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# High Technology Policy In The European Union

# Avrupa Birliğinde Yüksek Teknoloji Politikası

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*Technological progress and digital transformation have created new competitive conditions for the global economy. This development process, which is named as the Fourth Industrial Revolution, provides important opportunities for humanity and causes the change of all balances and the reshaping of competition conditions at the level of countries. European Union countries aimed to establish a common market for the community, develop economic activities within the community, strengthen stability and improve the standard of living. The European Union follows common policies in many areas such as agriculture, industry, competition and foreign trade. Against the new world order emerging with the rapidly developing technology, the European Union has started to need to strengthen its economic and social structure and increase its competitiveness. In this study, the current high technology policy of the European Union is tried to be examined in outline. In the first section, it deals with the concept of high technology. In the second section, high technology investments in the European Union are evaluated. In the third section, the goals of the high technology policy of the European Union and the tools used to achieve these goals are discussed. In this context, Lisbon strategy, R&D policies, Europe 2020 strategy as well as Framework Programs are evaluated. In addition, entrepreneurship policy and, in this context, policies applied to improve the environment for small and medium enterprises in the high technology of the European Union are discussed.*

*Keywords: European Union, High Technology, Lisbon Strategy*

*JEL Classification: A1, H50, H70, N74, O30*

*Teknolojik ilerleme ve dijital dönüşüm, küresel ekonomi için yeni rekabet koşulları yaratmıştır. Dördüncü Sanayi Devrimi olarak adlandırılan bu gelişme süreci, insanlık için önemli fırsatlar sunmakta ve ülkeler düzeyinde tüm dengelerin değişmesine ve rekabet koşullarının yeniden şekillenmesine neden olmaktadır. Avrupa Birliği ülkeleri, toplum için ortak bir pazar kurmayı, topluluk içinde ekonomik faaliyetleri geliştirmeyi, istikrarı güçlendirmeyi ve yaşam standardını iyileştirmeyi amaçlamaktadır. Avrupa Birliği tarım, sanayi, rekabet ve dış ticaret gibi birçok alanda ortak politikalar izlemektedir. Hızla gelişen teknoloji ile ortaya çıkan yeni dünya düzenine karşı Avrupa Birliği, ekonomik ve sosyal yapısını güçlendirmeye ve rekabet gücünü artırmaya ihtiyaç duymaya başlamıştır. Bu çalışmada Avrupa Birliği'nin mevcut yüksek teknoloji politikası ana hatlarıyla incelenmeye çalışılmıştır. Birinci bölümde yüksek teknoloji kavramı ele alınmaktadır. İkinci bölümde Avrupa Birliği'ndeki yüksek teknoloji yatırımları değerlendirilmektedir. Üçüncü bölümde, Avrupa Birliği'nin yüksek teknoloji politikasının hedefleri ve bu hedeflere ulaşmak için kullanılan araçlar tartışılmaktadır. Bu kapsamda Lizbon stratejisi, Ar-Ge politikaları, Avrupa 2020 stratejisi ve Çerçeve Programları değerlendirilmektedir. Ayrıca girişimcilik politikası ve bu bağlamda Avrupa Birliği'nin yüksek teknolojisinde küçük ve orta ölçekli işletmeler için çevreyi iyileştirmek için uygulanan politikalar tartışılmaktadır.*

*Anahtar Kelimeler: Avrupa Birliği, Yüksek Teknoloji, Lisbon Stratejisi*

*JEL Sınıflandırması: A1, H50, H70, N74, O30*

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## 1. Introduction

Technological progress and digital transformation have created new competitive conditions for the global economy. This development process, which is named as the Fourth Industrial Revolution, provides important opportunities for humanity and causes the change of all balances and the reshaping of competition conditions at the level of countries. Advanced and disruptive technologies such as artificial intelligence, internet, big data and data analytics, nanotechnology, biotechnology, robotics and advances in areas such as autonomous driving, drones, space aviation, precision medicine are rapidly transforming production, consumption and policies. This technological transformation has a significant impact on the global economy and human well-being.

Since it is important to produce and export high-tech products in order to increase the competitiveness and efficiency of countries in the world market. Export revenues to be obtained from high technology are important for the economic growth, development and economic future of countries (Durmaz and Yildiz 2020). In order to reach their economic development goals in the long run, countries need systematically developed and implemented policies. European Union countries aimed to establish a common market for the community, develop economic activities within the community, strengthen stability and improve the standard of living. In line with these goals, the common market was completed in 1993. The Euro went into circulation in 2002 as one of the most important results of these targets. However, for all regions of the European Union to benefit from these developments, support had to be given to policies towards developing high-tech products, financed and developed by the European Union itself.

The European Union follows common policies in many areas such as agriculture, industry, competition and foreign trade. Against the new world order emerging with the rapidly developing technology, the European Union has started to need to strengthen its economic and social structure and increase its competitiveness. The first legal basis in the European Community for science and technology policies was the Single European Act of 1987 (Single European Act 1987). Within the framework of the Single European Act, it is aimed to ensure the free movement of production factors by attaching importance to the development of R&D and technology capabilities in order to increase the international competitiveness of companies. Community institutions have been given authority on science and technology issues. In Single European Act, the main objective is to strengthen the industries of member countries and increase their international competitiveness. With the Lisbon Strategy adopted in 2000, the goal of transforming the European Union into “the

world's most competitive, dynamic and knowledge-based economy" has been set by 2010. With the Europe 2020 Strategy, it is aimed to transform the European Union into an economy based on knowledge and innovation, using resources efficiently, environmentally friendly and more competitive, and supporting social and regional harmony by providing high employment. The European Union Framework Programs are the Union Program structure created in order to harmonize the science and technology policies and practices of Europe between the member and candidate member countries of the Union. Framework Programs, the first of which was initiated in 1984, are the world's highest budgeted civil research program.

The relationship between high-tech products, science, technology, innovation and economic performance has long been controversial in the academic field (Dedrick et. all 2003; Jamali et. all 2011; Lundvall and Borras 2005; Rosenberg 1971). High-tech products, science, technology and innovation policies directly affect the welfare levels of countries and at the same time direct social developments. The importance of these policies implemented by countries in order to achieve economic and social development goals is increasing. Thus, high technology policies are among the issues that are emphasized in the European Union. Also, European Union countries have thought it would be more effective at Union level of common policies and have developed high-tech strategies in this context. As the most important implementation tool of the European Union's high technology policies, can be sited as examples strategic programs such as Lisbon Strategy, Europe 2020 Strategy, Framework programs and Horizon 2020 for research and technological development. When the literature is examined, it is seen that there are a limited number of studies evaluating the high technology policies of the European Union. However, in previous studies, it was observed that a general assessment of European Unions' high technology policies was not made. The study differs from other studies in the literature with the different statistical analysis methods it uses.

In this study, the current high technology policy of the European Union is tried to be examined in outline. In the first section, it deals with the concept of high technology. In the second section, high technology investments in the European Union are evaluated. In the third section, the goals of the high technology policy of the European Union and the tools used to achieve these goals are discussed. In this context, Lisbon strategy, R&D policies, Europe 2020 strategy as well as Framework Programs are evaluated. In addition, entrepreneurship policy and, in this context, policies applied to improve the environment for small and medium enterprises in the high technology of the European Union are discussed.

## 2. Definition of High Technology

There is no definite and scientific definition of high technology accepted by everyone. However, it has been tried to be defined by various authors in economics, political science, marketing, business and management literature. Major advances in technology have brought along the concept of high technology. It is possible to see direct or indirect high technology applications in all products used in daily life. These applications can be directly used in the product or service itself, or indirectly in the production phase of the product, such as design, manufacturing, software or service. High technology products; defined as products with high R&D intensity such as aerospace, computers, medical products, scientific devices-instruments and electrical machines (World Bank, 2020). High technology is developing rapidly and is an important factor in the development of countries. Also it is a very cost-intensive field. High technology products generally; It is smaller, lighter, more reliable and energy efficient, less costly and more readily available. Most high-tech products; It is researched and developed in major universities, research centers, large companies and public facilities.

The OECD has developed a four-way export classification: high technology, medium-high technology, medium-low technology and low technology product. The classification is based on the gross income and added value of different exporting industries and research and development expenditures. High-tech products include aircraft, computers, office machinery, electronics-communications and pharmaceutical products; medium-high technology products include scientific instruments, motor vehicles, electrical equipment and chemicals, non-electrical machinery; medium-low technology products include rubber, plastics, base metals and shipbuilding; low-technology products are products such as food processing, textiles, paper printing, clothing and shoes (Hatzichronoglou 1997). High technology products defines as devices, procedures, processes, techniques or sciences that are described by current development and have a short and volatile life (Grunenwald and Vernon 1988: 61).

