15 How to Address the Turkish Paradox of Innovation to Build a Competitive Economy?

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Abstract

The ability to innovate has become a crucial prerequisite of strong organizations as well as economies. Theoretical and empirical evidence demonstrates that developing countries with effective innovation policies and well-functioning national innovation systems are better positioned to close the development gap and improve their competitiveness. Turkey started discussing the innovation subject from the policy perspective in the mid-1990s, during the same time as the EU, where—at that time—a wide-ranging debate was stimulated by the "Green Paper on Innovation," and the government defined its main objective in this topic as "the establishment of the National Innovation System that would enable systematic operation of the whole institutions and mechanisms required to carry out scientific and technological research and development activities and to transform the results of those activities into economic and social benefit." However, until today, this goal has not been fully achieved and the innovation performance remained below the desired level. Although innovation performance is low, demand for innovative products/services, one of the prime drivers of innovation, is very high in Turkey. Departing from this paradox, this chapter discusses how to increase the innovative capabilities of the Turkish firms in favor of a competitive economy.

15.1 Introduction

The innovation literature dates back to the Schumpeterian times, early 1990s. Joseph Schumpeter, founder of the modern growth theory, was the first to emphasize the importance of new products as

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a stimulus to economic growth. He argued that with their innovator roles, entrepreneurs destroy the equilibrium in the market and lead to a continuous dynamism in an economy. To him, the entrepreneur brings in something new. It might be a new idea, product, or service, a new technology, or the entrepreneur finds new ways of using factors of production (Schumpeter 1990). In the contemporary literature, 1980s, we see Drucker as an advocate of innovative entrepreneurship. To him, "innovation is the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or a different service" (Drucker 1985). Similar to Schumpeter, he focuses on the wealth creation character of innovation, and argues that businesses and societies who can organize and manage for innovation can prosper.

Innovation can be defined as the successful implementation of creative ideas within an organization (Amabile 1983). In spite of the varying definitions of innovation provided in the literature, most studies agree with its important contributions to economies. That is why this topic has recently attracted a considerable amount of interest from policy-makers, academicians, and practitioners. It is a well-established fact today that innovation is essential for the success and competitive advantage of organizations as well as for strong economies in the twenty-first century. A significant body of international theoretical and empirical evidence demonstrates links between technology, innovation and skills (the knowledge factors), total factor productivity (TFP) and economic growth (World Bank 2006). The OECD study (OECD 2001) that investigates the patterns of economic growth in the 1990s, and the role of innovation and information technology in growth reveals that levels of GDP per capita are no longer converging across OECD countries: Growth is higher in high-income countries and in those who continue to catch-up using technological innovation, like Ireland and South Korea. Countries with higher per capita growth rates maintain or even increase employment, while employment stagnate or fall in those experiencing a slowdown in growth. The reason is largely due to the fact that some countries were able to both increase the number of people working and increase their productivity through technological developments and innovation.

Developing countries with effective science, technology and innovation policies, and well-functioning national innovation systems

(NIS) (Lundvall 2000) are better positioned to close the development gap and mitigate inequalities. In this respect, based on effective policies, government intervention is necessary to develop human capital, to increase absorptive capacity of firms, and to create an environment conducive to innovation. The importance of such interventions is evident in the success cases of East Asian countries that achieve high growth and decline in inequality at the same time (World Bank 1993). These countries enjoyed fast catch-up by mastering sophisticated technological and managerial skills (Hobday 1995), and as a result of the ability to learn (Stiglitz 1996). In line with this, they provide lessons to developing countries like Turkey, who urgently need to make reforms in building an innovative economy.

In this short chapter, we do not aim to go into much detail regarding the innovation and innovation policy issues in Turkey. There is a growing amount of studies on the subject, most notably by the European Commission and the World Bank. Here, we limit ourselves to a brief overview of the situation with respect to innovation and the key challenges to address for increasing the innovation performance of the country.

15.2 Innovation in Turkey: An Overview

15.2.1 Private Sector Development and Entrepreneurship in Turkey

The short history of liberalization of her markets for Turkey began only after the 1980s. Before then, little room had been left to the private sector. After the 1930s, state-owned enterprises were established to compensate for the lack of a bourgeoisie who could otherwise replace the shortcomings of scarce resources and low productivity. The liberalization efforts after the 1980s, as well as the export-led growth strategy adopted, helped to develop a private sector of small and medium-sized businesses where social institutions supporting business development were established. Financial backups in the form of subsidies, tax exemptions, or cheap credits to business owners were provided. However, the slow pace of privatization, lack of regulatory institutions, high taxation, the inadequate technological infrastructure coupled with an inflation-prone and highly volatile macroeconomic

environment remained impediments to private business development. In spite of all these drawbacks, the number of entrepreneurs kept increasing. With the membership to the Customs Union after 1995, there started a gradual shift from low value-added sectors such as textile and clothing to higher value-added sectors such as electronics, consumer durables, vehicles, and transport equipment (Cakmakci 2005). Furthermore, in 2000, the share of SMEs (1–250 workers) in the Turkish market reached 99.8 percent of total enterprises, which created 76.7 percent employment, but however accounted for only 26.5 percent of the value-added sectors and 10 percent of the exports (OECD 2004).

There are several studies about the profile of entrepreneurship in Turkey. A recent one (Gurel et al. 2003), based on the Household Labor Force Survey data collected by the State Institute of Statistics of Turkey, reports that entrepreneurship in Turkey falls short in the EU in terms of: (1) the share of women entrepreneurship (11 percent in Turkey, 22 percent in the EU), (2) and sectoral composition, where the shift from agriculture to nonagriculture in entrepreneurship has been much faster in the EU (share of entrepreneurship in agriculture in Turkey: 50 percent, the EU: 19 percent). Most studies also show that Turkish SMEs are below the EU-OECD average in terms of know-how and financing. These findings point out that to boost the innovativeness of Turkish firms and build a stronger economy, they need to be supported.

