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INNOVATION IN THE EUROPEAN UNION WITHIN THE FRAMEWORK OF THE THEORY OF CREATIVE DESTRUCTION: AN OVERVIEW AFTER THE GLOBAL FINANCIAL CRISIS 2008*

Yaratıcı Yıkım Teorisi Çerçevesinde Avrupa Birliği'nde Yenilik: 2008 Küresel Krizi Sonrasına Bir Bakış

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Schumpeter, Creative Destruction, Innovation, Entrepreneurship, European Union

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Abstract

Innovations are vital for economic development. Schumpeter, the famous economic theorist who drew attention to the innovation activities, was the first to reveal that capitalism has a structure that realizes development through innovations. Along with the 2000s, the European Union adopted a Schumpeterian approach and launched the Lisbon Strategy, however, this strategy has not been successful for various reasons. In this context, the Schumpeterian theory of "creative destruction" is well suited for evaluating innovation activities in the European Union. The main purpose of the study is to analyze the innovation activities in the European Union through research and development expenditures, business research and development expenditures, and the numbers of patent applications in the context of the theory of "creative destruction" put forward by Schumpeter. In this context, it was tried to reveal the Schumpeterian innovation capacity of the European Union between 2008 and 2018 in line with the data obtained from Eurostat. As a result of the study, it was concluded that innovation activities in the European Union could not fully realize the creative destruction effect and that there is a serious texture incompatibility in terms of economic structures within the EU member countries.

Anahtar Kelimeler:
Schumpeter, Yaratıcı Yıkım, Yenilik, Girişimcilik, Avrupa Birliği

JEL Kodları:
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Özet

Ekonomik gelişme için yenilikler hayati önem taşımaktadır. Yenilik faaliyetlerine ünlü iktisat düşünürü Schumpeter dikkati çekerek, kapitalizmin yenilikler yolu ile kalkınmayı gerçekleştiren bir yapıya sahip olduğunu ortaya koyan ilk düşünür olmuştur. 2000'li yıllar ile birlikte Avrupa Birliği Schumpeteryan bir yaklaşım benimseyerek Lizbon stratejisini kabul etmiş, ancak strateji çeşitli nedenlerle başarılı olamamıştır. Bu bağlamda Schumpeteryan "yaratıcı yıkım" teorisi Avrupa Birliği'nde yenilik faaliyetlerini değerlendirmek için oldukça uygundur. Çalışmanın temel amacı; Schumpeter tarafından ortaya konulan "yaratıcı yıkım" teorisi bağlamında Avrupa Birliği'ndeki yenilik faaliyetlerinin, araştırma ve geliştirme harcamaları, işletme araştırma ve geliştirme harcamaları ve patent başvuru sayıları ile analiz edilmesidir. Bu bağlamda Eurostat'tan elde edilen veriler doğrultusunda 2008 ile 2018 yılları arasında Avrupa Birliği'nin Schumpeteryan yenilik kapasitesinin gösterilmesine gayret edilmiştir. Çalışma sonucunda Avrupa Birliği'nde yenilik faaliyetlerinin yaratıcı yıkım etkisini tam olarak gerçekleştiremediği ve AB üyesi ülkelerde iktisadi yapılar bakımından ciddi bir doku uyuşmazlığı olduğu sonucuna varılmıştır.

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1. Introduction

Revealing that innovations are the triggering events of economic development and stating that capitalism entered in a reorganization process with the fluctuations in the business cycles created by entrepreneurs, who initiate innovations, and this situation revolutionized the entire economic system, Schumpeter, thanks to his theory of "creative destruction" established in 1942, made a remarkable analysis on capitalism. Schumpeter argued that old technologies were replaced by new technologies through innovations and a systemic innovation process took place in a revolutionary way.

Examining today's developments as part of the theory of "creative destruction" developed by Schumpeter, it is seen that the theory is quite ahead in terms of understanding the developments occurring in the context of innovations today. Studies dealing with the relationship between economic development and innovations have shown the importance of innovation in the economic development process and in making economies competitive and positive relationship between them, by using data such as R&D expenditures, business R&D expenses, and the number of patents.

Unlike a nation-state, the European Union is a different actor of international relations due to its sui generis structure and the depth of its economic integration intensely exposes it to globalization challenges. Increasing competition in the global economy after the digital revolution seen in information technology systems ended in the European Union losing its competitive power. The paper adopted as the Lisbon Strategy and prepared in the light of the Schumpeterian Theory aimed to make the EU the leading and most competitive economy in the world, but could not achieve the desired targets in the action plan due to the emergence of the 2008 global financial crisis and reasons stemming from the structure of the EU. As a matter of fact, although the EU 2020 Strategy adopted in 2010 gave priority to innovative activities, it has not been effective in transforming the economic structure of the Union.