According to Meldrum (1995), defining high technology products is highly complex given its breadth of scope. First of all, products with this feature are pioneers, that is, the latest technology products. However, high-tech products: 1) It is developed in a highly technical framework; 2) It is produced in cooperation with new and advanced technology; 3) It occurs with a high degree of uncertainty with a technological base; and 4) It does not always cooperate with existing infrastructure equipment outside the enterprise (Meldrum 1995). High technology products are prepared in accordance with certain standards. The knowledge and technology density it contains requires that these products be produced in a certain order.

Compliance of products with international standards in this field is an important factor in consumer preferences (Reddy 1987).

By focusing on distinguishing the features of high technology companies, these characteristics can be listed as follows: they tend to employ engineers intensively; product life cycles are short; they are portrayed as risky and are faced more intensely in rapid growth or rapid decline than non-high-tech companies (Riggs 1983). High technology products are defined as products that contain turbulent technology in usage, production or distribution, while traditional products are accepted as products containing familiar and accepted technologies (Gardner et all. 2000).

The important factor for the development of high technology is capital investment. Individuals can put forward their ideas for high technology, but capital is required to make these ideas feasible and productive. Government incentives are also important along with capital investments for high technology research and development activities. The added value of consumer products and other social and economic advantages that will result from high technology investments with the collected taxes make these investments feasible (Ajagbe et all. 2012; Mansfield 1995; Spar 1998; Gimmon and Levie 2010). In order for a job to be labeled as "high technology", it must meet the following criteria: 1) the job requires a strong scientific-technical foundation; 2) new technology can make old one obsolete in a short time; 3) as new technologies arrive, their applications create new markets and demand or radically change existing ones (Shanklin and Ryans 1998).

## 3. High Technology Investments in the European Union

Increasing the share of value-added and high technology exports in total exports depends on the intensity and productivity of the countries' research and development activities. In this direction, countries should carry out their investments and research and development activities in high technology sectors where they can gain comparative advantage in order to exist in international competition. With the technological advances realized, the range of products with high technology and added value in exports will be expanded by providing international competitive advantage. This will enable countries to gain comparative advantage in global trade. Another important point for countries to gain comparative advantage in global competition is the capital investments made. In order to gain international competitive advantage, countries should direct their capital investments to high value-added and high-technology intensive areas (SelectUSA2017; Tonkova et. all 2019; Lovely and Huang 2018). The achievement of export-driven economic growth is based on both the high added value of

the products exported by the countries and the high product range. At this point, it is necessary to evaluate the European Union's capital investments in high technology (see Figure 1).

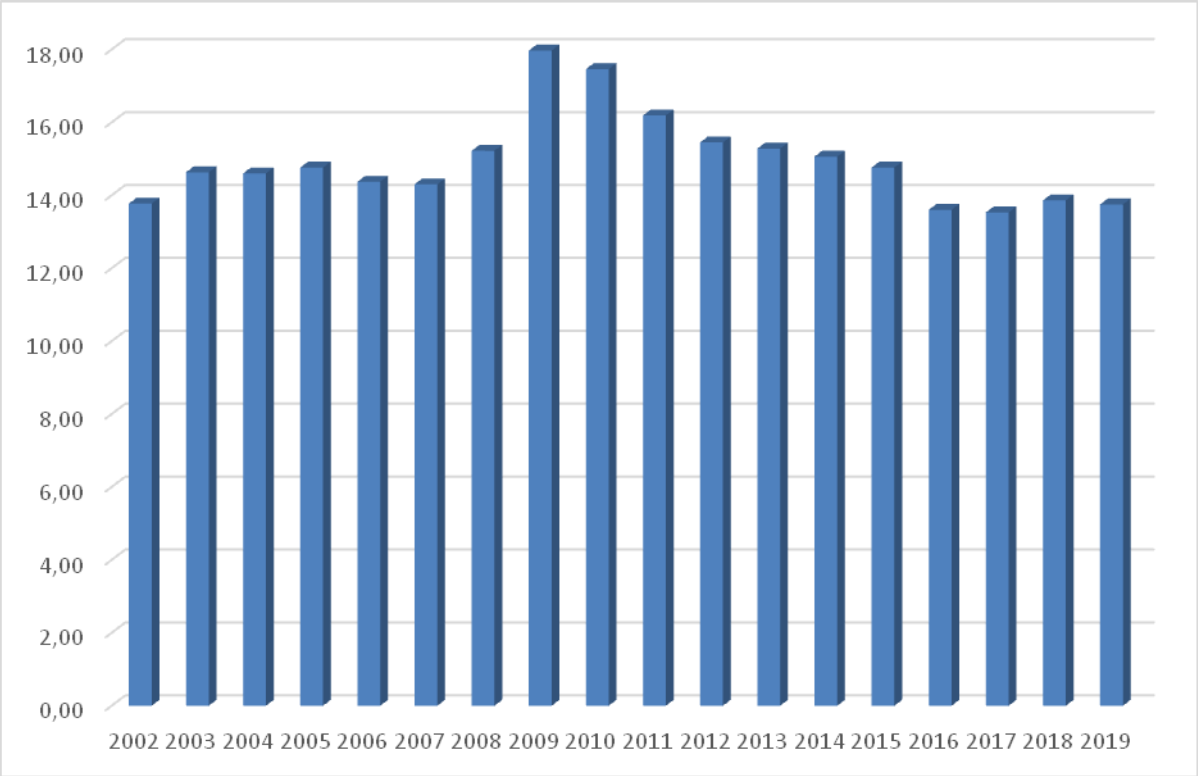


Figure 1. Investment by Sector in European Union, % of GFCF, 2002-2019

*Source: OECD (2020), Investment by sector (indicator). doi: 10.1787/abd72f11-en (Accessed on 28 December 2020). Note: Data for General Government. For government this typically means investment in R&D, military weapons systems, transport infrastructure and public buildings such as schools and hospitals.*

Also, the number of domestic patents owned by the countries reflects the number of inventions and inventions realized in the country and shows how effectively the research and development system works. The number of domestic patents showing the number of inventions made by the countries enables the countries to show their research and development capacities and to measure the output based on research and development. However, the number of patents owned by countries reflects the innovation potential of that country (Ang et. All 2015). Companies producing high-tech products generally protect their new products and production methods with patents. With the patent application, innovative companies protect their new products from counterfeits that will be put on the market by their competitors (Helmers and Rogers 2011).

Figure 2 includes the patent application numbers of the European Union, United States and Japan. Patent applications contain important information about the innovation level of the residents of a country. However, it is important in terms of showing the technological development level of the European Union.

