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INNOVATION: IS THE ENGINE FOR THE ECONOMIC GROWTH?

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Innovation: Is the engine for the economic growth?

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Abstract: This paper surveys the empirical evidence on the link between innovation and economic growth.It considers a number of different measures of innovation,such as R&D spending, patenting and researchers per thousand employed full time equivalent as well as the pervasive effect of technological spillovers between firms, industries, and countries.In the second part after introduction we introduced the relation between growth and innovation.In the third part we pointed out the importance of intellectual property rights to create innovation.In the fourth part we compared Turkey's and other countries' performances,and finally in the last part we applied the econometric models on Turkey and several countries to make comparisons. There are three main conclusions. The first is that innovation makes a significant contribution to growth. The second is that there are significant spillovers between countries, firms, and industries, and to a lesser extent from government-funded research. Third, that these spillovers tend to be localized, with foreign economies gaining significantly less from domestic innovation than other domestic firms. This suggests that although technological 'catch-up' may act to equalise productivity across countries, the process is likely to be slow and uncertain, and require substantial domestic innovative effort.

1-INTRODUCTION

The relationship between innovation and economic growth has been well studied. However, that is not to say that it is well understood. Renowned scholars continue to work with incredibly simplified models of an incredibly complex economy. Consequently, empirical results are usually carefully annotated with caveats noting the limitations of all findings and the great uncertainties that remain concerning fundamental assumptions in the field.(Statistics Canada, Innovation Analysis Bulletin,2002)

A theoretical link between innovation and economic growth has been contemplated since at least as early as Adam Smith (1776). Not only did he articulate the productivity gains from specialization through the division of labour as well as from technological improvements to capital equipment and processes, he even recognized an early version of technology transfer from suppliers to users and the role of a distinct R&D function operating in the economy:

"All the improvements in machinery, however, have by no means been the inventions of those who had occasion to use the machines. Many improvements have been made by the ingenuity of the makers of the machines, when to make them became the business of a peculiar trade; and some by that of those who are called philosophers or men of speculation, whose trade it is not to do anything, but to observe everything; and who, upon that account, are often capable of combining together the powers of the most distant and dissimilar objects. In the progress of society, philosophy or speculation becomes, like every other employment, the principal or sole trade and occupation of a particular class of citizens… and the quantity of science is considerably increased by it." (Smith,1776)

Although the relationship between innovation and growth had been articulated at an intuitive level for some time, innovation was not introduced into formal economic growth models until 1957 (Solow, 1957). Robert Solow, a professor at MIT, was awarded a 1987 Nobel Prize in Economics for this and related work. Like scholars before him, he defined growth as the increase in GDP per hour of labour per unit time. He carefully measured the fraction of this growth that was actually attributable to increases in capital, such as investments in machinery and related equipment, since the theory of the day was that capital accumulation was the primary determinant of growth. However, capital accumulation accounted for less than a quarter of the measured growth. Solow's insight was in attributing the remainder of the growth, the majority share, to "technical change." The magnitude of the residual calculated in this empirical study placed the role of innovation in economic growth squarely on centre stage, where it has remained for the past half century. Since Solow's contributions, the relationship between innovation and growth has been modeled in increasingly sophisticated ways. Perhaps the most notable recent advances came from Lucas (1988) and Romer (1986, 1990), who emphasized the concepts of human capital and knowledge spillovers, respectively. Following the recent idea of distinguishing human capital, which is developed by investments in education and training, from physical capital, Lucas modeled human capital with constant rather than diminishing returns, thus offering useful insights into the critical role of a highly skilled workforce for long-term growth. Romer endogenized innovation in the growth model by introducing knowledge spillovers, which resulted in deep implications for how scholars think about growth.

The following is a gross simplification of how the Romer model works. Firms engage in R&D because they expect it will be profitable. In other words, firms allocate funds to R&D as long as the expected payoff (return on investment, or “ROI”) from R&D at the margin is higher than for any other allocation of those resources. This investment in R&D results in the creation of two types of knowledge, that which is appropriable and that which is not. Appropriable knowledge refers to knowledge the firm can utilize itself, exclude others from using, and generate profits from. Knowledge that is not appropriable has the properties of a public good; it is non-rivalrous (use by one firm does not preclude use by another) and non-excludable (it is difficult to prevent others from using). The more knowledge there is, the more productive R&D efforts using human capital are. So, when firms conduct R&D, they apply human capital to the stock of knowledge for profit-maximizing purposes. In the process, however, the firm unintentionally contributes back to the increasing stock of knowledge. This unintentional contribution is referred to as a knowledge spillover.

The implications of this model are increasing returns to growth from investments in human capital and R&D due to knowledge spillovers. This is because the more human capital that exists in an economy, the more value that economy can derive from the stock of public knowledge through R&D efforts, which further raises the value of conducting R&D. As a result, the economy engages in more R&D, which in turn makes further contributions to the stock of knowledge spillovers; this argument continues in a virtuous circle. This model is based on the assumption that profit-seeking firms will engage in R&D for selfish reasons, since they can appropriate some of the value from the knowledge they create. Most economists argue that a role also exists for the public funding of some types of R&D, particularly basic research that is often very hard for any single firm to appropriate, since the resulting knowledge spillovers are valuable to the overall economy and would otherwise suffer from under-investment.

This explains why the concept of knowledge spillovers is central to our thinking about innovation and growth. If knowledge spillovers are a public good, why does it matter which country produces them? In fact, might it not be optimal for a particular country to "free ride" on the efforts of other nations? At the same time, the concept of knowledge spillovers as a public good may seem inconsistent with the evidence, given the variety of growth rates across open economies. Why haven’t all countries converged towards equal prosperity if knowledge spillovers are freely available? There may be many path dependency reasons for this (i.e., differences in initial conditions).

2-GROWTH AND INNOVATION: INSEPARABLE TWINS IN CONTEMPORARY ECONOMICS

2.1 Growth

The global economy is on its way to achieving a historic growth record. With an annual growth rate of nearly 3.2% since 2000, the world economy grew more in the five past years than in any five-year period since the second world war. With a projected increase of nearly 5% in 2007, some private think-tanks say global output could be heading for one of its best decades ever.

This economic expansion has happened in spite of a number of economic and political shocks: the collapse of the stock market bubble in 2000; the terrorist attacks of September 11, 2001; wars in Afghanistan and Iraq; the escalation of oil and comodity prices; a break-down in the Doha round of multilateral trade talks; some worrisome global imbalances and modest performances in some of the traditional engines of growth. Despite all this, the economic wheel is moving forward.

What looked as a recent global economic slowdown turned out to be a "rebalancing" of growth.The slowing pace of activity in the US and Japan, which should remain well contained, is being compensated by an apparently solid upswing in the euro area. Furthermore, and perhaps most surprisingly, the global economy now runs on a new powerful economic turbine: the emerging economies.(Gurria,2007)

According to several experts, China and India, along with other developing nations, are in a position to give the world economy its biggest boost since the industrial revolution. The participation of these countries in global economic flows has been increasing at a remarkable pace, representing now: more than half of total world GDP (if we measure it at purchasing power parity), 43% of world exports and nearly half of the world's energy consumption.

In 2006 developing countries have grown at a near record 7%. During 2007 and 2008 they are expected to grow more than 6% per year, in comparison to a 2.7% GDP growth in developed economies. According to recent analysis by The Economist, if these trends continue, "it is estimated that in 20 years' time emerging economies will represent nearly two-thirds of global output (again, at purchasing-power parity)".

How has the global economy managed to grow so setadily in a time of international uncertainty and recurring economic threats? Part of the answer lies in one single intangible factor: innovation, the new arbiter of progress.

2.2 Innovation

Indeed, a key driver of this growth has definitely been innovation. The creation, dissemination and application of knowledge has become a major engine of economic expansion. Corporations have come to rely more and more on this precious tool. It is a practice that has moved from the periphery of many corporate agendas right to the center of their strategies for growth and leadership. Most sectors and industries are currently experiencing what is called a "Schumpeterian renaissance": innovation is today the crucial source of effective competition, of economic development and the transformation of society.

It is difficult to agree on one single definition. However, we can argue without hesitation that innovation has proved to be: 1) an efficient stimulant for building world-leading organisations (such as Microsoft, Rolls Royce and Apple); 2) a discipline of creativity that attracts the best people (look at companies like Dyson, Egg and Google); 3) a message that reinforces a corporate ambition (3M, Toyota or Adidas); and 4) an instrument to foster leadership (think of BP, UPS and H&M). No wonder why every CEO wants some of this "magic dust".

Innovation has also bred a fruitful collaboration between universities and corporations in many parts of the world. Turning a novel thought into a profitable product is a hard thing to do. Every great inventor needs a great entrepreneur and viceversa. Chester Carlson's invention of xerography would never have become the remarkably profitable Xerox photocopying business were it not for what Charles Ellis calls the "extreme entrepreneurship" of Joe Wilson. Very often this association between universities and corporations becomes the space where the future is invented.

The number of already established university spin-ups like Cambridge or MIT is large, but more and more institutions are pressing forward. Oxford University, for example, is challenging Cambridge as one of the main centers of entrepreneurship and innovation in Europe.

Modern economies are built with ideas, as much as with capital and labour. It is estimated that nearly half the US' GDP, for example, is based on intellectual property. The EU has set the 'Barcelona target' of increasing R&D to 3% of GDP by 2010 to become "the most competitive and dynamic knowledge-based economy in the world". Look at China: according to OECD estimations, in 2006 for the first time China spent more on R&D than Japan, becoming the world's second largest investor in R&D after the US.

Globalisation itself is a product of innovation. The application of constantly improved technologies to the massive means of transport and communication has produced an unprecedented level of global connectivity, of global awareness. Economies are becoming more interdependent, while cultures are becoming more permeable, transparent and stronger through an intensified exchange of goods, services, ideas, values, experts, problems and solutions.

Today, innovation is facing new challenges. Its own dynamism has produced a world that requires in many ways a rethinking of innovation itself. In the corporate sector, the determinants of innovation performance have changed in a globalised knowledge-based economy, partly as a result of recent developments in information and communication technologies. Strategies like market capitalisation, mergers and acquisitions and just-in-time delivery, have to be revised in the light of the Internet, online shopping and digital TV. Companies are hungry for new ideas about new ideas.(L S Goh,2004)

In summary;

(1) Innovation takes many forms. Innovation can be a process, product, service, or anything that helps firms to perform better.

(2) Innovation can originate from anyone. Anyone can innovate, as innovation requires a mindset that probes perceived boundaries to bring new ideas to fruition.

(3) Innovation is not creativity alone. Innovation is more than creativity as it begins with an idea and subsequent implementation to produce new value.

(4) Innovation is more than improvement. Improvement is the refinement of existing methods to get more output from the same input while innovation breaks new ground, giving new outputs from less or different inputs.

(5) Innovation pays in quantum amounts. The impact of innovation results in quantum leaps in value creation that encompasses effective results.

2.3 Innovative Activities

Innovation is a complex development of discoveries and inventions (e.g. new machinery) brought into the business and social environment (e.g. introduced on the market) that hopefully leads to diffusion (adoption by new users). During the diffusion path, improvements to both the idea and implementation often require further innovation. Successful innovations are often imitated by other players in the same industry or applied in other industries.(Lehtoranta,2005)

Out of several cases, innovation can basically be:
1. Product innovation (e.g. new goods or services put on sale);
2. Process innovation, which changes the way a given good is produced within the firm or across a supply chain;
3. Behavioural innovation, when an organisational routine is replaced with a new one.

Quite often, the innovation turns out to be a mix of all three categories, as in the case of introduction of a new product that requires new productive competencies and changes in the organisation. Furthermore, what to a supplier is a product innovation can be a process innovation to a user, as in the case of a new machine that revolutionises the process of manufacturing. In this case, investment is the means by which innovation is spread over the economy.

Although technology is often at the heart of an innovation, marketing and financing organisations can also be sources and multipliers of innovation. In an enlarged meaning, innovation embraces the introduction of known things to new markets or different industries. The environment in which something is said to be an innovation is also relevant. Thus, we can have an innovation simply relative to past achievements of the innovator or to the (local) market or to the world frontier. In the first two cases, it is possible to achieve the innovation just by imitating world-class practices.

A useful distinction can be made between radical innovation and incremental innovation. Radical innovations comprise entirely new products, often undertaken by new entrants with a diversified knowledge base, for example. Minor improvements in existing products and processes constitute incremental innovations, often undertaken by incumbent firms with a specific knowledge base.

The following broad definition of innovative activities is used here: innovative activities refer to all those activities the target of which is to develop and launch an innovation onto the market. Examples of these activities include acquisition of R&D, and acquisition of external knowledge and financing. These activities are measured by R&D performing, recruitment of highly qualified personnel and participation in an R&D collaboration project.

3-THE ROLE OF INTELLECTUAL PROPERTY RIGHTS IN CREATING INNOVATION

Intellectual property helped make possible the conditions for innovation, entrepreneurship and market-oriented economic growth that shaped the 20th Century. In the 21st Century, IPRs increasingly will define these conditions, and will dictate the pace and direction of innovation, investment and economic growth around the world.

Today, more than ever before, innovation, enterprise and intellectual assets drive economic growth and increase standards of living. Innovation is instrumental in creating new jobs, providing higher incomes, offering investment opportunities, solving social problems, curing disease, safeguarding the environment, and protecting our security. To help achieve these objectives, governments must create appropriate incentives for continued growth in innovation and technology development and embrace sound policies for assuring broad social diffusion and access to key scientific and technological advances that enable us, as Newton first observed, "to stand on the shoulders of geniuses". A critical enabling tool increasingly is intellectual property protection.

Intellectual property rights are essential for achieving many of today's challenges related to innovation and economic growth while providing the foundation on which tomorrow's societal needs can be met. Their vitality derives from the multiple roles they play. These include:

3.1 Stimulating Innovation and Spurring Widespread and Sustainable Economic Growth

Intellectual property rights are policy instruments that play an increasingly important and positive role in driving innovation and expanding information. By stimulating innovation, information and creativity, IPRs directly affect economic performance and create economic growth through increased productivity, increased trade and investment, and expanded economic activity that enhances consumer welfare.

<u>-IPRs Create Incentives for Invention and Creation :</u> Intellectual property rights provide an efficient mechanism to overcome traditional "market failure" problems associated with public goods, information asymmetry and innovation – especially, the imperfect appropriation of returns and uncertainty with regard to research and investment first identified by Nobel-laureate Kenneth Arrow. A principal source of market failure is the inability of individuals and firms to prevent others from making use of the new knowledge they generate. Without the incentives provided by the temporary exclusivity generated by IPR protection, there will not be sufficient incentives for business to invest in risky R&D and other value-enhancing activities because the benefits from those investments cannot be appropriated fully. In economic terms, innovation will be suboptimal.

Strong and effective IPR protection is a particularly powerful incentive that will permit firms to invest in generating new technology in sectors where the returns to technological or product investment are longer term and involve significant risks, and where the invention may be easy to copy or imitate. Such protection, in turn, is a highly effective way to promote the diffusion of knowledge in the long term.

