International Journal of Managerial Studies and Research (IJMSR)
Volume 2, Issue 3, April 2014, PP 37-49
ISSN 2349-0330 (Print) & ISSN 2349-0349 (Online)
www.arcjournals.org

Innovation Performance of EU Countries in Selected Dimensions and Position of Turkey

H. Mustafa Paksoy
Faculty of Economics and Administrative Sciences
Kilis 7 Aralik University
Kilis, Tıurkey
email@address.com

Sadettin Paksoy
Faculty of Economics and Administrative Sciences
Kilis 7 Aralik University
Kilis, Tıurkey
spaksoy@kilis.edu.tr

Mehmet Özçalici
Faculty of Economics and Administrative Sciences
Kilis 7 Aralik University
Kilis, Tıurkey
mozcalici@gmail.com

Yunus Kaymaz
Faculty of Economics and Administrative Sciences
Kilis 7 Aralik University
Kilis, Tıurkey
kymzyns@gmail.com

Abstract: *Innovation, "to do something new and different" in Latin means "innovare" is derived from the root. The simplest definition of innovation is to develop different, varied, and to apply new ideas. These ideas can be developed to solve a previously unsolved problems or in order to meet previously unmet needs. Or these ideas are aim to do more beautiful, more useful, more benefit products and services that already exist. Innovations are done with the implementation of these ideas which are products, services or methods of doing business, and then subtracting the sale of these products and services or methods of doing business. Process of innovation is defined as transformation of knowledge to economic and social benefits. Therefore innovation is a whole that composed from technical, economic and social processes. The demand for change of individuals and society requires openness to innovation and the spirit of entrepreneurship which is a culture. The basic elements of this culture are social structure, educational level, the accumulation of capital and economic and social policies. Innovative place of Turkey in EU may be examined with these basic elements. The results obtained here may shed light on discussing full EU membership of Turkey because innovation is an important factor for developing. .*

Keywords: *Innovation, Turkey, European Union*

1. INTRODUCTION

Innovation now becomes crucial and outstanding issue for today's economies and countries' policies. It also plays a guidance role for countries and firms. Furthermore, there is a close relationship between these three (innovation, country, firm). Innovation and related R&D activities have effects for these two dimensions. This guidance role mostly reveal itself in crisis, production, creativity and culture and areas that decision making mechanisms see risky that concern closely both country and firms.

This mission of innovation arises from its natural standing ground which sees internal and external factors holistically. This characteristic of innovation has a potential of exploiting from environmental factors and internal development. Countries and firms are organisms affected form environmental factors with a high level. The meaning of innovation goes beyond to the notions such as development, change, newness and comprises knowledge, technology, services, research and development (R&D) issues. Close and strong Networks constructed between these areas benefits for both country and firm wide. It can be seen on the basis of country, perception and diffusion of innovation is not instant and explicit. From a macro perspective the construction of innovation culture and the integration to the governmental policies take much more time compared to the firm and organizations. Cooperation between institutions and willingness to change become prominent in these areas and the synergy created governmental institutions and public sector will ultimately produce an innovative culture. In this context, investment and policies related to R&D and innovations acts as a locomotive element for developed and developing economies. From a wide perspective, countries' knowledge, technology, R&D and innovation investments create highly value added product and services so this increases the development and competitive powers. Furthermore on firm basis, R&D and innovation investments allow firms to create competitive advantage by strengthening their actual market conditions. In this context, when we talk about the importance of innovation and R&D, the abilities mentioned previously have a positive effect on countries foreign trade deficits. With activities in subject (R&D, innovation), new products and services creates product diversification and this enables an increase in foreign trade and growth.

1.1 Definition of Innovation

Many definitions regarding to innovation can be seen in literature. However, within these definitions the word "new" is prominent. Briefly, we can define innovation as a creation of new and developed in service, product, and organizational issues. In this sense, OECD Oslo Manual (2005) acts as guidance in interpreting innovative actions and defines innovation as:

"An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations."

Besides, Tidd et al. (1997:66) defines innovation as the transformation of opportunities to new ideas and putting these into widely used practice. Furthermore, Elçi (2006:2) sees innovation as all kinds of novelty, differences, and changes in service, product and business manners in order to create financial and social value.

After all these definitions of innovations, it is necessary to introduce types of innovation. Although, many types of innovation has discussed in literature we see four basic types of innovation, so as OECD Oslo Manual explains innovation types as product, process, service and organizational innovation.