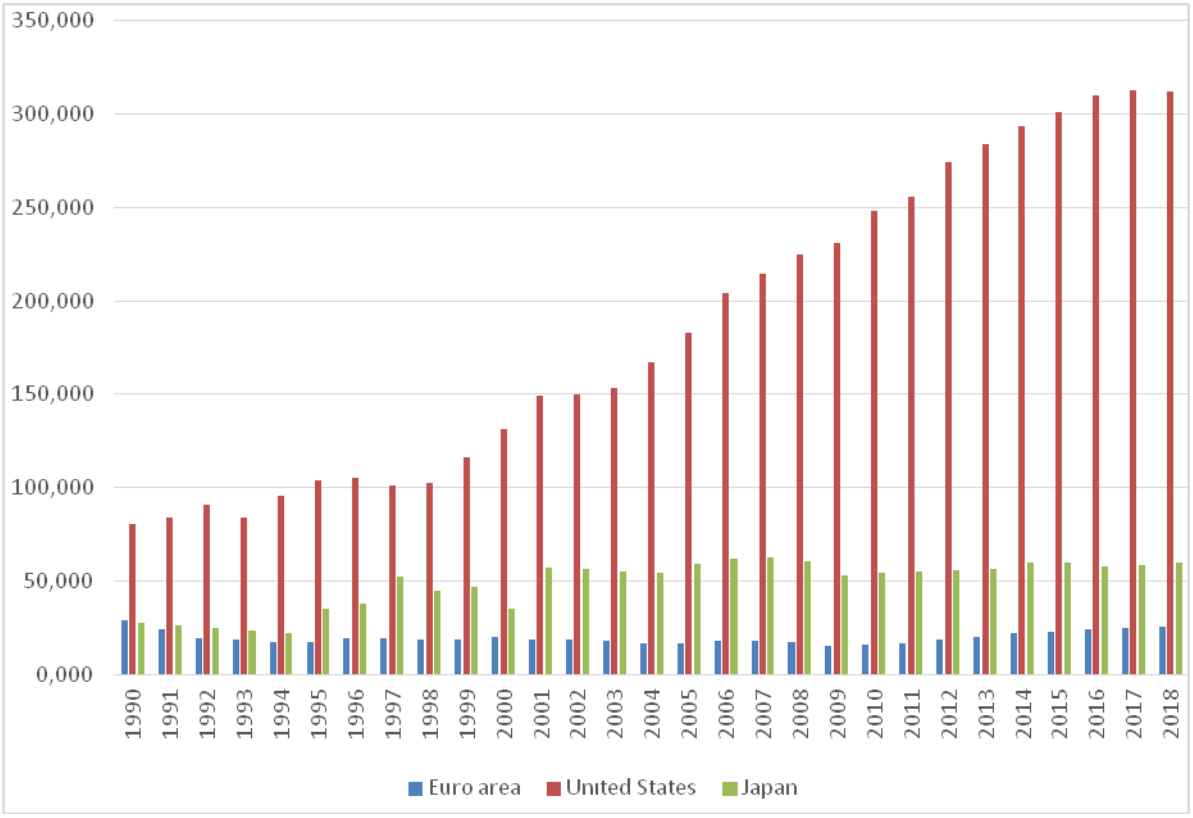


Figure 2. Patent Applications, 1990-2018

*Source: World Development Indicators*

When the years of 1990-2018 are examined, an increase in the number of patent applications handled to represent technological development in the European Union is not observed. For example, patent applications in the European Union were 28,634 in 1990 and 25,673 in 2018 (see Figure 2). On the contrary, significant increases are observed in the United States and Japan. This situation indicates that innovation initiatives have increased in line with the importance given to technological development in the United States and Japan.

Figure 3 includes the numbers of scientific and technical journal articles in the European Union. When examined over the years, a significant increase is observed in the number of scientific and technical journal articles. This implies that the importance given to technological development in the European Union has increased.

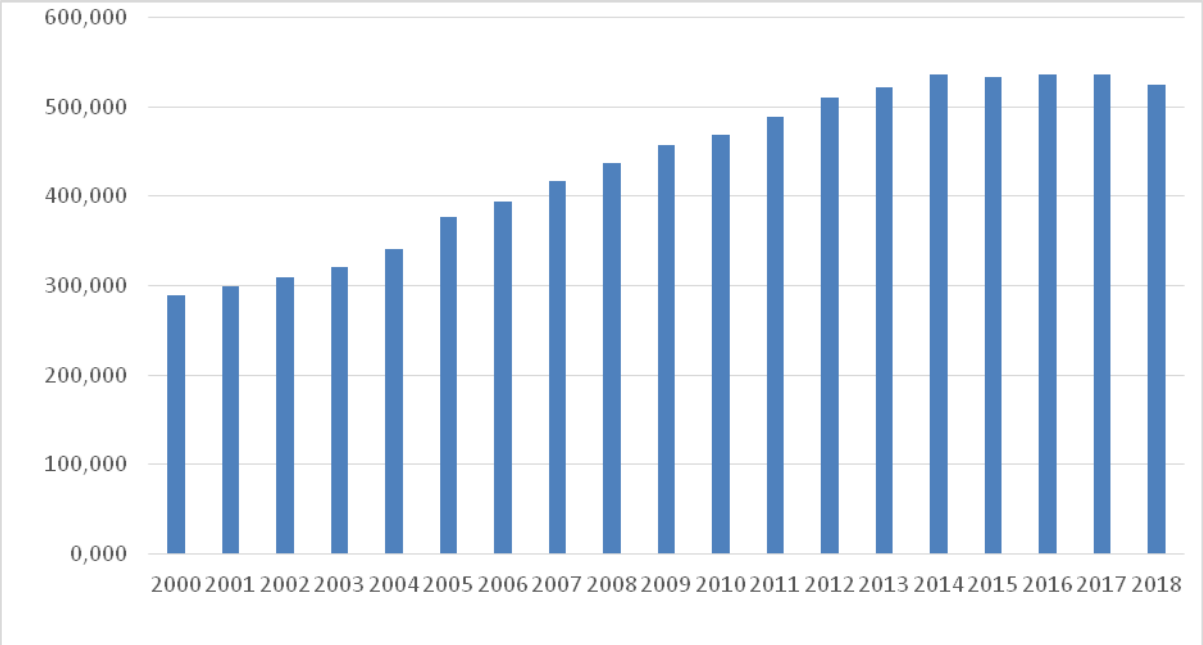


Figure 3. Scientific and Technical Journal Articles in European Union, 2000-2018

*Source: World Development Indicators. Note: Scientific and technical journal articles refer to the number of scientific and engineering articles published in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences.*

Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, as well as in the management of these projects. In this context, we can see that according to the information obtained from the World Bank database, the number of researchers in research and development in the European Union increased continuously between 1996 and 2018 (see Figure 4).

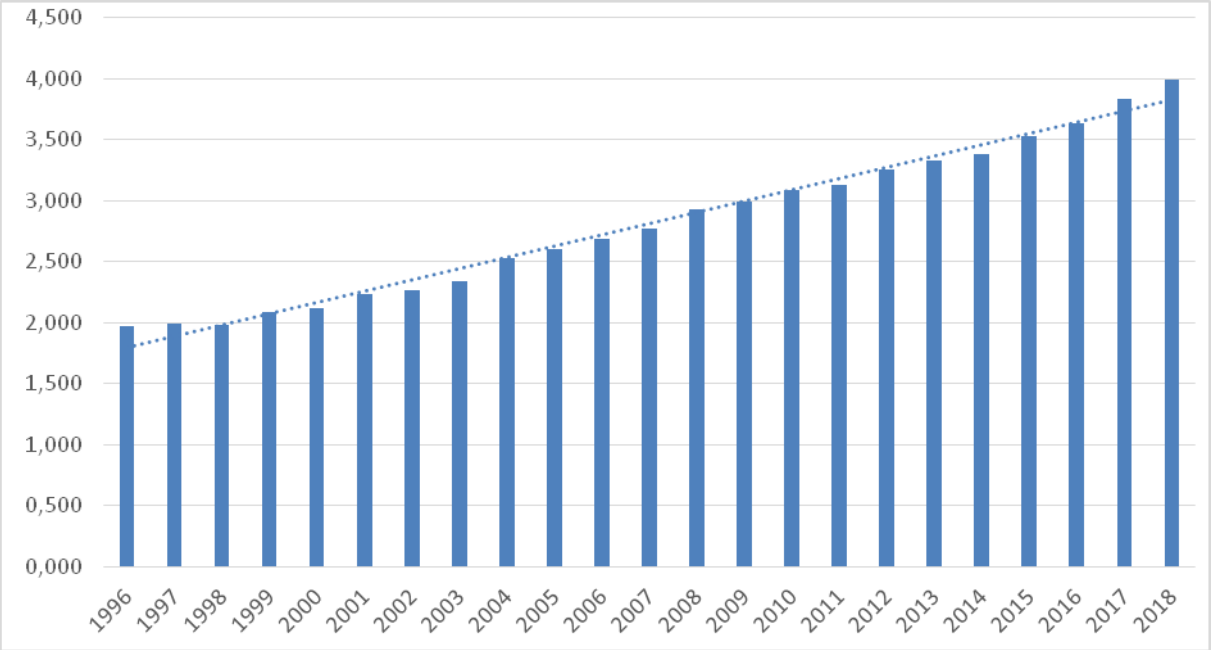


Figure 4. Researchers in R&D in European Union (per million people), 1996-2018

*Source: World Development Indicators.*

**4. European Union High Technology Policies**

In order to understand the purpose and general framework of the high technology policy pursued by the European Union today, it is useful to look at the basic foundations of this policy. Within the framework of developing technology in the European Union, large-scale and important strategies, projects and programs have been implemented. Main strategies, programs and projects created for long-term innovation and technological development; Lisbon Strategy, Europe 2020 Strategy, Information Technology Europe Strategic Program (ESPRIT), European Technology Cooperation Agency (EUREKA), Cooperation Program (COST). Also, the European Union supports scientific and technological studies within the framework of Framework Programs. The most important aspect of Framework Programs is that they provide integrity and coordination between the research and technology development programs of the European Union. Framework Programs that are directed to comprehensive high technology; It coordinates the activities of the member countries in this field by developing cooperation between industry, innovation, service sectors and research institutions.

The first legal basis in the European Community for science and technology policies was the Single European Act (Single European Act 1987). With Single European Act, it is aimed to ensure the free movement of production factors by attaching importance to the

development of R&D and technology capabilities in order to increase the international competitiveness of companies.