Research is only one critical component of innovation. Studies confirm that research constitutes only about 25% of the cost of commercializing a new technology or technique and substantial up-front additional resources are needed to bring most products or processes to the market. The exclusive rights granted a patent holder for a limited time provide the incentive for encouraging all the up-front investments needed to develop an idea and to generate a marketable product or technology.

<u>-IPRs promote the disclosure of inventions and pioneering information, which stimulates innovation across industries. :</u> Intellectual property rights are not a mechanism for hiding knowledge. They are a powerful market-based mechanism for disseminating knowledge. The diffusion of IPRs, and the bundle of rights that often go with them, can serve as a central policy tool in shaping the knowledge economy. The public disclosure of information is one of the most important functions of IPRs but, often, one of the most neglected by policymakers.

3.2 IPRs promote risky, uncertain and costly investments

Forward-looking intellectual property rights protection provides the incentives for firms and individuals to invest in generating new technology and new products, including incremental improvements. This is especially important where the returns from investment are longer-term, where the investment involves significant costs or risks, and where the invention or creation may be easy to copy or imitate.

<u>-IPRs enable technology transfer :</u> IPRs increasingly facilitate the operation of markets. Strong and effective intellectual property rights are an essential tool for technology transfer. They encourage private and public enterprises to transfer technology not only through voluntary licensing and other contractual arrangements but also through the development of innovative approaches for promoting technological development, direct investment, technology sales and dissemination, and cooperative ventures.

<u>- IPRs help stimulate and focus the process of knowledge creation and innovation through the necessity of finding legal means to “invent around” or “reverse engineer” patented inventions:</u>
By providing exclusive rights to an invention, the patent system frequently spurs others to innovate by developing alternative solutions to technical problems or new and improved inventions. Innovators are stimulated to “invent around” or “design around” the original invention in order to avoid infringing the applicable patent(s). While this may, in some circumstances, lead to “me-too” innovation, it most often leads to the emergence of different technologies and competing pathways that promote competition and spur innovation. The circumvention of existing patents means that new technological solutions put market pressure on the exploitation of existing technologies.

History also provides a number of examples about inter-industry technology "leaps." Perfume sprayer mechanisms influenced the development of the carburetor, while various e-commerce innovations have come from the banking industry rather than the computer industry. Such technological convergence among industries is enabled by an intellectual property system that creates a public pool of knowledge, allowing companies to look beyond their own industry boundaries for R&D innovation.

3.3 Empowering consumer protection in the global economy

The increase in cross border trade has promoted a growth in trade of trademarked / branded products that also incorporate copyrighted content and patented innovations. As a result, recognition of famous brands exists around the world. Moreover, international efforts to harmonize patent and trademark acquisition procedures have made it possible for companies to seek IPRs in more countries, in turn promoting the introduction of new products into markets around the world.

The new global economy increasingly depends on the international recognition and dissemination of IPRs related to branded products. Trademarked brand names, copyrighted systems and patented inventions define the multinational marketplace as products and services are negotiated, shared and transferred with little regard to jurisdictional barriers or related to the country from where they originated. With increased trade and investment, and the concomitant growth of branded products, IPRs increasingly serve as trade facilitators.

Nevertheless, counterfeiting and digital piracy are booming. Innumerable fake products, ranging from pirated software and copied CDs to counterfeit medicines and aircraft parts, plague global trade and harm consumers. Counterfeiting increasingly poses a direct and serious threat to public health and safety. The market in fake pharmaceuticals and healthcare products is thriving in both developed and developing countries, too often putting the health and even the lives of consumers at risk. Counterfeiting also threatens legitimate trade and economic growth. The best estimates suggest that companies are losing more than $ 200 billion annually to counterfeiting and piracy. In addition to lost sales, counterfeiting damages the reputations of legitimate manufacturers because the quality of fake products usually is inferior and can taint consumer perception of the genuine product. Moreover, counterfeiters pay no taxes or duties, thus costing governments as well. Counterfeiting causes global job losses of more than 200,000 jobs per year. In this way, counterfeiting, which counts for approximately 5 – 7 % of world trade, threatens economic growth as a whole.

3.4 Supporting and enhancing competition

Both intellectual property and competition policy are vital to maintaining competition in a market-driven society because each, in its own way, encourages innovation and enhances consumer welfare. In protecting the rights of inventors and allowing innovators and creators to profit from their ideas and inventions, IPRs also depend on a legal and policy framework that ensures competitive markets.

3.5 Securing the benefits of IP for the digital economy

Computers, telecommunications, semiconductors, entertainment and educational content, and other information-based sectors depend on IPRs as the legal and economic backbone of these industries. Intellectual property protection for these sectors -- especially digital-related copyrights, software patents and other computer-implemented inventions -- are the essential tools that create new businesses, new jobs and new markets that drive the digital economy.

3.6 Creating New Technology Markets because IPRs are Tradeable and Transferable

At the center of the innovation process and technological change today is information and it's application, knowledge. Estimates suggest that more than one-half the store of human knowledge was produced in the second half of the 20th Century, more than one-half of all patents have been issued in the last 30 years, and the number of marketable new products, services and innovations has tripled in the last 20 years. An important component of this explosive growth is the role played by IPRs in creating new markets for technology and accelerating the pace of future innovation. The principal reasons for this are the market-oriented characteristics of IPRs; they are tradeable, transferable and transparent.

4-TURKEY’S PERFORMANCE IN THIS GLOBAL AND COMPETITIVE WORLD

4.1 Competitiveness and the global context

A number of processes have contributed to the transformation of the global economy since World War II.The opening of national borders has led to a remarkable expansion of international trade and resulted in important efficiency gains in resource allocation.The collapse of barriers to the flow of goods and services, capital and labor has not always been orderly and has proceeded at different speeds in different parts of the world. But it is now virtually universal in scope. Not only has it emerged as an important driver of global economic growth, but greater openness and stronger links with the world economy have imposed on domestic producers everywhere the valuable discipline of international competition and attracted much needed capital and expertise, thus enhancing the prospects for growth through increased efficiency.

We understand national competitiveness as the set of factors, policies and institutions that determine the level of productivity of a country. Raising productivity—meaning making better use of available factors and resources—is the driving force behind the rates of return on investment which, in turn, determine the aggregate growth rates of an economy.Thus, a more competitive economy will be one which will likely grow faster in a medium to long-term perspective.

In order to enhance productivity growth, education and training are emerging as key drivers of competitiveness. As the global economy has become more complex, it has become evident that to compete and maintain a presence in global markets it is essential to boost the human capital endowments of the labor force,whose members must have access to new knowledge, be constantly trained in new processes and in the operation of the latest technologies. As coverage of primary education has expanded rapidly in the developing world, higher education has gained importance.Thus, countries which have invested heavily in creating a well-developed infrastructure for tertiary education have reaped enormous benefits in terms of growth. Education has been a particularly important driver in the development of the capacity for technological innovation, as the experience of Finland, Korea,Taiwan, and Israel clearly shows. (Lopez-Claros,2006)

As numerous as these factors may be they will matter differently for different countries, depending on their particular starting conditions or, broadly defined, their institutional endowments, current state of policies, and other factors inherent to their stage of development. Sound public finances may be important everywhere for creating the conditions for productivity growth, but they will be less important in countries with a long history of sound fiscal management.On the other hand a move to better fiscal management in a country known for fiscal indiscipline, such as Argentina, is likely to be beneficial for growth.The notion of the relative importance of these factors being a function of a country’s endowments and stage of development is explicitly incorporated in the Global Competitiveness Index.

The factors themselves will evolve over time,reflecting the rapid pace of change in the global economy.For example, we may look to the growing importance of the latest technologies in enhancing productivity growth through improved processes and management practice, as compared to the early part of the post-war period, when growth in the global economy appears to have been driven mainly by the expansion of resource endowments.

4.2 The Global Competitiveness Index

Since 2001, World Economic Forum has been using the Growth Competitiveness Index (Growth CI) developed by Jeffrey Sachs and John McArthur to assess the competitiveness of nations. Then Professor Xavier Sala-i-Martin, a leading expert on growth and economic development, has developed a new comprehensive competitiveness model for the World Economic Forum. the GCI, albeit simple in structure, provides a holistic overview of factors that are critical to driving productivity and competitiveness, and groups them into nine pillars:

- ***Institutions***
- ***Infrastructure***
- ***Macroeconomy***
- ***Health and primary education***
- ***Higher education and training***
- ***Market efficiency***
- ***Technological readiness***
- ***Business sophistication***
- ***Innovation***

The selection of these pillars as well as the factors that enter each of them is based on the latest theoretical and empirical research. It is important to note that none of these factors alone can ensure competitiveness. The value of increased spending in education will be undermined if rigidities in the labor market and other institutional weaknesses make it difficult for new graduates to gain access to suitable employment opportunities. Attempts to improve the macroeconomic environment—e.g., bringing public finances under control—are more likely to be successful and receive public support in countries where there is reasonable transparency in the management of public resources, as opposed to widespread corruption and abuse.Innovation or the adoption of new technologies or upgrading management practices will most likely not receive broad-based support in the business community, if protection of the domestic market ensures that the returns to seeking rents are higher than those for new investments.Therefore, the most competitive economies in the world will typically be those where concerted efforts have been made to frame policies in a comprehensive way, that is, those which recognize the importance of a broad array of factors, their interconnection, and the need to address the underlying weaknesses they reveal in a proactive way.

The ninth pillar, **innovation**, is particularly important for countries that have reached the high-tech frontier, as it is the only self sustaining driver of growth. (Romer, P. 1987)While less advanced countries can still improve their productivity by adopting existing technologies or making incremental improvements in other areas, for countries that have reached the innovation stage of development, this is no longer sufficient to increase productivity. Firms in these countries must design and develop cutting-edge products and processes to maintain a competitive advantage. This requires an environment that is conducive to innovative activity, supported by both the public and the private sectors. In particular, this means sufficient business investment in research and development, high-quality scientific research institutions, collaboration in research between universities and industry, and protection of intellectual property.

Given the importance of innovation for long-term growth, innovation policy is currently very much at the center of economic policy in many countries. Overall, there is consensus that simply promoting and supporting large, isolated R&D projects has not proven to be a successful strategy. Instead, cumulative small improvements, along with informal innovation, can have similar growth effects to large R&D projects.(Trajtenberg,2005)These small innovative increments also tend to bring about additional spillover effects, such as complementary innovations, the development of specific skills, and additional investment. Thus, rather than focusing on national champions, innovation policies should aim to foster an environment which promotes entrepreneurship and innovation across the economic spectrum.

4.3 Stages of Economic Development

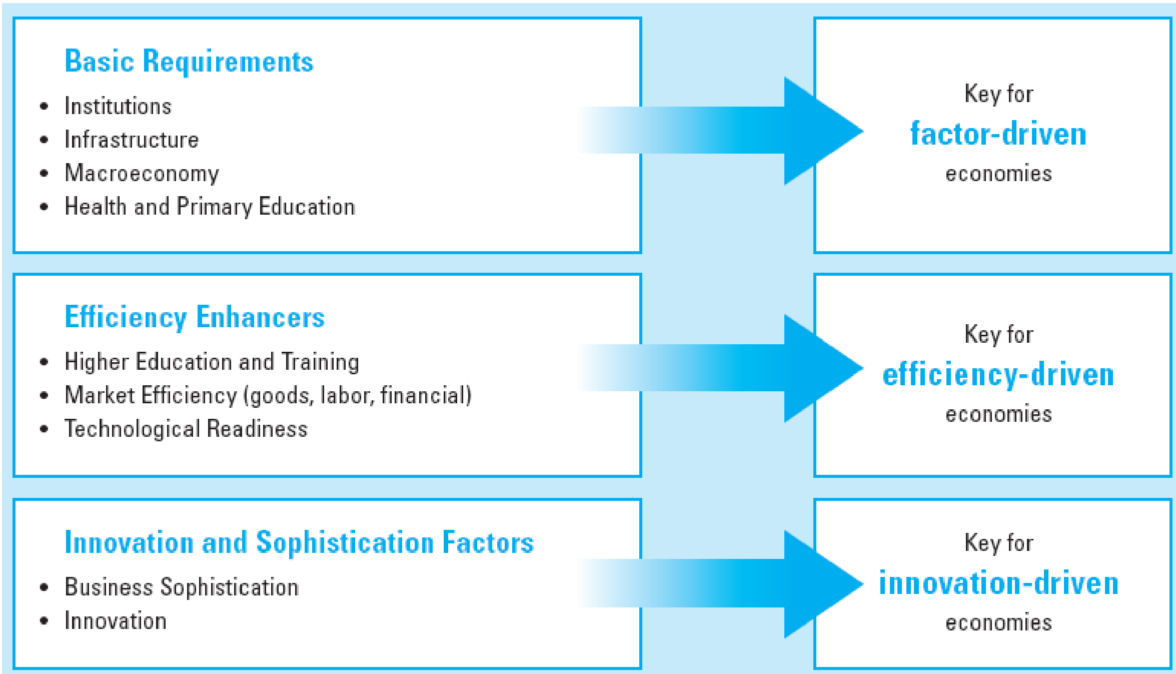
In the *factor-driven* stage countries compete based on their factor endowments, primarily unskilled labor and natural resources. Companies compete on the basis of prices and sell basic products or commodities, with their low productivity reflected in low wages. To maintain competitiveness at this stage of development, competitiveness hinges mainly on a stable macroeconomic framework (pillar 1), well-functioning public and private institutions (pillar 2), appropriate infrastructure (pillar 3), and a healthy, literate workforce (pillar 4).

As wages rise with advancing development, countries move into the *efficiency-driven* stage of development, when they must begin to develop more efficient production processes and increase product quality. At this point, competitiveness becomes increasingly driven by higher education and training (pillar 5), efficient markets (pillar 6), and the ability to harness the benefits of existing technologies (pillar 7).

Finally, as countries move into the *innovation-driven* stage, they are only able to sustain higher wages and the associated standard of living if their businesses are able to compete with new and unique products. At this stage, companies must compete through innovation (pillar 9),producing new and different goods using the most sophisticated production processes (pillar 8).

Thus, although all nine pillars matter to a certain extent for all countries, the importance of each one depends on a country's particular stage of development. To take this into account, the pillars are organized into three subindexes, each critical to a particular stage of development.

