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The technological activity of neighbouring countries: a prelimiiary overview

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Part 2.

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Abstract

The purpose of this paper is to offer a preliminary descriptive overview of the technological activity of the European Neighbourhood Countries (ENC) based on the few available information. Furthermore, we aim at making a comparison between EU and EN countries but also among EN countries and two geographical areas: South and East. The idea is to start developing a set of information to illustrate, even though partially and incompletely, the national innovation systems of each ENC (Lundvall, 1992, Pavit, 1994).

Technological indicators are usually divided into two main groups: input and output indicators. As the main input variable, we employ R&D expenditure (million of dollars and as a percentage of GDP) and as output indicators we use patents applications. R&D is considered to be the most important innovative input indicator and it is defined as the creative work undertaken systematically with a view to increase the stock of knowledge, and, thanks to its use, to devise new applications. As for output indicators, patents are expected to measure the return resulting from the technological activity of individuals and firms and are used as a proxy for R&D effectiveness. We consider both patent applications at the European Patent Office (EPO) and international applications under the Patent Cooperation Treaty (PCT) for each country. Patent statistics include breakdowns by applicants and inventors and by some selected sector.

1. Introduction

It is commonly recognized that innovation is a key factor for growth and development of economic systems and it also widely recognized that exists a large heterogeneity across territories in their capacity to create knowledge and innovation, but also in their abilities to exploit available ideas and technologies.

Most literature on knowledge capital relies on the concept of knowledge externalities or spillovers, underlying the strong relation between geography and knowledge accumulation. Empirical studies have demonstrated that this kind of spillovers are spatially bounded and they have also identified some key drivers to stimulate this "knowledge transmission" such as education, mobility of people and resources, connectivity of systems, existence of social networks, (see, among others, from the seminal paper of Griliches, 1979 to Almeida and Kogut, 1999; Breschi and Lissoni, 2001; Agrawal et al., 2006; Faggian and McCann, 2006; Breschi and Malerba, 2007).

However, as stressed by Paci and Usai (2009), this research line has suffered since the beginning from the lack of adequate indicators, as these interactions are hard to appraise, especially when tacit knowledge plays an important role. In fact, Krugman (1991) observed that knowledge flows are invisible and cannot be measured and tracked. This view was opposed by Jaffe et al. (1993) who suggested that indeed knowledge spillovers may leave a "paper trail" in the form of patent citations, which can be easily measured and therefore used to obtain information on several dimensions of the technological transmission mechanism.

The purpose of this paper is to offer a preliminary overview of the technological activity of the European Neighbourhood Countries (ENC) based on the few available information. Furthermore, we will be able to make comparisons between EU and EN countries but also among EN countries and two geographical areas: South and East. The idea is to start developing a set of information to illustrate, even though partially and incompletely, the national innovation systems of each ENC (Lundvall, 1992, Pavit, 1994).

Moreover, a large strand of literature has stressed that differences in economic behaviours and outcomes are primarily related to differences in institutions and basic socio-economic conditions (Hodgson, 1988, 1998; Whitley, 1992, 2003; Saxenian, 1994; Gertler, 1997). Following this suggestion, we present some basic socio-economic indicators in order to have a comprehensive overview of all countries and highlight the most important characteristics and peculiarities. The aim is also to outline the main trends between 2000 and 2008, the period considered in our analysis.

Technological indicators are usually divided into two main groups: input and output indicators. As the main input variable, we employ R&D expenditure (million of dollars and as a percentage of GDP) and as output indicators we use patents applications. R&D is considered to be the most important innovative input indicator and it is defined as the creative work undertaken systematically with a view to increase the stock of knowledge, and, thanks to its use, to devise new applications. As for output indicators, patents are expected to measure the return resulting from the technological activity of individuals and firms and are used as a proxy for R&D effectiveness. We consider both patent applications at the European Patent Office (EPO) and international applications under the Patent Cooperation Treaty (PCT) for each country. Patent statistics include breakdowns by applicants and inventors and by some selected sector.

All in all, in section 2 we describe the main socio-economic indicators both for EU27 and EN countries and in section 3 we focus on measures of innovative performances. In section 4 we conclude. The Annex reports for each country a table with the patent sectoral profile.

2. Socio-economic overview

2.1 EU and ENC: a comparison

The gradual enlargement of the European Union has resulted in the continuous change of the external borders through the acquisition of new members and consequently of new neighbours. The EU Commission, over the past years, has recommended to reinforce and develop the existing forms of cooperation and several European projects and policies that have been promoting this effort. In particular, the European Neighbourhood Policy aims at avoiding the emergence of new dividing lines between the enlarged EU and its neighbors to the South and East, going beyond the existing relationships to offer a deeper political relationship and economic integration.

This section aims at giving an exploratory overview of social and economic conditions in these neighbouring areas. We need such information in order to have the basic knowledge of the diverse context of the 16 countries pertaining to the group of ENC. A group which despite some common feature, include very diverse countries in terms of size, wealth, administrative organization, geography and history. The EU policy has created a common interest but the countries respond to it differently and according to their own needs and characteristics.

In the following analysis we build different indicators for different groups of countries, namely: EU27, referring to all the countries that are part of the European Union from 2007, EU15 including the Old Member State and the NMS12 that includes the New Members from Centre and East Europe that joined in 2004. Furthermore, we maintain the distinction between East and South ENCs and keep Israel isolated because of its particular features.

Table 1. Socio-economic indicators for areas, average 2000-2008

area	**population** million	**density** pop per square km	**GDP PPP** constant 2005 million $	**GDP per capita constant 2005 $**	**education** public spending % GDP
EU15	386.4	123.6	11,624,792	30,082	4.3
NMS12	104.1	98.6	1,406,346	13,510	4.5
EU27	490.5	117.3	13,031,138	26,565	4.3
ENC-South	185.0	30.6	1,096,302	5,926	2.9
ENC-East	76.8	77.1	400,448	5,217	4.1
Israel	6.8	314.6	159,914	23,490	6.3
ENC16	261.8	37.2	1,496,751	5,718	3.3

Source: CRENoS calculation on World Bank data

Table 1 shows the main economic and social data in terms of population, GDP and expenditure on education for the period 2000-2008. It is immediately evident that there are marked differences across groups. In particular, we notice that ENC population is quite large, 262 million people, about two thirds of EU27. The population density is however, much higher in the EU nations: on average three times the ENCs one. Great disparities also emerge when analyzing the income level: with the exception of Israel, neighbouring nations show a GDP per capita of less than six thousand dollars, about one fifth of the EU27 group. Israel has a wealth level which is comparable to EU27 country. Later in the analysis, we see that this observation is valid for other economic and technological issues. The percentage of GDP spent by governments in education is less differentiated, even though it is rather low for the Southern area (2.9 versus 4.3 for EU27) and almost equal to EU27 for Eastern countries (4.1). The Eastern group has however a lower average income per capita than the Southern area (5,217 and 5,926 respectively).

2.2 ENCs: analysis at country level

In this section we analyze the same basic indicators for each country, as reported in Table 2. First of all, we observe a great variability in size: population is the variable with the highest relative standard deviation. Armenia, Moldova and Lebanon are the smallest countries with fewer than 5 million inhabitants. Among the biggest countries we find Morocco and Algeria with around 30 million, Ukraine with nearly 48 million and Egypt, at the top of the ranking, with almost 73 million people. Population density shows a great variability, too. Due to their small size, Lebanon and Israel show the highest density with 389 and 315 inhabitants per square kilometer. The lowest density is, as expected, found in two of the biggest North African countries: Lybia and Algeria have only 3 and 14 people per squared kilometer, respectively, due to their special geographic and ecological environment.

