EFFECTIVENESS OF TURKEY’S PUBLIC POLICIES SUPPORTING TECHNOLOGICAL INNOVATION AND PRODUCTIVITY INCREASE AT THE AGE OF KNOWLEDGE ECONOMY

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Abstract

There is consensus in Turkey that knowledge economy and technological innovation are the driving force of economic growth. However, there are deficiencies in the development of holistic and result-oriented technology management and supportive public policies. Turkey has difficulty in achieving organizational change required by the knowledge economy since the beginning of the 21st century, with falling competitiveness, workforce skill levels and technological infrastructure can not be developed at the level that would support productivity growth and technological innovation. Turkey with having a young population, productive universities, flexible and enterprising private sector and being close to markets, to realize its potential, technology should become one of the main elements of public policy and a technological innovation culture should be developed under the leadership of the public sector. In this study, it is tried to reveal the outlines of the change in technological innovation and productivity increase. In this context, traditional production structures and the reasons for failure of technology policies are examined and the increasing and changing role of public sector is emphasized. In the second part of the study, to examine Turkey’s technological innovation and to make comparisons; The Global Competitiveness Index developed by the World Economic Forum, the Global Innovation Index developed by the World Intellectual Property Organization and the Basic Science and Technology Indicators published by the OECD are being used. At the conclusion of the study, R&D and innovation support policies of the public sector in Turkey is evaluated in the light of new international practices. It also includes policy and solution proposals that strengthen the links between scientific research and commercial entrepreneurship, including reforms and investments that improve technological production infrastructure and human resources.

Keywords: Knowledge Economy, Technological Innovation, Productivity Increase, Public Policies

JEL Code: O32, O38, H39.

1. Introduction

With the beginning of the 21st century, information technologies have shown a rapid development that has profoundly changed human lifestyles and economic structures. The “Digital Revolution” triggered a rapid paradigm shift in traditional industrial production processes and management models, in parallel with the transformation of traditional trading methods and monetary regimes. Biochemistry, aerospace, material science and nanotechnology fields supported by laboratories have come to the forefront. Technological innovations and knowledge economy have changed the rules of international trade competition. Previously, firms that considered growth as a solution to achieve economies of scale and cost reduction focused on R&D and innovation with the transition to knowledge economy. The search for cheap labor has been replaced by the search for highly skilled workforce that can adapt to technological innovations. Especially, the commercial life of technological products is shortened and the producers have entered a continuous R&D and innovation cycle in line with the increasing demands of the

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customers. With the information economy, the physical boundaries have become transparent, the design, production, renewal and marketing of the products have become cost-effective in many different places. Companies competing with each other, have cooperated on specific issues at the same time. The innovation capacity has progressed rapidly to be a key determinant of rapid economic growth and the ability to compete and develop in the 21st century global economy. Providing the infrastructure required by the knowledge economy and accelerating technological innovation by supporting it has become one of the important tasks of the state. The objectives of establishing intellectual property rights and increasing the competitiveness of the country have gained importance.

2. Evaluation of Turkey's Global Competitiveness and Innovation Performance

The concept of global competitiveness has found widespread use of space in nowadays. The World Economic Forum (WEF) defines the competitiveness as the level of efficiency that encompasses all of the institutions, policies and production factors that will ensure sustainable growth in a country. According to the OECD, competitiveness is the ability to produce goods and services that can withstand foreign competition in parallel with the increase in real national income of a country under free market conditions (Reinert, 1994:3). As the level of global competition in the world increases day by day, the basis of competition has shifted towards the production of knowledge (Ovalı, 2014:18).

The Global Competitiveness Report began in 1979 as a research project. At the end of the forty-year period, it has become evaluating the key factors of economic development in over 140 countries. Since 2005, the Global Competitiveness Index (GCI) has been calculated to quantify the level of competition of countries (WEF, 2018: vii). As can be seen in Graph 1, according to the results of the GCI 2018, Turkey ranks 53 among 137 countries. The best ranking was in 2013. Even though its score remained the same, the ranking declined by 10 rows in 5 years.

Graph 1. Turkey's 2008-2018 Global Competitiveness Ranking

Source: World Economic Forum, 2018.

Graph 2 shows that in the last decade, some important developing countries have come closer to the technology boundaries; however, it is also understood that the leading developed countries, which continue to benefit from historically strong innovation ecosystems, still make a clear difference. In terms of the evolution of the innovation environment, Japan and S. Korea still in the top group, seem to have lost momentum in recent years. At the beginning of the 2000's Brazil and Turkey which were seen as having great potential in the developing markets, lost most of the momentum they gained before 2013. However, China, India and Indonesia continue to develop and close the gap with the upper class.