To define briefly these types (Elçi 2006:3-12);

1- Product innovation: introduction of a new and different product or changes in existing product and launching this product to the market.

2- Process innovation: creating new production systems or developing distribution systems or developing existing systems much further.

3- Organizational innovation: introducing new or developed way of business manners or benchmarking existing methods to the organizations.

4- Service innovation: any novelty or development in service delivery or difference in distribution systems or new technology implementations in service delivery.

1.2 Dimensions of Innovation

The notion of "new" is a relative word that will change from region to region, industry to industry and has a different perception for individuals. Briefly, a process, service or product labeled as new in a country or firm, can already have been using. In this context, OECD Oslo Manual (2005) defines three concepts for novelty. These are new to the firm, new to the market and new to the world. These are explained as below:

- **New to the Firm**

Oslo Manual (2005) specifies the lowest level of innovation as new to the firm which means this is the entry level for the innovation. According to Oslo Manual's definition new to the firm refers to;

"A product, process, marketing method or organizational method may already have been implemented by other firms, but if it is new to the firm (or in case of products and processes: significantly improved), then it is an innovation for that firm" (Oslo Manual 2005).

- **New to the Market**

As it can be understood form the term, Oslo Manual (2005) defines new to the market that if a firm first to introduce an innovation on its market and that market composed from the firm and its competitors as well as it can include a geographic region or product line. The geographical scope of new to the market is thus subject to the firm's own view of its operating market and thus may include both domestic and international firms (Oslo Manual 2005).

- **New to the World**

"An innovation is new to the world when the firm is the first to introduce the innovation for all markets and industries, domestic and international. New to the world therefore implies a qualitatively greater degree of novelty than new to the market (Oslo Manual 2005)."

It is crucial to implement innovation policies in actual country policies with an effective way. Also the assessment and a continuous development should be done in a systematic view. Today's countries and firms traditional competitive variables have changed and in this sense, customers' perceptions to a product and service have varied (Turanlı and Sarıdoğan 2010). In other words, today it becomes an essential characteristic for an organization to supply a service, product with finest quality and an innovative way. While the success of firms mostly related with innovativeness, the same can be possible in a country basis. The most important factor behind countries' profitability and competitive power are science-technology and innovation. Some example countries regarding to this are Sweden, Finland, South Korea, Japan and USA. As mentioned before, except from firm-industry basis effects of innovation and R&D, there are also effects for country-society. However, due to its nature, notions such as innovation, technology, R&D has a close connection with economy, politics and environmental factors. Such highly continuous changing factors should not be unconcerned by countries because these factors plays a determinant role in protecting global market dominance. Weaknesses in these areas will ultimately resulted by a loose of actual place in markets. Furthermore, incapability of creating new markets and eventually a decrease in societies' welfare is inevitable. In order to increase social welfare it is necessary to change countries structure from a consumption type to a producer type. Reinforcing production resources with different activities which means with innovation and R&D implementations will enhance productivity of firms' and countries' endogenous sources. These activities are country and industrial policies constructed via innovation and R&D basis. In this context, R&D expenditures differ from country to country and it can be expected that countries with higher GDPs invest more to R&D activities compared to the countries with low GDPs.

Figure-1 indicates countries R&D expenditures from 1998 to 2008 and here, Turkey has a great effort for investing R&D activities.