Table 2. Socio-economic indicators for countries, average 2000-2008

country	**pop** (million)	**density** (pop per sqKm)	**GDP** (constant PPP 2005, million $)	**GDP** per capita	**HDI** (2011)	**Literacy index** (% pop)	**Public exp. in education** (% GDP)
Armenia	3.07	108.7	11,645	3,795	86	-	2.7
Azerbaijan	8.34	101.0	38,402	4,602	76	99.7	2.9
Belarus	9.82	48.4	79,201	8,062	65	99.7	3.3
Georgia	4.37	62.9	14,992	3,430	75	-	2.6
Moldova	3.60	109.6	7,892	2,190	111	98.5	6.7
Ukraine	47.55	82.1	248,317	5,222	76	99.5	4.7
ENC-East	76.77	77.1	400,448	5,217	-	-	4.1
Algeria	32.43	13.6	221,201	6,821	96	90.0	0.6
Egypt	72.90	73.2	330,173	4,529	113	85.0	3.0
Israel	6.81	314.6	159,914	23,490	17	97.4	6.3
Jordan	5.29	59.9	22,447	4,244	95	99.0	-
Lebanon	3.98	388.8	37,875	9,522	71	89.6	2.5
Libya	5.67	3.2	76,350	13,466	64	88.9	-
Morocco	30.07	67.4	105,167	3,497	130	55.1	4.3
Syria	17.90	97.5	73,266	4,092	119	92.0	1.3
Tunisia	9.94	64.0	69,910	7,030	94	94.0	6.4
ENC-South	185.00	30.6	1096,302	5,926	-	-	2.9

Source: CRENoS calculation on World Bank data

Moreover, the socio-economic indicators show a second important common feature: the ENCs are mainly within the middle-low income group of developing countries, with the exception of Israel whose inhabitants earn an average income of 23 thousand dollars. Libya, the second country in the ranking, reaches the same GDP per capita of the new member states in EU, that is around 13,500 dollars. As far the other neighbouring countries are concerned, they are all the under the threshold of ten thousands dollar per capita. Particularly critical is the situation in Moldova, Georgia, Morocco and Armenia, whose income does not reach five thousand dollar. Lebanon and Belarus have a relatively better situation, with 9,500 and 8,000 dollars per year.

The low level in GDP per capita implies low values in many other indices which account for other aspects of development other than economic ones. In particular the column on the Human Development Index (HDI) ranking in 2011 shows that rankings for ENC goes from the 64^{th} to the 130^{th} rank for Belarus and Morocco respectively. The only exception is Israel, ranked 17 out of 187 countries and territories, which falls into the category of highly human developed countries.

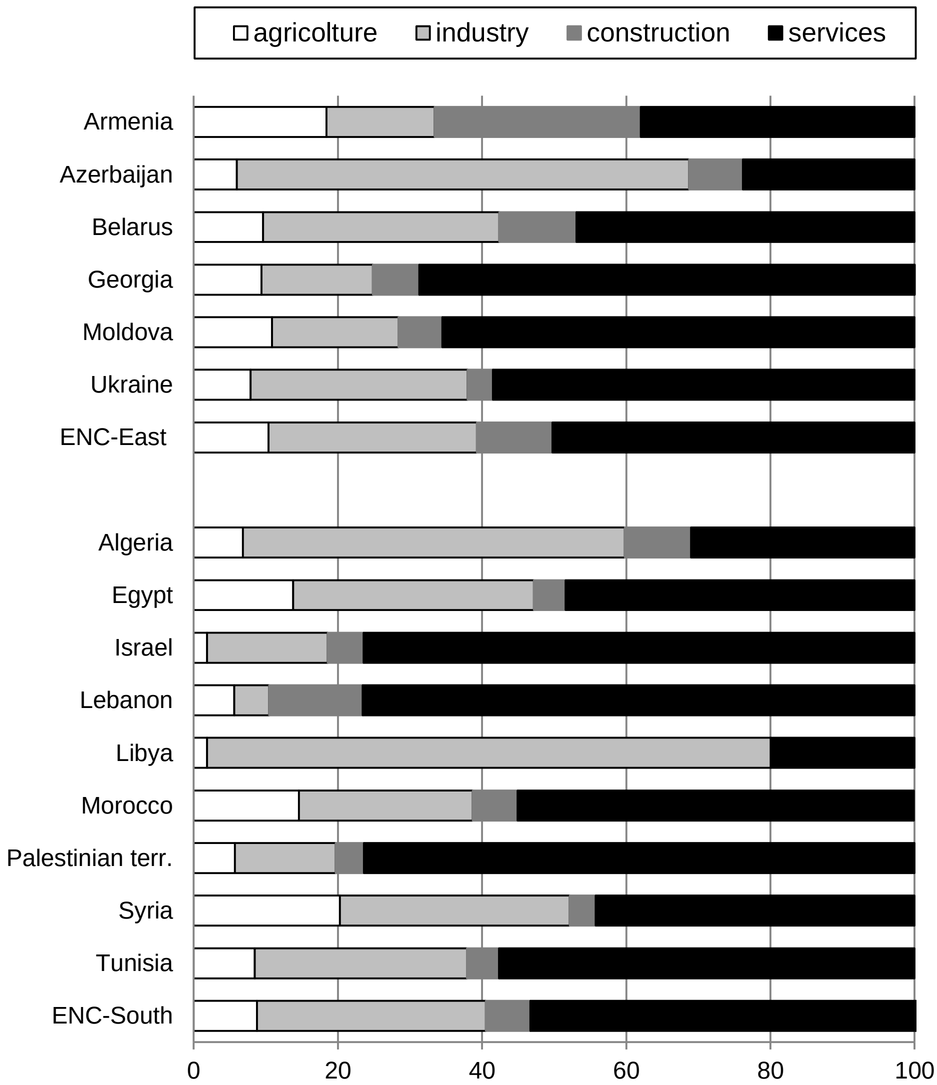
The low ranking in HDI is confirmed by the low literacy and schooling rates in several countries. Table 2 shows, for example, that, the country with the lowest HDI has also the worst literacy rate, with 55 percent, far away from all other countries. A look to the share of GDP devoted to education (in the last column) reveals that public spending is in general quite low for all the ENC but with an ample variability. The comparison of this index with the previous ones implies that the relationship between investment in human capital does not always correspond to good results in HDI and literacy rates, probably due to remarkable difference in the quality of the public investments made by each country. Israel, Tunisia and Moldova are important exceptions, with over six points of GDP devoted to education, a percentage that is much higher than that of other ENC's and also higher than that of EU27.

Figure 1 offers a further important information on the economic situation of ENCs: it shows the productive structure with its sectoral composition in terms of value added. As expected, the macro-economic relevance of the four main sectors (agriculture, industry, construction and services) differs widely among ENCs. It is clear that for the majority of ENC, agriculture is still an essential component of economic activities. This sector contributes for around 10 percent in many countries; with some remarkable exceptions, as in the case of Israel and Libya (with a share of less than 2 percent). On the contrary, in Armenia and Syria, agriculture still represents around one fifth of the total value added.

As far as the industry is concerned, some countries, such as Libya, Azerbaijan and Algeria, are strongly specialized in this sector with half of the total value added produced by manufacturing and transformation, mainly because of their endowment of natural resources. This specialization makes these countries very dependent on this main sector. The construction sector seems to have quite a relevant weight with respect to the total value added just in Armenia (28 per cent), in all others economies this sector has a quota of less than 10 per cent.