Yet another European Union Program is the European Research Area. In September 1999, Philippe Busquin, then Commissioner for Research at the European Commission, introduced the concept of European Research Area (Banda 2002; Lawn 2002). Accordingly, by examining the situation of the European Union in the field of R&D, it was stated that a more comprehensive approach should be followed in order to make the best use of R&D resources. Its main goal is; to promote research and innovation by making better use of available resources to increase European Union's competitiveness around the world.

These developments are a turning point in the creation of high technology policies of the European Union and determining their targets. In addition, the Lisbon summit held in 2000 is important for the European Union's common technology policy. At the summit, it is aimed that the European Union will achieve a sustainable growth with better employment and social cohesion by gaining the characteristics of the most competitive, knowledge economy in the world in 2010.

Also, the 6th Framework Program, covering the years 2002-2006, aims to increase the competitiveness of the European Union in the world, especially in the United States and Japan, and to turn towards advanced integration in the field of science and technology. The main lines of this strategy and policy will be explained in this section.

### *4.1. Lisbon Strategy*

One of the main lines of the European Union's technology policy are made up of the decisions expressed as the Lisbon Strategy. It is a growth and employment strategy that was put forward after the extraordinary summit of the Council of Europe on 23-24 March 2000. Lisbon summit has an important place in terms of European Union common science and technology policy. The problems faced by the European Union were determined at the summit and then evaluations were made for the future of the European Union from the new perspective offered by globalization and the new knowledge-driven economy. It was determined that in order to take advantage of the opportunities offered by globalization and communication technology, it was determined that an ambitious program was required to set clear strategic goals, to build the information infrastructure, to develop innovative and economic reforms, and to modernize the social welfare and education system.

The strategy determined to achieve this goal is to prepare for the transition to a knowledge-based economy, to create new policies for information society and R&D, to

accelerate structural reforms for competitiveness and innovation, to complete the internal market, to modernize the European Social Model, to invest in human resources, to combat social exclusion and preserving the healthy outlook and positive growth expectations in the economy by applying appropriate macroeconomic policies. This strategy, in which structural indicators are used to formulate, monitor and evaluate development policies, aims to make the European Union economy the most competitive and dynamic economy in the world. The perspective of the strategy is aimed at measuring the success of policies implemented in the European Union by comparing them with other major economies. In other words, it is aimed at comparing the success of other competing economies such as the United States and Japan with the success of the European Union economy (European Parliament 2000).

Within the framework of this strategy, it has determined as one of its concrete goals to allocate 3% of GDP to R&D (Rodriguez 2010). The basic determinations presented by the strategy as the weaknesses of the European Union economies are the result of comparisons with the United States economy. According to the basic view of the strategy, if the European Union wants to compete with the United States, it must first accept and correct the following determinations (Rodriguez 2003):

- First, the economic growth rate of the European Union is generally behind the United States.
- Second, the European Union economy is not as dynamic and job-generating as its main rivals, especially the United States.
- Third, unemployment is unacceptably high in the European Union, and besides the economic losses it creates, it also creates a social problem that causes many people to feel excluded from society.

After these determinations, the Lisbon strategy focuses on the reasons for these fundamental weaknesses of the European Union economy. First of all, the European Union economy cannot adequately meet the entrepreneurial need and the number of new small and medium enterprises that join the economy remains limited. Inadequate participation of new small and medium enterprises in the economy negatively affects job creation. Inadequate employment makes it difficult to fight unemployment (Rodrigues 2003). In addition, one of the most important weaknesses of the European Union is the lack of research and development activity. Infrastructure and indicators as share of national income for research and development activities, internet use and access, which will form the basis of research and development activities, are also behind the United States. Other major problems are the high regulatory costs in the European Union, the lack of an effective patent law and regulations

across the European Union to protect intellectual property and some restrictions on service sector trade.

In the Lisbon Strategy, the target was determined as 3% stable growth and reaching full employment level. A consensus was reached on the open method coordination of the strategy, monitoring the strategic path and progress followed under the supervision and guidance of the Council of Europe, and reviewing the progress at the European Council meeting every spring. The Open Method of Coordination would be implemented by setting specific guidelines and dates for goals to be achieved in the short, medium and long term. Consensus was also on what policies to set and how to conduct regular monitoring and evaluation to achieve these goals.

The main measures that are among the targets of the Lisbon Strategy to realize the information society are as follows (Kok 2004):

- Determining the legal framework for electronic communication.
- Disseminating the use of information and communication technologies.
- Creating the necessary conditions for the development of e-Commerce.
- Supporting the leadership of the European Union in mobile communication technologies.
- Creation of the European Research Area.
- To increase the share allocated to science and research in GDP to 3 percent.
- Making the European Union more attractive for researchers.
- Promoting the development of new technologies.
- To halve the rate of school leaving.
- Developing education and training systems to meet the needs of the information society.
- Promoting lifelong learning for all.
- Promoting and facilitating mobility.

Has the Lisbon strategy achieved the expected goals? When the actions foreseen within the scope of the Lisbon Strategy and the results obtained at the end of 2010 are briefly examined, it is not possible to say that the European Union has achieved the expected targets (European Commission 2010a; European Parliament 2014; Oliver 2011; Copeland and Papadimitriou 2012; Lundvall and Lorenz 2012). Despite all the reforms carried out, it can be said that the weak coordination between the members of the European Union caused disruptions in this process. However, the economic crisis that shook the European Union made it difficult to realize the reforms under the Lisbon Strategy.

The rapidly developing technology in recent years, the decreasing productivity rate in the European Union economy due to the aging population in the globalizing world, started to feel that it was losing its competitive power. According to the evaluations made by the European Commission on the Lisbon Strategy, this project has turned into a very complex structure with the multi-faceted goals and action plans determined by the strategy in question (European Commission 2010a).

As pointed out in the Lisbon Strategy Midterm Evaluation Report prepared by Wim Kok (2004), it was determined from that time that the European Union will have difficulties in achieving its goal of "the world's most competitive, dynamic and knowledge-based economy" in 2010. Another important development that hinders the achievement of the Lisbon Strategy's target is the financial crisis that emerged in the United States in 2008, the rapid spread of this crisis in the European Union, and especially the debt crisis of some members of the European Union. After the economic crisis, GDP in the European Union declined by 4.5 percent (see Figure 5).