Figure 1. Composition of the three subindexes



Source:Global Competitiveness Report,2006-2007

Table 1. List of countries/economies in each stage of development,see Appendix 1
Table 2: Global Competitiveness Index rankings and 2005–2006 comparisons,see Appendix 1
Table 3: The Global Competitiveness Index 2006–2007, see Appendix 1
Table 4: Global Competitiveness Index: Basic requirements, see Appendix 1
Table 5: Global Competitiveness Index: Efficiency enhancers, see Appendix 1
Table 6: Global Competitiveness Index: Innovation factors, see Appendix 1

4.4 Is Turkey competitive enough for Europe?

Turkey has come a long way from the instability and structural weaknesses which undermined its economy in the 1990s, bringing the country to a serious crisis in 2001, when GDP contracted by almost 8 percent. Indeed, the tough IMF-backed reforms adopted in the aftermath of the collapse, combining tight fiscal and monetary policies with a broad range of reforms aimed at addressing other deep-seated distortions, seem to have set Turkey on a healthier development path, with GDP growth rates in the 2002–2005 period averaging 7 percent, and inflation rates falling dramatically to single-digit figures. Moreover, the decision by the government to accelerate the onset of accession negotiations with the EU prompted a wave of substantial political and economic reforms to meet key elements of the Copenhagen criteria. This includes the abolition of the death penalty, adoption of a new penal code in May 2005, reduction of the army's role in politics, as well as other measures aimed at better protecting human rights, and establishing a foundation of macroeconomic stability, and implementing regulatory reform essential for successful integration with the rest of Europe.

Macroeconomic environment: Last among the countries shown in Table 4, Turkey ranks a dismal 111th in the macroeconomy pillar, reflecting the continued vulnerability of its economy to external shocks. Despite bold reforms undertaken in recent years and a sharp improvement in the management of the public finances in the aftermath of the 2001 crisis, gross public debt levels (72.8 percent of GDP) and the budget deficit (5.9 percent of GDP) are still very high by international standards, severely constraining the ability of the authorities to respond to pressing needs, beyond servicing of the public debt. Indeed, Turkey ranks 86th and 115th, respectively, in these two indicators in 2005. The current account deficit has mushroomed to near 7 percent of GDP, reflecting high oil prices and the strength of the lira. This gap, financed partially by short capital inflows, leaves Turkey prey to the whims of foreign investors, as the recent May 2006 episode of emerging market turmoil eloquently demonstrated. Indeed, the country was hit hard by the investor selling frenzy of 11 May 2006, which targeted emerging market shares. With structural vulnerabilities, high levels of public debt and a burgeoning current account deficit, Turkey is at a disadvantage with respect to other emerging markets which have gone through similar crises of their own in recent years—e.g., Russia, Brazil, Argentina, Korea, Thailand, all of them in a much stronger position now.

On the positive side:

Business sophistication: Turkey achieved a high rank of 39 in the business sophistication pillar of the GCI, particularly for the quality and quantity of networks and supporting industries (33), well above the EU average, and above all except Estonia, the Czech Republic, and Slovenia in Table 1. This strongly suggests that while Turkey does have a large agricultural sector with rather low productivity, both in relation to the agricultural sector of other recent EU entrants and in relation to other sectors in the Turkish economy, it does have sophisticated industrial and service sectors which are already operating at high levels of efficiency, adopting advanced technologies, efficient production processes, and exploiting economies of scale with respect to their competitors elsewhere in Europe, particularly the new members in central and Eastern Europe.

Table 7: GCI performance of Turkey, recent EU entrants,* and candidate countries

	Global CI		Institutions		Infrastructure		Macroeconomy		Health/ primary education		Higher education/ training		Market efficiency		Technological readiness		Business sophistication		Innovation	
Country/Economy	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Estonia	25	5.12	30	4.7	30	4.66	16	5.31	43	6.58	23	5.26	25	4.98	16	5.29	35	4.65	30	3.83
Czech Rep.	29	4.74	60	3.8	33	4.50	42	4.81	58	6.42	27	5.04	41	4.43	26	4.74	29	4.96	28	3.98
Slovenia	33	4.64	43	4.3	32	4.51	29	5.08	19	6.83	26	5.07	63	4.17	29	4.51	36	4.64	34	3.71
Average (new entrants)		4.59		4.17		4.28		4.62		6.54		4.84		4.44		4.38		4.46		3.54
Latvia	36	4.57	50	4.1	39	4.33	34	4.93	79	6.27	28	5.01	40	4.44	43	3.98	54	4.28	66	3.19
Slovak Rep.	37	4.55	53	4	47	4.08	68	4.37	74	6.31	38	4.52	34	4.66	30	4.50	45	4.41	42	3.51
Lithuania	39	4.54	59	3.9	44	4.14	41	4.82	70	6.37	29	4.97	45	4.35	42	3.99	41	4.56	50	3.35
Malta	39	4.54	31	4.6	37	4.37	76	4.26	32	6.69	47	4.36	46	4.35	22	5.00	51	4.32	62	3.26
Hungary	41	4.52	46	4.2	48	4.05	98	3.94	66	6.39	30	4.93	37	4.61	35	4.17	49	4.34	31	3.82
Cyprus	46	4.36	35	4.5	34	4.47	72	4.33	22	6.79	41	4.48	55	4.22	38	4.10	50	4.32	55	3.30
Poland	48	4.30	73	3.6	57	3.64	70	4.34	26	6.76	33	4.79	64	4.16	51	3.56	63	4.13	44	3.47
Croatia	51	4.26	66	3.7	51	3.98	73	4.30	67	6.38	44	4.43	68	4.11	47	3.68	61	4.17	45	3.45
Turkey	**59**	**4.14**	**51**	**4.05**	**63**	**3.46**	**111**	**3.58**	**78**	**6.28**	**57**	**4.15**	**47**	**4.35**	**52**	**3.56**	**39**	**4.58**	**51**	**3.35**
Romania	68	4.02	87	3.4	77	3.05	97	3.94	69	6.38	50	4.34	76	4.03	49	3.59	73	3.89	68	3.14
Bulgaria	72	3.95	109	3.1	65	3.41	35	4.92	39	6.61	62	4.05	90	3.75	68	3.21	84	3.59	87	2.93

Source: Global Competitiveness Report,2006-2007

Innovation and market efficiency: Turkey is outperforming not only the other candidate countries, but also a few of the EU10 countries in these indicators. In particular, in market efficiency Turkey, at 47, scores only marginally lower than the EU10 average (4.44), but ranks higher than Malta, Cyprus, Slovenia, and Poland. In this respect, Turkey is probably favored by its large internal markets (19), but also shows the benefits of the recent microeconomic reforms, aimed at reducing red tape and bureaucracy, and promoting competition.

The snapshot emerging from the GCI leads to the following conclusions: with its rank of 59 and a score of 4.14, Turkey, quite predictably, finds itself toward the bottom of the ranking shown in Table 1, performing better than Romania and Bulgaria, but still at some distance from Estonia (5.12), the top performer within the group, and from the EU10 average (4.59). The picture becomes more mixed, however, once Turkey's performance is disaggregated at the pillar level. Although Turkey has certainly not dealt fully with all of the key determinants of competitiveness at its level of development—such as macroeconomic stability or education and health—nonetheless, it has made good progress in factors which tend to become more important at more advanced development stages, such as business sophistication and innovation. In this sense, given its stage of development, Turkey's future competitiveness will hinge crucially on the establishment of efficient production practices and improvements in the operations of its labor and financial markets.

5- ECONOMETRIC MODEL

5.1 Components of Econometric Model

5.1.1 Expenditure on R&D

Expenditure on research and development (R&D) is a key indicator of government and private sector efforts to obtain competitive advantage in science and technology. In 2004, research and development amounted to 2.3% of GDP for the OECD as a whole.

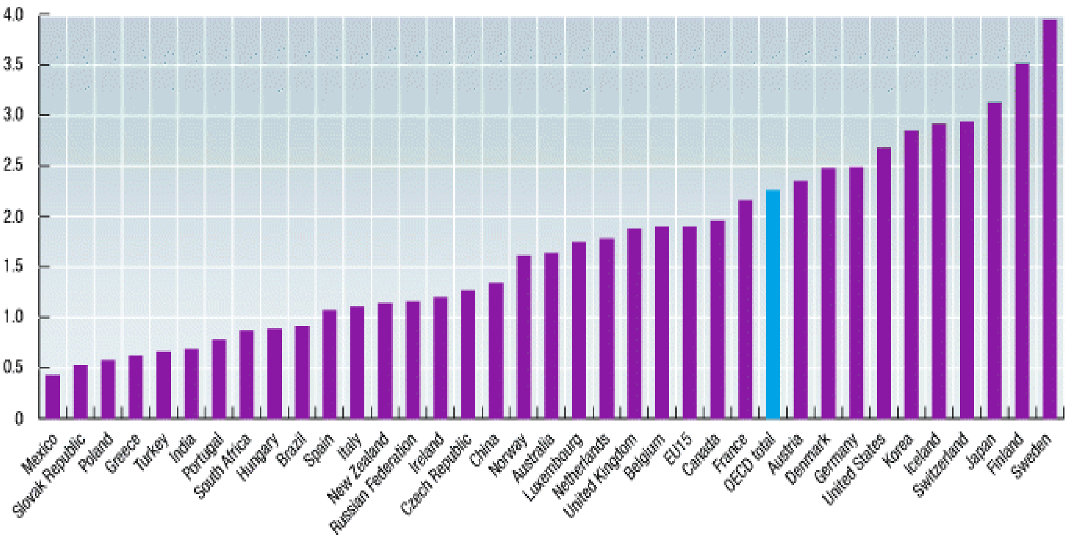
Research and development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. R&D is a term covering three activities: basic research, applied research, and experimental development. *Basic research* is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view. *Applied research* is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. *Experimental development* is systematic work, drawing on existing knowledge gained from research and/or practical experience, that is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

The main aggregate used for international comparisons is gross domestic expenditure on R&D. This consists of the total expenditure (current and capital) on R&D by all resident companies, research institutes, university and government laboratories, etc. It excludes R&D expenditures financed by domestic firms but performed abroad.

The R&D data obtained have been compiled according to the guidelines of the Frascati Manual. It should, however, be noted that over the period shown, several countries have improved the coverage of their surveys of R&D activities in the services sector(United States) and in higher education (United States).For Korea, social sciences and humanities are excluded from the R&D data. For the United States, capital expenditure is not covered.

Since 2000, R&D expenditure relative to GDP (R&D intensity) has increased in Japan, and it has decreased slightly in the United States. In 2003 and 2004, Sweden, Finland, and Japan were the only three OECD countries in which the R&D-to-GDP ratio exceeded 3%, well above the OECD average of 2.3%. Since the mid-1990s, R&D expenditure (in real terms) has been growing the fastest in Iceland and Turkey, both with average annual growth rates above 10%.R&D expenditure for China has been growing even faster than GDP, resulting in a rapidly increasing R&D intensity, growing from 0.9% in 2000 to 1.3% in 2005.

Figure 2:Gross Domestıc Expenditure On R&D as a percentage of GDP, 2005 or latest available year



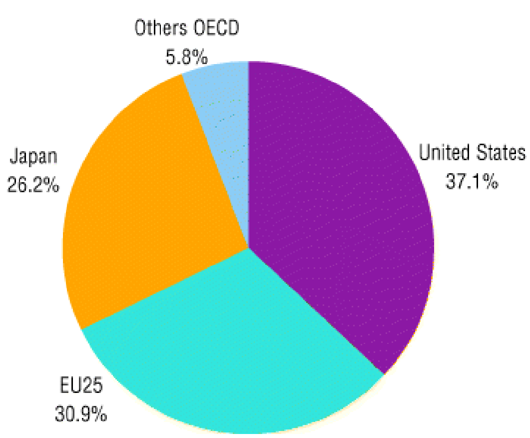
Source:OECD

5.1.2 Patent

Patent-based indicators provide a measure of the output of a country's R&D, *i.e.* its inventions .The OECD where we obtained patent data has developed *triadic patent families*, which are designed to capture all important inventions only and to be internationally comparable.

A patent family is defined as a set of patents taken in various countries (*i.e.* patent offices) to protect the same invention. Triadic patent families are a set of patents taken at all three of these major patent offices – the European Patent Office (EPO), the Japan Patent Office (JPO) and the United States Patent and Trademark Office (USPTO).

Figure 3:Percentage, Year 2003



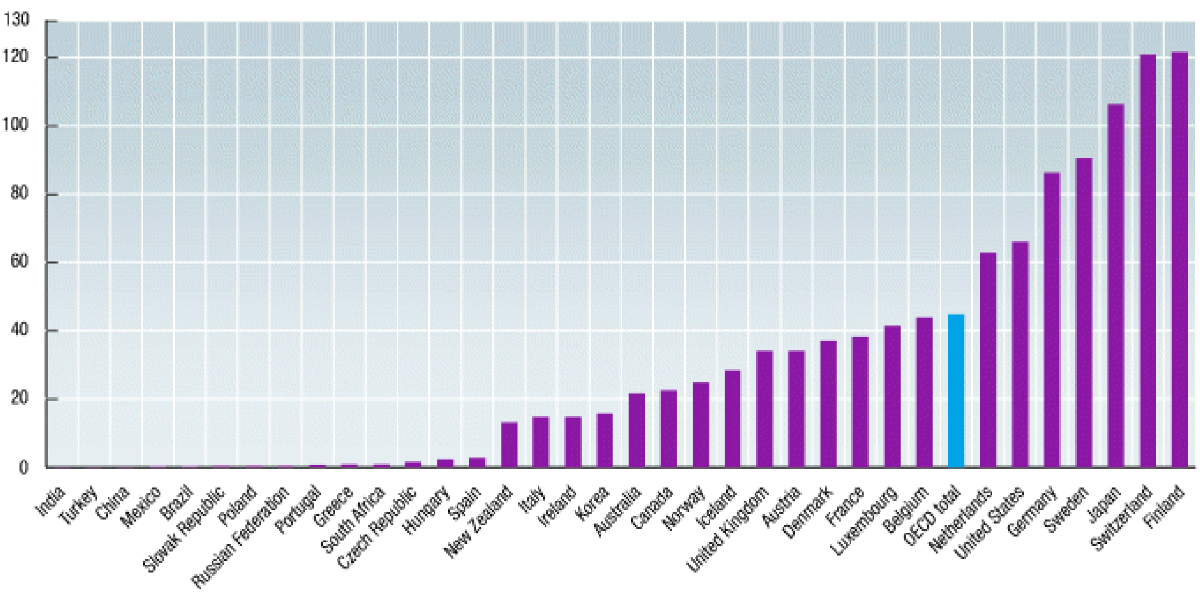
Source:OECD

The beginning of the 21st century was marked by a slowdown, with patent families increasing by 1% to 2% a year, following a steady growth of 6% a year on average until 2000. About 53 000 triadic patent families were filed in 2003.

The United States accounts for 37.1% of the OECD total in 2003, followed by the European Union (30.9%) and Japan (26.2%). Since the mid 1990s, the United States' share of patent families increased, whereas the relative proportion of patent families originating from Europe and Japan has tended to decrease.

The ratio of triadic patent families to population identifies Finland, Switzerland, Japan, Sweden and Germany as the five most innovative countries in 2003. Finland had the highest propensity to patent, with 122 patent families per million population and Switzerland had 121. Most countries have seen their patent intensity increase over the last decade, and the largest increase occurred in Korea. By size, China has less then 0.1 patent families per million population.

Figure 4:Number of triadic patent families Per million population, 2003



Source:OECD

5.1.3 Researcher

Researchers are the central element of the research and development system. In 2002, approximately 3.6 million persons in the OECD area were employed in research and development and approximately two-thirds of these were engaged in the business sector.