Finally, as far as the service sector is concerned, the countries which are more specialized are Israel, Palestinian territories and Lebanon, with shares which are around 75 per cent of the total value added. They are followed by Georgia and Moldova with shares of 68 and 65, respectively.

Figure 1. Sectoral composition of value added, 2008



Source: CRENoS calculation on Eurostat data

In conclusion it should be noticed that, even if some common features have been identified, there is a great variety among ENCs. In particular, neighboring countries have different endowments in natural resources, relative production structure and resulting development strategies (past and present), which make them very diverse. Israel has to be considered a very special case among ENCs.

3. Innovative activity, a comparison of EU and ENC

Evaluating how countries perform in developing and commercializing technology is not an easy task. Since the extensive review by Griliches (1990), the issue of measuring innovative activity and technological progress has been debated by economists and, even though no universal solution has been proposed, two typologies of indicators are usually identified: technology input measures (such as R&D expenditure) and technology output measures (such as patents).

Research and development expenditure data, in spite of their limitations, have long been the principal innovation input measure because they are usually available for an extended period for firms and industries. The main indicator is the ratio of expenses dedicated to R&D as related to the National Gross Product (GDP). It is called Gross Expenditure on R&D (GERD).

In the case of ENC there are some difficulties related with this measure. The GERD is based on an assessment of the financial resources of public institutions and of private sector. This assessment involves a budget analysis that could permit to differentiate what is dedicated to R&D and what is devoted to other tasks inside universities and other public institutions. However, in many of ENC these difficulties are highly critical because in most of them (such as Algeria, Tunisia and Egypt) research is rarely identified as such either in Universities' or in public institutions' budgets.

It is important to underline these cautionary notes because of the variety of the ENCs. Nonetheless, the most difficult task concerns the comparability of data. This is why, whatever definition is adopted for the specific indicators, it is important to have a consensus on the definition and use of the indicators. We base our analysis on a number of data sources available at OECD and WIPO, and the tables below present statistical data and indicators are designed to illustrate the trends and structure of science, technology and innovation for the ENC and in comparison with the European Union ones.

Although patents do not cover every kind of innovation, they do include many of them. Patents have become one of the most widely used sources of data in the construction of indicators on inventive output, as they are closely linked to invention and they provide detailed information in relatively long time-series. Nevertheless, patent indicators also have several shortcomings and therefore need to be combined with other Science & Technology (S&T) output indicators in order to obtain a full picture of innovation activities in individual countries. In conclusion, we have to take into account that not all inventions are patented and that not all patents have the same value. Patent statistics have, nevertheless, made rapid progress in recent years. A continuing effort is made to improve the quality and availability of IP statistics. It is difficult to obtain data for all IP offices with all possible breakdowns, as a result, when it proved necessary and feasible, missing data have been estimated. Intellectual property data published in this report are mostly taken from the OECD and WIPO Statistics Database that offer a unique tool for analysts.

Patent counts will be also presented by technology areas such as: information communication technology (ICT), biotechnology, nanotechnology and technologies related to the environment. And in conclusion we will discuss three patent-based indicators of internationalization of technology reflecting the international co-operation in research between those countries and the rest of the world, focusing in particular in the network with EU countries, USA and Japan.

3.1 Innovation activity

In this section, we present two indicators commonly used to measure the technology input: the R&D expenditure in volume (million dollars) and the R&D intensity measured as a percentage of GDP.

Table 3 shows that a marked difference in the R&D expenditure occurs both within and across European and the Neighbouring countries. On average, new member states from East and Central Europe spend slightly more than 10 million dollars which represent quite a low percentage of GDP (0.74). By contrast, the EU15 countries, with almost 220 millions spent, invest a much higher percentage of income (1.89). The 16 neighboring countries as a whole spend about 13 million, which implies an R&D intensity slightly less than 1% of their GDP. Obviously such an average hides some variability: the R&D intensity for the Eastern area (0.8) is lower than the Southern one (1.1). This can be explained with the great amount spent by Israel alone (more than 7 million dollars), equal to 4.5% of its GDP, which accounts for almost 60% of the total ENCs' expenditure.

Table 3. R&D expenditure for areas, average 2000-2008

area	**R&D expenditure** (PPP 2005 million $)	**R&D expenditure** (% GDP)
EU15	219,894	1.89
NMS12	10,417	0.74
EU27	230,312	1.77
ENC-South	9,814	1.07
ENC-East	3,207	0.80
Israel	7,193	4.50
ENC16	13,020	0.99

NB. Calculation made only for available years

Source: CRENoS calculation on OECD Data

The main indicator for innovation performance is identified by the number of applications at either Patent Cooperation Treaty (PCT) and at the European Patent Organization (EPO). The PCT enables an international patent application to have the same effect as a national application in each of the contracting states designated in the application. When the EPO is designated, the patent is known as a Euro-PCT patent. The PCT system is superimposed on the national and European systems, but patents are always nationally and/or regionally granted. All PCT applications are centralized through the World Intellectual Property Organisation (WIPO). We have to take into account that the PCT patent data do not suffer (or suffer less) from the usual home bias effect of the EPO data. Since patents at EPO protect innovation within their respective geographical area, they are preferred by domestic firms, and thus their quota overestimates their innovative capability with respect to foreign firms.

We present patent data both by applicant's and by inventor's country of residence. In most cases the applicant is an institution[1] (a firm, a government body such as an university or a public laboratory), which is the legal owner of the patent at the time of the application. Thus, the number of patents, according to the applicant's country of residence, measures the degree of control on patents by each country's residents. It reflects the innovativeness of firms of a given country, whatever the location of their research facilities. The inventor, instead, is almost always an individual, usually a researcher employed in the applicant firm. Since patent statistics by inventor's captures the national location where the invention is introduced, it better reflects the technological innovativeness of researchers and laboratories located in a given country, whatever their ownership[2]. Moreover, in order to measure inventive activity, patent are counted according to the priority year. Since it corresponds to the first filing worldwide, this date is considered the closest to the introduction of the invention.

In Table 4 we present the number of patents filed to the EPO per million population in the EU27 and ENC. It is clear that large disparities are observed in patenting activity, too. The EU27 is the most active world economy in patents granted at the EPO with an average that overcomes 17 thousands patents per country. Patenting in the European Union is, in fact, highly concentrated in the so called Old Europe (EU15) with more than 30 thousand patents per country. From 2000 to 2008 they generated most part of patent applications, accounting for more than 90% of overall patent activity in the EU27. Among EU Member States, Germany is one of the leader, while the leading non-EU countries in EPO patent applications includes Israel, which has a number of EPO patents per capita even higher than the EU15 average. Israel applies for more than 95% of total ENC patents (by inventors and by applicants). When Israel is excluded, the neighbouring countries, as expected, register very low levels of patenting activity. The Southern and Eastern area have 69 patents by inventor residence and

[1] For EPO patents the share of institutions in total applicants is usually estimated to be higher than 90%.
[2] When a patent has more than one inventor/applicant, a proportional share is attributed to each country.

just 38 by applicant residence, which implies less than 1 patent per million inhabitants for both statistics.

In this report we focus on patenting activity in three platform technologies: ICT, biotechnology and nanotechnology, whose combined impacts are considered to have profound implications for long-term economic growth and transformation. Moreover, we extend the analysis by including statistics on the environmental related technologies, the grand challenge for mature and developing economies. These four sectors are regarded as key enabling technologies because of their expected fast growth, and spanning different industry sectors for their high spillover potentials to other technologies.