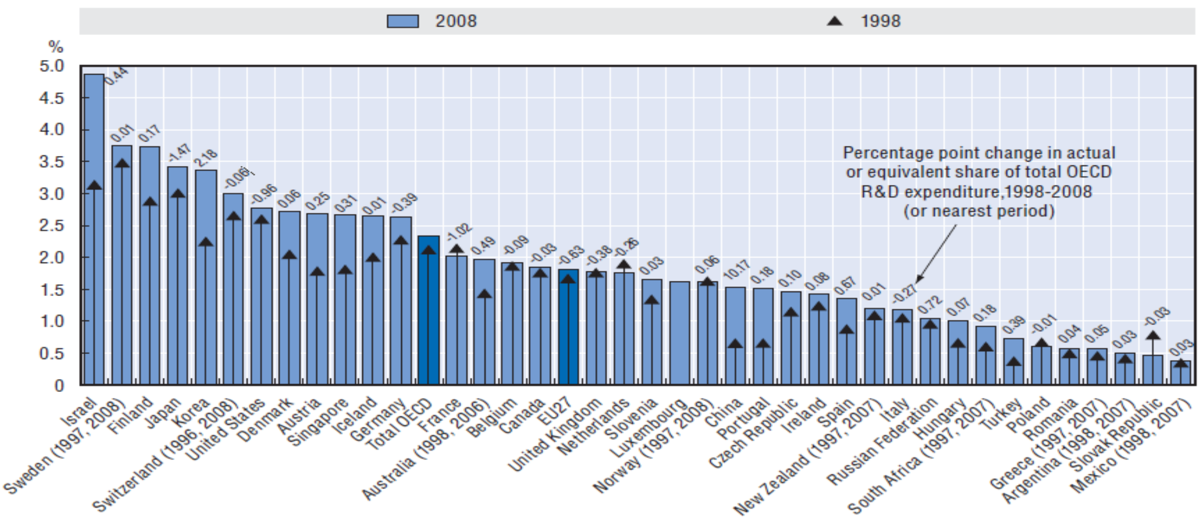
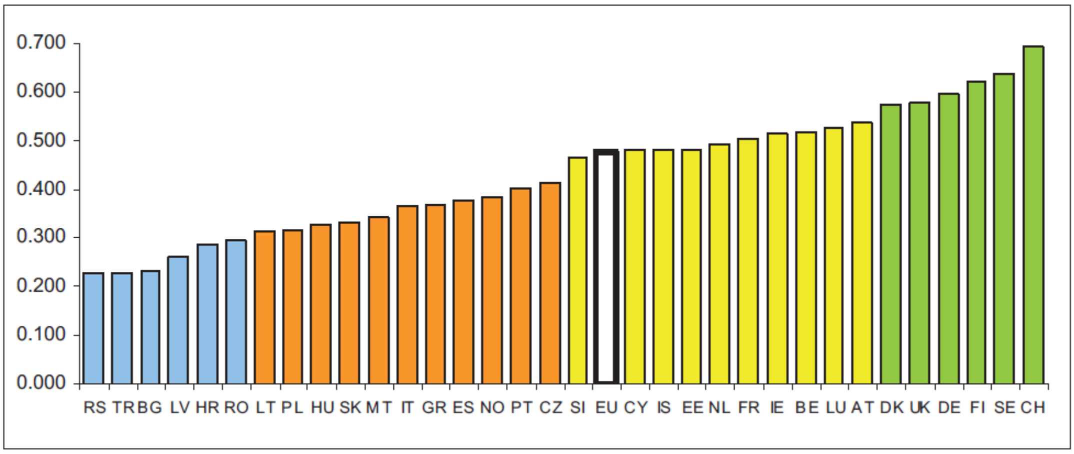


Figure 1. *Gross expenditure on R&D as a percentage of GDP, by country*

Source: OECD, STI Outlook, 2010

Countries innovative positions can be analyzed from European Innovation Scoreboard (EIS) 2009. Figure-2 highlights the innovation leaders, moderate innovators and catching-up countries. In Figure-2, blue columns demonstrate catching-up countries (including Turkey), orange columns demonstrate moderate innovators, yellow columns show innovation followers and green columns demonstrates innovation leaders. Compared to other scoreboards, (i.e. EIS 2006) Turkey's performance increased from 0.10 to 0.20.



Source: EIS 2009

Figure 2. *Innovation performance of selected countries*

2. METHODS

2.1 The Purpose of the Research

In this study we want to compare the innovative performance of Turkey with other EU countries. Also we want to examine the relationship between innovation indicators.

2.2 Concept and Limitation of the Research

We mainly used European Innovation Scoreboard reports, Eurostats and OECD statistics. Innovation indicator statistics are surveyed. Years 2006 through 2009 is selected as time frame. 21 European Union members are selected for comparison.

2.3 Data, Variables, Method of the Research

In this part of the study the data which is used in the correlation analysis will be introduced. Education related variables (3), research and development expenditure, patent related variables (2), high-tech exports, human resources in science and technology, population and real gdp growth rate is used in this study.

Eurostats publishes the relevant data for 33 countries that includes Turkey. From these 33 countries some values were missing for some variables so they excluded from the analysis in order to get a balanced pooled data.

Another issue was the variables that do not have any value for the year 2010. Instead of excluding the variables, we decided to exclude the year 2010 from the analysis.