Researchers are defined as professionals engaged in the conception and creation of new knowledge, products, processes, methods and systems as well as those who are directly involved in the management of projects. They include researchers working in both civil and military research in government, universities, research institutes as well as in the business sector.

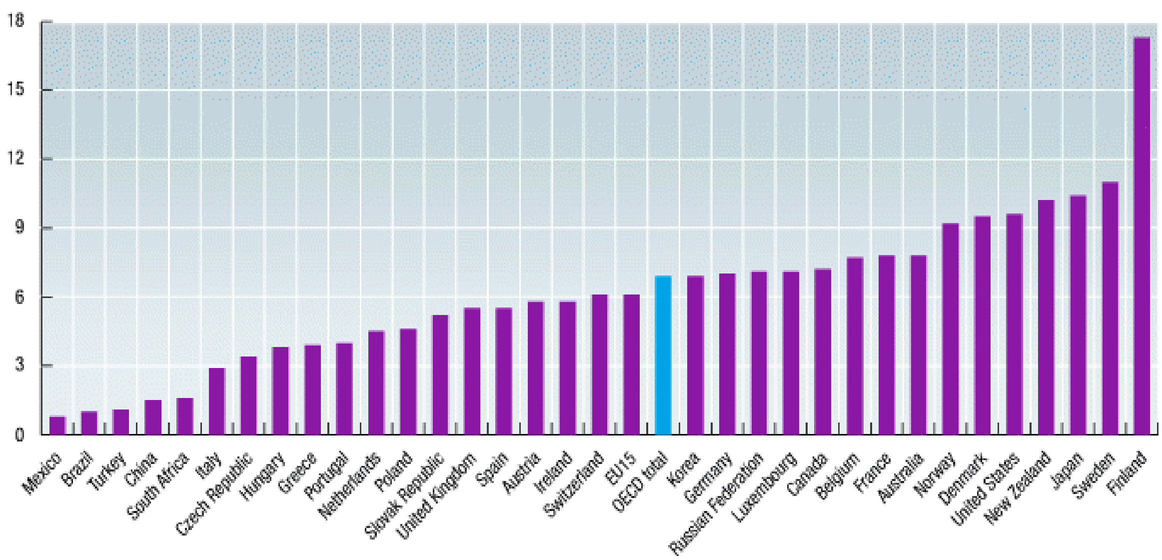
The number of researchers is expressed in full-time equivalent (FTE) on R&D (*i.e.* a person working half-time on R&D is counted as 0.5 person-year) and includes staff engaged in R&D during the course of one year. The data have been compiled on the basis of the methodology of the *Frascati Manual*.

In 2002, there were about 6.9 researchers per thousand employees in the OECD area, compared with 5.8 per thousand in 1992. The number of researchers has steadily increased over the last two decades. Among the major OECD regions, Japan has the highest number of researchers relative to total employment, followed by the United States and the European Union.

Finland, Japan, New Zealand and Sweden have the highest number of research workers per thousand persons employed. Rates are also high in the United States, Denmark and Norway. Research workers per thousand employees are low in Mexico, Turkey, Italy and the Czech Republic.

Among the major non-member countries, growth has been steady in China, although, at 1.2 in 2004, it still remains well below the OECD average. The rate for the Russian Federation has been falling since 1994, but was still above 7 researchers per thousand employed in 2004.

Figure 5:Per thousand employed, full-time equivalent, 2004 or latest available year



Source:OECD

5.2 Application of this model on Turkey and several countries

5.2.1 TURKEY

1.Equation) $\log Y_t = \beta_0 + \beta_1 X_{1t} + u_t$
($Y_{t=}$ Real GDP in terms of YTL, $X_{1t=}$ Gross R&D expenditure as a percentage of GDP)

$\text{Log}Y_{t=} -2.63 + 0.68\, X_{1t} + u_t$

According to this model,it points out that 1% increase in Gross R&D expenditure as a percentage of GDP, increases the Real GDP in terms of YTL by 0.68%.

2.Equation) $\log Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + u_t$
($Y_{t=}$ Real GDP in terms of YTL, $X_{1t=}$ Gross R&D expenditure as a percentage of GDP,
$X_{2t=}$Number of Triadic Patent Families)

$\text{Log}Y_{t=} -2.46 + 0.12 X_{1t} + 0.034 X_{2t} + u_t$

If we add the number of triadic patent families, 1% increase in Gross R&D expenditure as a percentage of GDP, increases the Real GDP in terms of YTL by 0.12%.when the number of triadic patents increase by 1 unit,it increases the Real GDP in terms of YTL by 0.034%.However,at 5% significance level the probability of t-value of Gross R&D expenditure as a percentage of GDP is 0.61,which is insignificant.So that Gross R&D expenditure as a percentage of GDP is quite insufficient in Turkey.

3.Equation) $\log Y_t = \beta_0 + \beta_2 X_{2t} + \beta_3 X_{3t} + u_t$
($Y_{t=}$ Real GDP in terms of YTL, $X_{3t=}$ The first degree lag of Gross R&D expenditure as a percentage of GDP,$X_{2t=}$Number of Triadic Patent Families)

$\text{Log}Y_{t=} -2.34 + 0.39 X_{2t} - 0.127 X_{3t} + u_t$

At 5% significance level,if we add the first degree lag of Gross R&D expenditure as a percentage of GDP instead of Gross R&D expenditure as a percentage of GDP,we can see that the coefficient of this is insignificant.

4.Equation) $\log Y_t = \beta_0 + \beta_2 X_{2t} + \beta_4 X_{4t} + u_t$
($Y_{t=}$ Real GDP in terms of YTL, $X_{4t=}$ The second degree lag of Gross R&D expenditure as a percentage of GDP,$X_{2t=}$Number of Triadic Patent Families)

$\text{Log}Y_{t=} -2.19 + 0.04 X_{2t} - 0.48 X_{4t} + u_t$

At 5% significance level, if we add the second degree lag of Gross R&D expenditure as a percentage of GDP instead of Gross R&D expenditure as a percentage of GDP,we can see that the coefficient of this is insignificant.

We applied tests like F-Test,First Order Breusch-Godfrey Serial Correlation Lm Test, Second Order Breusch-Godfrey Serial Correlation Lm, White Heteroskedasticity Test, Ramsey Reset

Test,we found that at 5% significance level,there is no Heteroskedasticity, autocorrelation in this model and the models are correctly specified.

Table 8:Econometric models we applied for Turkey

TURKEY	1.Eq	2.Eq	3.Eq	4.Eq
β0	-2.63	-2.46	-2.34	-2.19
t value	-21.26	-24.4	-21.6	-23.2
prob.	0.00	0.00	0.00	0.00
β1	0.68	0.12		
t value	2.89	0.51		
prob.	0.01	0.61		
β2		0.034	0.039	0.04
t value		3.42	3.5	5.02
prob.		0.006	0.006	0.001
β3			-0.127	
t value			-0.46	
prob.			0.65	
β4				-0.48
t value				2.00
prob.				0.08
Ftest	8.37	14.15	13.02	16.00
prob.	0.014	0.0012	0.00	0.00
R2	0.43	0.73	0.74	0.80
Dw	0.91	0.90	1.43	2.43

5.2.2 SOUTH KOREA

1.Equation) $\log Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + u_t$
($Y_{t=}$ Real GDP in terms of Korean Wan, $X_{1t=}$ Gross R&D expenditure as a percentage of GDP, $X_{2t=}$Number of Triadic Patent Families)

$\log Y_{t=}12.2+0.25X_{1t}+0.0007X_{2t}+u_t$

At 5% significance level, 1% increase in Gross R&D expenditure as a percentage of GDP, increases the Real GDP in terms of Korean Wan by 0.25%.when the number of triadic patents increase by 1 unit, it increases the Real GDP in terms of Korean Wan by 0.0007%.

2.Equation) $\log Y_t = \beta_0 + \beta_2 X_{2t} + \beta_3 X_{3t} + u_t$
($Y_{t=}$ Real GDP in terms of Korean Wan, $X_{3t=}$ The first degree lag of Gross R&D expenditure as a percentage of GDP, $X_{2t=}$Number of Triadic Patent Families)

$\log Y_{t=}12.55+0.0008X_{2t}+0.102X_{3t}+u_t$

At 5% significance level,if we add the first degree lag of Gross R&D expenditure as a percentage of GDP instead of Gross R&D expenditure as a percentage of GDP,we can see that the coefficient of this is insignificant.

We applied tests like F-Test,First Order Breusch-Godfrey Serial Correlation Lm Test, Second Order Breusch-Godfrey Serial Correlation Lm, White Heteroskedasticity Test, Ramsey Reset Test,we found that at 5% significance level,there is no Heteroskedasticity, autocorrelation in this model and the models are correctly specified.

Table 9:Econometric models we applied for S.Korea

S.KOREA	1.Eq	2.Eq
β0	12.2	-12.55
t value	-78	-54.8
prob.	0.00	0.00
β1	0.25	
t value	3.1	
prob.	0.01	
β2	0.0007	0.0008
t value	7.6	5.3
prob.	0.00	0.00
β3		0.102
t value		0.84
prob.		0.42
Ftest	162	60
prob.	0.00	0.00
R2	0.97	0.93
Dw	2.53	2.02

5.2.3 IRELAND

1.Equation) $\log Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + u_t$
($Y_{t=}$ Real GDP in terms of Euros, $X_{1t=}$ Gross R&D expenditure as a percentage of GDP, $X_{2t=}$Number of Triadic Patent Families)

$\log Y_{t=}10.09+0.533X_{1t}+0.017X_{2t}+u_t$

At 5% significance level,1% increase in Gross R&D expenditure as a percentage of GDP, increases the Real GDP in terms of Euros by 0.533%.when the number of triadic patents increase by 1 unit,it increases the Real GDP in terms of Euros by 0.017%.

2.Equation) $\log Y_t = \beta_0 + \beta_2 X_{2t} + \beta_3 X_{3t} + u_t$
($Y_{t=}$ Real GDP in terms of Euros, $X_{3t=}$ The first degree lag of Gross R&D expenditure as a percentage of GDP, $X_{2t=}$Number of Triadic Patent Families)

$\mathbf{LogY_{t=}}10.26+0.016\mathbf{X_{2t}}+0.45\mathbf{X_{3t}}+\mathbf{u_t}$

At 5% significance level,if we add the first degree lag of Gross R&D expenditure as a percentage of GDP instead of Gross R&D expenditure as a percentage of GDP,we can see that the coefficient of this is significant.When the first degree lag of Gross R&D expenditure as a percentage of GDP increases by 1% , Real GDP in terms of Euros increases by 0.45% and 1 unit increase in the number of Triadic Patent Families, Real GDP in terms of Euros increases by 0.016%.

3.Equation) $\log Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_4 X_{4t} + u_t$

($Y_{t=}$ Real GDP in terms of Euros**,** $X_{1t=}$Gross R&D expenditure as a percentage of GDP**,** $X_{2t=}$Number of Triadic Patent Families, X_{4t} =Researchers Per Thousand Employed Full Time Equivalent)

$\mathbf{LogY_{t=}}9.51+0.352\mathbf{X_{1t}}+0.013\mathbf{X_{2t}}+0.198\mathbf{X_{4t}}+\mathbf{u_t}$

At 5% significance level, 1% increase in Gross R&D expenditure as a percentage of GDP, increases the Real GDP in terms of Euros by 0.352%.when the number of triadic patents increase by 1 unit,it increases the Real GDP in terms of Euros by 0.013% and 1 unit increase in Researchers Per Thousand Employed Full Time Equivalent increases Real GDP in terms of Euros by 0.198.

4.Equation) $\log Y_t = \beta_0 + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + u_t$

($Y_{t=}$ Real GDP in terms of Euros**,** $X_{3t=}$ The first degree lag of Gross R&D expenditure as a percentage of GDP**,** $X_{2t=}$Number of Triadic Patent Families, X_{4t} =Researchers Per Thousand Employed Full Time Equivalent)

$\mathbf{LogY_{t=}}9.52+0.0127\mathbf{X_{2t}}+0.353\mathbf{X_{3t}}+0.205\mathbf{X_{4t}}+\mathbf{u_t}$

At 5% significance level,if we add the first degree lag of Gross R&D expenditure as a percentage of GDP instead of Gross R&D expenditure as a percentage of GDP,we can see that the coefficient of this is significant.When the first degree lag of Gross R&D expenditure as a percentage of GDP increases by 1% , Real GDP in terms of Euros increases by 0.353% and 1 unit increase in the number of Triadic Patent Families, Real GDP in terms of Euros increases by 0.0127% and 1 unit increase in Researchers Per Thousand Employed Full Time Equivalent increases Real GDP in terms of Euros by 0.205.

We applied tests like F-Test,First Order Breusch-Godfrey Serial Correlation Lm Test, Second Order Breusch-Godfrey Serial Correlation Lm, White Heteroskedasticity Test, Ramsey Reset Test,we found that at 5% significance level,there is no Heteroskedasticity, autocorrelation in this model and the models are correctly specified.However in the fourth equation we found out that the model is misspecified.

Table 10:Econometric models we applied for Ireland

IRELAND	1.Eq	2.Eq	3.Eq	4.Eq
β0	10.09	10.26	9.51	9.52
t value	51.4	53.65	35.87	28.66
prob.	0.00	0.00	0.00	0.00
β1	0.533		0.352	
t value	3.24		2.42	
prob.	0.008		0.038	
β2	0.017	0.016	0.013	0.0127
t value	11.04	9.52	7.6	6.74
prob.	0.000	0.00	0.00	0.00
β3		0.45		0.353
t value		2.64		2.51
prob.		0.02		0.036
β4			0.198	0.205
t value			2.7	2.516
prob.			0.02	0.036
Ftest	68	59	76	65.17
prob.	0.00	0.00	0.00	0.00
R2	0.93	0.92	0.96	0.96
Dw	2.00	1.98	2.6	2.50

6-CONCLUSION

Innovation can originate anywhere. Increased education and economic growth have improved the capacity of developing countries to offer new products and services. Modern communications and transportation technologies allow these countries to share advances with consumer across the globe.As a result ,great ideas-regardless of where they originate-are less likely to be lost in our increasingly interconnected world.

In the most fundamental sense, there are only two ways of increasing the output of the economy: (1) you can increase the number of inputs that go into the productive process, or (2) if you are clever, you can think of new ways in which you can get more output from the same number of inputs. And, if you are an economist you are bound to be curious to know which of these two ways has been more important - and how much more important. And this study supports that second one is crucially important in terms of increasing the output of the economy.

It is not a coincidence that countries such as USA or Japan are the world's top economies because their allocation of resources into creating innovation is massive. It obviously indicates that innovation is the key driving growth and prosperity. Economists calculate that approximately 50% of US annual GDP growth is attributed to increases in innovation. For the past two centuries, the US has been the world-leader in developing innovative products and services.