ICT relates to the tools and the processes to access, retrieve, store, organize, produce and share data and information by electronic and other automated means. Both established ICTs (radio, television, video) and well developed ICTs (mobiles, network hardware and software) are pervasive and allow the exchange of knowledge by separating content from physical location, which can lead to efficiency improvements in production and markets. The global connection of individuals and organizations across the world by means of the communication and information systems has a potential use for social and economic development that can be still exploited.

The second sector, biotechnology, exploits biological processes, some of which at the molecular scale of the gene, to produce or process commercial products. These techniques can be used in different disciplines ranging from agriculture to chemical treatments, from medicine to food processing.

Nanotechnologies, that promise to be the foundation of the next industrial revolution, deal with design and production of structures and systems that entails the control of the shape and size at the nanometre scale. It is the latest emerging general purpose technology with potential multisectorial applications.

The last sector analyzed in this section refers to the environmental related technologies, considered the key to sustainable economic development. They cover a wide range of applications that are commonly grouped under the following areas: air and water pollution control, emissions mitigation, waste management, renewable energy generation, climate change mitigation, emissions abatement and fuel efficiency in transportation, efficiency in buildings and lighting.

Obviously, as expected the volume of patents in these sectors by ENC is rather modest: ENCs just report 674 patents by inventor and 495 by applicant in the previous selected sectors in the period under examination. It is interesting to investigate the country relative specialization in these technologies by looking at the share over total patents.

The Southern area shows a relative specialization in biotechnologies with 16% and 18% over total patents by inventor and by applicant, while the same share is equal to 5% for the

EU15 group. Israel, with 40% and 35% of patents by inventor and by applicant respectively, show quite a strong attitude towards innovation in ICT with respect to other European nations.

Table 4. EPO patents by area, yearly average 2000-2008

by inventor(s)	EU27	EU15	NMS12	ENC	South*	East	Israel
total patents	54,662.2	54,057.8	604.4	1,212.5	31.7	37.5	1,143.3
patents per million inhab	111.4	139.9	5.8	4.6	0.2	0.5	167.9
ICT (%)	*28.0*	*28.0*	*22.8*	*40.0*	*32.7*	*21.4*	*40.9*
biotechnology (%)	*5.3*	*5.3*	*6.0*	*11.0*	*16.2*	*6.2*	*11.0*
nanotechnology (%)	*0.7*	*0.7*	*1.0*	*1.1*	*1.8*	*1.9*	*1.1*
environmental (%)	*6.9*	*6.9*	*7.8*	*3.4*	*5.2*	*8.9*	*3.2*
by applicant(s)							
total patents	53,207.8	52,742.0	465.9	959.4	19.9	18.1	921.4
patents per million inhab	108.5	136.5	4.5	3.7	0.1	0.2	135.3
ICT (%)	*28.2*	*28.3*	*16.2*	*34.5*	*26.2*	*17.3*	*35.0*
biotechnology (%)	*5.3*	*5.3*	*6.3*	*12.4*	*17.5*	*3.9*	*12.4*
nanotechnology (%)	*0.7*	*0.7*	*1.0*	*1.2*	*1.9*	*2.2*	*1.1*
environmental (%)	*6.9*	*6.9*	*9.9*	*3.6*	*5.0*	*7.0*	*3.5*
international cooperation (% of patents)							
with foreign co-inventor(s)	17.7	17.4	37.7	19.9	56.5	64.7	16.2
invented abroad	20.9	20.8	23.4	11.6	20.4	29.8	10.9
owned by foreigners	24.1	23.8	50.5	32.5	66.8	76.1	28.9

** South ENC data for patents by inventor(s) and by applicant(s) is excluding Israel*

Source: CRENoS calculation on WIPO Data

The nanotechnology sector counts an extremely low number of patents for the whole area (14 and 11 when counting respectively by inventors and by applicant), showing that ENCs do not seem to support and implement innovation in this specific field.

The technologies related to environment show a slightly higher number of patents, which are almost entirely the prerogative of Israel. Nevertheless, this country shows a relative low share in green technologies, approximately half of the European share.

Finally, we investigate the degree of internationalisation of technology of the different areas by means of three useful indicators. We consider patents with several inventors from different countries or an applicant and inventor from different countries and compare them to total patents calculated by inventor or applicant.

The statistics on patents with foreign co-inventors are calculated as the share of patent with at least one foreign co-inventor in total patents domestically invented (that is introduced by resident inventors). The following two indicators are related to cross-border ownership. The percentage of patents invented abroad shows the degree of domestic control of inventions made abroad. It is calculated as the share of patents invented by at least one foreign resident (inventor) and owned by residents in total patents owned by residents (applicants). The third indicator, related to the foreign ownership of domestic inventions, is calculated as the share of patents invented by domestic inventors and owned by at least one foreign resident (applicant) in total patents invented domestically.

A clear feature of ENC's, when keeping Israel excluded, is the high degree of internationalisation, when considering both co-inventorship and foreign ownership. The high share of research co-operation in low innovative countries can be explained by the small number of researchers in the same technological areas and the consequent need for them to go abroad for collaborations. The high foreign ownership is due by the concentration of multinational firms with a high control of cross-border patents in a few countries. In other words, the first measure better reflects the real circulation of knowledge whilst the second one is more affected by firms' financial structures and business strategies. In conclusion, we can say that a "size effect" emerges in the statistics proposed: the propensity to international co-operation in research of a country seems to be highly correlated with its small innovative size, in the same way as small economies are more open to foreign investment flows or international trade.

The last issue in this section is to determine whether the previous observations are specific to EPO patents or apply also to PCT patents. Table 5 reveals that ENCs, as expected, prefer to apply for international patents at PCT rather than at EPO, reaching nearly of 1,900 and 1,600 patents by inventors and by applicants, respectively. Thus the number of PCT patents per capita is remarkably higher than for EPO patents for both Southern (0.4 by inventor and 0.3 by applicant) and Eastern countries (1.6 by inventor and 1.3 by applicant). As for the relative specialization and the level of internationalisation, most results and interpretations do not change.

Table 5. PCT patents by area, yearly average 2000-2008

by inventor(s)	EU27	EU15	NMS12	ENC	South*	East	Israel
total patents	43,198.2	42,471.6	726.7	1,887.4	69.1	123.8	1,694.5
patents per million inhab	88.1	109.9	7.0	7.2	0.4	1.6	248.9
ICT (%)	*30.4*	*30.6*	*22.2*	*43.0*	*26.1*	*22.0*	*45.3*
biotechnology (%)	*6.7*	*6.7*	*6.1*	*9.4*	*10.7*	*3.7*	*9.8*
nanotechnology (%)	*0.9*	*0.9*	*0.9*	*1.1*	*0.7*	*1.1*	*1.1*
environmental (%)	*7.4*	*7.3*	*8.2*	*4.2*	*8.1*	*11.3*	*3.5*
by applicant(s)							
total patents	42,791.0	42,183.7	607.3	1,568.8	53.9	98.1	1,416.8
patents per million inhab	87.2	109.2	5.8	6.0	0.3	1.3	208.1
ICT (%)	*30.9*	*31.1*	*17.3*	*38.6*	*19.6*	*20.8*	*40.6*
biotechnology (%)	*6.7*	*6.7*	*5.9*	*10.1*	*8.6*	*2.7*	*10.6*
nanotechnology (%)	*0.9*	*0.9*	*0.9*	*1.1*	*0.3*	*0.8*	*1.1*
environmental (%)	*7.4*	*7.4*	*9.2*	*4.3*	*8.8*	*10.4*	*3.8*
international cooperation (% of patents)							
with foreign co-inventor(s)	19.9	19.7	32.2	17.6	36.9	39.2	14.8
invented abroad	23.3	23.4	20.1	11.0	11.4	21.7	10.2
owned by foreigners	25.0	24.7	41.2	28.0	47.0	45.1	25.6

** South ENC data for patents by inventor(s) and by applicant(s) is excluding Israel*

Source: CRENoS calculation on WIPO Data

In the next sections we investigate in detail the innovative activity in single neighboring countries.