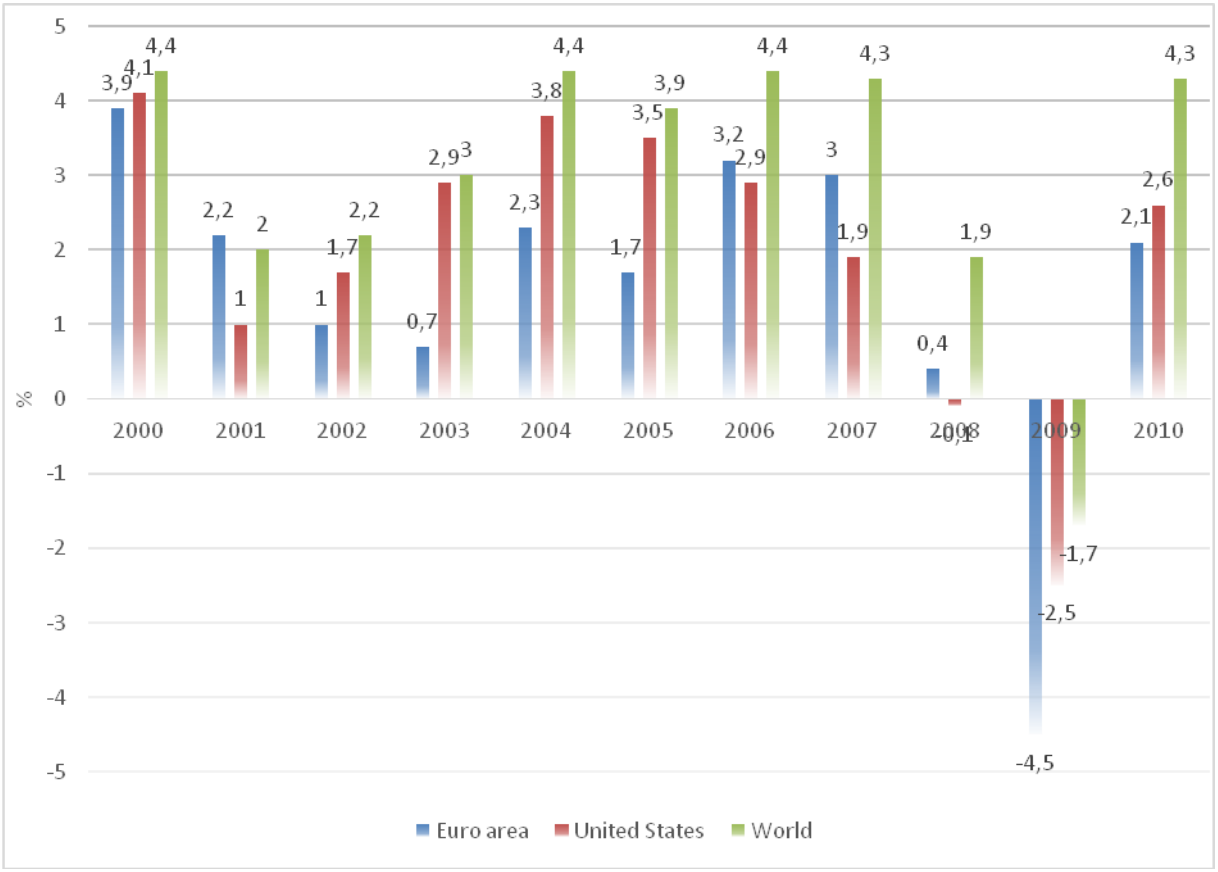


Figure 5. GDP Growth (annual %), 2000-2010

*Source: World Development Indicators*

Therefore, the Lisbon Strategy's goal of developing an economic structure that "can achieve sustainable economic growth with more and better jobs and greater social consensus" has not been realized as a result of this crisis that also shook the European Union. Also, this economic crisis of the European Union prevented the realization of the Lisbon Strategy's goals for employment. Although the evaluation report of the European Commission on the Lisbon Strategy pointed out that approximately 18 million new jobs were created before the global crisis spread to the European Union, the crisis exceeded 10 percent of the unemployment rate in the European Union member countries (European Commission 2010a).

Table 1. Unemployment Rate, Total, % of Labor Force, 2000-2010

| **Location** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Austria | 3,93 | 3,98 | 4,38 | 4,76 | 5,51 | 5,63 | 5,25 | 4,87 | 4,14 | 5,33 | 4,84 |
| Belgium | 6,88 | 6,59 | 7,53 | 8,18 | 8,39 | 8,43 | 8,25 | 7,48 | 6,97 | 7,89 | 8,32 |
| Czech Republic | 8,78 | 8,13 | 7,29 | 7,78 | 8,29 | 7,94 | 7,13 | 5,33 | 4,41 | 6,68 | 7,29 |
| Denmark | 4,33 | 4,53 | 4,58 | 5,41 | 5,5 | 4,84 | 3,91 | 3,75 | 3,71 | 6,41 | 7,77 |
| ***Estonia*** | ***14,46*** | ***13,04*** | ***11,33*** | ***10,35*** | ***10,08*** | ***7,97*** | ***5,94*** | ***4,6*** | ***5,52*** | ***13,57*** | ***16,74*** |
| **European Union (28 countries)** | **8,98** | **8,73** | **9,05** | **9,17** | **9,26** | **9,01** | **8,23** | **7,18** | **7,05** | **8,97** | **9,65** |
| Finland | 9,78 | 9,13 | 9,07 | 9,01 | 8,82 | 8,4 | 7,72 | 6,87 | 6,37 | 8,24 | 8,38 |
| France | 9,56 | 8,74 | 8,63 | 8,5 | 8,85 | 8,87 | 8,84 | 7,99 | 7,42 | 9,11 | 9,27 |
| Germany | 8,01 | 7,86 | 8,68 | 9,81 | 10,5 | 11,28 | 10,28 | 8,54 | 7,42 | 7,64 | 6,97 |
| ***Greece*** | ***11,23*** | ***10,68*** | ***10,33*** | ***9,74*** | ***10,61*** | ***10,01*** | ***9,03*** | ***8,42*** | ***7,77*** | ***9,63*** | ***12,75*** |
| Hungary | 6,27 | 5,58 | 5,58 | 5,74 | 6,07 | 7,17 | 7,46 | 7,39 | 7,8 | 10,03 | 11,17 |
| ***Ireland*** | ***4,5*** | ***4,17*** | ***4,72*** | ***4,85*** | ***4,74*** | ***4,63*** | ***4,78*** | ***5*** | ***6,78*** | ***12,65*** | ***14,56*** |
| Italy | 10,05 | 9,01 | 8,47 | 8,43 | 8 | 7,71 | 6,79 | 6,08 | 6,71 | 7,75 | 8,35 |
| ***Latvia*** | ***14,34*** | ***13,48*** | ***12,49*** | ***11,64*** | ***11,75*** | ***10,05*** | ***7,04*** | ***6,06*** | ***7,74*** | ***17,57*** | ***19,48*** |
| ***Lithuania*** | ***16,44*** | ***17,42*** | ***13,78*** | ***12,43*** | ***10,89*** | ***8,32*** | ***5,79*** | ***4,26*** | ***5,83*** | ***13,8*** | ***17,84*** |
| Luxembourg | 2,23 | 1,9 | 2,56 | 3,81 | 4,95 | 4,65 | 4,58 | 4,17 | 4,92 | 5,12 | 4,58 |
| Netherlands | 3,67 | 3,08 | 3,67 | 4,84 | 5,67 | 5,88 | 5,01 | 4,17 | 3,67 | 4,35 | 5,01 |
| OECD-Total (Estimated Value) | | 6,67 | 7,2 | 7,31 | 7,17 | 6,82 | 6,3 | 5,81 | 6,14 | 8,3 | 8,51 |
| Poland | 16,07 | 18,31 | 20,03 | 19,75 | 19,14 | 17,93 | 13,97 | 9,61 | 7,04 | 8,12 | 9,68 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Portugal | 5,08 | 5,13 | 6,14 | 7,4 | 7,77 | 8,77 | 8,87 | 9,13 | 8,78 | 10,68 | 11,98 |
| ***Slovak Republic*** | ***18,91*** | ***19,46*** | ***18,81*** | ***17,69*** | ***18,36*** | ***16,38*** | ***13,47*** | ***11,23*** | ***9,57*** | ***12,12*** | ***14,5*** |
| Slovenia | 6,74 | 6,19 | 6,34 | 6,7 | 6,34 | 6,54 | 5,99 | 4,86 | 4,39 | 5,89 | 7,28 |
| ***Spain*** | ***11,92*** | ***10,56*** | ***11,44*** | ***11,49*** | ***10,96*** | ***9,17*** | ***8,46*** | ***8,22*** | ***11,27*** | ***17,87*** | ***19,88*** |
| Sweden | 5,6 | 5,83 | 5,95 | 6,57 | 7,38 | 7,64 | 7,04 | 6,12 | 6,17 | 8,3 | 8,57 |
| **United States** | **3,99** | **4,73** | **5,78** | **5,99** | **5,53** | **5,07** | **4,62** | **4,62** | **5,78** | **9,27** | **9,62** |

*Source: OECD, https://data.oecd.org/unemp/unemployment-rate.htm*

According to 2010 data, the countries with the most prominent unemployment problem are Spain (19,88 percent), Latvia (19.48 percent), Lithuania (17,84 percent), Estonia (16.74 percent), Ireland (14.56 percent), Slovak Republic (14,5 percent) and Greece (12.75 percent).

As stated in Lisbon strategy, it aimed to increase the share allocated to science and technology from the total GDP in the European Union until 2010 to 3 percent. However, conforming to the data obtained from the OECD database, it is possible to see that the targets indicated in the strategy for 2010 were not achieved (Table 2). In this period when public expenditures are restricted, it is obvious that increasing the shares of GDP for research and development is not a priority for governments.