After all we have studied, we finally found the answer to the question on our minds which was Innovation: Is the engine for the economic growth? We concluded that innovation makes a great contribution in economic growth and development in an economy or world as a whole. We also proved this right by developing some econometric models applied on Turkey and several countries so as to make comparisons. We especially chose South Korea and Ireland to apply these models , because these countries made great leaps even though their economic performance wasn't far too different from Turkey only two or three decades ago.We think that Turkey is not doing good enough to catch up the countries ahead,that's the reason why we were so willing to do this study in order to make every single person to think and to be deeply concerned about that. We are quoting here:"**Innovation distinguishes between a leader and a follower.**"(Steve Jobs American Entrepreneur Apple co-Founder)We completely agree with this idea.

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-http://www.tubitak.gov.tr

-http:// www.worldbank.org

8-APPENDIX 1

Table 1. List of countries/economies in each stage of development

Stage 1	Transition from 1 to 2	Stage 2	Transition from 2 to 3	Stage 3
GDP p.c. < US$2,000	GDP p.c. US$2,000–US$3,000	GDP p.c. US$3,000–US$9,000	GDP p.c. US$9,000–US$17,000	GDP p.c. > US$17,000
Angola	Albania	Algeria	Bahrain	Australia
Armenia	Bosnia and Herzegovina	Argentina	Barbados	Austria
Azerbaijan	Colombia	Botswana	Czech Republic	Belgium
Bangladesh	Ecuador	Brazil	Estonia	Canada
Benin	El Salvador	Bulgaria	Hungary	Cyprus
Bolivia	Jordan	Chile	Korea	Denmark
Burkina Faso	Macedonia, FYR	Costa Rica	Malta	Finland
Burundi	Namibia	Croatia	Taiwan, China	France
Cambodia	Peru	Dominican Republic	Trinidad and Tobago	Germany
Cameroon	Suriname	Jamaica		Greece
Chad	Thailand	Kazahkstan		Hong Kong SAR
China	Tunisia	Latvia		Iceland
Egypt		Lithuania		Ireland
Ethiopia		Malaysia		Israel
Gambia, The		Mauritius		Italy
Georgia		Mexico		Japan
Guatemala		Panama		Kuwait
Guyana		Poland		Luxembourg
Honduras		Romania		Netherlands
India		Russian Federation		New Zealand
Indonesia		Serbia and Montenegro		Norway
Kenya		Slovak Republic		Portugal
Kyrgyz Republic		South Africa		Qatar
Lesotho		Turkey		Singapore
Madagascar		Uruguay		Slovenia
Malawi		Venezuela		Spain
Mali				Sweden
Mauritania				Switzerland
Moldova				United Arab Emirates
Mongolia				United Kingdom
Morocco				United States
Mozambique				
Nepal				
Nicaragua				
Nigeria				
Pakistan				
Paraguay				
Philippines				
Sri Lanka				
Tajikistan				
Tanzania				
Timor-Leste				
Uganda				
Ukraine				
Vietnam				
Zambia				
Zimbabwe				

Source: Global Competitiveness Report,2006-2007

Global Competitiveness Index rankings 2006–2007

Table 2: Global Competitiveness Index rankings and 2005–2006 comparisons

Country/Economy	GCI 2006–07 rank	GCI 2006–07 score	GCI 2005–06 rank
Switzerland	1	5.81	4
Finland	2	5.76	2
Sweden	3	5.74	7
Denmark	4	5.70	3
Singapore	5	5.63	5
United States	6	5.61	1
Japan	7	5.60	10
Germany	8	5.58	6
Netherlands	9	5.56	11
United Kingdom	10	5.54	9
Hong Kong SAR	11	5.46	14
Norway	12	5.42	17
Taiwan, China	13	5.41	8
Iceland	14	5.40	16
Israel	15	5.38	23
Canada	16	5.37	13
Austria	17	5.32	15
France	18	5.31	12
Australia	19	5.29	18
Belgium	20	5.27	20
Ireland	21	5.21	21
Luxembourg	22	5.16	24
New Zealand	23	5.15	22
Korea, Rep.	24	5.13	19
Estonia	25	5.12	26
Malaysia	26	5.11	25
Chile	27	4.85	27
Spain	28	4.77	28
Czech Republic	29	4.74	29
Tunisia	30	4.71	37
Barbados	31	4.70	—
United Arab Emirates	32	4.66	32
Slovenia	33	4.64	30
Portugal	34	4.60	31
Thailand	35	4.58	33
Latvia	36	4.57	39
Slovak Republic	37	4.55	36
Qatar	38	4.55	46
Malta	39	4.54	44
Lithuania	40	4.53	34
Hungary	41	4.52	35
Italy	42	4.46	38
India	43	4.44	45
Kuwait	44	4.41	49
South Africa	45	4.36	40
Cyprus	46	4.36	41
Greece	47	4.33	47
Poland	48	4.30	43
Bahrain	49	4.28	50
Indonesia	50	4.26	69
Croatia	51	4.26	64
Jordan	52	4.25	42
Costa Rica	53	4.25	56
China	54	4.24	48
Mauritius	55	4.20	55
Kazakhstan	56	4.19	51
Panama	57	4.18	65
Mexico	58	4.18	59
Turkey	59	4.14	71
Jamaica	60	4.10	63
El Salvador	61	4.09	60
Russian Federation	62	4.08	53
Egypt	63	4.07	52
Azerbaijan	64	4.06	62
Colombia	65	4.04	58
Brazil	66	4.03	57

(cont'd.)

Country/Economy	GCI 2006–07 rank	GCI 2006–07 score	GCI 2005–06 rank
Trinidad and Tobago	67	4.03	66
Romania	68	4.02	67
Argentina	69	4.01	54
Morocco	70	4.01	76
Philippines	71	4.00	73
Bulgaria	72	3.96	61
Uruguay	73	3.96	70
Peru	74	3.94	77
Guatemala	75	3.91	95
Algeria	76	3.90	82
Vietnam	77	3.89	74
Ukraine	78	3.89	68
Sri Lanka	79	3.87	80
Macedonia, FYR	80	3.86	75
Botswana	81	3.79	72
Armenia	82	3.75	81
Dominican Republic	83	3.75	91
Namibia	84	3.74	79
Georgia	85	3.73	86
Moldova	86	3.71	89
Serbia and Montenegro	87	3.69	85
Venezuela	88	3.69	84
Bosnia and Herzegovina	89	3.67	88
Ecuador	90	3.67	87
Pakistan	91	3.66	94
Mongolia	92	3.60	90
Honduras	93	3.58	97
Kenya	94	3.57	93
Nicaragua	95	3.52	96
Tajikistan	96	3.50	92
Bolivia	97	3.46	101
Albania	98	3.46	100
Bangladesh	99	3.46	98
Suriname	100	3.45	—
Nigeria	101	3.45	83
Gambia	102	3.43	109
Cambodia	103	3.39	111
Tanzania	104	3.39	105
Benin	105	3.37	106
Paraguay	106	3.33	102
Kyrgyz Republic	107	3.31	104
Cameroon	108	3.30	—
Madagascar	109	3.27	107
Nepal	110	3.26	—
Guyana	111	3.24	108
Lesotho	112	3.22	—
Uganda	113	3.19	103
Mauritania	114	3.17	—
Zambia	115	3.16	—
Burkina Faso	116	3.07	—
Malawi	117	3.07	114
Mali	118	3.02	115
Zimbabwe	119	3.01	110
Ethiopia	120	2.99	116
Mozambique	121	2.94	112
Timor-Leste	122	2.90	113
Chad	123	2.61	117
Burundi	124	2.59	—
Angola	125	2.50	—

Source:Global Competitiveness Report,2006-2007

Table 3: The Global Competitiveness Index 2006–2007

	OVERALL INDEX		SUBINDEXES: Basic requirements		Efficiency enhancers		Innovation factors	
Country/Economy	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Switzerland	1	5.81	5	6.02	5	5.59	2	5.89
Finland	2	5.76	3	6.10	4	5.60	6	5.65
Sweden	3	5.74	7	5.95	2	5.65	5	5.66
Denmark	4	5.70	1	6.15	6	5.59	7	5.40
Singapore	5	5.63	2	6.13	3	5.63	15	5.11
United States	6	5.61	27	5.41	1	5.66	4	5.75
Japan	7	5.60	19	5.53	16	5.33	1	6.02
Germany	8	5.58	9	5.75	17	5.22	3	5.89
Netherlands	9	5.56	8	5.94	9	5.45	11	5.35
United Kingdom	10	5.54	14	5.67	7	5.59	10	5.36
Hong Kong SAR	11	5.46	4	6.04	11	5.40	18	4.97
Norway	12	5.42	6	5.96	13	5.38	21	4.95
Taiwan, China	13	5.41	21	5.50	14	5.36	9	5.38
Iceland	14	5.40	12	5.70	8	5.47	17	5.00
Israel	15	5.38	29	5.34	12	5.40	8	5.40
Canada	16	5.37	13	5.68	15	5.35	16	5.08
Austria	17	5.32	18	5.58	20	5.16	12	5.28
France	18	5.31	15	5.66	22	5.07	13	5.28
Australia	19	5.29	11	5.72	10	5.43	24	4.66
Belgium	20	5.27	17	5.59	23	5.07	14	5.21
Ireland	21	5.21	23	5.46	18	5.21	19	4.96
Luxembourg	22	5.16	10	5.73	24	5.00	23	4.81
New Zealand	23	5.15	16	5.65	21	5.15	25	4.65
Korea, Rep.	24	5.13	22	5.47	25	5.00	20	4.96
Estonia	25	5.12	30	5.31	19	5.18	32	4.24
Malaysia	26	5.11	24	5.44	26	4.89	22	4.91
Chile	27	4.85	28	5.35	31	4.58	33	4.22
Spain	28	4.77	25	5.42	28	4.62	30	4.34
Czech Republic	29	4.74	42	4.89	27	4.73	27	4.47
Tunisia	30	4.71	31	5.27	42	4.31	28	4.42
Barbados	31	4.70	32	5.24	29	4.60	54	3.78
United Arab Emirates	32	4.66	26	5.41	35	4.55	40	4.08
Slovenia	33	4.64	36	5.17	30	4.58	34	4.18
Portugal	34	4.60	34	5.22	37	4.47	37	4.14
Thailand	35	4.58	38	4.98	43	4.29	36	4.15
Latvia	36	4.57	41	4.90	36	4.48	58	3.74
Slovak Republic	37	4.55	47	4.70	34	4.56	43	3.96
Qatar	38	4.55	20	5.51	39	4.41	55	3.78
Malta	39	4.54	39	4.98	33	4.57	53	3.79
Lithuania	40	4.53	45	4.80	38	4.44	44	3.96
Hungary	41	4.52	52	4.64	32	4.57	39	4.08
Italy	42	4.46	48	4.70	40	4.41	31	4.29
India	43	4.44	60	4.51	41	4.32	26	4.60
Kuwait	44	4.41	33	5.24	45	4.20	46	3.85
South Africa	45	4.36	58	4.58	46	4.19	29	4.35
Cyprus	46	4.36	37	5.03	44	4.27	49	3.81
Greece	47	4.33	40	4.96	47	4.18	45	3.89
Poland	48	4.30	57	4.59	48	4.17	51	3.80
Bahrain	49	4.28	35	5.18	49	4.15	77	3.47
Indonesia	50	4.26	68	4.41	50	4.12	41	4.07
Croatia	51	4.26	55	4.60	52	4.07	50	3.81
Jordan	52	4.25	50	4.66	58	3.92	61	3.65
Costa Rica	53	4.25	64	4.48	51	4.08	35	4.16
China	54	4.24	44	4.80	71	3.66	57	3.75
Mauritius	55	4.20	49	4.70	61	3.86	47	3.84
Kazakhstan	56	4.19	51	4.64	56	3.97	74	3.51
Panama	57	4.18	46	4.72	62	3.86	62	3.64
Mexico	58	4.18	53	4.61	59	3.91	52	3.80
Turkey	59	4.14	72	4.34	54	4.02	42	3.96
Jamaica	60	4.10	79	4.24	53	4.06	56	3.77
El Salvador	61	4.09	54	4.60	68	3.70	75	3.51
Russian Federation	62	4.08	66	4.43	60	3.91	71	3.55
Egypt	63	4.07	59	4.52	74	3.61	65	3.63
Azerbaijan	64	4.06	56	4.59	78	3.52	70	3.59
Colombia	65	4.04	73	4.34	65	3.82	48	3.82
Brazil	66	4.03	87	4.14	57	3.94	38	4.09
Trinidad and Tobago	67	4.03	63	4.49	64	3.82	63	3.63
Romania	68	4.02	83	4.19	55	3.99	73	3.52
Argentina	69	4.01	67	4.42	66	3.79	79	3.44
Morocco	70	4.01	65	4.44	75	3.58	72	3.54

(cont'd.)

			SUBINDEXES					
	OVERALL INDEX		Basic requirements		Efficiency enhancers		Innovation factors	
Country/Economy	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Philippines	71	4.00	84	4.19	63	3.85	66	3.63
Bulgaria	72	3.96	62	4.50	70	3.67	85	3.26
Uruguay	73	3.96	61	4.51	73	3.63	80	3.41
Peru	74	3.94	76	4.28	67	3.70	68	3.61
Guatemala	75	3.91	75	4.32	82	3.46	64	3.63
Algeria	76	3.90	43	4.88	92	3.24	90	3.22
Vietnam	77	3.89	71	4.37	83	3.45	81	3.32
Ukraine	78	3.89	86	4.15	69	3.68	78	3.47
Sri Lanka	79	3.87	80	4.22	79	3.51	67	3.61
Macedonia, FYR	80	3.86	70	4.37	80	3.47	87	3.24
Botswana	81	3.79	77	4.27	77	3.52	95	3.15
Armenia	82	3.75	81	4.21	88	3.33	93	3.17
Dominican Republic	83	3.75	89	4.09	76	3.58	91	3.22
Namibia	84	3.74	69	4.40	90	3.28	86	3.25
Georgia	85	3.73	82	4.20	87	3.36	113	2.86
Moldova	86	3.71	88	4.09	85	3.38	98	3.09
Serbia and Montenegro	87	3.69	99	3.87	72	3.63	83	3.27
Venezuela	88	3.69	85	4.19	84	3.40	96	3.14
Bosnia and Herzegovina	89	3.67	78	4.24	93	3.22	99	3.08
Ecuador	90	3.67	74	4.34	96	3.13	97	3.14
Pakistan	91	3.66	93	3.96	91	3.27	60	3.66
Mongolia	92	3.60	97	3.91	86	3.37	110	2.92
Honduras	93	3.58	90	4.07	100	3.10	100	3.07
Kenya	94	3.57	107	3.62	81	3.47	59	3.73
Nicaragua	95	3.52	95	3.93	95	3.15	107	2.94
Tajikistan	96	3.50	94	3.94	103	3.07	103	3.02
Bolivia	97	3.46	98	3.89	97	3.13	119	2.64
Albania	98	3.46	92	3.98	99	3.12	121	2.57
Bangladesh	99	3.46	96	3.92	108	3.01	104	3.01
Suriname	100	3.45	91	4.06	107	3.01	114	2.86
Nigeria	101	3.45	112	3.53	89	3.31	69	3.60
Gambia	102	3.43	101	3.82	101	3.09	112	2.89
Cambodia	103	3.39	100	3.83	110	2.94	102	3.05
Tanzania	104	3.39	111	3.54	94	3.16	76	3.49
Benin	105	3.37	104	3.68	105	3.02	88	3.23
Paraguay	106	3.33	102	3.81	115	2.89	117	2.68
Kyrgyz Republic	107	3.31	109	3.56	102	3.08	108	2.93
Cameroon	108	3.30	105	3.66	113	2.90	101	3.05
Madagascar	109	3.27	110	3.56	112	2.92	89	3.23
Nepal	110	3.26	106	3.65	117	2.87	111	2.90
Guyana	111	3.24	108	3.58	114	2.89	106	2.95
Lesotho	112	3.22	103	3.68	119	2.80	120	2.59
Uganda	113	3.19	118	3.22	98	3.12	82	3.30
Mauritania	114	3.17	114	3.40	111	2.94	105	2.98
Zambia	115	3.16	113	3.43	106	3.01	124	2.43
Burkina Faso	116	3.07	121	3.13	109	2.95	84	3.27
Malawi	117	3.07	117	3.26	116	2.87	109	2.93
Mali	118	3.02	120	3.14	118	2.83	94	3.17
Zimbabwe	119	3.01	122	2.96	104	3.02	92	3.18
Ethiopia	120	2.99	115	3.29	120	2.68	116	2.72
Mozambique	121	2.94	119	3.21	121	2.62	115	2.86
Timor-Leste	122	2.90	116	3.27	122	2.57	125	2.36
Chad	123	2.61	123	2.84	125	2.35	122	2.53
Burundi	124	2.59	124	2.68	124	2.46	118	2.66
Angola	125	2.50	125	2.48	123	2.51	123	2.52