4. Innovative activity in neighbouring countries

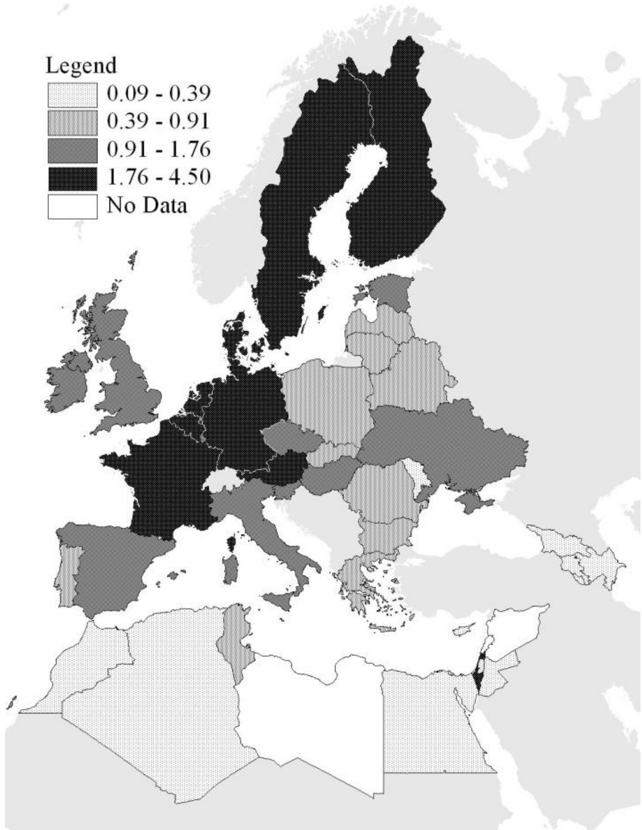
4.1 Innovative input indicators

Innovation policies and innovation activities in firms are, with the exception of Israel, not very frequent in the context of Mediterranean, North African and other neighboring countries. However, some innovation policies have been developed in the latest years by some governments, such as Algeria, Egypt, Turkey, Morocco and Tunisia. Other countries in the Mediterranean region have also promoted specific schemes and measures to promote and sustain innovation activity and technological change (Jordan, Lebanon, and, to a lesser degree, Syria).

0 2 below shows the average R&D expenditure over GDP for each ENC for years 2000-2008. R&D expenditure refers to intramural expenditure, including all expenditure on R&D during a specific period, regardless of the source of funds.

We have to point out that for most countries, data related to R&D are very limited, and as a result some of them are estimated. At the same time they may be missing for some years and, consequently, the average does not always concern the same year or period. Moreover, data are not available for Lebanon, Libya, Palestinian territories and Syria.

Figure 2. R&D expenditure (percentage of GDP), average 2000-2008



Source: CRENoS calculation on OECD Data

As we can see from Table 6, the Southern group has an average of R&D expenditure of one point while the Eastern group reaches approximately 0.8 per cent. However, we have to take into account that the slightly higher average for Southern ENC is again biased by Israel; its Gross domestic expenditure on R&D (GERD) reaches the exceptional average of 4.50 per cent of GDP in the period between 2000 and 2008. An average which is much higher with respect to the same index for EU27 or for the whole of OECD countries. As for the other countries, the share of R&D in GDP is quite low, around 0.2 per cent of GDP, in several countries, such as Algeria (0.20), Georgia (0.21), Armenia (0.22), Azerbaijan (0.23) and Egypt (0.25). Jordan and Moldova have a slightly higher share (0.39 and 0.43 respectively). Finally, the countries which invest the largest share of GDP in R&D are Belarus and Ukraine among the Eastern countries (with shares of 0.71 and 0.99 respectively) and Morocco and Tunisia in the South (with a quota of 0.61 and 0.88 respectively).

Table 6. R&D expenditure, country average 2000-2008

country	**R&D exp PPP** (constant 2005, million $)	**R&D expenditure** (% GDP)
Armenia	25.39	0.22
Azerbaijan	88.19	0.23
Belarus	566.05	0.71
Georgia	27.76	0.21
Moldova	37.38	0.43
Ukraine	2461.82	0.99
ENC-East	3206.58	0.80
Algeria	421.02	0.20
Egypt	865.71	0.25
Israel	7192.88	4.50
Jordan	94.50	0.39
Lebanon	-	-
Libya	-	-
Morocco	624.72	0.62
Syria	-	-
Tunisia	614.81	0.88
ENC-South	9813.63	1.07

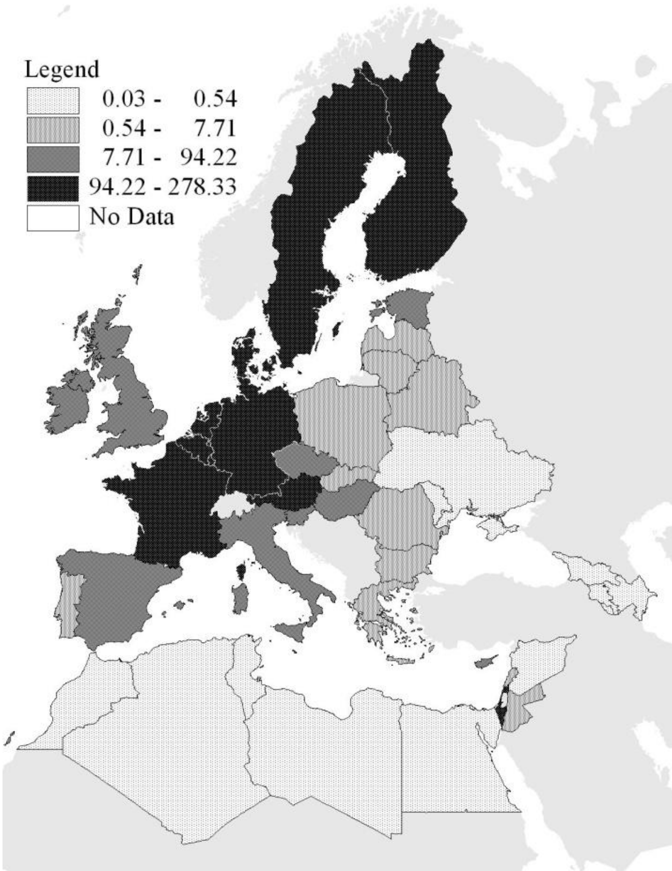
Source: CRENoS calculation on World Bank data

When data is available it is possible to assess the evolution of R&D expenditure in the latest period. It is thus possible to note that the biggest effort in increasing R&D expenditure has been made by Tunisia with an increment of 72% during the period starting from 2000 until 2005 (latest available data). Since 2000 Egypt and Moldova have also improved their R&D share of about 30%, even though their respective averages for the period 2004-2007 are quite different: 0.25 and 0.42%, respectively. Many other countries have not experienced big changes in their R&D investments: Ukraine, for example, has maintained its effort of about 1% of GDP constant for the whole period (2000-2007). Belarus and Morocco continue to show an average of 0.60% of GDP while Jordan and Georgia around 0.30%. Israel's R&D expenditure has remained constant (above 4 per cent of GDP) for several years but it has been increasing in the latest period. Finally, Algeria has followed a decreasing trend reaching in 2005 its lowest share of 0.07% of GDP.