Table 2. Gross Domestic Spending on R&D, Total, % of GDP, 2000-2010

| **Location** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Austria | 1,88 | 1,99 | 2,06 | 2,17 | 2,16 | 2,37 | 2,35 | 2,41 | 2,56 | 2,59 | 2,72 |
| Belgium | 1,93 | 2,03 | 1,9 | 1,84 | 1,82 | 1,79 | 1,82 | 1,85 | 1,93 | 1,99 | 2,06 |
| China | 0,89 | 0,94 | 1,05 | 1,12 | 1,21 | 1,3 | 1,36 | 1,37 | 1,44 | 1,66 | 1,71 |
| Czech Republic | 1,11 | 1,1 | 1,1 | 1,14 | 1,14 | 1,16 | 1,23 | 1,3 | 1,23 | 1,29 | 1,33 |
| Denmark | | 2,32 | 2,44 | 2,51 | 2,41 | 2,39 | 2,4 | 2,51 | 2,77 | 3,05 | 2,91 |
| Estonia | 0,59 | 0,69 | 0,71 | 0,76 | 0,84 | 0,91 | 1,11 | 1,05 | 1,25 | 1,38 | 1,56 |
| ***European Union (28 countries)*** | ***1,67*** | ***1,69*** | ***1,69*** | ***1,68*** | ***1,66*** | ***1,66*** | ***1,68*** | ***1,69*** | ***1,75*** | ***1,83*** | ***1,83*** |
| Finland | 3,24 | 3,19 | 3,25 | 3,29 | 3,3 | 3,32 | 3,33 | 3,33 | 3,53 | 3,73 | 3,7 |
| France | 2,09 | 2,13 | 2,17 | 2,12 | 2,09 | 2,05 | 2,05 | 2,02 | 2,06 | 2,21 | 2,17 |
| Germany | 2,41 | 2,4 | 2,43 | 2,47 | 2,43 | 2,44 | 2,47 | 2,46 | 2,61 | 2,74 | 2,73 |
| Greece | | 0,55 | | 0,54 | 0,52 | 0,57 | 0,56 | 0,57 | 0,66 | 0,62 | 0,59 |
| Hungary | 0,79 | 0,91 | 0,98 | 0,91 | 0,86 | 0,92 | 0,97 | 0,95 | 0,97 | 1,13 | 1,13 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ireland | 1,08 | 1,05 | 1,05 | 1,12 | 1,17 | 1,19 | 1,19 | 1,23 | 1,38 | 1,6 | 1,59 |
| Italy | 1 | 1,04 | 1,08 | 1,05 | 1,05 | 1,04 | 1,08 | 1,12 | 1,16 | 1,21 | 1,21 |
| ***Japan*** | ***2,9*** | ***2,97*** | ***3,01*** | ***3,04*** | ***3,03*** | ***3,18*** | ***3,27*** | ***3,34*** | ***3,33*** | ***3,23*** | ***3,13*** |
| Latvia | 0,43 | 0,4 | 0,41 | 0,36 | 0,4 | 0,53 | 0,65 | 0,55 | 0,58 | 0,45 | 0,61 |
| Lithuania | 0,58 | 0,66 | 0,65 | 0,66 | 0,75 | 0,74 | 0,79 | 0,8 | 0,78 | 0,83 | 0,78 |
| Luxembourg | 1,57 | | | 1,62 | 1,6 | 1,57 | 1,66 | 1,59 | 1,62 | 1,67 | 1,5 |
| Netherlands | 1,79 | 1,79 | 1,74 | 1,78 | 1,78 | 1,77 | 1,74 | 1,67 | 1,62 | 1,66 | 1,7 |
| OECD-Total | 2,09 | 2,13 | 2,11 | 2,11 | 2,09 | 2,11 | 2,14 | 2,18 | 2,24 | 2,29 | 2,25 |
| Poland | 0,64 | 0,62 | 0,55 | 0,53 | 0,55 | 0,56 | 0,55 | 0,56 | 0,59 | 0,66 | 0,72 |
| Portugal | 0,72 | 0,76 | 0,72 | 0,69 | 0,72 | 0,75 | 0,95 | 1,12 | 1,44 | 1,58 | 1,53 |
| Romania | 0,36 | 0,39 | 0,37 | 0,39 | 0,38 | 0,41 | 0,45 | 0,51 | 0,55 | 0,44 | 0,45 |
| Slovak Republic | 0,63 | 0,62 | 0,56 | 0,56 | 0,5 | 0,49 | 0,47 | 0,44 | 0,46 | 0,47 | 0,61 |
| Slovenia | 1,36 | 1,46 | 1,44 | 1,24 | 1,37 | 1,41 | 1,53 | 1,42 | 1,62 | 1,81 | 2,05 |
| Spain | 0,88 | 0,88 | 0,96 | 1,02 | 1,04 | 1,1 | 1,17 | 1,24 | 1,32 | 1,36 | 1,36 |
| Sweden | | 3,87 | | 3,57 | 3,36 | 3,36 | 3,47 | 3,23 | 3,47 | 3,39 | 3,16 |
| ***United States*** | ***2,62*** | ***2,64*** | ***2,55*** | ***2,56*** | ***2,5*** | ***2,51*** | ***2,55*** | ***2,63*** | ***2,76*** | ***2,81*** | ***2,73*** |

*Source: OECD, https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm*

While the share allocated to research and development in the total GDP of the European Union in 2010 was 1.83 percent, this rate was 2.73 percent in the United States and 3.13 percent in Japan. However, it is possible to see that some European Union member countries are advancing towards the target even though the targets foreseen in the Lisbon Strategy have not been achieved throughout the European Union. For example, Finland and Sweden have reached a share of more than 3 percent of the total GDP allocated to science and technology in the Lisbon Strategy. On the other hand, some countries of the European Union (Latvia, Lithuania, Poland, Romania, Slovak Republic and Greece) are still far from the targets envisaged in the Lisbon Strategy.

### *4.2. Europe 2020 Strategy*

The European Union has set out to create a new strategy in order to develop and activate the strategies it has implemented in the past. The global financial crisis occurred in 2008, it has been obstacles to reach the goal set out in the Lisbon strategy. The European Union has developed the Europe 2020 Strategy based on the Lisbon Strategy, taking into account the global financial problems. As in the Lisbon Strategy, the Europe 2020 Strategy is aimed at advancing the economic integration process of the European Union, based on the principle of

sustainable growth. By evaluating the effects of these problems on the European Union, the structural transformation of the European Union is aimed within the framework of the targets determined by 2020. One of the important topics in the realization of the European Union's 2020 strategy is a smart growth based on knowledge and innovation.

Within the framework of this strategy announced by the European Commission in 2010, as the main priorities in order to establish high employment, productivity and social cohesion. These are particularly (European Commission, 2010b):

● Smart growth: Developing an economy based on knowledge and innovation;

● Sustainable growth: Supporting a greener and more competitive economy where resources are used effectively;

● Inclusive growth: It has been determined to achieve a high level of employment in order to ensure social and regional cohesion.

Within the scope of its smart, sustainable and inclusive growth priorities, the Europe 2020 strategy set 5 mutually supportive goals in employment, education, social inclusion, R&D, and climate and energy. It is envisaged that 7 initiatives will be implemented in order to achieve these goals. These initiatives are "Innovation Union", "Youth on the Move", "A Digital Agenda for Europe", "Resource Efficient Europe", "An Industrial Policy for the Globalization Era", "An Agenda for New Skills and Jobs" and "European Platform Against Poverty" (European Commission, 2010b).

According to the strategy, the economic targets aimed to be achieved in 2020 are as follows (European Commission, 2010b):

● Increasing the employment rate of the population aged 20-64 to 75%;

● Realization of the target of allocating 3% of the GDP to R&D;

● Reducing greenhouse gas emissions by at least 20%, if conditions are favorable, by 30%, increasing the share of renewable energy in the energy consumption of the European Union to 20% and ensuring energy efficiency by 20%;

● Decreasing the rate of early school leavers to 10, increasing the rate of university graduates aged 30-34 to at least 40%;

● Reducing the number of EU citizens living below the national poverty line by lifting 20 million people out of poverty.

The initiatives required to achieve these goals are seven under three headings (European Commission, 2010b):

● Smart growth

Smart growth sees knowledge and innovation as the key to future growth and aims to transform innovative ideas into economic growth, employment-generating products and services by improving the quality of education within the European Union, strengthening research studies and enabling knowledge transfer. Initiatives to be established in this context are as follows: “Innovation Union” initiative in the field of innovation; “Youth on the Move” initiative in the field of education, vocational training and lifelong learning; and Initiative “A Digital Agenda for Europe” in the field of digital society.

● Sustainable growth:

Sustainable growth has been defined as efficient use of energy and resources, sustainable and competitive economic growth. This approach positions the European Union at a point that prevents environmental degradation, protects bio-diversity and prevents waste of resources in a world with low carbon and reduced resources. The initiatives are as follows: In the field of climate change and clean and efficient energy use “Resource Efficient Europe” initiative; and initiative “Industrial Policy for the Globalization Era” in the field of competitiveness.

● Inclusive growth:

Within the scope of inclusive growth, it is aimed to provide high-level employment, invest in talents, fight poverty and modernize the labor market, vocational education and social protection systems in order to manage change and create a harmonious society. Under this heading, the leading initiatives are as follows: “Agenda for New Skills and Jobs” initiative in the field of employment and skills; and “European Platform Against Poverty” initiative in the field of combating poverty.

So, has the share allocated to research and development activities within the scope of Europe 2020 strategy reached 3% of gross domestic product? Considering that innovations affect the economic development of countries, R&D investments and support for innovative ideas are important for countries. Innovative investments and supports are the main source of sustainable efficiency and efficient use of resources (Roth and Thum, 2010).

According to the information obtained from the World Bank database, it is seen that the ratio of R&D expenditures to GDP in the European Union is increasing, and according to 2018 data, some countries have reached a certain level even though they are behind the 2020 target (see Table 3).

