

A GLOBAL COMPARATIVE PERSPECTIVE ON INNOVATION AND ECONOMIC DIVERSIFICATION IN TURKEY

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1 INTRODUCTION

This policy brief addresses the reasons why Turkey needs to put more political emphasis on innovation and economic diversification. It argues that the main reasons are: 1) to prevent a deep economic crisis, once the construction boom comes to a halt, 2) to facilitate sustained economic and technological catch-up and 3) to open up the way for better mutual understanding and renewed cooperation with the EU. Turkey has made significant improvements in its technological and productive capabilities in the last decade. Indeed, in 2008 Turkey had a higher level of export diversity than countries such as Greece, Russia and Brazil. Increasingly companies, politicians and academia put emphasis on innovation and diversification into value added sectors. However, the crude data reality also shows that there is still a long way to go to bridge the absolute gap with the central European member states or come close to the rapid technological upgrading rates of countries such as Bulgaria or China. For this reason, there is a need to put more emphasis on R&D and general education as well as a need to put explicit focus on a) internal and external knowledge transfers as well as b) on diversification into related sectors could be a cornerstone of a sustained economic development strategy. After a decade of stability and significant growth, Turkey now has an historic opportunity for technological and economic catch-up. To make this happen, a more widespread awareness of the importance of diversity and innovation is necessary and concerted action between companies, government and academia from different regions and political perspectives must be promoted. Otherwise, the economic success story may end in a deep crisis. Section 2 shows the economic diversity performance of Turkey in a global comparison. Section 3 explains why more policy focus on economic diversification is needed. Section 4 illustrates Turkey's still weak though improving innovation performance in comparison with other EU countries. Section 5 explains why the European Union puts policy emphasis on knowledge and innovation. Section 6 outlines a set of innovation and diversification policies. Section 7 summarizes and suggests that emphasis on innovation could revitalize the Turkey - EU negotiations, by putting the focus on economic win-win situations through international cooperation and innovation networks.

2 THE ECONOMIC DIVERSIFICATION OF TURKEY IN A GLOBAL COMPARISON

Table 1. Economic complexity ranking

THE ECONOMIC COMPLEXITY OF TURKEY, EU MEMBER STATES AND LARGE DEVELOPING COUNTRIES IN 2008		
Rank	Country (EU Accession)	Complexity Value
EU member states, Japan and USA		
1	Japan	2.37
2	Germany	2.01
9	United Kingdom	1.58
11	France	1.49
13	United States	1.47
26	Croatia (acceding)	0.99
27	Romania	0.93
28	Spain	0.93
35	Portugal	0.69
40	Bulgaria	0.58
53	Greece	0.19
EU (potential) accession candidates		
37	Serbia	0.63
38	Bosnia and Herzegovina	0.59
43	**Turkey**	**0.42**
58	Albania	0.06
63	Macedonia	-0.05
Large developing countries		
20	Mexico	1.16
29	China	0.89
45	Russia	0.31
51	India	0.23
52	Brazil	0.23
61	Indonesia	-0.03

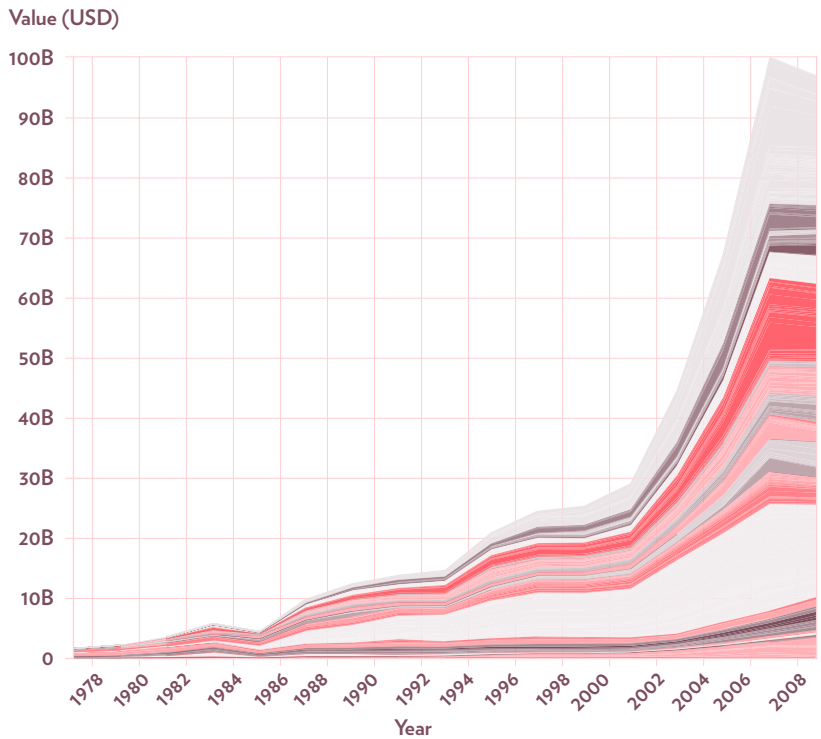
Data source: Hausmann, Hidalgo et al., 2011; own illustration

Many empirical and theoretical studies in development economics testify to the indispensability of diversification for sustained economic growth. Leading scholars in development economics show the crucial role of diversification in economic growth. The seminal work of Imbs and Wacziarg (2003) illustrates that countries diversify their economy for most of their development path and only at very high income levels tend to specialize. This specialization, though, involves very complex and sophisticated products, often requiring a great variety of inputs and organizational skills. A significant advance in the measurement of economic diversity and productive development was made by a group of researchers around Ricardo Hausmann and Cesar Hidalgo at the Harvard Center of International Development and the MIT Media Lab. They show with the help of large export data sets and network analysis techniques that the position in the global product space and sectoral diversification are key explanatory factors for the economic growth of countries over time (Klinger and Hausmann, 2006, Hidalgo et al., 2007). In the so-called economic complexity index in 2008, Turkey ranked 43rd out of 128 countries (Hidalgo and Hausmann, 2009; Hausmann, Hidalgo et al., 2011). This indicator measures both the number and quality of sectors in which the country exports. Thereby, the measures take differences in country size and product quality into account by using thresholds of revealed comparative advantage instead of absolute export values (Detailed information can be found in Hausmann, Hidalgo et al., 2011). Measuring the variety and quality of the products a country exports seems to be indeed a good proxy indicator for the productive capabilities of countries. It infers the productive capabilities of countries by measuring whether the country

merely exports standardized agricultural products or whether it is capable of producing and exporting a varied set of complex products such as machinery or chemical products. In 2008, Japan and Germany show the highest economic complexity scores. Their technological knowledge, education and institutions and other factors allow these countries to achieve competitive advantages in many sectors and sell large quantities of varied products to the global market. Turkey's position is at number 43 in the economic complexity ranking, significantly behind central European countries and other large developing countries such as China or Mexico, but also places it in front of Russia, Brazil and India as well as European member and potential candidate states such as Greece, Albania or Macedonia and not far behind Bulgaria.