The aim of the study, in the framework of the Schumpeterian approach, is to analyze the innovation activities of the European Union after the 2008 global financial crisis crisis in the context of the ratio of R&D expenditures to the Gross National Product, the R&D activities expenditures of enterprises, and patent numbers, and to handle the innovation activities of the European Union in a Schumpeterian approach. In this regard, the first part of the study discusses Schumpeter's "creative destruction" theory, while the second part examines the data associated with innovation activities, and the final part analyzed the innovation activities in the European Union within the context of data provided by Eurostat. Ethics of research and publication were followed in this study, which does not require permission from the ethics committee and / or legal / special permission.

2. Conceptual Background: Innovation, Creative Destruction and Creative Entrepreneur in Schumpeter

2.1. Schumpeter and Innovation

Merriam-Webster dictionary describes innovation as "a new idea, method, or device" or "the introduction of something new". Although the words innovation and invention overlap semantically but are really quite distinct. While the word invention generally refers to something originated after study and experiment and has not been previously been in existence,

innovation can refer to something new or to a change made to something already exists; besides, the first known use of innovation is dated to the 15th century (Merriam-Webster, 2020). Schumpeter's thoughts on innovation also differ from the accepted views. According to Schumpeter, the concept of innovation should be explained in the context of a change in the production function. In other words, according to Schumpeter, the concept of innovation can be possible with the increase in output and quality as a result of the change in the production function, and on the other hand, the decrease in cost. A new product to be put forward in the specified context, a new organizational model, and opening up new markets are accepted as innovation according to Schumpeter, in short, the emergence of new combinations or new consolidations is considered as innovation (Schumpeter, 1939, p. 88). The concept of innovation defined differently by Schumpeter, therefore, is the central catalyst that initiates change within the Schumpeterian economic thought (Sweezy, 1943, p. 93).

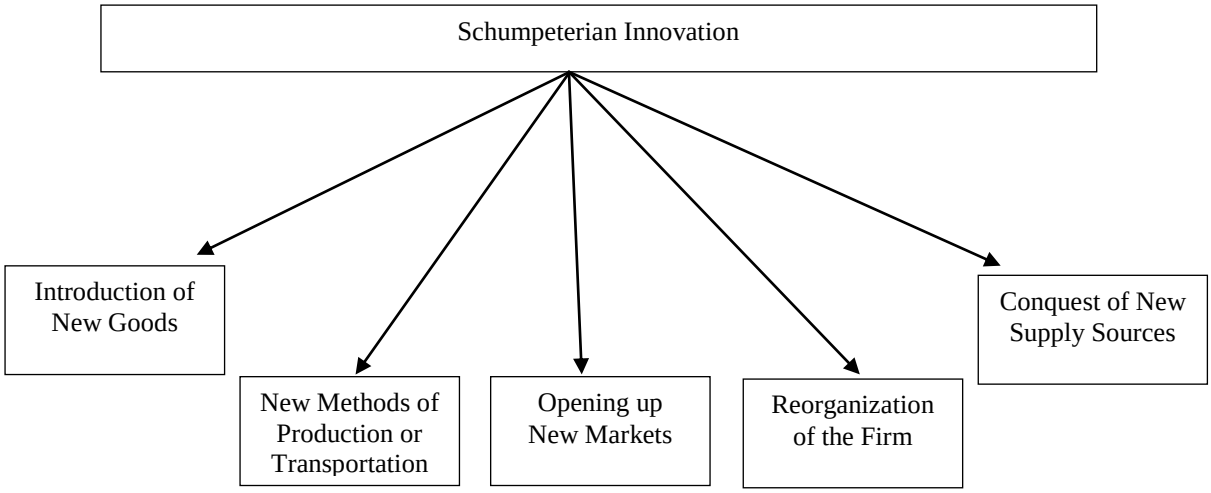

Figure 1. Innovation According to Schumpeter[1]
Source: (Schumpeter, 1951, p. 66)

Schumpeter draws attention to the difference between innovation and invention, as well as the distinction between the concept of innovation and the innovator, in other words inventor, and the differences between both concepts. According to Schumpeter, the person defined as an inventor is expressed as the person who generates an idea and embodies it, it is revealed that inventors can also be entrepreneurs. However, as is known, the role Schumpeter has given to his entrepreneur is quite special. Thus, not every inventor is also recognized as an entrepreneur. In the economic change model put in the center by Schumpeter, a thought brought forward as an idea but not experienced economically has no value (Schumpeter, 1947, p. 152). In the Schumpeterian economic approach, the critical dimension of economic change and the main reason for business cycles to happen is identified as innovation. For this reason, ideas put forward by Schumpeter in the context of innovation have been remarkable (Godin, 2008, s. 344). Besides, Schumpeter, assigning a different meaning to entrepreneurs, recognizes them as agents that initiate economic change by leading to a breakdown in the treatise of circular flow. In other words, for Schumpeter, entrepreneurs are defined as "individuals who bring together new combinations", as well as being the personification of innovation (Hagedoorn, 1996, p. 889).