At the end of these processes, there were 22 countries, for 9 variables between the years 2006 and 2009.

Pearson Correlation coefficients for all of the variables are calculated in order to get insight into the major relationships between innovations, education, and related other variables.

Varsakelis (2006) examined the political institutions, education and innovative activities using panel regression analysis. Author used patent applications, research and development expenditures, number of students in higher education and political variables. Author used the data between 1995-2000 years. In recent years the relationship may be changed. So the relationship between variables must be re-investigated using recent data. Different from Varsakelis (2006) we tested other variables that may have relation with innovation too.

Table 10. *Country List*

List of Countries		
Belgium	Lithuania	Sweden
Bulgaria	Hungary	United Kingdom
Czech Republic	Austria	Iceland
Denmark	Poland	Norway
Estonia	Portugal	Croatia
Ireland	Romania	Turkey
Spain	Slovenia	
France	Finland	

Before conducting any correlation analysis data must be preprocessed in order to get more reliable results. Data must be standardized and reviewed for possible outliers that may have distorted the result of correlation. In this study as can be seen from the descriptive tables population has higher/bigger values than other variables. This may distort the results. Data is also trimmed for outliers. Outliers could be serious problem if not handled appropriately (Anscombe 1973). For this calculation purposes the SPSS software is used.

Table 11. *Variables list*

Variables used in this study
Persons of the age 20 to 24 having completed at least upper secondary education by gender
Tertiary educational attainment by gender, age group 30-34
Research and development expenditure, by sectors of performance
Patent applications to the European Patent Office
European high-technology patents
Human resources in science and technology as a share of labour force - Total
Doctorate students in science and technology fields - Total
Population at 1 January
Real GDP growth rate - volume

There are 36 possible correlation coefficients between 9 variables. Bu only the highest 14 of them interpreted in this study.

3. Result and Discussion

Table 1 indicates number of persons aged 20-24 having completed at least upper secondary education and the indicator measures the qualification level of the population aged 20- 24 years in terms of formal educational degrees. So far it provides a measure for the “supply” of human capital of that age group and for the output of education systems in terms of graduates (EIS 2006:39). Turkey has a disadvantageous position in here, as demonstrated in the table; Turkey has low level of percentage for persons of the age 20-24 having completed tertiary education. Although all the numbers are low compared to the other countries there is a slight increase.

Table1. *Persons of the age 20 to 24 having completed at least upper secondary education by gender as percentage*

geo\time	2006	2007	2008	2009
Belgium	82,4	82,6	82,2	83,3
Bulgaria	80,5	83,3	83,7	83,7
Czech Republic	91,8	91,8	91,6	91,9
Denmark	77,4	70,8	70,6	70,1

Estonia	82	80,9	82,2	82,3
Ireland	85,8	86,8	87,7	87
Spain	61,6	61,1	60	59,9
France	83,3	82,4	83,8	83,6
Lithuania	88,2	89	89,1	86,9
Hungary	82,9	84	83,6	84
Austria	85,8	84,1	84,5	86
Poland	91,7	91,6	91,3	91,3
Portugal	49,6	53,4	54,3	55,5
Romania	77,2	77,4	78,3	78,3
Slovenia	89,4	91,5	90,2	89,4
Finland	84,7	86,5	86,2	85,1
Sweden	84,9	85,5	85,6	86,4
United Kingdom	78,8	78,1	78,2	79,3
Iceland	49,3	52,9	53,6	53,6
Norway	68,6	67,9	70,1	69,7
Croatia	94,6	95,3	95,4	95,2
Turkey	46	47,7	48,9	50

Source: Eurostats (01.03.2012)

Table 2 indicates the share of the population aged 30-34 years who have successfully completed university or university-like (tertiary-level) education with an education level ISCED 1997 (International Standard Classification of Education) of 5-6. The table shows years from 2006 to 2009 with 22 countries. This table and indicators can be useful to understand the effect of educational attainment to the innovativeness of a country. In this table, it is easy to find that Turkey has increased this proportion with an incremental but slow rate.