It was in mid-1990s that Turkey started discussing the innovation subject from the policy perspective during the same time with the EU where—at that time—a wide-ranging debate was stimulated by the "Green Paper on Innovation," and the Turkish government defined its main objective in this topic as "the establishment of the National Innovation System that would enable systematic operation of the whole institutions and mechanisms required to carry out scientific and technological research and development activities and to transform the results of those activities into economic and social benefit." However, until today, this goal has not been fully achieved and the innovation performance remained below the desired level. Although innovation performance is low, demand for innovative products/services, one of the prime drivers of innovation, is very high in Turkey. This is referred to as the "Turkish paradox of innovation" in this chapter and will be discussed in the next section. However, in order to better understand

the innovation context Turkish firms are operating in, the preceding part presents the innovation climate and the National Innovation System in Turkey.

15.3 Innovation Climate in Turkey in the 2000s

The innovation climate in a country is determined by the political, macroeconomic, and institutional set-ups, and the demand conditions. Well-functioning financial and product markets, clearly defined and affordable intellectual property rights (IPR), favorable conditions for creation and growth of enterprises, and openness and ability of economy to engage in international trade and foreign direct investments are among the main framework conditions to enhance innovation in the private sector.

In spite of the timely initiation of political debate on innovation in Turkey in the mid-1990s, insufficient political commitment, weak economic environment, ineffective governance of NIS, and unfavorable framework conditions have been the major obstacles in development of a climate conducive to innovation in Turkey (Elci 2004).

Public sector imbalances, crises in Asia and Russia, the Marmara earthquake in the 1990s, and the economic crises in the early 2000s negatively affected Turkey's economic performance. However, a new economic program for restructuring the economy and achieving long-term stability, and structural reforms initiated led to a remarkable economic recovery. Inflation fell to single digits after 30 years. Gross Domestic Products (GDP) growth in 2004 reached 9 percent, followed by approximately 5 percent in 2005, and 6 percent in 2006, more than double of the EU-27 average. Foreign Direct Investment (FDI), which has been traditionally low, has started to rise; and particularly large-scale acquisitions in services, mainly in telecommunications and banking, increased FDI inflows to Turkey. The pace of privatization picks up and privatization sales reached nearly US$ 20 billion.

The reform programs continue to improve the business environment. The "Doing Business 2008" issued by the World Bank and International Finance Corporation provides information about the quality of the business environment, which is a key element influencing innovation climate. In the "ease of doing business," Turkey ranks 57 in 178 economies. The key indicator "starting a business," which

is also a stimulating factor for innovative entrepreneurship, has been remarkably improved compared to the first "Doing Business" report issued in 2004, in terms of number of procedures and days. On the other hand, further actions are required in some areas like "closing a business." In an article on innovation called "Lessons from Apple" in *The Economist* 2007, the writer draws a wider conclusion from a lesson from Apple (which is what they call "fail wisely"). The wider lesson is phrased as "not to stigmatize failure but to tolerate it and learn from it." This argument is supported with the fact that "Europe's inability to create a rival to Silicon Valley owes much to its tougher bankruptcy laws" (*The Economist* 2007). The same issue remains as an obstacle in the creation of a favorable innovation climate in Turkey. According to "Doing Business 2008," the time and cost required to resolve bankruptcies are 3.3 years and 15 percent of income per capita, respectively. Both figures are comparable to the economies in the region, but nearly 2.5 times higher than the OECD average.

15.3.1 National Innovation System and Innovation Policy in Turkey

NIS is a network of organizations, individuals, and institutions that determine and shape the generation, diffusion and use of technology and knowledge, which in turn explains the pattern, pace, and the rate and economic success of innovation. Effectiveness of the NIS is determined by the quality and intensity of linkages, interactions, and flows between them: NIS is dynamic due to the "financial flows between government and private organizations. . .human flows between universities, firms, and government laboratories, regulation flows emanating from government agencies toward innovation organizations, and knowledge flows (spillovers) among these institutions" (Niosi 2002). Thus, public policies seek to facilitate and promote interactions between the different elements of the NIS, and to remove barriers to the flows.

The innovation system in Turkey is formed by the government bodies, implementing agencies of support programs, private sector establishments, knowledge and skill providers, innovation intermediaries, and other stakeholders such as technology parks, venture capital companies, incubators, and research centers. It has a relatively

well structured government institutions in the NIS at national level. The Supreme Council of Science and Technology is the highest level policy coordination body for science, technology, and innovation in Turkey. It is chaired by the Prime Minister and is composed of related ministries, high level representatives of the government bodies, universities, and nongovernmental organizations. On the enterprise side, there are approximately 1.8 million firms, majority of which are SMEs; nearly 15 percent of the enterprises are manufacturing industry companies; on the knowledge and skills providers' side, universities are the most important research performers; 67.9 percent of the country's R&D spending is performed; and 61.9 percent of the researchers are employed by universities. R&D and innovation support programs are implemented by central agencies.

There is a remarkable effort for intensifying connections between the enterprises and the university system by innovation intermediaries and support programs. Technological support services and infrastructure (in particular accreditation, metrology, quality control, and standards) are in place, and their effectiveness is being improved in the process of the EU accession.

An important aspect of the Turkish innovation system is the large number of dynamic private and nongovernmental organizations that act as innovation intermediaries. These organizations are highly effective in creating awareness on innovation, and thanks to them, innovation is a hot topic for discussion, and innovation policy in Turkey is driven by a broader public awareness (two examples of such efforts are provided in Box 1 and Box 2 in Section 15.4.1).