4.2 Innovative output indicators

The analysis on patents, as output indicator, is based on the latest available international comparable data made available by OECD and WIPO. Figure 3 shows the annual average number of patents filed at EPO in the period 2000-2008, classified by inventor(s) country of residence over total population (million).

Figure 3. EPO patents by inventor(s) residence per million population, 2000-2008



Source: CRENoS calculation on OECD Data

The European map of the spatial geography[3] of innovation reveals, as expected, that the most active countries in patenting activity are situated close together, forming economic/innovative clusters. This the case for France, Belgium, Netherlands, Luxembourg, Germany, Austria, Denmark, Sweden and Finland, which filed more than 100 EPO patents per million inhabitants on average every year in the period 2000-2008. For the ENC Israel occupies the eighth position in this ranking, with almost 168 patent per million population, while all the other Arab and Mediterranean countries registered on average, less than one Southern ones (with the usual exception of Israel together with that of Jordan, too).

[3] For ENCs, contrary to the case of EU27 countries, the regionalization of innovative activity (measured by patent data, is not reasonable since the number of patent applications for some countries are almost negligible.

A first preliminary view can be inferred by data supplied to WIPO Statistics database where the counts of patents are based on the international filing date and the country of residence of the first named applicant. The WIPO database allows us to have data for Azerbaijan, Libya and Syria that are not included in the OECD patent data. The only countries with no available patent data are the Palestinian territories in neither of the databases. We should, therefore, note that this indicator is only imperfectly comparable with the one which is obtained from the OECD database where multiple applicants are taken into account by assigning patents' share to countries with respects to the inventors residence country. However, the divergence in the two databases in term of per capita values is very small and therefore insignificant.

As shown in Table 7, the total patents applications to the EPO from 2000 to 2008 are more than 8.5 thousand and more than 14 thousand those filed under the PCT. As we might expect, Israel is the country with the highest number of patents, which represent respectively 96 and 90 per cent of total EPO and PCT. Within the ENC group, with a much more modest number of EPO patents, we find Ukraine (with 106 EPO patents, just 0.25 for million inhabitants per year). Ukraine applied more intensely at the PCT with 1.44 patent per million population. Surprisingly this value is below that of Armenia. This country, due to the low value of population, reaches almost two PCT patents per million inhabitants on average every year, even though the count of patents filed stops at just 52 PCT in the period under observation.

Table 7. EPO and PCT patents by applicant(s) residence, 2000-2008

country	EPO stock	EPO per million pop	PCT stock	PCT per million pop
Armenia	3	0.11	52	1.90
Azerbaijan	6	0.08	43	0.57
Belarus	37	0.42	133	1.50
Georgia	7	0.17	51	1.29
Moldova	10	0.31	31	0.94
Ukraine	106	0.25	616	1.44
ENC-East	168	0.24	926	1.34
Algeria	4	0.01	52	0.18
Egypt	43	0.07	254	0.39
Israel	8,293	135.35	12,751	208.11
Jordan	68	1.42	30	0.64
Lebanon	13	0.36	16	0.45
Libya	2	0.04	1	0.02
Morocco	26	0.10	88	0.33
Syria	4	0.02	25	0.16
Tunisia	25	0.28	45	0.51
ENC-South	8,478	5.09	13,262	7.97

Note: EPO data for AZ, LY, SY : CRENoS calculation on European patent bulletin dataset.
PCT data for AZ, LY, SY : WIPO data

Source: CRENoS calculation on OECD Data

When we exclude Israel, the yearly number of patents per million population in the Southern area decreases drastically from 5.1 to 0.1 for EPO statistics and from 8.0 to 0.3 for the PCT ones; in fact patents per million inhabitants for countries such as Libya, Algeria and Syria are extremely limited, none of them going above 0.05 yearly patent per capita. The only exception being that of Jordan (with 1.4 EPO patents and 0.6 PCT patents per capita). It is interesting to note that while Eastern countries are clearly oriented towards applications at PCT rather than at EPO, this preference is less marked in the case of Southern countries.

In Table 8 we study the same innovation process by another classification criteria, showing the EPO and PCT statistics counted by inventor's residence. We observe a general increase of the phenomenon, since the number of patents is sensibly higher than when we count by applicant's residence. This is what usually occurs in the case of small or less innovative countries, reflecting the higher level of internationalisation of their research activities with a foreign ownership of domestic inventions.

Table 8. EPO and PCT patents by inventor(s) residence, 2000-2008

country	EPO stock	EPO per million pop	PCT stock	PCT per million pop
Armenia	10	0.37	60	2.18
Azerbaijan	9	0.12	-	-
Belarus	61	0.69	173	1.96
Georgia	20	0.52	71	1.81
Moldova	14	0.43	39	1.19
Ukraine	231	0.54	771	1.80
ENC-East	346	0.50	1,114	1.81
Algeria	7	0.03	58	0.20
Egypt	79	0.12	305	0.46
Israel	10,289	167.94	15,250	248.91
Jordan	82	1.72	56	1.18
Lebanon	35	0.99	41	1.14
Libya	3	0.05	-	-
Morocco	50	0.18	110	0.41
Syria	8	0.05	-	-
Tunisia	32	0.36	52	0.58
ENC-South	10,585	6.36	15,873	10.93

Note: EPO data for AZ, LY, SY : CRENoS calculation on European patent bulletin dataset.

Source: CRENoS calculation on OECD Data

If we focus on the first two columns which provide data on EPO patents we find that Israel is, as usual by far the best performers with 168 patents per million inhabitants. Jordan has the second best performance per population (with 1.7 patent per capita), followed by Lebanon, that reaches the unit per million inhabitants; then we find Belarus (0.7), Ukraine (0.5) and Georgia (0.5), while all the other countries are under the 0.45 patents per million inhabitants. In the botton of the rank we find Algeria, Syria and Libya where innovation activities are almost absent. As before, PCT statistics are relatively higher with respect to EPO, but as before this is particularly true for Eastern countries rather than for Southern ones. As regards the former group, it is interesting to note the relatively good performance for Armenia (60 patents in the period) and for Belarus, with almost 2 patents per year per million inhabitants. Further down in the ranking we find Georgia and Ukraine (about 1.8 patents per million population). As for the Southern countries it is worth mentioning the case of Jordan, which, contrary to most other countries, have a lower number of PCT patents than of EPO patents (56 and 82, respectively).

4.3 Innovative activity in some selected sectors

In this section we analyse the innovative activity of neighbouring countries related to the four selected technologies already presented in the previous section: ICT, biotechnology, nanotechnology and environmental related technologies.

In Table 9 and Table 10 we report the number of applications filed at EPO and under the PCT, by applicant and by inventor residence respectively for the period 2000-2008. Table 11 and 12 replicate the same information but in percentage of total patents in order to highlight the relative importance of these sectors.

Firstly, if we focus on absolute numbers (tables 9 and 10), the sector with the highest number of patents is ICT for almost all countries both for applicant and for inventors. More than 4,000 applications made by Israelian inventors to the EPO are related to the information and communication technology (ICT) sector. And the number rises to almost 7,000 for PCT patents. Moreover, more than 1120 EPO patents are related to the biotechnology and only 187 to the environmental technology sector. The second most important country in ICT patenting is Ukraine: Ukrainians invented 168 ICT patents filed at PCT while Ukrainian firms applied for 133 PCT patents.