Furthermore, over the last decades Turkey has significantly increased its export portfolio in terms of quantity and also quality. Figure 1 (acquired from the Observatory of Complexity, 2013) shows the steep increase in the overall level of exports (SITC-4 Rev.2) from 2 billion in 1977 to 14,6 billion in 2002 to almost 124,7 billion US$ in 2008. Apart from further augmenting its exports of textiles, it has also significantly increased in mining, chemical and health related products, food processing, construction materials and equipment and machinery and metal products. This positive export diversification has helped Turkey to move up in the economic complexity ranking from 54th in 1977 to 51st in 2002 and to 43rd in 2008.

Figure 1. Evolution of Turkish exports from 1977-2009



Source: The Observatory of Economic Complexity; two years interval, SITC-4 Rev.2 classification; own colour shading of the export varieties (retrieved on the 20.08.2013 from http://atlas.media.mit.edu).

A further positive prediction made by the Atlas of Economic Complexity (Hausmann, Hidalgo et al. 2011) is that Turkey could achieve a considerable average economic growth rate (of approximately 2.83 % per year between 2009 and 2020) by closing its holes in the product space. This means that Turkey is already producing several end-products and inputs that substitute the basic necessary building blocks to diversify into related existing sectors in which it does not yet produce. Nevertheless, the overall distance to the most diversified economies such as Germany and Japan is still huge. Furthermore, Turkey has not achieved the expected economic growth rates of some EU member states such as Bulgaria (3.30 %), Romania (3.39 %) or fast catching-up developing countries such as India (4.26 %) or China (4.32 %).

Now the question arises, how can Turkey further promote its economic diversification? One key task is to upgrade the capabilities of companies, scientists and regions in order for them to innovate and create new products, processes and organizational structures. However, to establish innovation and diversification as key goals, another fundamental question must be addressed first: why should the Turkish decision makers, policy makers, and opinion leaders promote economic diversification?

3 THE VALUE OF ECONOMIC DIVERSIFICATION

Economic diversification has a variety of positive effects; most importantly: economic growth, systemic stability and a more even distribution of political power (Hartmann, 2013).

Many development economists agree that economic diversification is a key driver and outcome of economic development. In seminal works, Joseph Schumpeter (1912, 1939) has illustrated that long-run economic development is driven by creative destruction processes, in which the introduction of novelties (new products, processes, inputs, organization and marketing methods) lead to the rise of new sectors and the decline or reshaping of other sectors. Prominent examples are steam engines, railroads, electricity, automobiles or recently the information and communication technologies. All of these technologies led to significant changes in the production system and triggered entirely new possibilities for investment, economic growth and job creation (Freeman, 1982). Certainly some sectors become obsolete during this creative destruction process (for instance stagecoaches for post deliveries), however, in many cases, traditional technologies (such as newspapers and printing process) reorganize and lose their relative share of the market (in comparison to online journals for instance) but do not become obsolete. From the beginning of the Industrial Revolution to the present day, the number of products has massively expanded. The most competitive economies are capable of producing and exporting a huge variety of products; thereby also providing their people with a big variety of occupational choices. Indeed, Adam Smith's concept of the division of labor does not necessarily mean the specialization of countries in just a few products, but rather leads to an enormous amount of different occupations and products. Furthermore, several economists such as Jane Jacobs (1969) or Weitzman (1998) have shown how economic development is closely connected to the recombination of ideas and knowledge. For instance, Jane Jacobs illustrates how the access to a diversity of ideas within cities allows for creativity and the rise of new goods and services.

A second reason why economic diversification is needed is to prevent major economic crises on the demand side (Pasinetti, 1981, 1983). A capitalist economic system needs to constantly revolutionize itself and innovate to prevent its collapse (Marx, 1867). If the growth of an economy is merely driven by the growth in efficiency of the existing sectors, then over time less and less workers and employees are necessary. First, because routines are created that make the workers more efficient, and second, because the workers are eventually replaced by machines. This tends to lead to unemployment, problems on the demand side and to social instability. This situation becomes aggravated if the markets are saturated by products that the production system currently produces (e.g. food and housing). Hence the introduction of new products and sectors are necessary to overcome systemic crises, create jobs and demand (Saviotti, 1996; Saviotti and Pyka, 2004). A more diversified economy is furthermore more capable in dealing with economic shocks or the decline of particular sectors; thereby it contributes to economic stability and makes an economy more capable of dealing with uncertainty. This is particularly relevant for Turkey. If Turkey does not manage to significantly raise its economic diversification it might run into a deep economic crisis when the construction and housing boom levels out. This is precisely the problem in the current economic crises of coun-

tries, such as Portugal or Spain. Once the housing bubble has burst, people, especially the low skilled, did not find work in other sectors, because they did not exist. The disruption to demand by both unemployment as well as the steep cuts in the income of house owners further reduces demand, entering into a vicious circle, which could only be overcome by the rise of new sectors.