Source:Global Competitiveness Report,2006-2007

Table 4: Global Competitiveness Index: Basic requirements

Country/Economy	Basic requirements		1. Institutions		2. Infrastructure		3. Macroeconomy		4. Health and primary education	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Albania	92	3.98	108	3.09	121	1.92	83	4.21	34	6.68
Algeria	43	4.88	58	3.87	78	2.91	1	6.19	45	6.56
Angola	125	2.48	111	3.02	113	2.07	123	2.40	125	2.45
Argentina	67	4.42	112	2.98	72	3.26	51	4.64	23	6.78
Armenia	81	4.21	84	3.44	92	2.66	71	4.33	62	6.40
Australia	11	5.72	11	5.51	18	5.42	23	5.15	21	6.79
Austria	18	5.58	13	5.45	17	5.43	36	4.91	49	6.52
Azerbaijan	56	4.59	72	3.63	56	3.67	17	5.30	96	5.76
Bahrain	35	5.18	45	4.21	40	4.26	11	5.55	30	6.72
Bangladesh	96	3.92	121	2.88	117	2.03	47	4.72	90	6.04
Barbados	32	5.24	23	4.94	28	4.85	61	4.45	28	6.74
Belgium	17	5.59	26	4.85	11	5.85	44	4.76	15	6.89
Benin	104	3.68	90	3.32	114	2.06	92	4.03	101	5.29
Bolivia	98	3.89	118	2.90	107	2.22	77	4.25	81	6.20
Bosnia and Herzegovina	78	4.24	106	3.10	96	2.50	45	4.75	38	6.63
Botswana	77	4.27	37	4.46	66	3.37	39	4.85	112	4.42
Brazil	87	4.14	91	3.29	71	3.29	114	3.42	47	6.54
Bulgaria	62	4.50	109	3.07	65	3.41	35	4.92	39	6.61
Burkina Faso	121	3.13	62	3.78	110	2.14	116	3.37	124	3.24
Burundi	124	2.68	113	2.97	123	1.71	122	2.51	120	3.50
Cambodia	100	3.83	95	3.26	97	2.48	101	3.87	98	5.71
Cameroon	105	3.66	117	2.91	120	1.93	40	4.83	104	4.96
Canada	13	5.68	21	5.01	13	5.81	32	4.96	2	6.95
Chad	123	2.84	124	2.44	125	1.43	107	3.76	119	3.74
Chile	28	5.35	25	4.88	35	4.41	7	5.70	57	6.43
China	44	4.80	80	3.51	60	3.54	6	5.72	55	6.44
Colombia	73	4.34	68	3.70	75	3.15	65	4.43	88	6.07
Costa Rica	64	4.48	55	3.97	73	3.22	81	4.23	52	6.49
Croatia	55	4.60	66	3.72	51	3.98	73	4.30	67	6.38
Cyprus	37	5.03	35	4.52	34	4.47	72	4.33	22	6.79
Czech Republic	42	4.89	60	3.84	33	4.50	42	4.81	58	6.42
Denmark	1	6.15	2	5.98	5	6.24	14	5.44	4	6.94
Dominican Republic	89	4.09	93	3.26	80	2.86	85	4.20	89	6.04
Ecuador	74	4.34	116	2.92	94	2.65	21	5.18	41	6.59
Egypt	59	4.52	48	4.12	55	3.72	108	3.75	50	6.51
El Salvador	54	4.60	61	3.80	54	3.75	64	4.44	60	6.41
Estonia	30	5.31	30	4.70	30	4.66	16	5.31	43	6.58
Ethiopia	115	3.29	83	3.45	102	2.34	95	3.98	121	3.39
Finland	3	6.10	1	6.05	10	5.91	12	5.50	7	6.93
France	15	5.66	24	4.91	4	6.25	56	4.55	12	6.92
Gambia	101	3.82	54	4.02	95	2.62	105	3.77	107	4.85
Georgia	82	4.20	78	3.51	79	2.87	93	4.02	61	6.40
Germany	9	5.75	7	5.69	1	6.51	63	4.44	71	6.37
Greece	40	4.96	41	4.36	29	4.71	102	3.86	11	6.92
Guatemala	75	4.32	81	3.49	74	3.20	79	4.24	73	6.34
Guyana	108	3.58	115	2.93	104	2.27	121	2.81	75	6.31
Honduras	90	4.07	110	3.03	81	2.86	87	4.18	80	6.22
Hong Kong SAR	4	6.04	10	5.54	3	6.29	9	5.65	35	6.67
Hungary	52	4.64	46	4.18	48	4.05	98	3.94	66	6.39
Iceland	12	5.70	3	5.98	20	5.39	58	4.51	3	6.95
India	60	4.51	34	4.55	62	3.50	88	4.12	93	5.90
Indonesia	68	4.41	52	4.04	89	2.72	57	4.52	72	6.35
Ireland	23	5.46	17	5.15	31	4.61	20	5.27	24	6.78
Israel	29	5.34	29	4.77	24	5.06	50	4.65	17	6.86
Italy	48	4.70	71	3.66	50	4.00	84	4.21	8	6.93
Jamaica	79	4.24	76	3.58	53	3.75	118	3.21	65	6.39
Japan	19	5.53	22	4.97	7	6.11	91	4.05	1	6.98
Jordan	50	4.66	33	4.55	52	3.85	103	3.84	63	6.40
Kazakhstan	51	4.64	75	3.59	68	3.33	10	5.57	86	6.08
Kenya	107	3.62	98	3.22	86	2.75	99	3.91	110	4.59
Korea, Rep.	22	5.47	47	4.18	21	5.38	13	5.48	18	6.85
Kuwait	33	5.24	38	4.39	45	4.12	2	6.13	76	6.30
Kyrgyz Republic	109	3.56	123	2.66	103	2.30	117	3.27	91	6.02
Latvia	41	4.90	50	4.07	39	4.33	34	4.93	79	6.27
Lesotho	103	3.68	86	3.40	119	1.99	52	4.64	109	4.69
Lithuania	45	4.80	59	3.86	44	4.14	41	4.82	70	6.37
Luxembourg	10	5.73	14	5.45	15	5.63	19	5.28	46	6.56
Macedonia, FYR	70	4.37	103	3.15	82	2.83	30	5.03	54	6.47
Madagascar	110	3.56	92	3.28	116	2.03	115	3.39	100	5.53
Malawi	117	3.26	63	3.78	115	2.06	124	2.31	106	4.89

(cont'd.)

Country/Economy	Basic requirements Rank	Basic requirements Score	1. Institutions Rank	1. Institutions Score	2. Infrastructure Rank	2. Infrastructure Score	3. Macroeconomy Rank	3. Macroeconomy Score	4. Health and primary education Rank	4. Health and primary education Score
Malaysia	24	5.44	18	5.12	23	5.09	31	4.97	42	6.58
Mali	120	3.14	70	3.66	112	2.09	113	3.48	122	3.34
Malta	39	4.98	31	4.59	37	4.37	76	4.26	32	6.69
Mauritania	114	3.40	64	3.77	111	2.09	120	2.82	105	4.91
Mauritius	49	4.70	44	4.26	42	4.17	104	3.79	44	6.58
Mexico	53	4.61	69	3.68	64	3.41	54	4.63	31	6.71
Moldova	88	4.09	101	3.18	85	2.77	67	4.41	92	6.01
Mongolia	97	3.91	105	3.13	106	2.24	60	4.46	95	5.82
Morocco	65	4.44	57	3.87	59	3.57	78	4.24	87	6.07
Mozambique	119	3.21	107	3.09	99	2.41	112	3.50	117	3.85
Namibia	69	4.40	49	4.07	43	4.15	43	4.79	111	4.58
Nepal	106	3.65	99	3.20	122	1.83	59	4.47	102	5.09
Netherlands	8	5.94	9	5.60	8	6.09	22	5.16	13	6.90
New Zealand	16	5.65	8	5.65	27	4.88	25	5.12	6	6.93
Nicaragua	95	3.93	102	3.15	101	2.34	89	4.07	83	6.16
Nigeria	112	3.53	94	3.26	105	2.26	55	4.62	116	3.98
Norway	6	5.96	6	5.71	19	5.41	5	5.80	10	6.93
Pakistan	93	3.96	79	3.51	67	3.36	86	4.19	108	4.79
Panama	46	4.72	65	3.77	46	4.10	75	4.27	27	6.76
Paraguay	102	3.81	122	2.66	109	2.15	90	4.07	68	6.38
Peru	76	4.28	96	3.25	91	2.69	49	4.66	48	6.53
Philippines	84	4.19	88	3.38	88	2.73	62	4.45	82	6.20
Poland	57	4.59	73	3.62	57	3.64	70	4.34	26	6.76
Portugal	34	5.22	28	4.83	26	4.93	80	4.23	16	6.88
Qatar	20	5.51	16	5.16	41	4.22	3	6.03	37	6.64
Romania	83	4.19	87	3.40	77	3.05	97	3.94	69	6.38
Russian Federation	66	4.43	114	2.97	61	3.52	33	4.95	77	6.29
Serbia and Montenegro	99	3.87	97	3.24	90	2.72	106	3.76	97	5.74
Singapore	2	6.13	4	5.90	6	6.16	8	5.67	20	6.81
Slovak Republic	47	4.70	53	4.03	47	4.08	68	4.37	74	6.31
Slovenia	36	5.17	43	4.27	32	4.51	29	5.08	19	6.83
South Africa	58	4.58	36	4.49	49	4.04	46	4.74	103	5.07
Spain	25	5.42	39	4.37	22	5.22	24	5.13	5	6.94
Sri Lanka	80	4.22	82	3.48	76	3.07	110	3.66	36	6.66
Suriname	91	4.06	89	3.37	100	2.36	94	4.01	51	6.50
Sweden	7	5.95	12	5.51	9	5.97	15	5.40	9	6.93
Switzerland	5	6.02	5	5.73	2	6.34	18	5.28	29	6.72
Taiwan, China	21	5.50	32	4.56	16	5.58	27	5.10	25	6.77
Tajikistan	94	3.94	77	3.53	108	2.20	96	3.94	85	6.09
Tanzania	111	3.54	56	3.88	93	2.65	100	3.88	118	3.76
Thailand	38	4.98	40	4.37	38	4.36	28	5.10	84	6.09
Timor-Leste	116	3.27	119	2.90	124	1.66	82	4.22	114	4.31
Trinidad and Tobago	63	4.49	85	3.41	70	3.29	38	4.88	64	6.39
Tunisia	31	5.27	19	5.09	36	4.39	37	4.91	33	6.69
Turkey	72	4.34	51	4.05	63	3.46	111	3.58	78	6.28
Uganda	118	3.22	100	3.18	118	1.99	66	4.42	123	3.29
Ukraine	86	4.15	104	3.14	69	3.30	74	4.27	94	5.88
United Arab Emirates	26	5.41	20	5.05	25	4.99	4	5.92	99	5.67
United Kingdom	14	5.67	15	5.38	14	5.74	48	4.67	14	6.89
United States	27	5.41	27	4.84	12	5.82	69	4.37	40	6.60
Uruguay	61	4.51	42	4.29	58	3.59	109	3.73	59	6.41
Venezuela	85	4.19	125	2.38	84	2.78	26	5.11	53	6.48
Vietnam	71	4.37	74	3.62	83	2.79	53	4.63	56	6.43
Zambia	113	3.43	67	3.72	87	2.75	119	3.07	115	4.17
Zimbabwe	122	2.96	120	2.88	98	2.44	125	2.20	113	4.32