15.3.2 The Case of an Innovation Intermediary: IRC-EGE

Aegean Innovation Relay Centre (IRC-Ege) was established in April 2004 under the auspices of Ege University Science and Technology Centre (EBİLTEM), Aegean Region Chamber of Industry (EBSO), Izmir Ataturk Organized Industrial Zone (IAOSB), and Small and Medium Industry Development Organization (KOSGEB) as one of the two IRCs in Turkey. The primary objective of the center is to increase technical and commercial relationship between the Turkish and other European SMEs, with the help of IRC Network of the EU. In the long run, IRC-Ege aims to increase the level of competitiveness of the

local SMEs by providing guidance and assistance in their own R&D projects. IRC-Ege serves SMEs in 14 provinces in Western Anatolia and employs 6 full-time staff.

IRC-Ege has been very active in promoting its services, and creating awareness on R&D and innovation among the regional SMEs. They use a proactive approach in this respect. In addition to conferences, road shows, TV programs, and the like, 568 companies were visited and 97 technology audits were conducted since the date of establishment. During the visits and technology audits, 75 new technologies were brought into daylight. In order to promote these new technologies developed by the Turkish SMEs in the region, the center organized and/or participated in 97 brokerage events throughout Europe. They also introduced technology requests by the regional SMEs. Some 1,608 bilateral meetings were organized during these events between Turkish and European SMEs with the assistance of the center.

As a result of these activities, 48 transnational technology transfers (TTT) were achieved between SMEs in Turkey and in other European companies. Twenty-five were from Turkish companies and the rest from Greece, Italy, Bulgaria, Israel, Finland, and the Czech Republic; and 23 were from European companies into Turkish companies. Apart from these 48 technology transfers, 5 Turkish companies established business collaborations with other European companies with the help of IRC-Ege.

The value created to the Turkish economy through these technology transfers is estimated to be around € 30 million. Ten SMEs, which made technology transfer, had not contacted any foreign companies for whatever reason until IRC-Ege approached them; 15 SMEs do not have any foreign language speaker in the company. Two technology-based start-ups were created after an inward technology transfer and started to produce new products and services that were new to their local market. Nearly 100 new jobs were created in the region as a result of the TTT activities. In addition, some SMEs started to employ staff to follow up new technologies in the IRC Network and participate actively in IRC-Ege activities.

The innovation system and policy in a country influence innovation process and performance in enterprises. In this respect, public intervention does not only aim to reduce or overcome "market failures," but also to systemic problems that can arise from failures of institutions in the innovation system. In Turkey, actions have been taken since the

1990s to address both problems. For example, improving intellectual property rights legislation and its enforcement, and increasing institutional capacity by the creation of the Turkish Research Area (TARAL) that, as one of its key objectives, aims to increase institutional capacity for innovation and support public–private cooperation in this area. On the other hand, there are still weaknesses within the innovation system that are mainly related to the issues of coordinating, linking, or addressing various systemic needs.

Although science and technology policy-making practices date back to the early 1960s in Turkey, innovation policy has not been handled explicitly. Innovation has become an integral part of science and technology policies between the mid-1990s and 2000s. In those documents, there were implications of diffusion of innovation and knowledge from an innovation systems perspective. Overemphasis on research activities, scientist and research institutions are observed in the science and technology strategies, developed and issued in 2005. These strategies are based on the linear view of innovation. The first stand-alone innovation strategy document issued in 2007 again does not attach sufficient emphasis on the systemic nature of innovation.

The innovation policy mix in Turkey focuses on four main categories (Elci Forthcoming report) : (1) Increase rates of expenditure on research and technological innovation in enterprises, (2) intensifying cooperation between public or higher education research organizations and enterprises on R&D activities, (3) increase the number of new innovation intensive enterprises created and their survival, and (4) increase the rate of commercialization/marketing of the results of R&D activities by research and higher education organizations.

Although there is still a need for more balanced policy mix, the measures introduced in late 2006 and 2007 contributed to the enrichment of the policy mix. Considering the categories covered by the existing policy mix, one can conclude that there are a large number of areas that are not addressed by these measures. For example, innovation policy measures/programs to foster an innovation friendly environment, and those aiming to develop future skills base, innovation intermediaries, and nontechnological innovation, to optimize financial regulations, and to exploit new market opportunities are among the important areas that need to be addressed by policy measures. Additionally, much work also remains to be done to create framework conditions that are conducive to innovation.

From the financial point of view, funds allocated by the government for R&D and innovation have remarkably been increased since the issuance of the new science and technology strategies in 2005. The main target of the strategies has been fixed to increase the level of gross domestic expenditure for R&D as percentage of GDP from around 0.8 percent in 2005 to 2.0 percent by 2010. Accordingly, the total amount of funds put aside by the government for new and ongoing R&D programs for the last 3 years is € 2.2 billion while it was € 1 billion during 2000–2004.

15.3.3 Innovation Demand and Performance in Turkey

Demand is an important driver for innovation. First, companies can consider the needs and tastes of the customers and use a demand/pull model in producing new or improved products/services. Second, demand for innovative products or services can be of crucial importance to the commercial success of innovation. In other words, as Porter (1990) states, home demand pressure local firms to innovate faster and achieve more sophisticated competitive advantages compared to their foreign rivals.

The 2005 Innobarometer (EC 2005) provides a measure of innovation demand based on a survey of 30,000 Europeans in the 25 member states plus Bulgaria, Romania, Croatia, the Turkish Republic of Northern Cyprus, and Turkey. Interviews were conducted face-to-face where a set of questions was asked in order to identify to which extent citizens feel attracted by innovative products or services. The survey findings show that 57 percent of the EU citizens feel attracted toward innovative products or services. Turkey got one of the highest scores in the EU where 71 percent declared that they are drawn to innovative products or services. The receptiveness of the Turkish people is notable, with 63 percent responding that they "quickly try the innovative one at least once." Furthermore, 35 percent declared that they would replace what they already use by an innovative one "even if they have to pay a certain premium."

