks, have been the object of attention of industrial and commercial policies favouring their consolidation. Finally, regulatory institutions have been also consolidated that manage patents, ISO standards, quality standards, standards linked to the promotion of a local brands (local rural product, specific product), environmental standards, and so on.

All these institutions and actors are usually included under the heading of national innovation systems. We do not use the concept here since we have strong evidence that linkages are rather loose in-between these actors. Most actors are related on a bi-lateral scheme between the state and each of these actors. Moreover, a national innovation system would be rather centered on innovation activities either in traditional or new firms, whereas, as we insist above, most activities in the public sphere, and public policies are mainly concerned with linking the academia to the productive sector. Finally, what we want to underline here with the word ‘innovation world’ is the growth of new actors, a world by itself, not a system of closely connected and interdependent agents, as is implied in the word ‘system’.

The actual situation described above, arising from the results of the innovation surveys and this growth of the innovation world, indicate a paradox. On one hand, there is growth of innovation activities, basically in firms that were not interested in this activity some years before (or new businesses), and simultaneously we find a growth of the innovation world; on the other hand innovation surveys indicate a low level of interest of the firms with public support to innovation. In the surveys, many reasons are mentioned by companies, but mainly two arise: bad knowledge of the support schemes, and little involvement in them, little previous experience. This low use of public support is a common feature in Morocco and Tunisia, probably also in other MENA countries. It identifies a *public policy gap*, that we need to clearly analyze, one that seems very similar to the issue of privatization and performance of businesses in former East-European countries and in MENA countries (Labaronne 2006). Up to a certain point it is a difficult issue that cannot be answered by some simple relations between a single variable and some single explanatory item. It relates to the general issues pertaining to the governance of the innovation system in these countries

(Arvanitis, M'Henni, *et al.* 2010) and should be studied not only at the firm-level, but also taking into account the type of incentive schemes, the nature of the technological environment of the firms, and finally the functioning of the research system. More generally, the adequate response of firms to innovation policy relates to the general technological capabilities of firms, and to their technological learning.

Conclusion

This article intended to present the issues related to the analysis of innovation in the MENA region. It has been fed by different analysis undertaken in the last five years on innovation. Many queries are now on the table concerning:

- the degree of knowledge we have on the innovation system;
- the necessity to review innovation at the firm-level
- the need to take into account the European Union policy and its impact on MENA countries
- the need to focus not exclusively on firms or the state but on the “innovation world” composed of a large variety of actors: large and small companies, mission-oriented centres and basic research institutes.

The distance is still large before we have an assessment framework large enough but also well informed that could help us measure policy impact in the economy concerning innovation and technology. We only wanted here to stress the need for a more theoretical discussion and to underline the useful concepts for this analysis.

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