Source:Global Competitiveness Report,2006-2007

Table 5: Global Competitiveness Index: Efficiency enhancers

Country/Economy	Efficiency enhancers Rank	Efficiency enhancers Score	5. Higher education and training Rank	5. Higher education and training Score	6. Market efficiency Rank	6. Market efficiency Score	7. Technological readiness Rank	7. Technological readiness Score
Albania	99	3.12	92	3.24	109	3.55	104	2.56
Algeria	92	3.24	84	3.46	96	3.67	100	2.58
Angola	123	2.51	125	1.92	120	3.35	120	2.26
Argentina	66	3.79	39	4.51	94	3.68	70	3.19
Armenia	88	3.33	80	3.58	104	3.60	86	2.81
Australia	10	5.43	14	5.56	11	5.23	7	5.50
Austria	20	5.16	19	5.39	26	4.94	21	5.15
Azerbaijan	78	3.52	82	3.56	81	3.96	76	3.03
Bahrain	49	4.15	64	3.97	39	4.47	41	4.01
Bangladesh	108	3.01	108	2.68	83	3.93	114	2.41
Barbados	29	4.60	24	5.23	49	4.33	34	4.23
Belgium	23	5.07	4	5.83	32	4.69	27	4.68
Benin	105	3.02	101	2.96	95	3.67	112	2.42
Bolivia	97	3.13	89	3.40	111	3.53	111	2.46
Bosnia and Herzegovina	93	3.22	86	3.44	93	3.69	108	2.52
Botswana	77	3.52	87	3.41	59	4.20	80	2.95
Brazil	57	3.94	60	4.10	58	4.21	57	3.50
Bulgaria	70	3.67	62	4.05	90	3.75	68	3.21
Burkina Faso	109	2.95	116	2.51	87	3.78	103	2.56
Burundi	124	2.46	123	2.16	123	3.28	125	1.96
Cambodia	110	2.94	110	2.63	99	3.63	105	2.56
Cameroon	113	2.90	103	2.85	115	3.45	113	2.41
Canada	15	5.35	17	5.51	7	5.26	17	5.28
Chad	125	2.35	124	1.99	124	3.07	124	1.99
Chile	31	4.58	40	4.48	24	5.04	35	4.22
China	71	3.66	77	3.68	56	4.22	75	3.07
Colombia	65	3.82	69	3.89	51	4.32	65	3.24
Costa Rica	51	4.08	52	4.26	52	4.25	44	3.74
Croatia	52	4.07	44	4.43	68	4.11	47	3.68
Cyprus	44	4.27	41	4.48	55	4.22	38	4.10
Czech Republic	27	4.73	27	5.04	41	4.43	26	4.74
Denmark	6	5.59	2	5.91	6	5.40	10	5.46
Dominican Republic	76	3.58	91	3.36	82	3.95	58	3.42
Ecuador	96	3.13	97	3.09	112	3.51	88	2.79
Egypt	74	3.61	75	3.73	65	4.14	79	2.97
El Salvador	68	3.70	83	3.51	50	4.32	64	3.27
Estonia	19	5.18	23	5.26	25	4.98	16	5.29
Ethiopia	120	2.68	120	2.39	118	3.40	121	2.26
Finland	4	5.60	1	6.23	17	5.13	12	5.44
France	22	5.07	12	5.57	28	4.83	25	4.81
Gambia	101	3.09	106	2.81	89	3.77	92	2.69
Georgia	87	3.36	76	3.69	86	3.86	106	2.54
Germany	17	5.22	18	5.42	20	5.09	20	5.16
Greece	47	4.18	34	4.78	62	4.17	50	3.58
Guatemala	82	3.46	94	3.19	77	4.03	71	3.17
Guyana	114	2.89	114	2.54	106	3.56	101	2.57
Honduras	100	3.10	95	3.11	107	3.56	95	2.63
Hong Kong SAR	11	5.40	25	5.08	1	5.69	13	5.44
Hungary	32	4.57	30	4.93	37	4.61	36	4.18
Iceland	8	5.47	13	5.57	8	5.25	4	5.60
India	41	4.32	49	4.35	21	5.07	55	3.52
Indonesia	50	4.12	53	4.25	27	4.93	72	3.17
Ireland	18	5.21	16	5.52	13	5.22	24	4.89
Israel	12	5.40	20	5.39	14	5.17	3	5.65
Italy	40	4.41	35	4.77	78	4.02	32	4.43
Jamaica	53	4.06	67	3.94	61	4.19	40	4.04
Japan	16	5.33	15	5.54	10	5.23	19	5.21
Jordan	58	3.92	54	4.22	53	4.25	62	3.30
Kazakhstan	56	3.97	51	4.28	44	4.39	66	3.23
Kenya	81	3.47	88	3.41	72	4.10	81	2.91
Korea, Rep.	25	5.00	21	5.38	43	4.39	18	5.22
Kuwait	45	4.20	59	4.11	29	4.80	46	3.70
Kyrgyz Republic	102	3.08	79	3.60	114	3.48	122	2.16
Latvia	36	4.48	28	5.01	40	4.44	43	3.98
Lesotho	119	2.80	115	2.52	119	3.40	110	2.48
Lithuania	38	4.44	29	4.97	45	4.35	42	3.99
Luxembourg	24	5.00	45	4.42	18	5.11	9	5.47
Macedonia, FYR	80	3.47	66	3.96	91	3.74	91	2.71

(cont'd.)

Country/Economy	Efficiency enhancers Rank	Efficiency enhancers Score	5. Higher education and training Rank	5. Higher education and training Score	6. Market efficiency Rank	6. Market efficiency Score	7. Technological readiness Rank	7. Technological readiness Score
Madagascar	112	2.92	113	2.55	103	3.62	99	2.58
Malawi	116	2.87	119	2.46	88	3.77	118	2.37
Malaysia	26	4.89	32	4.80	9	5.24	28	4.64
Mali	118	2.83	118	2.48	102	3.62	117	2.38
Malta	33	4.57	47	4.36	46	4.35	22	5.00
Mauritania	111	2.94	121	2.33	101	3.62	84	2.86
Mauritius	61	3.86	68	3.94	67	4.11	54	3.55
Mexico	59	3.91	71	3.88	48	4.35	56	3.51
Moldova	85	3.38	73	3.78	92	3.73	96	2.62
Mongolia	86	3.37	70	3.89	100	3.62	97	2.60
Morocco	75	3.58	85	3.45	74	4.08	67	3.22
Mozambique	121	2.62	122	2.30	122	3.29	119	2.27
Namibia	90	3.28	105	2.82	79	4.00	78	3.00
Nepal	117	2.87	109	2.63	105	3.58	116	2.39
Netherlands	9	5.45	8	5.67	12	5.23	11	5.45
New Zealand	21	5.15	22	5.33	15	5.17	23	4.94
Nicaragua	95	3.15	93	3.23	98	3.65	98	2.59
Nigeria	89	3.31	100	3.04	70	4.10	87	2.79
Norway	13	5.38	9	5.64	16	5.16	15	5.32
Pakistan	91	3.27	104	2.82	54	4.23	89	2.77
Panama	62	3.86	74	3.75	42	4.41	59	3.41
Paraguay	115	2.89	102	2.93	121	3.33	115	2.40
Peru	67	3.70	72	3.79	66	4.12	69	3.21
Philippines	63	3.85	63	4.02	57	4.21	61	3.32
Poland	48	4.17	33	4.79	64	4.16	51	3.56
Portugal	37	4.47	37	4.63	38	4.61	37	4.18
Qatar	39	4.41	46	4.36	30	4.77	39	4.10
Romania	55	3.99	50	4.34	76	4.03	49	3.59
Russian Federation	60	3.91	43	4.44	60	4.20	74	3.10
Serbia and Montenegro	72	3.63	61	4.09	97	3.66	73	3.16
Singapore	3	5.63	10	5.59	4	5.62	2	5.69
Slovak Republic	34	4.56	38	4.52	34	4.66	30	4.50
Slovenia	30	4.58	26	5.07	63	4.17	29	4.51
South Africa	46	4.19	56	4.17	33	4.67	45	3.72
Spain	28	4.62	31	4.86	36	4.63	33	4.38
Sri Lanka	79	3.51	81	3.56	71	4.10	83	2.87
Suriname	107	3.01	99	3.08	117	3.41	107	2.53
Sweden	2	5.65	3	5.85	19	5.11	1	6.01
Switzerland	5	5.59	6	5.77	5	5.44	5	5.57
Taiwan, China	14	5.36	7	5.67	22	5.07	14	5.32
Tajikistan	103	3.07	98	3.09	108	3.56	102	2.57
Tanzania	94	3.16	112	2.56	75	4.07	82	2.87
Thailand	43	4.29	42	4.44	31	4.76	48	3.67
Timor-Leste	122	2.57	111	2.62	125	2.95	123	2.15
Trinidad and Tobago	64	3.82	65	3.97	69	4.11	60	3.40
Tunisia	42	4.31	36	4.72	35	4.65	53	3.56
Turkey	54	4.02	57	4.15	47	4.35	52	3.56
Uganda	98	3.12	107	2.78	84	3.90	94	2.67
Ukraine	69	3.68	48	4.35	80	3.96	90	2.71
United Arab Emirates	35	4.55	58	4.13	23	5.05	31	4.47
United Kingdom	7	5.59	11	5.57	3	5.63	6	5.56
United States	1	5.66	5	5.82	2	5.67	8	5.49
Uruguay	73	3.63	55	4.19	116	3.42	63	3.27
Venezuela	84	3.40	78	3.63	110	3.53	77	3.02
Vietnam	83	3.45	90	3.39	73	4.10	85	2.85
Zambia	106	3.01	117	2.48	85	3.87	93	2.67
Zimbabwe	104	3.02	96	3.10	113	3.48	109	2.48

Source:Global Competitiveness Report,2006-2007

Table 6: Global Competitiveness Index: Innovation factors

Country/Economy	Innovation factors Rank	Innovation factors Score	8. Business sophistication Rank	8. Business sophistication Score	9. Innovation Rank	9. Innovation Score
Albania	121	2.57	115	3.10	125	2.04
Algeria	90	3.22	103	3.36	76	3.09
Angola	123	2.52	123	2.74	121	2.30
Argentina	79	3.44	75	3.85	83	3.03
Armenia	93	3.17	104	3.34	84	3.00
Australia	24	4.66	28	4.98	24	4.35
Austria	12	5.28	4	5.91	17	4.65
Azerbaijan	70	3.59	70	3.92	63	3.26
Bahrain	77	3.47	55	4.24	101	2.71
Bangladesh	104	3.01	96	3.42	109	2.59
Barbados	54	3.78	58	4.21	49	3.36
Belgium	14	5.21	12	5.73	16	4.68
Benin	88	3.23	85	3.58	90	2.87
Bolivia	119	2.64	119	2.97	120	2.31
Bosnia and Herzegovina	99	3.08	92	3.47	104	2.68
Botswana	95	3.15	95	3.43	91	2.87
Brazil	38	4.09	38	4.61	38	3.56
Bulgaria	85	3.26	84	3.59	87	2.93
Burkina Faso	84	3.27	98	3.40	69	3.14
Burundi	118	2.66	117	3.01	119	2.32
Cambodia	102	3.05	100	3.37	98	2.72
Cameroon	101	3.05	101	3.37	97	2.73
Canada	16	5.08	18	5.33	13	4.82
Chad	122	2.53	121	2.81	122	2.26
Chile	33	4.22	30	4.88	39	3.56
China	57	3.75	65	4.05	46	3.44
Colombia	48	3.82	48	4.34	57	3.30
Costa Rica	35	4.16	34	4.66	36	3.65
Croatia	50	3.81	61	4.17	45	3.45
Cyprus	49	3.81	50	4.32	55	3.30
Czech Republic	27	4.47	29	4.96	28	3.98
Denmark	7	5.40	9	5.76	10	5.04
Dominican Republic	91	3.22	79	3.72	99	2.72
Ecuador	97	3.14	82	3.63	105	2.65
Egypt	65	3.63	57	4.22	82	3.04
El Salvador	75	3.51	62	4.13	89	2.89
Estonia	32	4.24	35	4.65	30	3.83
Ethiopia	116	2.72	120	2.94	114	2.50
Finland	6	5.65	11	5.74	4	5.56
France	13	5.28	10	5.76	14	4.80
Gambia	112	2.89	106	3.30	115	2.48
Georgia	113	2.86	116	3.02	102	2.71
Germany	3	5.89	1	6.26	5	5.51
Greece	45	3.89	46	4.35	47	3.43
Guatemala	64	3.63	60	4.19	78	3.07
Guyana	106	2.95	97	3.42	116	2.48
Honduras	100	3.07	87	3.53	107	2.61
Hong Kong SAR	18	4.97	13	5.48	22	4.46
Hungary	39	4.08	49	4.34	31	3.82
Iceland	17	5.00	14	5.45	19	4.55
India	26	4.60	25	5.06	26	4.14
Indonesia	41	4.07	42	4.53	37	3.60
Ireland	19	4.96	16	5.39	20	4.54
Israel	8	5.40	17	5.38	7	5.42
Italy	31	4.29	24	5.08	43	3.50
Jamaica	56	3.77	56	4.22	54	3.32
Japan	1	6.02	2	6.14	1	5.90
Jordan	61	3.65	67	4.04	64	3.25
Kazakhstan	74	3.51	72	3.90	70	3.13
Kenya	59	3.73	68	4.04	48	3.42
Korea, Rep.	20	4.96	22	5.20	15	4.71
Kuwait	46	3.85	33	4.66	81	3.04
Kyrgyz Republic	108	2.93	105	3.31	111	2.55
Latvia	58	3.74	54	4.28	66	3.19
Lesotho	120	2.59	122	2.80	117	2.37
Lithuania	44	3.96	41	4.56	50	3.35
Luxembourg	23	4.81	21	5.27	23	4.36
Macedonia, FYR	87	3.24	88	3.50	86	2.98

(cont'd.)

Country/Economy	Innovation factors Rank	Innovation factors Score	8. Business sophistication Rank	8. Business sophistication Score	9. Innovation Rank	9. Innovation Score
Madagascar	89	3.23	99	3.39	77	3.07
Malawi	109	2.93	113	3.16	103	2.70
Malaysia	22	4.91	20	5.29	21	4.53
Mali	94	3.17	107	3.29	80	3.04
Malta	53	3.79	51	4.32	62	3.26
Mauritania	105	2.98	102	3.36	108	2.60
Mauritius	47	3.84	44	4.44	65	3.23
Mexico	52	3.80	52	4.30	58	3.29
Moldova	98	3.09	93	3.46	100	2.72
Mongolia	110	2.92	118	2.98	94	2.86
Morocco	72	3.54	78	3.82	61	3.26
Mozambique	115	2.86	114	3.13	110	2.58
Namibia	86	3.25	83	3.60	88	2.91
Nepal	111	2.90	108	3.26	112	2.54
Netherlands	11	5.35	7	5.80	11	4.90
New Zealand	25	4.65	26	5.06	25	4.23
Nicaragua	107	2.94	109	3.23	106	2.64
Nigeria	69	3.60	74	3.87	52	3.33
Norway	21	4.95	19	5.30	18	4.59
Pakistan	60	3.66	66	4.05	60	3.27
Panama	62	3.64	53	4.29	85	2.99
Paraguay	117	2.68	112	3.16	123	2.20
Peru	68	3.61	47	4.35	92	2.86
Philippines	66	3.63	59	4.20	79	3.05
Poland	51	3.80	63	4.13	44	3.47
Portugal	37	4.14	43	4.47	32	3.81
Qatar	55	3.78	69	4.04	41	3.51
Romania	73	3.52	73	3.89	68	3.14
Russian Federation	71	3.55	77	3.83	59	3.28
Serbia and Montenegro	83	3.27	94	3.44	71	3.11
Singapore	15	5.11	23	5.17	9	5.04
Slovak Republic	43	3.96	45	4.41	42	3.51
Slovenia	34	4.18	36	4.64	34	3.71
South Africa	29	4.35	32	4.79	29	3.92
Spain	30	4.34	27	5.00	35	3.68
Sri Lanka	67	3.61	71	3.90	53	3.32
Suriname	114	2.86	111	3.18	113	2.54
Sweden	5	5.66	5	5.87	6	5.44
Switzerland	2	5.89	3	6.06	3	5.72
Taiwan, China	9	5.38	15	5.45	8	5.31
Tajikistan	103	3.02	110	3.19	95	2.85
Tanzania	76	3.49	81	3.68	56	3.30
Thailand	36	4.15	40	4.57	33	3.74
Timor-Leste	125	2.36	124	2.58	124	2.14
Trinidad and Tobago	63	3.63	64	4.10	67	3.17
Tunisia	28	4.42	31	4.80	27	4.05
Turkey	42	3.96	39	4.58	51	3.35
Uganda	82	3.30	90	3.49	72	3.11
Ukraine	78	3.47	76	3.84	73	3.11
United Arab Emirates	40	4.08	37	4.63	40	3.52
United Kingdom	10	5.36	6	5.82	12	4.89
United States	4	5.75	8	5.78	2	5.72
Uruguay	80	3.41	80	3.71	74	3.10
Venezuela	96	3.14	91	3.48	96	2.80
Vietnam	81	3.32	86	3.55	75	3.10
Zambia	124	2.43	125	2.51	118	2.35
Zimbabwe	92	3.18	89	3.50	93	2.86