The number of applications in the field of new technologies related to the environment is quite modest in all the countries; the countries more engaged in these activities are Israel with more than 300 PCT patents both by applicants and by inventors; Ukraine and Egypt with 54 and 16 PCT patents, respectively. Furthermore, the more relevant scientific activity into the field of nanotechnology (excluding Israel) was that one of Belarus with about 4 EPO and 7 PCT patent in 8 years.

Table 9. EPO and PCT patents by selected sectors and by applicant(s), stock 2000-2008

country	EPO				PCT			
	ICT	bio	nano	env	ICT	bio	nano	env
Armenia	0.3	0	0	0.3	9.8	2.5	0	1.333
Azerbaijan	-	-	-	-	-	-	-	-
Belarus	10.3	1	3.5	2	29.5	4	6.5	15.3
Georgia	0	2.5	0	1	6	3.2	1	4.7
Moldova	1	0	0	1	5	0	0	4
Ukraine	16.5	2.8	0	0	133.5	14.1	0	66.3
ENC-East	28.1	6.3	3.5	4.3	183.8	23.8	7.5	91.6
Algeria	2	0	0	2	7	1	0	8.5
Egypt	8	0.3	0	3	39.3	18.3	0	18
Israel	2905.3	1029.3	93	291.7	5171.5	1,355.00	146.5	479.5
Jordan	22.3	21	3.3	3	11.8	10	1.3	1
Lebanon	6	0.5	0	1	7	0.5	0	1
Libya	-	-	-	-	-	-	-	-
Morocco	5	2.5	0	0	24	4.7	0	12
Syria	-	-	-	-	-	-	-	-
Tunisia	3.5	7	0	0	6	7.2	0	2
ENC South	2952.1	1060.6	96.3	300.7	5266.6	1,396.60	147.8	522

Source : CRENoS calculation on OECD Data

Table 10. EPO and PCT patents by selected sectors and by inventor(s), stock 2000-2008

country	EPO				PCT			
	ICT	bio	nano	env	ICT	bio	nano	env
Armenia	4	1.6	0	1.3	14.4	3.3	0	2.3
Azerbaijan	-	-	-	-	-	-	-	-
Belarus	23.1	2.5	4	4.7	44.5	5.8	7.4	20.1
Georgia	3	4.4	0	1.5	10.6	6.2	1	7.5
Moldova	2.3	0	0	3	6.5	0	0	8.8
Ukraine	39.9	12.4	2.4	19.4	168.9	26.4	4.2	87.4
ENC-East	72.2	20.9	6.4	30.1	244.9	41.7	12.6	126.2
Algeria	3.5	1	0	2.4	10.2	2.3	0	11.4
Egypt	23.7	3	1.1	3.5	65.2	21.5	1.1	18.5
Israel	4204.5	1136.3	110.2	327.5	6903.7	1,496.60	175.2	535.3
Jordan	29.5	20.8	3.3	3.2	27.5	18.3	2.5	1
Lebanon	18.8	2.8	0.3	2.8	21	2.8	0.3	2.9
Libya	-	-	-	-	-	-	-	-
Morocco	9.9	5.7	0.3	2.4	28	8.2	0.8	13.4
Syria	-	-	-	-	-	-	-	-
Tunisia	8	13	0.3	0.8	10.3	13.4	0	3.3
ENC South	4297.9	1182.5	115.3	342.5	7065.9	1,563.20	179.8	585.7

Source : CRENoS calculation on OECD Data

Secondly, if we concentrate on country relative specialization, table 11 and 12 show that Southern countries are relatively more specialized in ICT than Eastern countries. At the same time Eastern countries are more specialized in environmental related technologies and Southern countries in biotechnologies. At the country level it is worth mentioning the strong specialization of Belarus in the ICT sector and that of Jordan in ICT and in biotechnologies, too. The country with the clearest specialisation in nanotechnology is Belarus with a quota of patent ranging from 4 to 9% depending on the patent office and the location considered (applicant or inventor). Finally, there are several country which have a relative specialization in environmental related technologies. Two cases are worth mentioning: Algeria and Moldova which have a significant share of applicant patents both at EPO (34% and 21% respectively) and at PCT (20% and 23%) in this sector.

Table 11. EPO and PCT patents by selected sectors and by applicant(s), % of total 2000-2008

country	EPO				PCT			
	ICT	bio	nano	env	ICT	bio	nano	env
Armenia	10%	0%	0%	10%	19%	5%	0%	3%
Azerbaijan	-	-	-	-	-	-	-	-
Belarus	28%	3%	9%	5%	22%	3%	5%	12%
Georgia	0%	36%	0%	14%	12%	6%	2%	9%
Moldova	10%	0%	0%	10%	16%	0%	0%	13%
Ukraine	16%	3%	0%	0%	22%	2%	0%	11%
ENC-East	17%	4%	2%	3%	20%	3%	1%	10%
Algeria	50%	0%	0%	50%	13%	2%	0%	16%
Egypt	19%	1%	0%	7%	15%	7%	0%	7%
Israel	35%	12%	1%	4%	41%	11%	1%	4%
Jordan	33%	31%	5%	4%	39%	33%	4%	3%
Lebanon	46%	4%	0%	8%	44%	3%	0%	6%
Libya	-	-	-	-	-	-	-	-
Morocco	19%	10%	0%	0%	27%	5%	0%	14%
Syria	-	-	-	-	-	-	-	-
Tunisia	14%	28%	0%	0%	13%	16%	0%	4%
ENC South	35%	13%	1%	4%	40%	11%	1%	4%

Source : CRENoS calculation on OECD Data

Table 12. EPO and PCT patents by selected sectors and by applicant(s), % of total 2000-2008

country	EPO				PCT			
	ICT	bio	nano	env	ICT	bio	nano	env
Armenia	40%	16%	0%	13%	24%	6%	0%	4%
Azerbaijan	-	-	-	-	-	-	-	-
Belarus	38%	4%	7%	8%	26%	3%	4%	12%
Georgia	15%	22%	0%	8%	15%	9%	1%	11%
Moldova	16%	0%	0%	21%	17%	0%	0%	23%
Ukraine	17%	5%	1%	8%	22%	3%	1%	11%
ENC-East	21%	6%	2%	9%	22%	4%	1%	11%
Algeria	50%	14%	0%	34%	18%	4%	0%	20%
Egypt	30%	4%	1%	4%	21%	7%	0%	6%
Israel	41%	11%	1%	3%	45%	10%	1%	4%
Jordan	36%	25%	4%	4%	49%	33%	4%	2%
Lebanon	54%	8%	1%	8%	51%	7%	1%	7%
Libya	-	-	-	-	-	-	-	-
Morocco	20%	11%	1%	5%	25%	7%	1%	12%
Syria	-	-	-	-	-	-	-	-
Tunisia	25%	41%	1%	3%	20%	26%	0%	6%
ENC South	41%	11%	1%	3%	45%	10%	1%	4%

Source : CRENoS calculation on OECD Data

5. Concluding comments

Innovation is a key factor for growth and development of economic systems but there is a large heterogeneity across territories in their capacity to create knowledge and innovation, and, as a result, in their abilities to exploit available ideas and technologies, too. The purpose of this paper is to offer a preliminary picture of the technological activity for the European Union and the European Neighbourhood Countries (ENC) based on indicators on R&D expenditures and patents.

In general, statistics confirm the big gap between EU27 countries and ENCs, with the remarkable exception of Israel. As a matter of fact, Israel is more similar to the EU27 countries than to the ENC's. Further, all indicators provide evidence of a great heterogeneity among ENC's, too. Remarkably, EN countries are almost always below the ten thousand dollar per capita threshold and, as a result, rank in the bottom position in terms of Human Development Index. The only exception is for Israel, ranked 17 out of 187 countries, which falls into the category of highly human developed countries. Moreover, the low levels of literacy and schooling rates have been one of the most crucial social difficulty in these countries.