Table 2. *Tertiary educational attainment by gender, age group 30-34 as percentage*

geo\time	2006	2007	2008	2009
Belgium	41,4	41,5	42,9	42
Bulgaria	25,3	26	27,1	27,9
Czech Republic	13,1	13,3	15,4	17,5
Denmark	43	42,5	45,4	48,1
Estonia	32,5	33,3	34,1	35,9
Ireland	41,3	43,3	46,1	49
Spain	38,1	39,5	39,8	39,4
France	39,7	41,4	41,2	43,2
Lithuania	39,4	38	39,9	40,6
Hungary	19	20,1	22,4	23,9
Austria	21,2	21,1	22,2	23,5
Poland	24,7	27	29,7	32,8
Portugal	18,4	19,8	21,6	21,1
Romania	12,4	13,9	16	16,8
Slovenia	28,1	31	30,9	31,6
Finland	46,2	47,3	45,7	45,9
Sweden	39,5	41	42	43,9
United Kingdom	36,5	38,5	39,7	41,5
Iceland	36,4	36,3	38,3	41,7
Norway	41,9	43,7	46,2	47
Croatia	16,7	16,7	18,5	20,6
Turkey	11,9	12,3	13	14,7

Source: Eurostats (01.03.2012)

Table 3 indicates all R&D expenditures in the business sector (BERD), according to the Frascati-manual definitions, in national currency and current prices. The indicator captures the formal creation of new knowledge within firms (EIS 2006: 40). In this dimension Turkey faces an incremental increase and exceeds Bulgaria, Romania and Poland however, its statistics are lower than other countries.

Table 3. *Research and development expenditure, by sectors of performance % of GDP Business enterprise sector*

geo\time	2006	2007	2008	2009
Belgium	1,29	1,32	1,34	1,34
Bulgaria	0,12	0,14	0,15	0,16
Czech Republic	0,97	0,92	0,87	0,89
Denmark	1,66	1,8	1,99	2,08
Estonia	0,5	0,51	0,55	0,64
Ireland	0,82	0,84	0,94	1,16
Spain	0,67	0,71	0,74	0,72
France	1,33	1,31	1,33	1,39
Lithuania	0,22	0,23	0,19	0,2
Hungary	0,49	0,49	0,53	0,67
Austria	1,72	1,77	1,85	1,85
Poland	0,18	0,17	0,19	0,19
Portugal	0,46	0,6	0,75	0,78
Romania	0,22	0,22	0,17	0,19
Slovenia	0,94	0,87	1,07	1,2
Finland	2,48	2,51	2,75	2,8
Sweden	2,75	2,47	2,74	2,54
United Kingdom	1,08	1,11	1,11	1,12
Iceland	1,59	1,46	1,44	1,64
Norway	0,8	0,85	0,86	0,93
Croatia	0,27	0,33	0,39	0,34
Turkey	0,21	0,29	0,32	0,34

Source: Eurostats (01.03.2012)

The following tables demonstrate the patent applications to European Patent Office. These statistics are important because patent applications show a great deal of progress level. Statistics are gathered from the eurostats.com and they are related with innovative capabilities of countries.

Table 4 demonstrates the number of patents applied for at the European Patent Office (EPO), of year 2006, 2007, 2008 and 2009. The capacity of firms to develop new products will determine their competitive advantage. One indicator of the rate of new product innovation is the number of patents. This indicator measures the number of patent applications at the European Patent Office (EIS 2007: 49). Turkey's position is far from innovative leaders such as Finland and Sweden, however, its numbers exceeds Romania and Lithuania.

Table 4. *Patent applications to the European Patent Office Applications per million inhabitants*

geo\time	2006	2007	2008	2009
Belgium	139,43	143,86	143,14	143,61
Bulgaria	3,51	1,57	1,69	1,22
Czech Republic	14,93	17,63	19,69	22,59
Denmark	199,63	227,91	235,81	242,64
Estonia	15,78	21,02	25,86	32,92
Ireland	66,4	72,1	73,96	77,44
Spain	30,53	30,76	31,39	31,55

France	132,26	133,56	133,85	134,3
Lithuania	2,84	2,9	3,77	4,17
Hungary	16,26	18,35	19,43	21,46
Austria	207,84	201,6	209,93	218,4
Poland	3,68	5,26	5,93	6,82
Portugal	10,14	11,59	13,59	14,34
Romania	0,91	1,52	1,67	1,79
Slovenia	49,46	59,25	60,29	61,86
Finland	251,77	233,9	224,38	215,67
Sweden	284,28	298,79	315,7	332,03
United Kingdom	91,92	87,34	85,51	83,42
Iceland	97,3	63,7	56,87	42,49
Norway	102,68	98,88	102,4	100,84
Croatia	7,77	6,24	5,92	5,39
Turkey	2,57	3,36	3,86	4,3

Source: Eurostats (01.03.2012)

Furthermore, high technology products and services also included in EIS 2007 Scoreboard and have an effect for countries innovation performances. Table 5 shows the high technology patent applications. In this context, for high tech patent applications Turkey is not at a good place in selected countries. Turkey has bad performance between the years 2006 and 2009 for high-tech patent applications. That puts forward the bad position of innovation for high technology.