Source:Global Competitiveness Report,2006-2007

9-APPENDIX 2

9.1 Data Series

Year	Real GDP			Number Triadic Patent Families			Gross R&D Expenditure as a percentage of GDP			res.
	TUR.	**S.KOREA**	**IRELAND**	**TUR.**	**S.KOREA**	**IR.**	**TUR.**	**S.KOREA**	**IRELAND**	**IR.**
	YTL	**K.WAN**	**EUROS**							
	1987 P.	2000 P.	2000 P.							
1990	0.084		60994	1		27	0.32		0.83	4
1991	0.084	350819.9	61995	0	92	27	0.53	1.84	0.93	4.4
1992	0.089	371433	64214	0	120	23	0.49	1.94	1.04	4.8
1993	0.097	394215.8	65700	2	166	19	0.44	2.12	1.17	4.1
1994	0.091	427868.2	69573	2	212	28	0.36	2.32	1.27	4.3
1995	0.098	467099.2	76246	2	326	30	0.38	2.37	1.28	4.5
1996	0.105	499789.8	82541	2	324	29	0.45	2.42	1.32	4.8
1997	0.113	523034.7	92183	3	386	34	0.49	2.48	1.29	5
1998	0.116	487183.5	100043	7	465	33	0.5	2.34	1.25	5.1
1999	0.111	533399.3	110768	4	500	56	0.63	2.25	1.19	4.9
2000	0.119	578664.5	120977	6	531	58	0.64	2.39	1.14	5
2001	0.11	600865.9	127931	7	593	58	0.72	2.59	1.11	5.1
2002	0.119	642748.1	135649	9	629	60	0.66	2.53	1.12	5.5

Source:OECD,IMF

9.2 Eviews Outputs

IRELAND

Dependent Variable: LOG(REALGDP)				
Method: Least Squares				
Date: 04/08/07 Time: 23:36				
Sample: 1990 2002				
Included observations: 13				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.09763	0.196317	51.43546	0.0000
Gross R&D expenditure as a percentage of GDP	0.533935	0.164401	3.247767	0.0088
Number of Triadic Patent Families	0.017683	0.001602	11.04100	0.0000
R-squared	0.931851	Mean dependent var		11.36689
Adjusted R-squared	0.918222	S.D. dependent var		0.291178
S.E. of regression	0.083268	Akaike info criterion		-1.934330
Sum squared resid	0.069336	Schwarz criterion		-1.803957
Log likelihood	15.57314	F-statistic		68.36908
Durbin-Watson stat	2.003598	Prob(F-statistic)		0.000001

1.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.008249	Probability	0.929621
Obs*R-squared	0.011905	Probability	0.913117

2.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.679986	Probability	0.533656
Obs*R-squared	1.888856	Probability	0.388902

White Heteroskedasticity Test:			
F-statistic	1.129202	Probability	0.407743
Obs*R-squared	4.691172	Probability	0.320477

Ramsey RESET Test:			
F-statistic	0.134006	Probability	0.722772
Log likelihood ratio	0.192137	Probability	0.661144

Dependent Variable: LOG(REALGDP)				
Method: Least Squares				
Date: 04/08/07 Time: 23:45				
Sample(adjusted): 1991 2002				
Included observations: 12 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.26689	0.191350	53.65507	0.0000
Gross R&D expenditure as a percentage of GDP (-1)	0.450310	0.170315	2.643975	0.0267
Number of Triadic Patent Families	0.016099	0.001691	9.520977	0.0000
R-squared	0.929574	Mean dependent var		11.39592
Adjusted R-squared	0.913924	S.D. dependent var		0.283798
S.E. of regression	0.083262	Akaike info criterion		-1.921321
Sum squared resid	0.062394	Schwarz criterion		-1.800095
Log likelihood	14.52793	F-statistic		59.39722
Durbin-Watson stat	1.989532	Prob(F-statistic)		0.000007

1.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.040864	Probability	0.844846
Obs*R-squared	0.060985	Probability	0.804946

White Heteroskedasticity Test:			
F-statistic	0.439623	Probability	0.777110
Obs*R-squared	2.409308	Probability	0.660946

Ramsey RESET Test:			
F-statistic	0.021264	Probability	0.887671
Log likelihood ratio	0.031853	Probability	0.858351

Dependent Variable: LOG(REALGDP)				
Method: Least Squares				
Date: 04/09/07 Time: 00:00				
Sample: 1990 2002				
Included observations: 13				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.511899	0.265168	35.87116	0.0000
Gross R&D expenditure as a percentage of GDP	0.352100	0.145061	2.427261	0.0382
Number of Triadic Patent Families	0.013870	0.001884	7.361099	0.0000
Researchers Per Thousand Employed Full Time Equivalent	0.198518	0.073266	2.709559	0.0240
R-squared	0.962468	Mean dependent var		11.36689
Adjusted R-squared	0.949957	S.D. dependent var		0.291178
S.E. of regression	0.065137	Akaike info criterion		-2.376980
Sum squared resid	0.038186	Schwarz criterion		-2.203149
Log likelihood	19.45037	F-statistic		76.93176
Durbin-Watson stat	2.601578	Prob(F-statistic)		0.000001

1.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.196142	Probability	0.305929
Obs*R-squared	1.690910	Probability	0.193481

2.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.470573	Probability	0.154235
Obs*R-squared	5.379291	Probability	0.067905

White Heteroskedasticity Test:			
F-statistic	1.678738	Probability	0.272428
Obs*R-squared	8.146968		0.227533

Ramsey RESET Test:			
F-statistic	3.687641	Probability	0.091070
Log likelihood ratio	4.928176	Probability	0.026422

Dependent Variable: LOG(REALGDP)
Method: Least Squares
Date: 04/09/07 Time: 00:33

Sample(adjusted): 1991 2002				
Included observations: 12 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.523062	0.332169	28.66929	0.0000
Gross R&D expenditure as a percentage of GDP (-1)	0.353230	0.140359	2.516614	0.0360
Number of Triadic Patent Families	0.012743	0.001890	6.741396	0.0001
Researchers Per Thousand Employed Full Time Equivalent	0.205838	0.081786	2.516786	0.0360
R-squared	0.960695	Mean dependent var		11.39592
Adjusted R-squared	0.945956	S.D. dependent var		0.283798
S.E. of regression	0.065976	Akaike info criterion		-2.337862
Sum squared resid	0.034822	Schwarz criterion		-2.176227
Log likelihood	18.02717	F-statistic		65.17898
Durbin-Watson stat	2.506959	Prob(F-statistic)		0.000006

1.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.830627	Probability	0.392395
Obs*R-squared	1.272890	Probability	0.259225

2.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.495409	Probability	0.297205
Obs*R-squared	3.991830	Probability	0.135889

White Heteroskedasticity Test:			
F-statistic	2.487383	Probability	0.168065
Obs*R-squared	8.988601	Probability	0.174220

Ramsey RESET Test:			
F-statistic	10.99206	Probability	0.012845
Log likelihood ratio	11.32825	Probability	0.000763

TURKEY

Dependent Variable: LOG(REALGDP)				
Method: Least Squares				
Date: 04/08/07 Time: 00:54				
Sample: 1990 2002				
Included observations: 13				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.631654	0.123744	-21.26692	0.0000
Gross R&D expenditure as a percentage of GDP	0.686033	0.236997	2.894693	0.0146
R-squared	0.432382	Mean dependent var		-2.282832
Adjusted R-squared	0.380781	S.D. dependent var		0.128898
S.E. of regression	0.101431	Akaike info criterion		-1.598245
Sum squared resid	0.113170	Schwarz criterion		-1.511330
Log likelihood	12.38859	F-statistic		8.379246
Durbin-Watson stat	0.910514	Prob(F-statistic)		0.014583

1.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	3.932609	Probability	0.075485
Obs*R-squared	3.669371	Probability	0.055421

2.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	3.932609	Probability	0.075485
Obs*R-squared	3.669371	Probability	0.055421

White Heteroskedasticity Test:			
F-statistic	1.700016	Probability	0.231457
Obs*R-squared	3.298530	Probability	0.192191

Ramsey RESET Test:			
F-statistic	0.230274	Probability	0.641644
Log likelihood ratio	0.295961	Probability	0.586426

Dependent Variable: LOG(REALGDP)				
Method: Least Squares				
Date: 04/08/07 Time: 01:11				
Sample: 1990 2002				
Included observations: 13				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.463585	0.100740	-24.45499	0.0000
Gross R&D expenditure as a percentage of GDP)	0.121591	0.235631	0.516023	0.6171
Number of Triadic Patent Families	0.034357	0.010023	3.427786	0.0065
R-squared	0.739023	Mean dependent var		-2.282832
Adjusted R-squared	0.686828	S.D. dependent var		0.128898
S.E. of regression	0.072134	Akaike info criterion		-2.221415
Sum squared resid	0.052033	Schwarz criterion		-2.091042
Log likelihood	17.43920	F-statistic		14.15878
Durbin-Watson stat	0.909429	Prob(F-statistic)		0.001211

1.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	3.464515	Probability	0.095612
Obs*R-squared	3.613353	Probability	0.057317

2.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.601458	Probability	0.260037
Obs*R-squared	3.716702	Probability	0.155930

White Heteroskedasticity Test:			
F-statistic	0.125682	Probability	0.968995
Obs*R-squared	0.768630	Probability	0.942603

Ramsey RESET Test:			
F-statistic	10.21885	Probability	0.010889
Log likelihood ratio	9.862669	Probability	0.001687

Dependent Variable: LOG(REALGDP)				
Method: Least Squares				
Date: 04/08/07 Time: 01:29				
Sample(adjusted): 1991 2002				
Included observations: 12 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.347477	0.108202	-21.69527	0.0000
Gross R&D expenditure as a percentage of GDP(-1)	-0.127035	0.273535	-0.464419	0.6534
Number of Triadic Patent Families	0.039221	0.011185	3.506476	0.0067
R-squared	0.743252	Mean dependent var		-2.266656
Adjusted R-squared	0.686197	S.D. dependent var		0.120061
S.E. of regression	0.067256	Akaike info criterion		-2.348314
Sum squared resid	0.040710	Schwarz criterion		-2.227087
Log likelihood	17.08988	F-statistic		13.02692
Durbin-Watson stat	1.431578	Prob(F-statistic)		0.002202

1.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.355061	Probability	0.567734
Obs*R-squared	0.509958	Probability	0.475157

2.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.287559	Probability	0.758543
Obs*R-squared	0.911065	Probability	0.634110

White Heteroskedasticity Test:			
F-statistic	0.397156	Probability	0.805206
Obs*R-squared	2.219620		0.695439

Ramsey RESET Test:			
F-statistic	4.635820	Probability	0.063468
Log likelihood ratio	5.485129	Probability	0.019179

Dependent Variable: LOG(REALGDP)				
Method: Least Squares				
Date: 04/08/07 Time: 01:45				
Sample(adjusted): 1992 2002				
Included observations: 11 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.191543	0.094337	-23.23097	0.0000
Gross R&D expenditure as a percentage of GDP(-2)	-0.489217	0.244224	-2.003150	0.0801
Number of Triadic Patent Families	0.044151	0.008783	5.026702	0.0010

1.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.003462	Probability	0.349837
Obs*R-squared	1.379164	Probability	0.240244

2.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.647355	Probability	0.556454
Obs*R-squared	1.952348	Probability	0.376750

White Heteroskedasticity Test:			
F-statistic	0.867848	Probability	0.533749
Obs*R-squared	4.031646	Probability	0.401740

Ramsey RESET Test:			
F-statistic	5.584036	Probability	0.050115
Log likelihood ratio	6.451708	Probability	0.011085

SOUTH KOREA

Dependent Variable: LOG(REALGDP)				
Method: Least Squares				
Date: 04/08/07 Time: 23:14				
Sample: 1991 2002				
Included observations: 12				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.23339	0.156723	78.05737	0.0000
Gross R&D expenditure as a percentage of GDP	0.251633	0.080158	3.139225	0.0119
Number of Triadic Patent Families	0.000754	9.88E-05	7.635281	0.0000
R-squared	0.973032	Mean dependent var		13.08496
Adjusted R-squared	0.967040	S.D. dependent var		0.192497
S.E. of regression	0.034948	Akaike info criterion		-3.657601
Sum squared resid	0.010992	Schwarz criterion		-3.536375
Log likelihood	24.94561	F-statistic		162.3666
Durbin-Watson stat	2.537223	Prob(F-statistic)		0.000000

1.Order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.071957	Probability	0.330784
Obs*R-squared	1.417940	Probability	0.233743

2.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	3.368379	Probability	0.094460
Obs*R-squared	5.885020	Probability	0.052733

White Heteroskedasticity Test:			
F-statistic	0.545698	Probability	0.708515
Obs*R-squared	2.852455	Probability	0.582812

Ramsey RESET Test:			
F-statistic	0.187191	Probability	0.676692
Log likelihood ratio	0.277552	Probability	0.598310

Dependent Variable: LOG(REALGDP)				
Method: Least Squares				
Date: 04/08/07 Time: 23:19				
Sample(adjusted): 1992 2002				
Included observations: 11 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.55132	0.228885	54.83668	0.0000
Gross R&D expenditure as a percentage of GDP (-1)	0.102428	0.121821	0.840805	0.4249
Number of Triadic Patent Families	0.000851	0.000160	5.316525	0.0007
R-squared	0.937549	Mean dependent var		13.11378
Adjusted R-squared	0.921936	S.D. dependent var		0.172635
S.E. of regression	0.048234	Akaike info criterion		-2.998506
Sum squared resid	0.018612	Schwarz criterion		-2.889989
Log likelihood	19.49178	F-statistic		60.05008
Durbin-Watson stat	2.021981	Prob(F-statistic)		0.000015

1.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.008224	Probability	0.930281
Obs*R-squared	0.012909	Probability	0.909542

2.order

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.236613	Probability	0.188024
Obs*R-squared	4.698217	Probability	0.095454

White Heteroskedasticity Test:			
F-statistic	1.352047	Probability	0.352380
Obs*R-squared	5.214682	Probability	0.265970

Ramsey RESET Test:			
F-statistic	0.005501	Probability	0.942949
Log likelihood ratio	0.008642	Probability	0.925935