As far as the productive structure is concerned, we, again, observe a great heterogeneity among countries and a big divide between Europe and ENC. Such a gap is even greater in terms of technological activity and performance. There is a marked difference in the R&D expenditure and in the production of innovation which are transformed in to patent applications.

On the one hand, we find that EU15, with almost 220 millions, invest a relatively high share (close to 2%) of their income in R&D. On the other hand, the 16 neighboring countries as a whole spend about 13 million, which implies an R&D intensity slightly less than 1% of their GDP. A share which is, nevertheless, slightly higher than that of new EU member states.

Larger disparities are observed in patenting activity. The EU27 is in general very active in patenting, especially EU15 countries which have an average of 30 thousand patents per country. On the contrary ENC's, Israel excluded, register very low levels of patenting activity. The Southern and Eastern countries, for example, have on average 69 EPO patents by inventor residence and just 38 by applicant residence. This implies far less than 1 patent per million inhabitants for both statistics whilst EU27 countries have slightly more than 100 patents. The same applies to PCT patents.

Moreover, if we look at country relative specialization, we see that Southern countries are relatively more specialized in ICT than Eastern countries. At the same time Eastern countries are more specialized in environmental related technologies and Southern countries in biotechnologies. Nanotechnologies are very sporadic.

A clear feature of ENCs, Israel apart, is the high degree of internationalisation, both when considering co-inventorship and foreign ownership. The high share of research co-operation in low innovative countries can be explained by the small number of researchers in the same technological areas and the consequent need for them to go abroad to look for collaboration. In conclusion, we can say that a "size effect" emerges: the propensity to international co-operation in research of a country seems to be highly correlated with its small innovative size, in the same way as small economies are more open to foreign investment flows or international trade.

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Annex

Country sectoral profiles

ENC-East

Armenia

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Civil engineering	9.81
Pharmaceuticals	8.30
Electrical machinery, apparatus, energy	7.17
Other special machines	6.79
Food chemistry	6.42
Basic materials chemistry	5.28
Medical technology	5.28
Machine tools	5.28
Measurement	4.53
Thermal processes and apparatus	3.77
Others	37.37

Source: Wipo statistics

Azerbaijan

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Engines, pumps, turbines	11.11
Measurement	9.08
Medical technology	7.67
Civil engineering	6.73
Other special machines	6.42
Electrical machinery, apparatus, energy	5.32
Materials, metallurgy	5.01
Food chemistry	4.38
Transport	4.38
Organic fine chemistry	3.76
Others	36.14

Source: Wipo statistics

Belarus

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Other special machines	7.67
Civil engineering	6.67
Medical technology	6.01
Measurement	5.97
Mechanical elements	5.38
Engines, pumps, turbines	5.21
Transport	4.97
Basic materials chemistry	4.72
Materials, metallurgy	4.72
Chemical engineering	4.62
Others	44.06

Source: Wipo statistics

Georgia

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Pharmaceuticals	10.19
Food chemistry	9.94
Other special machines	9.08
Engines, pumps, turbines	9.08
Civil engineering	6.18
Materials, metallurgy	5.62
Transport	5.62
Medical technology	4.88
Measurement	4.51
Mechanical elements	3.83
Others	31.07

Source: Wipo statistics

Moldova

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Medical technology	13.37
Food chemistry	9.16
Other special machines	7.71
Pharmaceuticals	7.31
Engines, pumps, turbines	5.97
Measurement	4.81
Basic materials chemistry	3.67
Environmental technology	3.58
Electrical machinery, apparatus, energy	3.56
Chemical engineering	3.56
Others	37.30

Source: Wipo statistics

Ukraine

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Medical technology	10.01
Materials, metallurgy	7.29
Other special machines	7.01
Measurement	6.44
Civil engineering	6.22
Pharmaceuticals	5.49
Engines, pumps, turbines	5.42
Chemical engineering	5.01
Machine tools	4.68
Electrical machinery, apparatus, energy	4.27
Others	38.16

Source: Wipo statistics

ENC-South

Algeria

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Engines, pumps, turbines	8.88
Medical technology	8.28
Thermal processes and apparatus	8.28
Civil engineering	8.28
Pharmaceuticals	7.10
Electrical machinery, apparatus, energy	6.51
Semiconductors	6.51
Audio-visual technology	3.55
Measurement	3.55
Macromolecular chemistry, polymers	3.55
Others	35.51
Patent Grants	

Source: Wipo statistics

Egypt

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Pharmaceuticals	12.10
Medical technology	11.16
Computer technology	6.93
Transport	4.94
Biotechnology	4.70
Civil engineering	4.47
Engines, pumps, turbines	4.23
Basic materials chemistry	4.23
Environmental technology	3.64
Electrical machinery, apparatus, energy	3.41
Others	40.19

Source: Wipo statistics

Israel

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Medical technology	15.05
Computer technology	10.90
Pharmaceuticals	9.95
Biotechnology	5.18
Organic fine chemistry	5.03
Measurement	4.59
Telecommunications	4.58
Digital communication	4.21
Audio-visual technology	3.15
Machine tools	2.95
Others	34.41

Source: Wipo statistics

Jordan

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Pharmaceuticals	38.11
Analysis of biological materials	13.29
Organic fine chemistry	8.39
Biotechnology	6.99
Medical technology	3.50
Other consumer goods	3.50
Transport	3.15
Electrical machinery, apparatus, energy	2.45
Measurement	2.45
Engines, pumps, turbines	2.10
Others	16.07

Source: Wipo statistics

Lebanon

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Materials, metallurgy	11.06
Computer technology	8.76
Thermal processes and apparatus	7.83
Furniture, games	7.37
Basic materials chemistry	6.91
Mechanical elements	6.91
Other consumer goods	4.61
Engines, pumps, turbines	4.15
Measurement	3.69
Audio-visual technology	3.23
Others	35.48

Source: Wipo statistics

Libya

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Computer technology	18.18
Measurement	18.18
Engines, pumps, turbines	18.18
Transport	18.18
Electrical machinery, apparatus, energy	9.09
Control	9.09
Handling	9.09
Others	0.01

Source: Wipo statistics

Morocco

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Pharmaceuticals	7.94
Civil engineering	7.06
Audio-visual technology	5.56
Transport	5.47
Furniture, games	4.94
Control	4.41
Medical technology	4.24
Mechanical elements	4.15
Electrical machinery, apparatus, energy	4.06
Handling	4.06
Others	48.11

Source: Wipo statistics

Syria

Patent Applications by Top Fields of Technology (1997 - 2011)	
Field of Technology	**Share**
Medical technology	24.10
Engines, pumps, turbines	10.84
Transport	10.84
Basic materials chemistry	8.43
Civil engineering	6.02
Control	6.02
Materials, metallurgy	4.82
Mechanical elements	4.82
Other consumer goods	3.61
Telecommunications	3.61
Others	16.89

Source: Wipo statistics

Tunisia

Patent Applications by Top Fields of Technology (1997 - 2011)

Field of Technology	**Share**
Pharmaceuticals	12.92
Basic materials chemistry	9.58
Civil engineering	8.33
Control	7.08
Furniture, games	6.67
Computer technology	4.17
Organic fine chemistry	4.17
Biotechnology	3.75
Food chemistry	3.75
Transport	3.75
Others	35.83

Source: Wipo statistics