Table 5. *European high-technology patents per million inhabitants*

geo\time	2006	2007	2008	2009
Belgium	28,171	32,387	25,338	14,861
Bulgaria	1,043	0,228	0,272	0,263
Czech Republic	1,841	1,55	1,933	0,545
Denmark	39,171	40,392	32,68	7,869
Estonia	8,865	10,652	10,053	1,492
Ireland	17,207	17,646	16,745	4,613
Spain	4,539	4,646	4,521	1,977
France	29,172	30,529	25,849	14,21
Lithuania	0,882	0,984	0,802	0,299
Hungary	4,399	3,866	3,243	0,316
Austria	35,644	34,036	18,163	11,219
Poland	0,59	1,005	0,641	0,481
Portugal	2,299	3,456	2,163	0,282
Romania	0,273	0,75	0,593	0,299
Slovenia	2,521	8,954	5,944	2,706
Finland	105,741	86,211	64,813	8,683
Sweden	75,4	83,962	63,671	8,233
United Kingdom	20,504	19,172	14,501	5,809
Iceland	17,673	32,502	27,484	2,098
Norway	15,435	11,786	9,909	1,144
Croatia	1,621	0,691	1,278	0,225
Turkey	0,319	0,502	0,272	0,253

Source: Eurostats (01.03.2012)

Table 6 shows the number of employed persons in the high-tech services sectors. The high technology services provide services directly to consumers, such as telecommunications, and provide inputs to the innovative activities of other firms in all sectors of the economy (EIS 2007:48). It is hard to say that Turkey is in a good position however, there is also an incremental increase.

Table 6. *Human resources in science and technology as a share of labour force*

geo\time	2006	2007	2008	2009
Belgium	46,6	46,7	47	48,2
Bulgaria	30,5	30,8	31	32,2
Czech Republic	34,8	36	37,1	37,9
Denmark	50,4	48,8	50,1	51,8
Estonia	44,1	44,4	44,2	45,6
Ireland	39,5	41,2	42,2	44,7
Spain	39,8	39,7	39,7	39
France	41,2	41,7	42,6	43,3
Lithuania	38,3	40,6	42,5	41,7
Hungary	31,9	31,7	33,2	33,2
Austria	38,3	37,6	37,8	39
Poland	31,4	32,5	33,4	34,9
Portugal	22	22,1	23,1	23,5
Romania	22,8	23	23,8	24,1
Slovenia	38,8	38,9	40,1	40,6
Finland	48,7	49,6	50,1	50,7
Sweden	48	48,7	49,3	49,6
United Kingdom	42,5	43,3	42,7	44,4
Iceland	42,8	46,4	48,2	50
Norway	48,8	49,4	50,1	51,3
Croatia	29,2	28,8	29,9	31,6
Turkey	18,4	18,8	20,5	20,7

Source: Eurostats (01.03.2012)

Table 7 introduces students participating in second stage of tertiary education in science and technology fields of study, as a percentage of the population 20-29 year old. This statistics includes the year 2006 to 2009. Furthermore, this statistics can be an indicator for innovation performance of countries; hence the relationship between doctorate students and other indicators is important. However, Turkey is in a disadvantageous position and only a slight change can be seen between 2006 and 2007.