In the study, there is also a typology analysis that revealed four groups that can be distinguished in terms of their attitudes toward innovation: the "anti-innovation" group (opposed to innovative products or services), the "reluctant" group (not yet ready to embrace

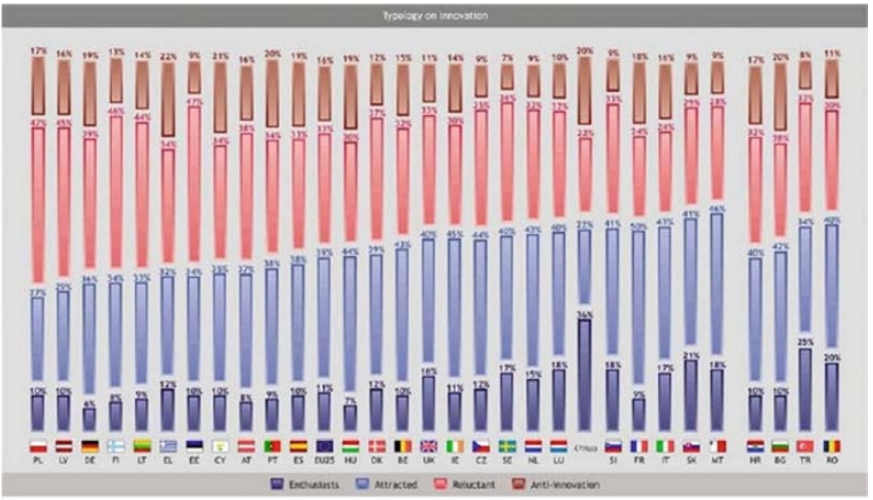

Fig. 15.1 Innobarometer 2005: typology on innovation

Source: Innobarometer, European Commission, 2006

innovative products or services), the "attracted" group (drawn toward innovative products or services), and the "enthusiasts" (calling out for innovation). Figure 15.1 shows the proportion of each of these groups in each country.

The survey findings revealed that in terms of enthusiasts, Turkish Republic of Northern Cyprus and Turkey can be distinguished with the highest proportions of 36 and 25 percent respectively. Romania, Slovakia, Malta, and Slovenia follow behind with the enthusiasts representing 11 percent of the EU-25 average. In terms of the "pro-innovation citizens" (i.e. either enthusiasts or the attracted group), Malta and Slovakia are the member states with the highest proportions—64 percent and 62 percent. Romania (60 percent) and Turkey (59 percent) follow very closely behind. The pro-innovation group represents 50 percent of the EU-25. Regarding the anti-innovation group, the highest proportions belong to Greece (22 percent) and Cyprus (21 percent). The anti-innovation group represents 16 percent of the EU-25 sample. For this group, Turkey ranks the second lowest with only 8 percent declaring that they are opposed to innovative products or services after Sweden (7 percent). Hence, all the findings indicate that citizens in Turkey are among the most ready to embrace innovation.

One example lending support to the high level of demand by the Turkish people to innovative products/services is the mobile phone usage rate in Turkey. The number of people using mobile phones has grown by over 200 percent over the past 6 years. According to the European Information Technologies Observatory, Turkey ranks the 10th among the frequent mobile phone user countries (*Turkish Daily News* 2007). Telecommunication Board (TK) President Mr. Acarer stated that the number of active subscribers exceeded 54 million in Turkey (*Financial News* 2007). This corresponds to around 80 percent of the whole population, similar to that of Russia (83 percent), and more than that of the United States (70 percent) (UN 2006).

Another form of demand can be observed in a country's imports of high technology. In this respect, Turkey is a net importer of high-tech products. By the end of the 1990s, 10 percent of Turkish imports were high-tech (of which 30 percent belonged to telecommunication equipment and 22 percent to chemicals), but the technological content of its exports were very low (2 percent) (Lemoine and Ünal-Kesenci 2003). Indeed, the high-tech intensity of exports during 2000–2004 decreased by 15.9 percent, and the average annual growth rate of the Turkish share in world high-tech exports during 2000–2005 decreased by 10 percent (EC 2007). These observations show that Turkish companies have declining competitiveness in world markets. In other words, while the technological intensity of world trade has increased over the past decade (OECD 2005), the ability of Turkey to develop new knowledge and use it in the production of technology goods has declined. These observations also lend support to the Turkish paradox of innovation in that the supply (exports) of high-tech products fall very short of demand (imports).

In spite of the high demand to innovative products/services in Turkey, the innovation performance of the country is low. Turkey faces several important challenges in overcoming this paradox. These challenges as well as policy recommendations will be provided in the next section. Before that, its innovation performance with respect to the EU countries as well as to the globe is discussed in the following paragraph.

From the innovation performance viewpoint, we refer to the data provided by the EC: The European Innovation Scoreboard (EIS) is an

instrument developed at the initiative of the European Commission under the Lisbon Strategy, to evaluate and compare the innovation performance of the EU member states. The EIS 2006 includes innovation indicators and trend analyses for the EU25 member states, plus the two new member states: Bulgaria and Romania, as well as for Croatia, Turkey, Iceland, Norway, Switzerland, the United States, and Japan (EC 2006). The 2006 results of the EIS for Turkey show the country's weak innovation performance. However, the poor availability of data continues to be a problem for the evaluation of Turkey's innovation performance, as seen in Fig. 15.2.

Although at low levels compared to the EU average, positive trends are observed in all innovation drivers indicators (S&E graduates, population with tertiary education, broadband penetration rate, participation in life-long learning, and youth education attainment level).