The third reason is that economic diversification tends to favor democracy building and social welfare, by distributing economic and political power among more agents and requiring the establishment of more democratic institutions (Hartmann, 2013 forthcoming). Economies with a varied set of different sectors tend to become more democratic, as different economic groups gain in economic, political and creative power. In order to produce a varied set of goods and service in a globally competitive way, a great variety of specialized and inter-connecting skills in different sectors are necessary, such as infrastructure, universities, laboratories, suppliers, design, machinery, chemistry, ICT and marketing. To some degree this can be internalized within huge industrial conglomerates or companies. However, the last decades have shown that in order to become competitive, many activities need to be outsourced and be produced by more flexible small and medium enterprises. Sometimes these SMEs and their workers themselves become powerful economic agents and hence claim new rights. Examples of this can be seen with the automobile supplier Bosch, which became itself a powerful agent, or the thousands of millionaires created by the success of the IT services company Infosys in India, which made many of its employees and shareholders millionaires. The same happened during different periods of the industrial revolution which saw the rise of new economic agents with strong political power. Innovation and diversification seldom can be accomplished by planning alone, but must draw upon the creativity of the people and innovation systems in which all agents from public and private institution can learn from each other. For this reason, good education systems are needed to be able to provide both the general and specialized skills to make economic diversity viable. A well-educated population then favors more democratic systems. In contrast, countries that are very dependent on a few resource-exploiting economic sectors tend to establish and reproduce very hierarchic power structures. The examples of some oil-rich countries such as Russia, Nigeria and several Arab countries show that resource richness together with a lack of economic incentives to diversify - for instance owing to monopoly powers and close relations between political and economic elites - leads to top-down structures with comparatively low levels of innovation. The rich have no incentive to change the system, the poor and low educated are not able to and the small fraction of the middle class searches for social stability and is driven into opportunistic rent-seeking and risk minimizing behavior. This leads to a vicious circle, low levels of opportunity based innovation and stagnancy. Some might mention China as a country with a high rate of technological upgrading and innovation, but with a hierarchic political system. However, it should not be forgotten that China is still not a rich country. The average per capita income in China is 7,476 US$, includes both some very rich and many poor Chinese citizens (UNDP, 2012). It could be argued that in the future a better distribution of wealth, higher levels of individual freedom and a more egalitarian and democratic organization will be necessary in order to establish a knowledge-based economy and achieve more widespread welfare.

4 TURKEY'S INNOVATION CAPABILITIES IN COMPARISON WITH EU AND EMERGING MARKET COUNTRIES

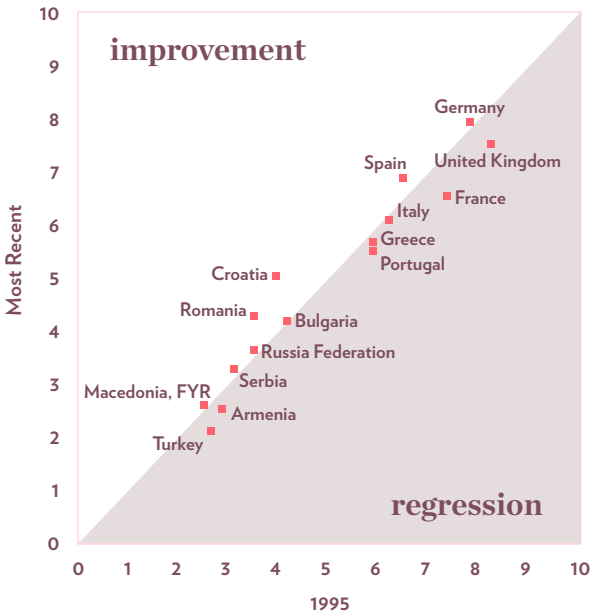
Economic diversification is closely connected with countries' innovation capabilities. Without the introduction of novelties into the production system, diversification is very difficult to obtain. For this reason, if countries want to attain diversified and competitive economies they need to establish innovation systems, in which the network of public and private institutions, companies, universities and civil society in a country manage to generate, implement and diffuse new technologies and knowledge (Freeman, 1987). Indeed, across the world, companies and governments increasingly put innovation and technology at the core of their economic development strategy. The promotion of technology and innovation forms the key rationale in common between the growth strategies of the European Union since 2000 and also fast growing economies such as China and India. Before turning to the political focus of the EU (as it regards to innovation), let us first have a look at the empirical data on Turkey's innovation capabilities in a global comparison.

Many company managers, researchers and the government in Turkey are increasingly becoming aware of the urgent need to upgrade technological capabilities and to diversify in order to maintain the growth dynamics. For instance, the goal of the Turkish government's National Science, Technology and Innovation Strategy 2011-2016 is "to contribute to new knowledge and develop innovative technologies to improve the quality of life by transforming the former into products, processes, and services for the benefit of the country and humanity" (Tübitak, 2010). Some progress has been made, for instance in creating internationally competitive universities, technology parks and research centers. Furthermore, the EU Innovation Union Competitiveness Report 2011 states: "The growth of the Turkish research and innovation system is evidenced in all the main indicators. Turkey improved at a higher rate than the other countries with comparable industrial structure and knowledge capacity, in particular in human resources for research and innovation." (cited in Eureka News, 2012)

However, actual knowledge and innovation performance is still weak, as seen in the huge distance of Turkey to the technology leaders such as Germany. For instance, whereas 2,672 applications for European Patent Office (EPO) patents at the EPO between 1978 and 2010 came from Turkey, 1.5 million came from Germany. A technological gap, which appears even more aggravated when we take into account the fact that a significant share of these few Turkish patent applications (only 0.03 % of EPO patents) are often driven by foreign companies, such as Bosch or Daimler. The number of Turkey's patents has been growing exponentially in recent years; however, the explosion in patents is a phenomenon all across the world, and Turkey still faces a long but necessary journey in order to come close to the technological capabilities of the most competitive economies.