Table 3. Research and Development Expenditure, % of GDP, 2010-2018

| **Location** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** |
|---|---|---|---|---|---|---|---|---|---|
| ***European Union (28 countries)*** | ***2,0*** | ***2,0*** | ***2,1*** | ***2,1*** | ***2,1*** | ***2,1*** | ***2,1*** | ***2,2*** | ***2,2*** |
| ***Japan*** | ***3,1*** | ***3,2*** | ***3,2*** | ***3,3*** | ***3,4*** | ***3,3*** | ***3,2*** | ***3,2*** | ***3,3*** |
| ***United States*** | ***2,7*** | ***2,8*** | ***2,7*** | ***2,7*** | ***2,7*** | ***2,7*** | ***2,8*** | ***2,8*** | ***2,8*** |
| Bulgaria | 0,6 | 0,5 | 0,6 | 0,6 | 0,8 | 1,0 | 0,8 | 0,8 | 0,8 |
| Belgium | 2,1 | 2,2 | 2,3 | 2,3 | 2,4 | 2,5 | 2,6 | 2,7 | 2,8 |
| ***Denmark*** | ***2,9*** | ***2,9*** | ***3,0*** | ***3,0*** | ***2,9*** | ***3,1*** | ***3,1*** | ***3,0*** | ***3,1*** |
| Czech Republic | 1,3 | 1,6 | 1,8 | 1,9 | 2,0 | 1,9 | 1,7 | 1,8 | 1,9 |
| Estonia | 1,6 | 2,3 | 2,1 | 1,7 | 1,4 | 1,5 | 1,2 | 1,3 | 1,4 |
| **Germany** | **2,7** | **2,8** | **2,9** | **2,8** | **2,9** | **2,9** | **2,9** | **3,0** | **3,1** |
| Ireland | 1,6 | 1,6 | 1,6 | 1,6 | 1,5 | 1,2 | 1,2 | - | 1,1 |
| Greece | 0,6 | 0,7 | 0,7 | 0,8 | 0,8 | 1,0 | 1,0 | 1,1 | 1,2 |
| France | 2,2 | 2,2 | 2,2 | 2,2 | 2,3 | 2,2 | 2,2 | 2,2 | 2,2 |
| Spain | 1,3 | 1,3 | 1,3 | 1,3 | 1,2 | 1,2 | 1,2 | 1,2 | 1,2 |
| Italy | 1,2 | 1,2 | 1,3 | 1,3 | 1,3 | 1,3 | 1,4 | 1,4 | 1,4 |
| Crotia | 0,7 | 0,8 | 0,8 | 0,8 | 0,8 | 0,8 | 0,9 | 0,9 | 1,0 |
| Cyprus | 0,4 | 0,5 | 0,4 | 0,5 | 0,5 | 0,5 | 0,5 | 0,6 | 0,6 |
| Lithuania | 0,8 | 0,9 | 0,9 | 1,0 | 1,0 | 1,0 | 0,8 | 0,9 | 0,9 |
| Latvia | 0,6 | 0,7 | 0,7 | 0,6 | 0,7 | 0,6 | 0,4 | 0,5 | 0,6 |
| Luxembourg | 1,5 | 1,5 | 1,3 | 1,3 | 1,3 | 1,3 | 1,3 | 1,3 | 1,2 |
| Hungary | 1,1 | 1,2 | 1,3 | 1,4 | 1,4 | 1,4 | 1,2 | 1,3 | 1,6 |
| Malta | 0,6 | 0,7 | 0,8 | 0,8 | 0,7 | 0,7 | 0,6 | 0,6 | 0,6 |
| Netherlands | 1,7 | 1,9 | 1,9 | 1,9 | 2,0 | 2,0 | 2,0 | 2,0 | 2,2 |
| ***Austria*** | ***2,7*** | ***2,7*** | ***2,9*** | ***3,0*** | ***3,1*** | ***3,0*** | ***3,1*** | ***3,1*** | ***3,2*** |
| Poland | 0,7 | 0,7 | 0,9 | 0,9 | 0,9 | 1,0 | 1,0 | 1,0 | 1,2 |
| Portugal | 1,5 | 1,5 | 1,4 | 1,3 | 1,3 | 1,2 | 1,3 | 1,3 | 1,4 |
| Slovenia | 2,1 | 2,4 | 2,6 | 2,6 | 2,4 | 2,2 | 2,0 | 1,9 | 1,9 |
| Romania | 0,5 | 0,5 | 0,5 | 0,4 | 0,4 | 0,5 | 0,5 | 0,5 | 0,5 |
| Slovak Republic | 0,6 | 0,7 | 0,8 | 0,8 | 0,9 | 1,2 | 0,8 | 0,9 | 0,8 |
| Finland | 3,7 | 3,6 | 3,4 | 3,3 | 3,2 | 2,9 | 2,7 | 2,8 | 2,8 |
| ***Sweden*** | ***3,2*** | ***3,2*** | ***3,3*** | ***3,3*** | ***3,1*** | ***3,3*** | ***3,3*** | ***3,4*** | ***3,3*** |
| United Kingdom | 1,7 | 1,7 | 1,6 | 1,6 | 1,7 | 1,7 | 1,7 | 1,7 | 1,7 |

*Source: World Development Indıcators*

As seen in Table 3, it is seen that in addition to a target of 3% at the European Union level, the member countries set a national target of over 3% according to their own strategies (e.g. Denmark, Austria and Sweden). When evaluating the 3% target for Europe 2020, Denmark, Sweden, Finland, Austria, Germany, Slovenia and Belgium can be expressed as successful countries among the European Union countries.

Products with high technology and technical infrastructure are products that provide competitive advantage in the global market and create added value in the economy. With the Lisbon Strategy published in 2000 and the Europe 2020 Strategy established in 2010, the European Union member countries have determined the necessary policies to switch to a production system where technology, innovation and R&D are at the forefront. Increasing the share of high technology in export products is an important measure of innovation in production output (Falk 2009). Figure 6 shows the course of high technology product export rates in the 2007-2019 period within the total goods exports of the United States, Japan and the European Union.

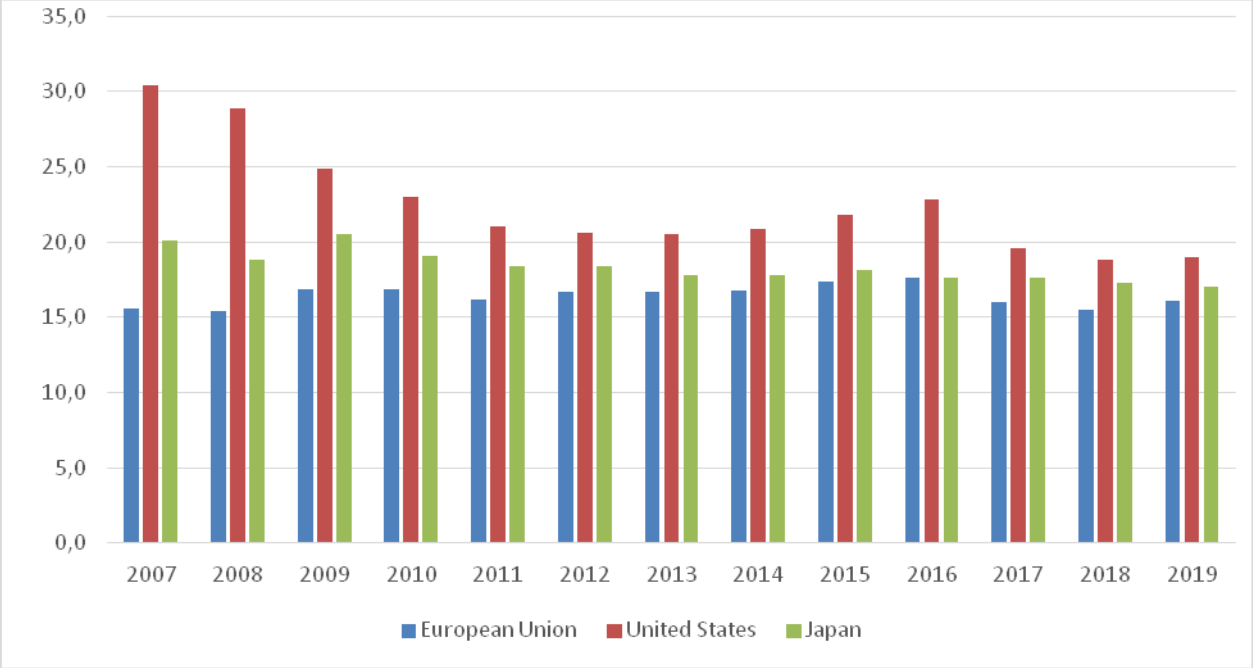


Figure 6. High Technology Exports of the European Union
(% of manufactured exports), 2007-2019
*Source: World Development Indicators*

According to Figure 6, the export rate of high technology products in total exports of goods in 2007 was 15,6% in the European Union, 30,4% in the United States and 20,1% in Japan. In the European Union, this rate was 16,1% in 2019, but it decreased to 19,0% in the United States and 17,0% in Japan.