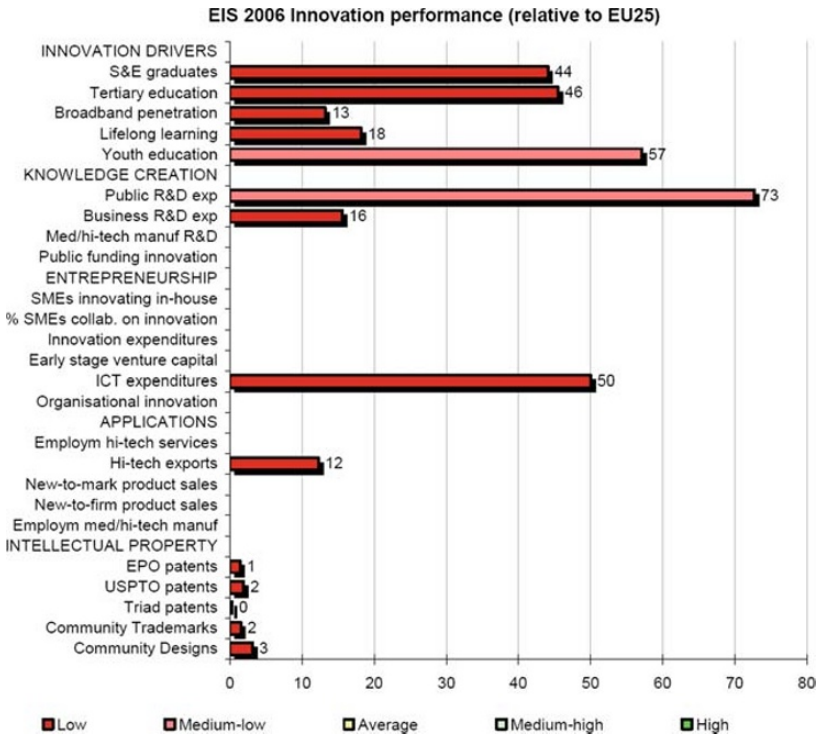

Fig. 15.2 Innovation performance of Turkey relative to EU25

Source: European Innovation Scoreboard, European Commission, 2006

Positive trends in public R&D continue with respect to knowledge creation. However, there is a decline in business R&D expenditures. Only one indicator is available in each of the "innovation and entrepreneurship" and "application categories," (ICT expenditures and exports of high technology products, respectively) and both show declines. Trend results suggest improvements in intellectual property (Elci Forthcoming report).

The 2006 EIS also compares the innovation performance of the EU25 to that of the candidate countries, and other major R&D spenders and emerging economies in the world (so-called "Global Innovation Scoreboard" [GIS]): Argentina, Australia, Brazil, Canada, China, Hong Kong, India, Israel, Japan, New Zealand, Republic of Korea, Mexico, the Russian Federation, Singapore, South Africa, and the United States. Of the 25 indicators used to measure innovation performance in the EIS, GIS data were available for 12 of them. GIS measures innovation performance by use of a composite indicator, the Global Summary Innovation Index (GSII) decomposed into five composite indices measuring five key innovation dimensions: innovation drivers, knowledge creation, diffusion, applications, and intellectual property (EC 2006). Based on the ranking of their GSII scores, the countries analyzed can be divided into four groups: Global innovation leaders, next-best performers, follower countries, and lagging countries. Figure 15.3 shows countries classified according to these groups.

Although Turkey is among the group of lagging countries, its performance is better than the four EU member states (Latvia, Poland, Cyprus, and Romania).

The results of the innovation performance analysis for Turkey suggest that it needs to focus on input innovation drivers and knowledge creation to be able to create an innovative private sector. R&D expenditure as percentage of Gross Domestic Products (GDP) remains at a low level (0.79 percent in 2004), with a slight increase since the mid-1990s. In spite of an increase in private R&D since the 1990s, firm-financed gross domestic expenditure in R&D was still low at 43.31 percent of the total in 2005. From the human capital and knowledge creation perspective, Turkey has low levels in new science and engineering graduates, population with tertiary education, participation in life-long learning, and youth education attainment level (more detailed analysis is presented in Section 15.4).

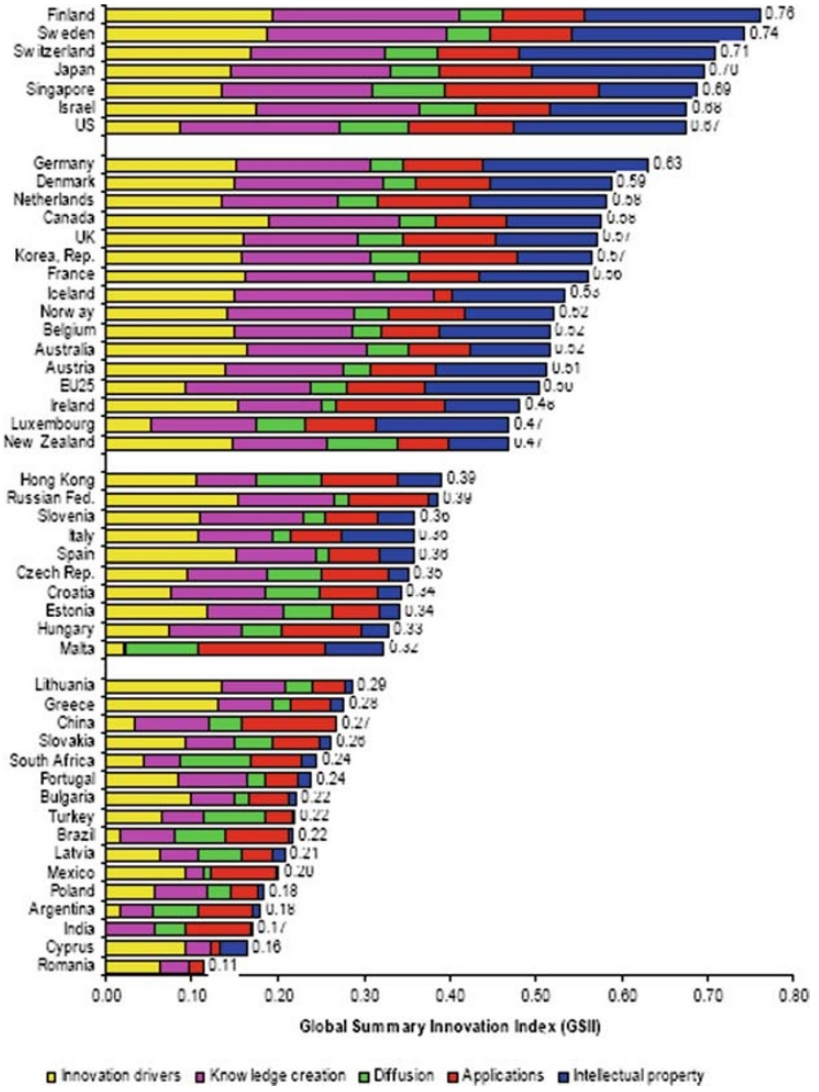

Fig. 15.3 Global innovation index

Source: European Innovation Scoreboard, European Commission, 2006

15.4 Challenges and Recommendations

The most recent indicators presented in the preceding paragraph, demonstrate that Turkey can only generate higher levels of innovation outputs only if it can improve its inputs. The public intervention for increasing the innovation performance of enterprises with a view