Furthermore, other geographically close EU member countries like Bulgaria and Romania have shown significantly higher absolute performances

Figure 2. Comparative performance of Turkey in the Knowledge Economy Index

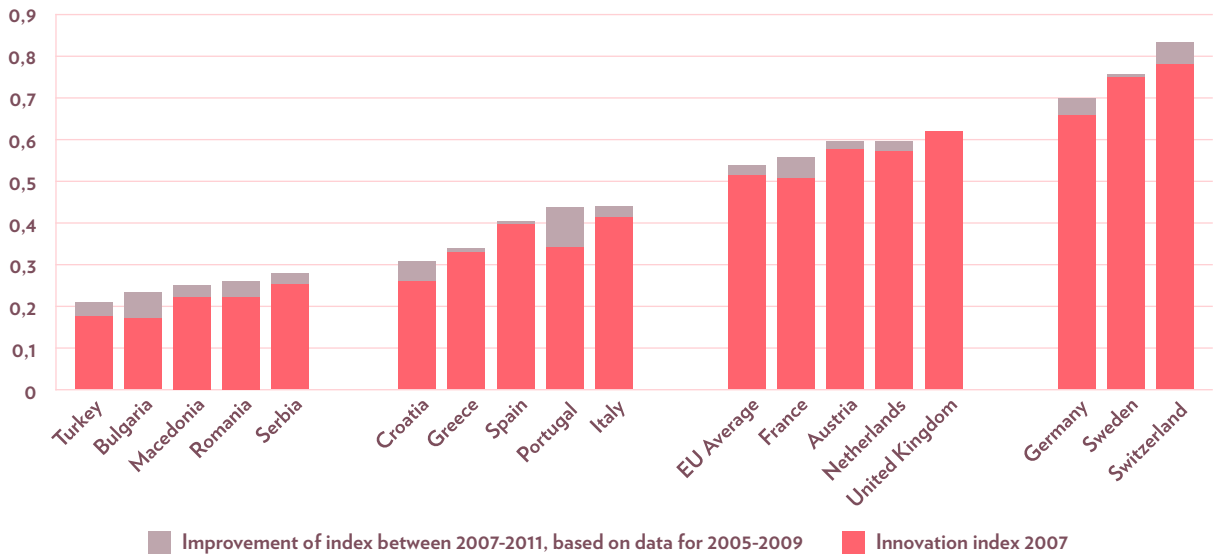


Source: World Bank's Knowledge Assessment Methodology 2012.

as well as growth rates. Turkey ranks 69th out of 145 countries in World Bank's 2012 Knowledge Economy Index. (See table 2 in the appendix) This index is made up of indicators pertaining to the economic incentive regimes, innovation achievements, education and ICT (further detailed information at http://web.worldbank.org/). Figure 2 allows for the comparison of both the absolute and relative progress of Turkey between 1995 and 2012 in comparison with other European and Central Asian countries. On the horizontal axis is the performance in the knowledge economy index in 1995 and on the vertical axis the performance in 2012 is illustrated. We can see that Turkey falls significantly behind other European countries in this index and could not show the same improvements in this period as found in Bulgaria, Romania, Spain or Germany. Still, Turkey has a long way to go in its transition towards a knowledge-based economy, deriving its income from high-value added activities based in knowledge and technology.

Also on the EU's Innovation Union Scoreboard (Pro Inno Europe, 2012), Turkey has one of the lowest places in the ranking (see Figure 2 above). This composite indicator considers a more comprehensive variety of indicators on different dimensions of innovation inputs and outputs of European and some comparative countries. The innovation summary index consists of innovation enablers (such as human resources, open research systems and finance), firm activities (such as firm investments, linkages and entrepreneurship or IPCs held by companies) as well as output (such as economic effects in sales or the number of companies innovating).

Figure 3. Innovation Union Scoreboard 2011



Source: PRO INNO Europe (2010, 2012); own calculations and illustration. It must be noted that the 2007 and the 2011 indices use many values from 2-3 years before, so we interpret that the index rather measures the performance in 2005 and 2009, and hence does not yet take the impact of the economic crisis, for instance in Portugal, into account.

Whilst this indicator shows a huge gap between Turkey and other European countries in its technological and innovative capabilities, this indicator also shows Turkey as having had a comparatively positive evolution over the last years. More detailed information on the comparative performance of Turkey in the different pillars constituting the Innovation Summary Index can be found in table 3 in the appendix.

The question however arises: Why is innovation so important and why should policy makers and firm managers promote innovation?

5 UNDERSTANDING THE POLITICAL EMPHASIS OF THE EUROPEAN UNION, CHINA AND INDIA ON INNOVATION

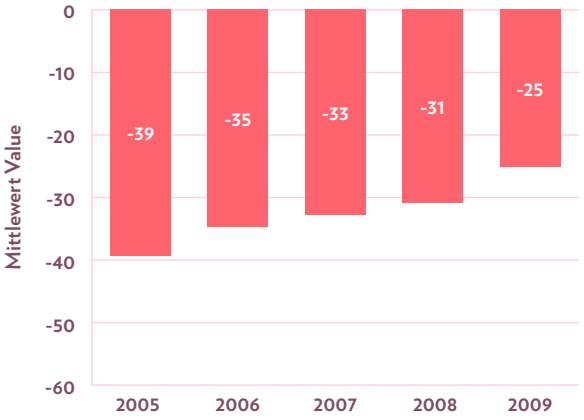
In the 2000 Lisbon Summit, the European Council declared its commitment to becoming "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion." European Council's pledge was a central tenet of its core development and action plan set for the period between 2000 and 2010. This strategy has been driven by the new global changes as well as theoretical approaches focusing on the creation of prolific innovation systems. Innovation system refers to "the network of institutions in the public and private sectors whose activities and interactions initiate, modify and diffuse new technologies" (Freeman, 1987). This is why the EU puts emphasis on entrepreneurship, mobility, knowledge transfer and cooperation between all economic agents. Furthermore, it tries to promote life-long learning and establish strong flexicurity systems which make the labor market more flexible and allow EU citizens to change their occupations more quickly owing to strong social security systems (Hartmann, 2007). Of course, recently there have been many changes in the EU, as it has entered a deep economic crisis, and financial regulation, climate change, and unemployment have become key tasks to be addressed. Thus, the current Europe 2020 strategy has highlighted the importance of smart, inclusive and sustainable growth. Innovation and diversification into knowledge-based and value added activities (e.g. renewable energies) continue to be viewed as the main drivers of development for the new period from 2010 to 2020.

Two further reasons are essential to understand the emphasis of the European Union on innovation and diversification into higher value added sectors: (a) the rise of new competitors from the developing world and (b) theoretical approaches highlighting the increasing importance of innovation.

The new innovation competitors:

Since the 1980s and 1990s, European companies and governments have been increasingly afraid of the rise of new competitors in the development world (such as China and India), because these new competitors no longer only produce outsourced inputs due to their low labor costs, but have also massively upgraded their technological capabilities to the point that they are even becoming technology leaders in certain areas. Indeed, since 1978, China has put strong emphasis on promoting "indigenous" innovation, trying to promote the country's own technological and productive capabilities (Gu and Lundvall, 2006). China has often been criticized for copying technologies, though even being able to copy requires a considerable set of knowledge and skills. Furthermore, Chinese companies have increasingly become competitive global enterprises, as seen with the success of Lenovo computers. The European Innovation Scoreboard 2009 shows how China is quickly catching up with Europe in its technological capabilities (PRO INNO Europe, 2010).