### *4.3. European Union Framework Programs*

As we saw in Lisbon Strategy and Europe 2020 Strategy developments in R&D are of great importance for the European Union. R&D contributes to the competitiveness of companies, creates employment and contributes to the increase in the quality of life of individuals. The purpose of the Framework programs is to make Europe the most dynamic and competitive information society in the world and to increase the share allocated to R&D. Framework programs of the European Union are the programs created in order to harmonize Europe's science, technology, policies and practices. Framework Programs are carried out in order to strengthen the research and technology development capacity of Europe, to encourage university-industry cooperation, to develop cooperation in different areas related to European Union policies with member states, candidate countries and other countries with which the European Union cooperates. The program has been established to guide the technologies of the future through international partnerships. Framework Programs are implemented with a special funding system established to support research and technology development activities within a comprehensive scientific framework.

The First Framework Program (1984-1987) was launched in 1984 and is the world's highest budget research program. The following points came to the fore in the purpose and structure of this accepted Framework Program: The Framework Program will not only be a programming tool, but also a financing instrument. It will also contribute to the solution of the economic crisis and support the competitiveness of member states. The most important feature of the First Framework Program is that it is structured in line with seven basic objectives. Six main priorities (Agriculture, Industrial Competitiveness, Raw Materials, Energy, Development Aid and Better Living Conditions) and mobilizing the cross-research potential of the Community are also included in the program as the seventh priority. In particular, the community's last priority focuses on supporting proposals for new discoveries that will develop from the bottom up in society (Bottom-up proposals), the free movement of researchers, and the linking of research centers to be established in Europe (Reillon, 2017).

The Second Framework Program was prepared to be implemented in 1987-1991. While explaining the priorities of this program, the European Commission emphasized that it will work to transform the European Union into a technology community for this implementation period, and the importance and priority of R&D for the community. Thematic issues presented in the Second Framework Program adopted by the Council in September 1987 were increased to 30. Priority topics of this period were accepted as 7 topics, and as the eighth priority, it was decided to take horizontal actions such as human resources management,

infrastructure, anticipation and dissemination of the findings (Commission of the European Communities, 1986).

In 1989, the Third Framework Program, which includes R&D measures to be implemented in 1990-1994, was adopted. Within the framework of this program, it has determined important areas under nine titles for the Community's R&D field regarding the harmony of science and technology in Europe. These areas prioritize issues such as supporting basic research, supporting application research, connecting universities and industry stronger, encouraging private sector investments, coordinating national strategies and supporting less developed regions with adaptation measures and cooperating with third countries (Reillon, 2017).

In April 1994, the Fourth Framework Program with a budget of 13.1 billion Euros was adopted for the period 1994–1998. 17 specific (special) programs were determined for this period and these programs were finalized in full synchronization within the period and as foreseen (Reillon, 2017).

The Fifth Framework Program of the European Union was adopted in 1997 for the period 1998-2002, with a budget of 13,7 billion Euros, based on two principles (flexibility and concentration). The commission has approved four main topics to be included in this program: to prepare a recyclable eco system; to create a user-friendly information society; to promote competitive and sustainable growth; and increasing the quality of life, protecting and using living resources (Reillon, 2017; Editorial Board, 1997).

The aim of the Sixth Framework Programme, which was carried out between 2002-2006, is to increase the effect of the programme on scientific and technological development in Europe, to support high value-added technologies, R&D and innovation process, and to follow the contribution to the harmonization of European researches. In the Sixth Framework program, thematic issues were increased to seven and top titles such as space, citizen in the information society and the state were added. In addition, with this program, it is envisaged to support policy development, support the international studies and cooperation of SMEs, design European Research Area and support innovation policies of science and society (Reillon, 2017; Tomellini and Faure, 2003).

The Seventh Framework Program, whose main purpose is to bring together all European Union initiatives related to research in a common field in order to achieve the Lisbon goals, was carried out for a period of seven years, 2007-2013. The structure of the Seventh Framework Programme has been renewed and structured according to four main objectives. These goals are (Kim and Yoo, 2019):

● Cooperation: Providing definite support for cross-border research projects in 10 thematic areas as a new and separate field;

● Ideas: Supporting bottom-up research projects with individual grants through the establishment of the European Research Centre;

● People: strengthening human capital in increasing research and mobility (free movement of people in the European Union);

● Capabilities: promoting key aspects of European research and innovation capacity (infrastructures, regional clusters, SMEs, international cooperation).

Within the scope of this program, it is aimed to support the strengthening of scientific and technological infrastructures and to encourage the development of competitiveness through free movement of researchers, free movement of information and technology.

The Eighth Framework Program Horizon 2020 is the European Union's Research and Innovation Framework program covering the years 2014-2020 and its main aim is to strengthen Europe's global competitiveness. Horizon 2020 also aims to bring together researchers who can reveal the research and innovation potential in different regions of Europe and to produce innovation. In addition to these basic goals, strengthening industrial leadership in innovation with large investments in key technologies, supporting SMEs, climate change, ensuring more efficient use of renewable energy resources, and increasing the productivity of the young European population are other supportive goals.

There are three key dimensions in Horizon 2020: excellence in science, industrial leadership and social change. Among these key dimensions, excellence in science has an important place with a budget of 24 billion Euros. This budget is reserved for technologies, jobs and science of the future, access to the best in research and for researchers to access the best infrastructures. Industrial leadership priority aims to make strategic investments in innovative technologies, to integrate more private institutions in the research and innovation process, and to empower SMEs by creating new business areas. In the field of social changes, for which a budget of 30 billion Euros was allocated, it was aimed to test and implement the proposed solutions, science and society relations, climate change, energy, transportation, innovation, multi-disciplinary collaborations (Kim and Yoo, 2019).

The next Ninth Framework Program is another seven-year term Horizon Europe to be accepted for. The Ninth Framework program will start on January 1, 2021 and will be effective between 2021-2027. The overall aim of the program is to support and strengthen projects in the European Research Area. The main objectives of Horizon Europe are as follows: to strengthen the scientific and technological foundations of the EU, to increase its

innovation capacity, competitiveness and employment, to meet the priorities of its citizens and to maintain the existence of socioeconomic models and values (Bahrke and Grammenou, 2020; Naujokaityte, 2020). The framework programs, the most prestigious research and innovation program of the European Union, are expected to continue to support the formation of high-level studies in the fields of science, technology and innovation today and in the future. Perhaps one of the most important goals in these processes is to increase the awareness of the European people in the fields of science, technology and innovation, as well as to ensure that the public contributes effectively to these processes. In conclusion for this chapter, considering the framework programs that implemented in European Union, it is possible to say that these processes have been successfully maintained.

## 5. Conclusıon

As a result of advances in science and technology since the last quarter of the 20th century, countries and companies have had to compete with the whole world. The process experienced deeply affected those who could not keep up with competition and change. The European Union is one of the powers with the highest prosperity and technology investments in the world. The European Union is trying to combine science and technology policies with many Framework Programs, especially Lisbon Strategy and Europe 2020 Strategy.

The issue of modernizing the European Union's economy based on high technologies was widely discussed during the Lisbon summit of the member states in March 2000. It was then that a difficultly attainable goal was formulated - to transform the European Union by 2010 into the most competitive knowledge-based economy in the world. However, as subsequent years have shown, a policy at the European Union level aimed at coordinating actions in the field of high technologies is not enough for the balanced development of all European Union.

Also, the implementation of science and technology policies at the European Union level aims to increase the European Union technological competitiveness against the United States and Japan. But, today the United States and Japan still maintain their leadership in these areas. It is observed that the European Union is far behind especially Japan and the United States in general in terms of research and development expenditures. Although the European Union has implemented the Framework Programs, it is not possible to say that the European Union is without problems in this area. In particular, the European Union countries' inability to develop their achievements in the field of science and technology in line with the demands of the market and their inability to fully dominate the market is the biggest problem of the European Union in this field.

The European Union has a huge potential to generate the factors of its future competitiveness, however, internal imbalances and the absence of a clear project for future development do not allow achieving this goal in a short time. Therefore, in order for the European Union to adapt to the developments in science and technology in the world, it is necessary to update and implement basic scientific and technology policies as soon as possible, and especially to increase the ratio of education, R&D and scientific expenditures in GDP.

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