[1] The figure was adapted by the author.

Schumpeter describes his entrepreneur as the one who disturbs the equilibrium, a figure that makes the system in equilibrium unstable, and an agent who ends the stagnation. Schumpeter's thoughts on entrepreneurship aim to ensure economic development in the long term, and Schumpeter's entrepreneur stands out as a leader, separated from innovators (Kirzner, 1999, p. 7). Schumpeter's entrepreneur endogenously provokes economic dynamism by realizing "Schumpeterian Innovations"[2]. The entrepreneur carries out his activities with a risk bearer capitalist and earns entrepreneurial profit with the innovations he realizes. Thanks to the profit he makes, the entrepreneur pays his debt to the risk bearer capitalist (Ebner, 2000, p. 5). Schumpeter was influenced by famous economic theorist when designing the Schumpeterian model of an entrepreneur that has been accepted a "persona causa". Having influenced by the most famous theorists of his time like Weber, Walras, Marx, Menger, Wieser, and Böhm-Bawerk, Schumpeter met on common ground with Marx's thoughts on economic change, reconsidered Walras's ghost entrepreneur in the context of his own model and gave it a new life by placing it at the center of economic change. At this point, focusing on disequilibrium like an economist from an Austrian school, Schumpeter attributed the central role in the economic change to the entrepreneur. Schumpeter first put forward this view in his "The Theory of Economic Development"[3] published in 1911 in German (Hébert and Link, 1989, p. 43). In the circular flow accepted by Schumpeter as the starting point, one who disturbs the equilibrium by including innovations in the economy and keeps the economic development constantly buoyant is the entrepreneur accepted by Schumpeter (Braunnerhjelm and Svensson, 2007, p. 3).

In his treatise published in 1911, Schumpeter clearly distinguished the differences between the entrepreneur and the non-entrepreneurial person, defined his entrepreneur as the "Man of Action"[4] and gave him a dynamic role. According to Schumpeter, the entrepreneur has a dynamic, disruptive, innovation-based, active, hardworking, and change-oriented role that brings new combinations together, struggles for his actions, loves creation and power, relies on his intuitions, and fulfills his activities with credit (Swedberg, 2006, p. 29). By realizing innovation activities, the Schumpeterian entrepreneur leads to a state of uncertainties in the economy. Along with innovations, credit expansion and an increase in prices and interests come into question, aggregate economic output remains stable, the economy digresses from the equilibrium state and it becomes impossible to act in the light of economic forecast. The escalation of risks and uncertainties resulting from the depleting of innovation opportunities follows the deceleration of innovation, besides, a new but higher regulation process in which growth and expansion reach a new level of equilibrium and the economy has begun to reorganize comes into question. In this period of stagnation, loan volumes, price, and interest rates show a decrease. The aggregate economic output is higher than in the previous period (Kuznets, 1940, p. 259).

Schumpeter's views and the generally accepted economic system run into a serious contradiction in terms of the importance of entrepreneurship. The fact that neoclassical economics does not attribute importance to entrepreneurship and considers the entrepreneur's task as an ordinary individual who combines "production factors" does not gain acceptance in the context of the Schumpeterian economic approach. Indeed, the Schumpeterian entrepreneur has a structure that discovers and becomes encouraged by making innovation. According to

[2] See Figure 1; Schumpeterian Innovation.
[3] The Theory of Economic Development would be translated into English 20 years later and published.
[4] A man who prefers to do things rather than think about and discuss them.

Schumpeter, the definition of an entrepreneur debarred of the ability to innovate can only be a businessman (Alada, 2001, p. 51).

For Schumpeter, capitalism has always been considered a method or form of economic change. Schumpeter, therefore, suggests that capitalism can only be understood as an evolutionary process and cannot be in a stationary state; and thus, he reaches the "creative destruction" process. According to Schumpeter, who states that capitalism has these characteristics due to its nature, capitalism, which has an evolutionary nature, affects the major political and social events that take place. As a matter of fact, the dynamism of capitalism is the innovations that keep the endogenous mechanism of capitalism continuously in motion, which are shown in Figure 1 (Schumpeter, 2006, p. 82-83).