Graph 2. Evolution of innovation environment in large advanced economies and large emerging economies

Note: Colors correspond to regional classifications: ■ Europe and North America; ■ East Asia and Pacific; ■ Latin American and the Caribbean; ■ Eurasia; and ■ South Asia.

Source: World Economic Forum, 2018: 16

In the last decade, as a result of the change in nature, innovation has been increasingly driven by the dispersed intelligence of a global community rather than individuals working within the boundaries of the company or university labs. Since many of the benefits of digital services; including using search engines, emails, digital maps, and social media, do not have a market price, they cannot be captured in GDP or reflected in efficiency estimates. However, it also provides an important benefit to individuals. The GCI's technological readiness component seeks to capture this capability through indicators related to the availability of the latest technologies. Graph 3 shows that the technological readiness of individuals and firms in China, India and Indonesia remains relatively low, and the benefits of innovation activities are not widely shared. Turkey, meanwhile, demonstrates a complementary effort to enable more people and firms to have the means to access and use new technologies.

Graph 3. Evolution of technological readiness in large advanced economies and large emerging economies

Source: World Economic Forum, 2018: 16

GCI evaluates countries in short and long term in terms of institutional and political aspects. In calculating the index, three main factors are used, consisting of 12 components and complementary data. The first basic factor is the “Basic Requirements” and the data of the Institutions, Infrastructure, Macroeconomic Environment, Health and Basic Education are brought together. The second is “Productivity Improving” Factors and is calculated as a combination of Higher Education and Vocational Training, Efficiency of the Goods Market, Efficiency of Labor Market, Financial Market Development, Technological Preparation and Size of Market. The last factor is the “Innovation and Competency” Factors covering the Competence Level and Innovation data of the Business World.

In Table 1, Turkey’s place in the GCI ranking in 2018, and the change of ranking between 2018-2012 information is provided in terms of some selected components and indicators related to innovation. Negative values in column Change (2018-2012) shows worsening of the component, positive values indicate improvement.

Accordingly, the component with the highest recovery was higher education and on-the-job training (component 5). However, according to this level of education quality (99th place) and on-the-job training indicator (100th place), the country ranking is very poor and the ranking has deteriorated in the last 5 years. According to the technological preparation (component 9), the 2018 country ranking is below the overall ranking but is acceptable (62th place). According to the innovation (component 12), the 2018 country ranking is 69. The key indicators in this component that worsen the rankings are the government’s performance in supplying high-

tech products and the capacity of companies in the country to innovate. In 2018, the country ranking of these two indicators was lower than the overall ranking of the country (64. and 74., respectively). Another indicator that has the lowest ranking is the quality of the scientific research institutions. In 2018, Turkey ranks 100th according to this indicator. Engineer and scientist presence and patent application indicators are indicators that increase the ranking of this component. According to the first indicator, the country ranking is 49 while it is 39 according to the second indicator.

Table 1. Ranking and Development of Some Selected Components and Indicators of Global Competitiveness Index

Index Component	Rank /137 (2017-2018)	Change (2018-2017)	Index Component	Rank /137 (2017-2018)	Change (2018-2017)
Global Competitiveness Index	53	6	C: Innovation and sophistication factors	66	-16
5. Higher education and training	48	26	11. Business sophistication	67	-20
5.01 Secondary education enroll. rate	37	56	11.01 Local supplier quantity	44	-9
5.02 Tertiary education enrollment rate	2	54	11.02 Local supplier quality	52	4
5.03 Quality of the education system	101	-19	11.03 State of cluster development	59	-16
5.04 Quality of math and science educ.	104	-4	11.04 Nature of competitive advantage	106	-20
5.05 Quality of management schools	108	-11	11.05 Value chain breadth	67	-32
5.06 Internet access in schools	72	-4	11.06 Control of i.national distribution	55	-31
5.07 Loc. avail. of specialized train. serv.	93	-16	11.07 Production process sophistication	51	-13
5.08 Extent of staff training	102	-37	11.08 Extent of marketing	92	-57
9. Technological readiness	62	-9	11.09 Willingness to delegate authority	86	11
9.01 Availability of latest technologies	57	-12	12. Innovation	69	-14
9.02 Firm-level technology absorption	46	-7	12.01 Capacity for innovation	74	-26
9.03 FDI and technology transfer	61	4	12.02 Quality of sci. research inst.	100	-12
9.04 Internet users	70	-1	12.03 Company spending on R&D	69	-13
9.05 Fixed-broadb. Int. subscriptions	59	-2	12.04 Univ-industry collab. in R&D	66	4
9.06 Internet bandwidth	61	-20	12.05 Gov't proc. of adv. tech. products	64	-32
9.07 Mobile-broadband subscriptions	60	13	12.06 Avail. of scientists and engineers.	49	-8
10. Market size	14	1	12.07 PCT patents	39	3

Source: Constructed by author from (World Economic Forum, 2018) data.