Figure 4. Rapid technological catch-up of China in comparison to the EU. It must be noted that the average time lag of the data is 2 years



Source: PRO INNO Europe, 2010.

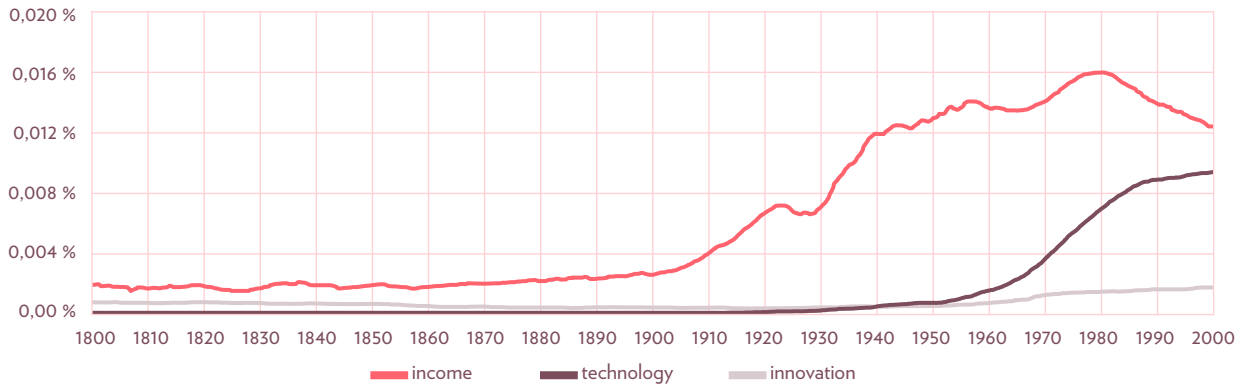
Whereas large developing countries such as China and India have been success stories, several European countries, especially in southern Europe missed the opportunities of high growth rates to deliberately promote further diversification and technological upgrading of their economies, rather than merely focusing on exploiting the construction, housing and tourism boom. Unfortunately, the current crises have led to many short-term survival strategies and a pronounced focus on saving instead of promoting the urgently needed economic revival, innovation and creation of new sectors and employment possibilities.

Theoretical background of the EU Lisbon strategy:

Economists, manager and policy makers increasingly highlight innovation as the key driver of economic competitiveness and diversification (e.g. Freeman, 1987; Lin and Monga, 2011; World Economic Forum, 2012). Nonetheless, this is not entirely new and technology has always played a crucial role in debates in economics, especially since the advent of the Industrial Revolution. For instance, the role of steam engines and scientific advance were crucial for the global success of the English textile companies in the first Industrial Revolution and the Fordist organization of production allowed the mass production and consumption during and after the Second World War. Today the focus has shifted to the new technology companies such as Apple, Google or Facebook. There have been structural changes which made terms such as innovation and technology even more widespread. The Figure 5 below, based on the Google books NGRAM viewer, shows the percentage of the terms income, innovation and technology in books from 1800 to 2000.

It seems something significantly changed in the last 50 years which made technology and innovation key terms in books. The economics literature (especially economic history, economic geography and innovation economics) has highlighted the significance of the rise of new technologies and a significant decline in relative costs in the transportation of goods, information and people. These

Figure 5. Increasing emphasis on technology



Source: Google books Ngram Viewer (retrieved on 20.02.2013).

developments have been major factors in globalization and also meant that in order to become a technology and knowledge leader, a good position in the global value chains is needed. Whereas mere standardized production can be produced elsewhere and hence such companies search for the cheapest labor and production costs, more advanced sectors and higher levels in the production chains (such as for instance: design, organization, launching new products) require knowledge and technology which are scarce resources. Indeed, many companies of the rich industrialized world outsourced part of their production in the 1980 and 1990s to regions with lower labor costs. This loss of employment in the rich world has led to the need to create new jobs in more knowledge-based and value added sectors (Audretsch and Thurik, 2000) This is the reason that the European Union has put strong emphasis on innovation and the structural transformation into a knowledge-based economy. It is important to note that globalization and lower transportation costs do not necessarily imply that value added production and income generation will be more widespread, but rather instead drives the concentration of production at the places where either the production is less cost-intensive or the most sophisticated goods and services can be produced. Exploiting low labor costs and specializing in low skills, standardized products therefore cannot be the long-run goal of countries which want to provide more and better jobs to their citizens and create income. This is why countries across the world aim to upgrade into the production of knowledge-based and complex products by for instance installing technology parks and clusters. The idea behind this is that the more complex and valuable products will increasingly be produced at places with agglomerations and networks of competing and cooperating economic agents such as powerful research labs, technology companies, networks of suppliers and the best educated and creative labor force, which exchange ideas, learn from each other and innovate. The key theoretical foundations of the Lisbon and Europe 2020 strategies

are the Innovation Systems approach (Freeman, 1987; Lundvall, 1992) and the theories of Joseph Schumpeter on entrepreneurship and innovation. The works of Schumpeter (1912, 1939, and 1943) illustrate how economic development is driven by innovation and creative destruction processes. Entrepreneurs or R&D Labs introduce new products, processes, inputs, marketing and organization techniques that trigger the emergences of some sectors and the decline of others. This creates entirely new opportunities for investment, growth and employment. It is worth noting that over time as diversification rises some traditional sectors (e.g. books) might decline, though they do not become obsolete owing to new technologies (e.g. internet). Modern approaches in innovation economics put emphasis on the interactive and cumulative character of innovation. No single firm is able to maintain an overview of all technological developments and thus they search for help and engage in innovation networks with external agents. A key task for policy then is to connect diverse agents and trigger knowledge exchanges and interactive learning between academia, businesses and governmental organizations (Freeman, 1987). Indeed, this thinking underlies not just the EU growth strategy but also triggered the rapid catch-up of Japan after World War II as well as the growth strategy of China in recent decades.