to improving competitiveness for economic growth and social well-being can seek to address longer-term drivers such as the investment in human capital for innovation, and relatively short term and direct needs of entrepreneurs and firms, like funding early stage start-ups. To this end, strategically focused interventions are needed to address both the short-term needs and longer-term drivers to increase the innovation performance of the country. This section provides an overview and recommendations for the main challenges that Turkey should focus on to improve its innovativeness.

15.4.1 Investing in Longer-Term Drivers for Innovation

Although looking at the longer-term drivers, we limit our focus on two main areas: Human capital, and knowledge creation and diffusion. As argued by Porter (1990), these advanced factors (human and knowledge resources) are integral to a firm's capacity to innovate, and without their presence firms may lack the ability to respond to the demanding home buyers.

The World Bank defines a knowledge economy as one where organizations and people acquire, create, disseminate, and use knowledge more effectively for greater economic and social development. Human capital is the most important foundation to a knowledge economy where countries abundant in human capital are at an advantage in producing and disseminating new knowledge. Countries such as South Korea and Ireland have built knowledge economies by investing heavily in education and training, and boosting innovation through intensive R&D.

One benchmark of countries' abilities to compete in the knowledge-based economy is provided by the World Bank—Knowledge Economy Index (KEI). This index is based on four pillars related to the knowledge economy: economic incentive regime, education, innovation, and ICT. According to the most recent study, Turkey has improved its ranking in the world from 60 in 1995 to 53 in 2007, basically due to its improvement of its score in the innovation pillar (World Bank 2007), However, 2007 scores show that Turkey still ranks (5.56) below both the world average (5.93) and the averages of Western Europe (8.70), and Europe and Central Asia (ECA) (6.30). Although Turkey scores better than the ECA countries with respect to

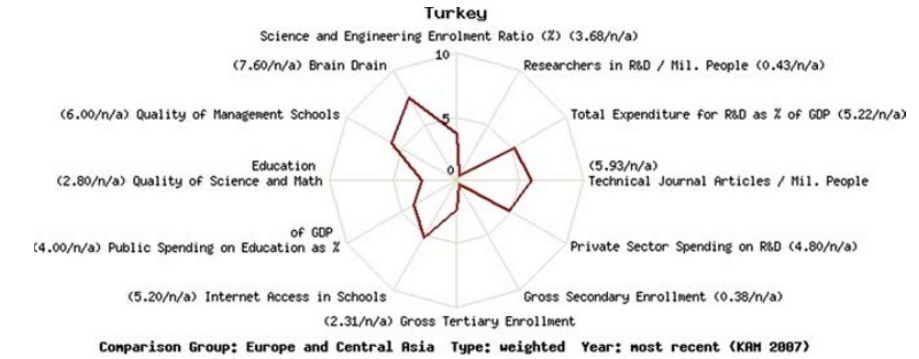

Fig. 15.4 Strengths and weaknesses of Turkey against the ECA region

Source: World Bank, KAM, 2007

its economic incentive and institutional regime, it performs worse in the education and the innovation pillars. Specifically, Fig. 15.4 show that Turkey has several strengths and weaknesses against the ECA region.

The indicators of the education pillar that Turkey has a weaker performance than the ECA average are gross secondary and tertiary enrolment, public spending on education as % of GDP, quality of science and math education, and the brain drain. As far as the knowledge creation is concerned, science and engineering enrolment, and researchers in R&D per million are some of the weaknesses whereas technical journal articles per million is a strength.

These findings are in line with those provided in ECA Knowledge Economy Study (Goldberg et al. 2006). By using KEI indicators from the World Bank's knowledge assessment methodology, this study provides a grouping of ECA countries according to their readiness for various innovation instruments. Similar to the World Bank methodology, it uses four pillars to calculate KEI—the composite index. Accordingly, countries are suggested to critically evaluate their scores for each pillar and consider reforming first those that have low scores. The rationale in doing so is that for a well-functioning NIS, problematic pillars need to be given a priori, as they create a bottleneck for government intervention; without reforming them, high performance on other pillars will not translate into an effective innovation system. Accordingly, Turkey ranks 21 out of 30 countries with its education pillar scoring the lowest (Education rank: 29, Economic Incentives

Rank: 16, Innovation Rank: 23, Information Infrastructure Rank: 18). In other words, the bottleneck in the Turkish NIS can be identified as education.

One other important benchmark study is provided by the European Innovation Scoreboard (EIS) mentioned in Section 15.3. According to the most recent EIS (2006) (EC 2006), although Turkish scores in the groups of innovation drivers and knowledge creation have experienced a slight increase, still they are notably below the EU-25 average.

Overall, the comparative statistics demonstrate that Turkey faces an urgent need to reform and improve its educational and knowledge creation capacity. First, there is the need to increase public spending on education where most of the total spending, 7 percent, comes from the private sector (WEF 2006–2007). Second, the quality of education should also be improved. In 2003, some important steps had been taken to modernizing the basic education curriculum to encourage creative thinking by the students. In fact, a notable progress along this line was realized as of fall 2006 where the national compulsory education curricula included innovation and innovative entrepreneurship as a subject to be taught in a three-year course entitled "Technology and Design." This was a success for Project Ekin "Triggering a Cultural Change for Innovation," which was launched by a civil organization. These modernization studies should continue and be evaluated periodically. Second, enrolment in secondary education should be increased. Although enrolment in secondary education (gross percentage) is 79 percent, only 27 percent of the Turkish children complete secondary education, as compared with 65 percent in the EU32 (Eighth Five Year Development Plan 2000). This raises the importance of making secondary education compulsory. It has been recognized by the Turkish policy-makers as a long run goal in the Eighth Five Year Development Plan (2000).