The Global Innovation Index, a United Nations agency developed by the World Intellectual Property Organization (WIPO), has been published for eleven years as of 2018. The essence of its report consists of a ranking of the innovation capabilities and results of world economies. Turkey ranks 50th in according to data from Global Innovation Index 2018, in Table 2, it is also seen that it is the best 8th country in the top-middle income group. Another indicator that demonstrates the innovation potential of Turkey is demonstration of the success of being the 5th best economy based on innovation output sub-index, and 4th in terms of efficiency of innovations.

Table 2. Top Ten Economies by Income Group (Upper-middle income group- 34 units)

GLOBAL INNOVATION INDEX			INNOVATION INPUT SUB-INDEX		INNOVATION OUTPUT SUB-INDEX		INNOVATION EFFICIENCY RATIO	
1	CHINA	17	CHINA	27	CHINA	10	CHINA	3
2	MALAYSIA	35	MALAYSIA	34	BULGARIA	34	IRAN	11
3	BULGARIA	37	CROATIA	42	MALAYSIA	39	BULGARIA	19
4	CROATIA	41	RUSSIAN FED.	43	CROATIA	42	TURKEY	25
5	THAILAND	44	BULGARIA	44	TURKEY	43	THAILAND	33
6	RUSSIAN FED.	46	S. AFRICA	48	THAILAND	45	CROATIA	37
7	ROMANIA	49	ROMANIA	49	IRAN	46	COSTA RICA	43
8	TURKEY	50	COLOMBIA	50	ROMANIA	48	ROMANIA	47
9	MONTENEGRO	52	MONTENEGRO	51	COSTA RICA	51	MALAYSIA	48
10	COSTA RICA	54	THAILAND	52	MONTENEGRO	55	MONTENEGRO	56

Source: World Intellectual Property Organization, 2018:29

Turkey's R&D spending share in the GDP of 2016, according to the Basic Science and Technology Database published by the OECD, was realized as 0.945%. Graph 4 shows that this ratio is well below the OECD average. China has begun to approach the OECD average with its moves.

Graph 4. R&D Expenditure Intensity in OECD and Some Other Economies

Source: OECD estimates based on, OECD, Main Science and Technology Indicators Database, February 2019

It is seen at Graph 5 that the burden of R&D expenditures has been undertaken by private sector and universities in recent years. According to the Global Competitiveness Index data, it is understood that cooperation between the private sector and universities in Turkey has made progress. The decrease in R&D expenditures of the public sector stems from the fact that the budget fiscal balance deteriorates and the state has preferred R&D supports such as tax incentives.

Graph 5. Gross Domestic Expenditure on R & D in Turkey by Sectors (USD Ind.= 2007)

Source: OECD estimates based on, OECD, Main Science and Technology Indicators Database, February 2019

3. Conclusion

In the public sector pillar of Turkey's Innovation Ecosystem, numerous public institutions (Ministries, including the Ministry of Industry and Technology, TÜBİTAK, TÜBA, KOSGEB, YÖK, SANTEZ, Universities, Local Governments, EU Funds) and a very complicated legislation (Law No: 5746 on Supporting Research and Development Activities, Technology Development Zones Law No. 4691, Development Agencies Law No. 5449, Laws of Taxation, Commercial Laws and Law on Court of Accounts) are located. It is seen that the High Council of Science Technology, which was established in order to provide coordination, could not solve the complexity. The aggravation of bureaucracy creates a deterrent effect when new innovation initiatives are too weak and delicate like in Turkey. Business should be facilitated and the bureaucracy should be minimized.

The public bureaucracy is reluctant to undertake risk in supporting the R&D expenditures of private sectors due to the uncertainty of the results of innovation studies and the prolongation of their returns. Supported projects need to meet very difficult requirements and many R&D activities of the private sector, especially the software sector, cannot be supported. The fact that the innovation studies, which are often undetectable and which are defined as global public goods, are not supported by the public, cause social damage. In addition, the studies that measure and report the effects of the support given should increase.

Nowadays, it is seen that domestic technologies are preferred in public procurement in many countries. However, in Turkey, import purchases are realized more intense. Selection of domestic technology in public procurement will be an important innovation support. Public funding and tax exemptions should also be expanded for the R&D expenditures. It is extremely important to start a technological innovation move and mobilization in Turkey, for the speed-winning and shape-shifting global competition in the age of knowledge economy without wasting time to be successful.

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