Lack of innovation in the Turkey-EU debate

It is worth noting that innovation and technology is not a key topic in the political debate on Turkey-EU relations. It seems that rather weak focus is put by politicians and academics in Turkey on this core economic strategy of the European Union. This is understandable given the other more urgent daily problems and the increasing (though still small) percentage of Turkish scholars working on innovation. However, more emphasis on innovation and upgrading into a knowledge-based economy seems crucial to understanding the EU goals and promoting the EU-Turkey accession negotiations. While the EU holds discussions with Turkey about border management, human rights and the chapters of negotiations, - excluding the current focus on crises management - the central European member states officials have been discussing economic competitiveness, innovation and job creation. Refocusing the discussion on these common economic interests of both the EU and Turkey may also help to reinforce the EU-Turkey negotiations. Of course, putting innovation higher on the agenda needs time, as these topics for instance have not been core topics in Turkey's university research and teaching on the European Union and International Relations. However, the business and policy making world is increasingly aware of the crucial role of innovation for economic development. Turkey has, for instance, taken the chairmanship of EUREKA[1], an EU research and innovation initiative which subsidies applied research of European companies engaging in research projects with two or more European partners.

1 http://www.eurekanetwork.org/

6 INNOVATION AND DIVERSIFICATION POLICIES

Without a significant upgrade in its innovation capabilities at some point the current growth of Turkey faces a certain end. In this scenario, Turkey runs the risk of entering the same housing bubble burst and economic crises that Spain did. To sustain Turkey's growth and diversify into higher value added sectors, there is an urgent need to make innovation a top priority in economic and social policy making. This entails placing a strong emphasis on knowledge, innovation networks and diversity of ideas. Accordingly, the Turkish government, companies and society must find a proper mix of internal and external capability upgrading and an appropriate sectoral diversification strategy. This economic growth strategy must stress the indispensability of diversification into both related and unrelated sectors across the Turkish regions (Gülcan et al., 2010). A requisite for this is the promotion of qualitative entrepreneurship and finding a proper coordination of tasks between the regional and national governments (Rodrik, 2004; Frenken et al, 2007; Lin and Monga, 2011). The following set of policy tasks is recommended:

1) Emphasis on education and applied R&D

The government needs to introduce incentives and subsidies to raise the quality and quantity of R&D. Beyond the establishment of critical infrastructures (such as laboratories) the government must promote an institutional environment that allows freedom and demands creativity and enables young early career researchers, for instance, to reap the fruits of their efforts. The government should provide incentives for companies to promote training, applied R&D and learning by doing as key factors needed for innovation (Arrow, 1962). For this reason, emphasis should be put on the establishment of technical training facilities and deliberate learning and innovation processes in companies should be enabled. Whereas R&D and technical training are crucial to achieving innovation, establishing a general good level of education is even more important. An average duration of schooling years in Turkey of merely 6.5 years (UNDP, 2011) is simply too low for it to be a leading economy. In 2003, Turkey has made a school curriculum reform aiming to promote the quality of education, but still the implementation must be improved and further reforms be made. Naturally, this is a slow and difficult process as it requires the establishment of an appropriate infrastructure, the education of the teachers and appropriate tools to fully apply a new curriculum, promoting creativity and critical thinking, in the classroom. A well performing innovation system requires a creative, well-educated and proactive labor force. This is not only necessary for production but it is also indispensable for having pro-active consumers. The innovativeness of an economy does not only depend on the technology by governments and companies, but it also flourishes with the critique and advice from the consumers. Modern technologies and changes increasingly result from the feedback and interactive learning between producers with well-educated and informed consumers. Therefore, the rights, influences, and skills of consumers must deliberately be promoted. In addition, a more widespread and better education system also introduces more meritocratic structures into an innovation system, by allowing more people to enter into the competition for good positions and qualitative entrepreneurship. Unequal access to higher education hampers the competition for good results and positions. Accordingly, more people

should have the basic educational skills, such as functional literacy, critical and analytic thinking in order to being able to compete, cooperate and being creative. It is worth noting that a better and more widespread education also allows more people to cooperate in R&D projects and qualitative ventures, by being able to understand more complex details. Increasing access to and quality of education, as well as R&D, generates considerable costs. Yet, undertaking these burdens are indispensable for Turkey's transformation into a leading economy. As mentioned above, 6.5 years average schooling is simply too low to establish a competitive innovation system.

2) Embedded autonomy of the state and cooperation between science, government and businesses

While competition can introduce important dynamics for knowledge creation and innovation into an economy, equal cooperation is a driving force for prolific innovation systems. Since, virtually no company is capable of maintaining an overview and mastery of all the relevant technologies and information in the modern world, deliberate focus should be put on R&D collaboration between academics, companies and government agencies, between different regions and different sectors. In fact, several initiatives to promote technology parks, such as the technology development zones law have been made (e.g. Tübitak, 2011); however, the interaction between the government, academia and companies must still be improved significantly, to understand the needs and demands of each other and create and diffuse new technologies through interactive learning and problem-solving activities. This involves a more science-based political decision process as well as concerted action by the different implied economic agents to achieve critical masses and competitiveness in new sectors. Promoting an embedded autonomy of the state can be a crucial driver for the future-orientation of an economy (Evans, 1995; Rodrik, 2004). While free market forces can certainly be a powerful mechanism for the promotion of innovation and productivity, achieving the initial critical masses to make the emergence of new sectors viable often requires the initial help of future-oriented states. For instance, often the initial investment in the necessary infrastructure, such as basic research facilities and laboratories, is too expensive for single firms. For this reason, governments - in close cooperation with scientists and the business sector - need to identify into which sectors the economy is able to and should diversify. One question that a government must answer together with the other agents in the economy is to what degree they aim to upgrade existing sectors and diversify into similar sectors (related variety growth, for instance from food processing to global food design brands) and to what degree the government should enable the emergence of entirely new activities and sectors (unrelated variety for instance in bio- or nanotechnology)? To answer these questions the government needs to work both in close cooperation with existing companies and research facilities in order to have enough understanding about the endogenous capabilities of its country. However, the government, companies and universities also need the necessary autonomy in order to overcome the influence of too much lobbying and/or to stop investing into out-phasing or unsuccessful activities (Rodrik, 2004).