Table 7. Doctorate students in science and technology fields – Total % of the population aged 20-29

geo\time	2006	2007	2008	2009
Belgium	0,26	0,25	0,34	0,4
Bulgaria	0,22	0,22	0,19	0,16
Czech Republic	0,68	0,72	0,81	0,81
Denmark	0,3	0,27	0,38	0,45
Estonia	0,42	0,46	0,51	0,53
Ireland	0,34	0,35	0,38	0,45
Spain	0,28	0,25	0,23	0,32
France	0,36	0,4	0,41	0,43

Lithuania	0,24	0,24	0,23	0,23
Hungary	0,18	0,16	0,16	0,16
Austria	0,49	0,54	0,53	0,55
Poland	0,17	0,18	0,17	0,17
Portugal	0,4	0,4	0,38	0,4
Romania	0,2	0,35	0,35	0,33
Slovenia	0,17	0,21	0,22	0,26
Finland	1,36	1,38	1,36	1,3
Sweden	0,83	0,79	0,74	0,72
United Kingdom	0,5	0,51	0,4	0,39
Iceland	0,1	0,15	0,22	0,22
Norway	0,37	0,41	0,43	0,46
Croatia	0,12	0,2	0,26	0,23
Turkey	0,09	0,1	0,1	0,1

Source: Eurostats (01.03.2012)

Table 8 demonstrates the selected countries' population. This data was chosen because it is important to understand the relationship between population and other variables. This dimension was chosen in order to understand that if population affects innovativeness or technological developments of countries. Table 8 includes the years 2006, 2007, 2008 and 2009. Here it can be seen that Turkey has the most crowded population within selected countries.

Table 8. *Population at 1 January*

geo\time	2006	2007	2008	2009
Belgium	10.511.382	10584534	10666866	10753080
Bulgaria	7.718.750	7679290	7640238	7606551
Czech Republic	10.251.079	10287189	10381130	10467542
Denmark	5.427.459	5447084	5475791	5511451
Estonia	1.344.684	1342409	1340935	1340415
Ireland	4.208.156	4312526	4401335	4450030
Spain	43.758.250	44474631	45283259	45828172
France	63.229.635	63645065	64007193	64369050
Lithuania	3.403.284	3384879	3366357	3349872
Hungary	10.076.581	10066158	10045401	10030975
Austria	8.254.298	8282984	8318592	8355260
Poland	38.157.055	38125479	38115641	38135876
Portugal	10.569.592	10599095	10617575	10627250
Romania	21.610.213	21565119	21528627	21498616
Slovenia	2.003.358	2010377	2010269	2032362
Finland	5.255.580	5276955	5300484	5326314
Sweden	9.047.752	9113257	9182927	9256347
United Kingdom	60.409.918	60781346	61191951	61595091
Iceland	299.891	307672	315459	319368
Norway	4.640.219	4681134	4737171	4799252
Croatia	4.442.884	4441238	4436401	4435056
Turkey	72.519.974	69689256	70586256	71517100

Source: Eurostats (01.03.2012)

According to Eurostats, Gross domestic product (GDP) is a measure of the economic activity, defined as the value of all goods and services produced less the value of any goods or services used in their creation. Thus Table 9 shows the years 2006, 2007, 2008 and 2009 furthermore, this data can be useful to understand the effect of countries' growth to innovations and development of countries.

Table 9. *Real GDP growth rate – volume percentage change on previous year*

geo\time	2006	2007	2008	2009
Belgium	2,7	2,9	1	-2,8
Bulgaria	6,5	6,4	6,2	-5,5
Czech Republic	7	5,7	3,1	-4,7
Denmark	3,4	1,6	-0,8	-5,8
Estonia	10,1	7,5	-3,7	-14,3
Ireland	5,3	5,2	-3	-7
Spain	4,1	3,5	0,9	-3,7
France	2,5	2,3	-0,1	-2,7
Lithuania	7,8	9,8	2,9	-14,8
Hungary	3,9	0,1	0,9	-6,8
Austria	3,7	3,7	1,4	-3,8
Poland	6,2	6,8	5,1	1,6
Portugal	1,4	2,4	0	-2,9
Romania	7,9	6,3	7,3	-6,6
Slovenia	5,8	6,9	3,6	-8
Finland	4,4	5,3	0,3	-8,4
Sweden	4,3	3,3	-0,6	-5,2
United Kingdom	2,6	3,5	-1,1	-4,4
Iceland	4,7	6	1,3	-6,7
Norway	2,5	2,7	0	-1,7
Croatia	4,9	5,1	2,2	-6
Turkey	6,9	4,7	0,7	-4,8

Source: Eurostats (01.03.2012)

4. RELATIONSHIP BETWEEN INNOVATION INDICATORS

4.1 Hypotheses of the Research

In this research, in order to analyze the strength, direction and significance level of relationships between selected dimensions Pearson Correlation Test were used. The aspects were mentioned as below;

- R&D expenses of countries and the relationship between patent application, high technology patent applications, human resources in science and technology, doctorate students in science and technology fields
- Tertiary education attainments and the relationship between R&D expenses of countries, patent applications, high technology patent applications, human resources in science and technology,
- Patent applications and the relationship between technology patent applications
- Human resources in science and technology and the relationship between patent applications and high technology patent applications
- Doctorate students in science and technology fields and the relationship between technology patent applications and human resources in science and technology

Table 12 demonstrates analyzes gathered from selected dimensions.