Reforms are also needed to increase both the quantity and the quality of graduates from higher education institutions. Only 10 out of a 100 in Turkey have tertiary education whereas it is 22.8 in the EU-25 (EC 2006). The first step for this is to redesign the university entrance examination (OSS) to include modern assessments aligned with the objectives of the revised curriculum. Recently, the OSS was revised to include some moderate levels of creativity measurement. Oral (2006)

investigated whether four dimensions of creativity (fluency, flexibility, originality, and elaboration) were accounted for at OSS to select prospective teachers in Turkey. The results showed that all dimensions of creativity have been included in the verbal test though not in the numerical one. Although she states that although this shift at the OSS is a sign of an educational innovation, it is not sufficient to produce an educational reform for a creative, developed society. Increasing the number of universities, particularly science and engineering faculties, but at the same time assuring that they provide quality education can be another solution. Besides, the current curricula should be redesigned to include courses about the needs of the private sector. As a matter of fact, some universities have started to offer courses on entrepreneurship, innovation and technology management. More such courses should be offered and the curricula of science and engineering faculties should be more flexible to include such courses from social science faculties.

Apart from these schooling issues, participation in life-long learning should be encouraged throughout the society. Life-long learning is one crucial input to a knowledge economy and can be through many means such as post-graduate programs, corporate training, courses for adults, and online learning. Unfortunately, participation in life-long learning in Turkey is very low (2 per 100 population aged 25–64) compared to the EU-25 average (11 per 100 population) (EC 2006). In fact, EU provides many opportunities in this respect through programs such as Erasmus, Leonardo da Vinci, and so on. Already, these programs have attracted many Turkish students and teaching staff. However, awareness about the importance of life-long learning should be created in the society at large. The support of media and civil organizations for this purpose can be very crucial at this point.

15.4.2 Triggering a Cultural Change for Innovation: Project Ekin

The project called "Triggering a Cultural Change for Innovation" (Project Ekin) was launched by the Technology Management Association (TYD) in cooperation with Technopolis Group, Bilkent University, Turkish Informatics Association, METU Technology Park, and Referans Daily. This project was one of the winning proposals of

the World Bank's Turkey Development Marketplace Competition in the category—"Social Inclusion and Progress on the way to Europe." Involving the cooperation of a large group of stakeholders from the private sector, academia, nongovernmental organizations, public organizations, and the media, the project intended to create awareness about the concept and importance of innovation-based entrepreneurship in educational institutions as well as the society at large. To this end, it aimed at training teachers and students in innovation and innovative entrepreneurship during June 2005–June 2006.

Three schools, two in a developed region and one in a less developed region of Turkey, participated in the pilot phase, carried out in two stages. In the first stage, the curriculum was defined, a book was produced, and the teachers were trained. In the second stage, the pupils were trained by their teachers in accordance with the content prepared. As well as the lectures, the students also experienced real life examples of innovation and innovative entrepreneurship as they visited several innovative companies located in the science parks. Then, in teams, they developed their own innovative ideas, established virtual companies, and prepared business plans. A group of university students trained on the subject coached these 12 virtual companies throughout the business planning process.

The pilot project ended with an event and award ceremony. In this final event, the teams presented their innovation ideas and business plans. Participants were invited to visit the virtual companies established by the students and become their "business angels" by buying virtual shares from those they preferred to invest in. The three companies that received most of the investments were presented with an award.

This project has been a big success as the main goal of "integrating innovation and innovative entrepreneurship in the national education curricula" was achieved (TrendChart Newsletter 2006). Following the project, and as of fall 2006, innovation is taught in schools throughout the country in a course entitled "Technology and Design."

As the knowledge creation and diffusion dimension of innovation is concerned, the main issues are to increase public and private R&D expenditures, the number patents filed by researchers and firms, and to intensify the linkages between firms and knowledge producers. As noted in Section 15.2.3, total spending on R&D, although increased

from 0.67 (percentage of the GDP) in 2004 to 0.79 today, it is still below the EU-25 average, and R&D activities are mainly conducted by universities. Despite the important role played by the Turkish universities in the field of research, applied knowledge is hardly transformed in innovation. Although no data are available on the commercialization of research results (the number of spin-offs and patents by university researchers, etc.), when we compare the increase in the number of publications with that of the patents registered by the residents, there is a significant increase in the scientific output in terms of publications. But the increase in the patent registration is quite low. The number of publications by scientists in Turkey increased from 2,333 in 1995 to 17,717 in 2005. Turkey's world ranking accordingly improved from 34th to 19th. However, the number of patent registration by residents increased from 58 in 1995 to 95 in 2005. The main reason is the lack of incentives and measures for universities that stimulates commercialization of research results and cooperation with the private sector. Although policy initiatives are implemented to encourage patenting by researchers and firms, further actions are required to create the culture of and develop human resources on the IPR, and building intellectual property units/technology transfer offices at universities.

Structures like technology transfer offices facilitate knowledge diffusion as well. Although there are 115 universities in Turkey, only a few of them have special units organized for this purpose.

Clusters and networks are important for knowledge creation and diffusion between knowledge producers and enterprises. According to the results of 2006 Innobarometer survey by the EC (2006), apart from the Nordic countries (Finland, Sweden, Denmark, and Norway), Turkey is the only country with the highest level—and intensity—of networking. The majority of cluster companies actively participate at least in two business networks, and about 9 out of 10 cluster companies take a meaningful part in at least one such network. With this strength in mind, the challenge is to ensure that enterprises and universities as well as other actors in the networks specifically collaborate for joint innovation activities and knowledge exchange. This requires designing and implementing policy initiatives to foster further development of clusters and increase their economic benefits through innovation.