3) Empower regional policy makers and the collaboration between the national and regional governments

Finding a proper mix of promoting related and unrelated economic variety growth goes together with an appropriate coordination of tasks and concerted action of national or regional governments in promoting innovation and sectoral strategies. Regional and national government should be complementary partners promoting both unrelated

and related variety growth. Considering the huge economic inequality within Turkey, the national government may need to empower the regions and their capacities to engage in diversification policies. This is especially important for promoting related variety growth. Often regional policy makers and companies know best what works in their regions, where bottlenecks are and where there are opportunities (Boschma, 2004). But of course they also require support and new information from outside. As such, the national government should help and promote interactive learning between different regions. It is worth noting that many EU countries and EU policy making also have a multi-layered structure with policies on the EU, the national and regional levels. Strong regional governments are important drivers of new ideas, competition, cooperation and diversity.

4) Pushing related variety growth and cross-linkages

Related variety growth refers to the introduction of new products, processes and sectors which are similar to the previously existing sectors and or require a similar knowledge base (Frenken et al. 2007). Examples may be the introduction of pears where there are apples or the upgrading of these into jams or juice, or introducing a variety of new types of clothing, using different designs. This is especially important for the immediate generation of income and increasing the sophistication of a sector. This requires the constant improvement of products and processes and the deliberate promotion of testing new similar products. It also requires the establishment of specialized research institutions, the deliberate promotion of spin-off companies as well as empowering the regional government. Importantly, related variety growth can also create bridges between formerly disconnected sectors. For this reason, bridging technologies, such as for instance (industrial) design or metrologies or logistics technologies, should be promoted. It is of note that sometimes governmental policy papers present internationally fashionable sectors such as ICT or Nanotechnology as their key technology goals; however the crucial importance of general purpose and bridging technologies in upgrading the existing sectors and making new ones viable is often neglected. Design and metrology are crucial examples of cross-cutting technologies that are necessary in order to reach economic and technological competitiveness and upgrade into value-added sectors.

5) Enabling unrelated variety growth

The national government should also work to increase the probability of the emergence of entirely new sectors. Naturally, radical innovation cannot be planned, otherwise by definition it would not be a radical innovation. However, governments, civil society and companies can increase the probability of innovation by facilitating creativity, diversity and cooperation. This is why freedom of expression and occupational choices as well as both widespread and elite education are necessary. Furthermore, a large number of technologies and sectors may not yet exist in the country, but the country may nonetheless have all the important ingredients needed to master them. Accordingly, Lin and Monga (2011) from the World Bank suggest that national governments produce what other countries with similar resources endowments but significantly higher incomes produce and focus on what could be learnt from them (Lin and Monga, 2011). Furthermore, there are of course new sectors such as ICT, renewable energies or biotechnology in which Turkey should not let itself be left behind and which can trigger further waves of innovation. The regional governments (except Istanbul maybe), alone however, do not have the means to fund the necessary investments in infrastructure and frontier basic and applied research facilities needed to let unrelated variety growth happen.

6) Promote outward oriented R&D policies

A point that has often been missed by previous import-substitution approaches (meant to fostering the development of the national industrial structure) is the crucial importance and positive effects of outward-oriented strategies. Inward-oriented development is often not sufficient and would deprive companies of an enormous source of knowledge inputs and partners from whom to learn from. By promoting the building of R&D facilities by Turkish companies abroad or encouraging contact between Turkish scientists and entrepreneurs, new knowledge and international innovation networks can be created. Ann-Lee Saxenian (2006) has shown, for instance, that many of the Indian entrepreneurs in Silicon Valley do not build up companies in the United States alone, but simultaneously, also in India. It is through these means that these so-called commuting entrepreneurs trigger knowledge transfers between more central and peripheral regions, promote business relations and promote economic win-win situations. Indeed, Turkey has a huge diaspora abroad, however the possibility of members of the diaspora becoming innovators and bridge builders is still underexploited. The TGIN project[2], for instance, studies the economic win-win situations that can result from knowledge migration, transnational entrepreneurs and innovation networks between Turkey and Germany. Indeed, leading global companies increasingly engage not just in asset exploiting activities, based on lower wages and resources in other countries, but also deliberately engage in asset expanding activities, profiting from the creativity and knowledge in other countries (Cantwell et al., 2004).

7) Trigger entrepreneurship and self-discovery processes

One of the most important tasks required for the promotion of economic development in less developed regions is probably the promotion of self-discovery processes (Hausmann and Rodrik, 2003). Often it is not so much the lack of R&D itself, but rather risk-minimizing behavior and lack of knowledge about existing technologies that hamper diversification in less developed regions. Many entrepreneurs and companies merely engage in very similar activities to the companies around them in order to minimize the risk of failure. Simply founding another textile, trade or low-technology agricultural company though may not be enough to sustainably upgrade the regions and promote diversification into more value-added sectors. For instance, a micro-entrepreneur establishing yet another small retailer may indeed help him and his family out of acute poverty. However, at the same time, many economic agents entering into these activities may further lower the already low benefits margins and thereby not allow the micro-entrepreneurs really upgrading into value-added small and medium companies to do so or often probably prevent them from attaining even more desired and stable and better paid jobs. Accordingly, institutional mechanisms must be developed which allow creativity and trial and error processes for creative companies. The government should promote people and companies in the eastern and central Anatolian regions to find out which nationally and globally existing technologies work in these places and can be produced competitively. This requires deliberately pushing knowledge transfers and experimentation with products in less developed regions and providing the population with social security in case an innovative venture fails.