Table 12: Pearson Correlation Analysis

Hypothesis	Pearson Correlation	Significant Level	Correlation Level	H_1 Reject/ Accept
The relationship between R&D expenditure and patent applications	0,934	0,000	High level positive significant linear relationship	H_1 Accepted
The relationship between tertiary education attainments and human resources in science and technology	0,876	0,000	High level positive significant linear relationship	H_1 Accepted
The relationship between patent applications and high technology patent applications	0,819	0,000	High level positive significant linear relationship	H_1 Accepted
The relationship between R&D expenditure and high technology patent applications	0,797	0,000	High level positive significant linear relationship	H_1 Accepted
The relationship between R&D expenditure and doctorate students in science and technology fields	0,689	0,000	Average level positive significant linear relationship	H_1 Accepted
The relationship between R&D expenditure and human resources in science and technology	0,685	0,000	Average level positive significant linear relationship	H_1 Accepted
The relationship between human resources in science and technology and patent applications	0,670	0,000	Average level positive significant linear relationship	H_1 Accepted
The relationship between doctorate students in science and technology fields and patent applications	0,620	0,000	Average level positive significant linear relationship	H_1 Accepted
The relationship between human resources in science and technology and high technology patent applications	0,577	0,000	Average level positive significant linear relationship	H_1 Accepted
The relationship between tertiary education attainments and patent applications	0,559	0,000	Average level positive significant linear relationship	H_1 Accepted
The relationship between tertiary education attainments and R&D expenditures	0,540	0,000	Average level positive significant linear relationship	H_1 Accepted
The relationship between doctorate students in science and technology fields and high technology patent applications	0,529	0,000	Average level positive significant linear relationship	H_1 Accepted
The relationship between tertiary education attainments and high	0,499	0,000	Average level positive significant linear relationship	H_1 Accepted

technology patent applications				
The relationship between doctorate students in science and technology fields and human resources in science and technology	0,457	0,000	Low level positive significant linear relationship	H_1 Accepted

5. Conclusion

In this study variables that indicates the innovation capabilities of countries are selected and innovation performance is compared across several countries.

It is clear from this data that Turkey is not at a good place in innovation within selected countries across several years.

As a result it is appropriate to note that using clustering techniques such as neural networks in order to classify the innovation capability of countries may be useful. Such an approach may provide more valuable insight into the position of Turkey regarding innovation capabilities. Furthermore, it was found that population is not a determinant for the innovativeness and developments for countries.

In order to be a more innovative country Turkey must examine the innovative countries and try to enhance its innovative position.

References

ANSCOMBE Frank (1973). “Graphs in Statistical Analysis” The American Statistician, 27 (1), 17-21.

European Union (2005). Oslo Manual –Guidelines for collecting and interpreting innovation data (3rd Ed.). European Commission: OECD Publishing.

ELÇI Şirin (2006), İnovasyon: Kalkınmanın ve Rekabetin Anahtarı, Nova Yayınları, Ankara.

Eurostats,http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database Access Date: 01.03.2012

TIDD Joe vd (1997), (2005, Third Edition). Managing Innovation: Integrating Technological, Market and Organizational Change. Chichester: John Wiley & Sons Ltd.

TURANLI Rona - Ercan Sarıdoğan, (2010). Bilim-Teknoloji-İnovasyon Temelli Ekonomi ve Toplum İstanbul, İstanbul Ticaret Odası.

OECD (2008), Science, Technology and Industry Outlook 2008, Paris, France: Organisation for Economic Co-operation and Development (OECD).

European Commission, (2009), European Innovation Scoreboard 2009.

European Commission, (2006), European Innovation Scoreboard 2006.

European Commission, (2006), European Innovation Scoreboard 2007.

European Commission, (2009), Eurostat Science, technology and innovation in Europe 2009.

VARSAKELIS Nikos (2006). “Education, political institutions and innovative activity: A cross-country empirical investigation” Research Policy, 35 (2006).1083-1090.