15.5 Addressing Short-Term Needs for Innovation

Addressing the short term and direct needs of entrepreneurs and firms for increasing the innovation performance requires policy measures, both to increase investments to improve capabilities for innovation in existing firms, and to stimulate creation of new innovative enterprises. It also necessitates the improvement of innovation policy governance. This can be achieved by developing a more coherent approach to policy-making, implementation, and evaluation, as well as by building effective coordination mechanisms.

Current policy initiatives encourage innovation in manufacturing firms and software companies, and mainly aim at cofinancing their R&D and technological innovation activities as well as stimulating cooperation with research community. Particular attention is needed to design and implement measures encouraging nontechnological innovation as well (marketing and organizational innovation), and specifically addressing innovation in the service sector and in traditional industries (agro-food, textile and apparel, tourism, etc., which are the most important sectors in the Turkish economy in terms of GDP, employment, and exports).

One can suggest that the main reasons for the Turkish paradox are that enterprises in general are not aware of the imperativeness of innovation, and most of them do not have the knowledge and capabilities to use the demand factor as a means to enhance their competitiveness. Not surprisingly, there are no policy initiatives designed so far specifically targeting raising awareness on innovation and developing innovation management skills in enterprises. As mentioned in Section 15.2.3, efforts on these issues have been taken by nongovernmental and private organizations. On the other hand, public intervention in these areas is needed to create a broad and sustainable impact.

The underdeveloped venture capital and business angels market is a crucial impediment for the creation and development of innovative businesses. Only a few of the existing venture capital companies prefer to invest in small and medium companies, and almost none chose to make early stage investments. Similarly, business angel investments are low and the very low number of business angels' networks prevents entrepreneurs' access to such finance options.

Existing venture capital firms do not prefer to invest in start-ups due to several reasons (Elci 2007): They do not want to invest in high-risk businesses, largely because of the traditionally risk averse culture they have as subsidiaries of banks; they do not have special expertise and experience in high-tech fields; they see investing in small deals as a problem, both due to heavy due diligence requirements and the requirement of the current venture capital legislation that foresees investment of 50 percent of the funds in a short period of time. On the demand side, there is an increasing interest from young entrepreneurs who are either new graduates from universities or students attending undergraduate and graduate programs. The fund-of-funds (FOF) programs have proved to be important tools in the development of seed and early stage venture capital industry. Successfully experienced in Israel through the Yozma program[1], the FOF program requires the government to act as a catalyst in the creation of venture capital industry by stimulating and preparing the conditions for private sector and foreign investors to set up new venture capital funds, and securing an obligation of the new venture capital funds to invest in start-up companies. The government's role in the FOF is temporary and ends with the privatization of the fund. The Turkish government could play an important role by learning from the FOF experience and adopting a program similar to Yozma.

Business angels are important sources of financing for seed, start-up and early stage ventures, and the potential for the growth of business angels' investments is high in Turkey due to the high volume of entrepreneurs looking for finance as well as that of individual savings. Stimulation of business angels' investments requires public

[1] The Israeli Government set up the Yozma venture capital company in 1993 to act as a catalyst for an emerging venture capital industry, and allocated US$ 100 million for that purpose. Under this program, a fund of funds—Yozma (initiative in Hebrew) was established. Under the Yozma initiative, 10 venture capital funds were formed in partnership with leading foreign venture investors. The total capital of each fund was US$ 20 to US$ 25 million of which the government's share was 40 percent and the foreign investors' was 60 percent. The major attraction of the Yozma program was the foreign investors' option to buy out the government's share at a pre-agreed price for a period of five years. In addition, Yozma was allowed to invest a certain portion of its capital directly. The government-owned Yozma fund was privatized in 1997 (Israel Venture Association, www.iva.co.il).

intervention. It is important to intensively promote the concept, raise awareness, and provide training and education both for the supply and demand sides. Equally important is to provide incentives to encourage investments in innovative businesses at early stages, for example through tax incentives.

Improving the innovation policy governance is another crucial issue to be dealt with in the short term. This requires the introduction of a more coherent policy-making approach. For instance, policies need to be developed involving consultation of key stakeholders at all stages, a well organized coherent system of policy coordination at government and agency levels should be in place, and policy mix need to be strategically focused on priorities. The evaluation of the programs and initiatives should be regularly exercised to support transparency, accountability, and the justification of funding decisions, and be a vital part of the policy-making process.

A change of culture is required at the policy level: The systemic view of innovation where innovation is not primarily a result of a science and R&D need to be recognized, and an innovation strategy that places innovation at the heart of all economic, and social development (including science and technology) policies should be adopted.

From the policy-making perspective, it is also important to recognize that given the size of the country and the economic, social, and geographical diversity of its regions, a fully centralized NIS is a barrier to addressing regional and local challenges. Regional and local strategies and institutions should be established to ensure that all regions are reached. It is worth to mention that such efforts have recently been initiated again in a bottom-up approach by the private sector and nongovernmental organizations.

15.6 Conclusion

Addressing the Turkish paradox of innovation is a critical part of achieving a sustainable, long-term economic growth, and social welfare. Most of the barriers on the way to reaching this goal could be overcome by taking the advantages of the demand for innovation in the society. Exploiting these advantages requires a good understanding of innovation, and its role in business and economy.

In that respect, it is important not to view innovation policy as a part of science and technology policy, but as a horizontal policy area: to ensure that the NIS functions properly and dynamically, policies are designed and implemented effectively and consistently, and that the challenges are satisfactorily addressed by suitable policy actions.

A firm commitment by the NIS actors to address the paradox will not only help Turkey to close the gap with the developed nations but also ensure that it reaps the social benefits of increased productivity and sustainable economic growth.

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