2 www.tgin.uni-hohenheim.de; www.tginnet.org

7 CONCLUSION: A HISTORICAL CHANCE FOR TURKEY'S LONG-RUN ECONOMIC DEVELOPMENT AND EU INTEGRATION

Establishing a competitive innovation system and promoting economic diversification requires considerable financial and political efforts. However, after a decade of high average growth rates Turkey has a historical opportunity for economic catch-up and also further integration as a more equal partner with the EU. Focusing on innovation policies is crucial to achieving this goal. However, innovation and diversification policies are not just important for economic growth and job creation, but also for opening up further possibilities for integration with the European Union and the global economy. The reason why this is the case is manifold. First, because more emphasis on economic diversification brings the debate on Turkey EU-integration more in line with the EU Lisbon and 2020 growth strategy and promotes discussion on a more equal level. Whereas the EU makes innovation, efficiency and economic growth the priority of the political agenda for its member countries, in the debate with Turkey it focuses on border management, the Middle East and human rights. Turkey deliberately putting innovation and diversification on the top of the agenda of meeting with EU representatives and heads of states may draw the attention away from stagnating positions and resentments on both sides. Second, focus on innovation also implies the need to be open for diversity and cooperation, thus it promotes freedom and democracy, some of the key political and social goals of the European Union. Third, innovation also implies to enable both competition and cooperation between different agents and regions of an economy. Accordingly it favors an institutional architecture that engages in multilayered policy-making on the regional, national and international level. Last but not least, focus on innovation and diversification deliberately promotes transnational entrepreneurship and cooperation.

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Knowledge Assessment Methodology

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Eureka

http://www.eurekanetwork.org/

Human Development Index

http://hdrstats.undp.org/en/countries/profiles/TUR.html

APPENDIX

Table 2. Performance in the knowledge economy indicators

WORLD BANK'S KNOWLEDGE ECONOMY INDEX 2012						
Rank	Country	Knowledge Economy Index	Economic Incentive Regime	Innovation	Education	ICT
EU member states, Japan and USA						
1	Sweden	9.43	9.58	9.74	8.92	9.49
2	Finland	9.33	9.65	9.66	8.77	9.22
8	Germany	8.90	9.10	9.11	8.20	9.17
12	United States	8.77	8.41	9.46	8.70	8.51
14	United Kingdom	8.76	9.20	9.12	7.27	9.45
21	Spain	8.35	8.63	8.23	8.82	7.73
22	Japan	8.28	7.55	9.08	8.43	8.07
24	France	8.21	7.76	8.66	8.26	8.16
30	Italy	7.89	7.76	8.01	7.58	8.21
34	Portugal	7.61	8.42	7.62	6.99	7.41
36	Greece	7.51	6.80	7.83	8.96	6.43
39	Croatia	7.29	7.35	7.66	6.15	8.00
44	Romania	6.82	7.39	6.14	7.55	6.19
45	Bulgaria	6.80	7.35	6.94	6.25	6.66
EU (potential) accession candidates						
49	Serbia	6.02	4.23	6.47	5.98	7.39
57	Macedonia (FYR)	5.65	5.73	4.99	5.15	6.74
69	**Turkey**	**5.16**	6.19	5.83	4.11	4.50
70	Bosnia and Herzegovina	5.12	5.55	4.38	5.77	4.77
82	Albania	4.53	4.69	3.37	4.81	5.26
Large developing countries						
55	Russian Federation	5.78	2.23	6.93	6.79	7.16
60	Brazil	5.58	4.17	6.31	5.61	6.24
72	Mexico	5.07	4.88	5.59	5.16	4.65
84	China	4.37	3.79	5.99	3.93	3.79
94	Iran, Islamic Rep.	3.91	0.73	5.02	4.61	5.28
108	Indonesia	3.11	3.47	3.24	3.2	2.52
110	India	3.06	3.57	4.50	2.26	1.90

Data source: World Bank's Knowledge Assessment Methodology, 2012; own illustration

Table 3. Performance in the Innovation Union Scoreboard Indicators

INNOVATION UNION SCOREBOARD 2011 - SUMMARY INNOVATION INDEX (INCLUDING EU MEMBER STATES AND ACCESSION CANDIDATES)												
Rank 2011	Country	2007	2011	Change 2007-2011	Human Resources	Research Systems	Finance and Support	Firm Investments	Linkages & Entrepreneurship	Intellectual Assets	Innovators	Economic Effects
Innovation leaders												
1	Switzerland	0.78	0.83	0.07	0.85	1.00	0.59	0.79	0.61	0.95	1.00	0.85
2	Sweden	0.75	0.75	0.01	0.89	0.82	0.90	0.69	0.79	0.80	0.56	0.62
3	Germany	0.66	0.70	0.06	0.61	0.55	0.58	0.64	0.63	0.79	0.99	0.74
Innovation followers												
6	United Kingdom	0.62	0.62	0.00	0.73	0.79	0.70	0.45	0.84	0.47	0.31	0.61
7	Netherlands	0.57	0.60	0.05	0.64	0.87	0.70	0.31	0.59	0.68	0.37	0.57
8	Austria	0.58	0.60	0.03	0.59	0.65	0.51	0.51	0.63	0.77	0.61	0.47
10	France	0.51	0.56	0.10	0.68	0.66	0.64	0.40	0.51	0.49	0.47	0.57
11	**EU average**	**0.52**	**0.54**	**0.04**	**0.56**	**0.53**	**0.58**	**0.44**	**0.49**	**0.55**	**0.51**	**0.59**
Moderate innovators												
16	Italy	0.41	0.44	0.07	0.43	0.43	0.35	0.29	0.39	0.52	0.56	0.48
17	Portugal	0.34	0.44	0.29	0.45	0.48	0.52	0.32	0.46	0.35	0.72	0.37
19	Spain	0.40	0.41	0.02	0.44	0.54	0.47	0.26	0.25	0.41	0.33	0.47
21	Greece	0.33	0.34	0.04	0.48	0.33	0.19	0.22	0.46	0.14	0.67	0.35
23	Croatia	0.26	0.31	0.19	0.53	0.18	0.28	0.29	0.40	0.09	0.40	0.37
Modest Innovators												
26	Romania	0.23	0.26	0.16	0.40	0.15	0.24	0.41	0.10	0.07	0.17	0.49
29	Bulgaria	0.17	0.24	0.38	0.46	0.19	0.16	0.31	0.09	0.20	0.11	0.31
25	Serbia	0.25	0.28	0.12	0.39	0.35	0.67	0.23	0.21	0.02	0.09	0.38
28	Macedonia (FYR)	0.23	0.25	0.12	0.33	0.11	0.00	0.24	0.18	0.02	0.48	0.39
31	**Turkey**	**0.18**	**0.21**	**0.18**	**0.07**	**0.21**	**0.39**	**0.08**	**0.22**	**0.10**	**0.56**	**0.27**

Source: PRO INNO Europe, 2012.

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