2.2. Creative Destruction

Creative destruction is a concept identified with the famous economics theorist Joseph Alois Schumpeter. In his work named "Capitalism, Socialism and Democracy" published in 1942, Schumpeter not only gave a striking analysis of capitalism, but also showed how the dynamic structure of capitalism works through innovation.

Schumpeter (2006) put forward his theory of creative destruction as follows;

> *"... the history of the produtive apparatus of a typical farm, from the beginnings of the rationalization of crop rotation, plowing and fattenin to the mechanized thing of today linking up with elevators and railroads is a history of revolutions. So is the history of the productive apparatus of the iron and steel industry from the charcoal furnace to our own type of furnace, or the history of the apparatus of power production from the overshot water Wheel to the modern power plant, or the history of transportation from the mail-coach to the airplane. The opening up new markets, foreign or domestic and the organizational development from the craft shop and factory to such concerns as U.S Steel illustrate the same process of industrial mutation – if I may use that biological term- that incessantly revoutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism. It is what capitalism consists in and what every capitalist concern has got tol ive in." (p. 83).*

An important point to note in the concept of creative destruction reached by Schumpeter is Schumpeter's approach to the concept of "revolutionize" in the definition. Schumpeter states that the motion of the revolutions, which took place within the system itself, happened through this process known as "business cycles", resulting from a radical change and acceptance/absorption of the results of revolutions (Schumpeter, 2006, p. 83).

Since the day Schumpeter put forward, the concept of creative destruction has been used in various fields and this usage was carried out to explain and interpret the changes and radical transformations in related fields. Reconsidering the concept in the context of sustainability, Hart and Milstein stated that there is a great sustainable development process dominated by creative destruction at the global level (Hart and Milstein, 1999, p. 24).

Page discussed the concept of creative destruction in the context of the city of Manhattan between the 1900s and the 1940s and used the concept to show the physical destruction of the

city and the creative impact of newly built buildings in Manhattan's cityscape. In this regard, placing Schumpeter's concept of creative destruction at the center of urban planning, Page brought a new perspective on the concept (Page, 2001, p. 2). The study carried out by Hartshorn, Maher, Crooks, Stahl, and Bond approached the concept of creative destruction from an engineering perspective, they highlighted and discussed the issue of creating future products and services that leapfrog over existing practices by using innovations in engineering planning and management (Hartshorn, Maher, Crooks, Stahl, and Bond, 2005, p. 170). A striking approach to the concept of creative destruction has been put forward by Ledeen. Using the concept of creative destruction synonymously with the United States of America (USA), Ledeen blames the USA for the process of creation and destruction occurring all over the world, moreover, he stated that creative destruction is the second name of the USA and that the USA is destroying the old orders in science, literature, art, architecture, cinema, politics, and law with its creative destruction power and its enemies fear this power and creativity of the USA; in this way, the author has given the concept a very radical form (Ledeen, 2007, p. 212-213).

Harvey argued that the concept put forward by Schumpeter was taken from Karl Marx and reinterpreted. Harvey states that in the event of making an evaluation between Schumpeter and Marx on the concept of creative destruction, Marx's approach draws attention to the creative tendency of the capitalist system and highlights the tendency to destruct; in Schumpeter's concept of creative destruction, on the other hand, the creative power of capitalism is highlighted and destruction appears as a result of trade (Harvey, 2010, p. 46). The concept of creative destruction has been redefined by Aghion and Howitt within the framework of the Schumpeterian economic approach and a growth model has been attempted to be created through creative destruction by remodeling. Placing Schumpeter's concept of creative destruction on an econometric and theoretical ground, Aghion and Howitt pointed out that individual innovations are sufficiently important to affect the entire economy (Aghion and Howitt, 1992, p. 324).

The "creative destruction" approach introduced by Schumpeter differs from the same concept accepted by other theorists. According to Schumpeter, the process of creating something new happens independently, so innovations made by the entrepreneur come first. The inclusion of innovations in the economic system destroys old business routines, too. In this context, it can be argued that the "creative destruction" process introduced by Schumpeter takes place in four stages: The first stage represents the economic system in which economic activities routinely continue as an initial equilibrium. This economic system is based on the assumption that the actors engaged in economic activity are in a balance they are accustomed to. In the second stage, the hypothetical equilibrium accepted in the first stage is disrupted by the innovations realized by the entrepreneurs few in number. At this stage, the economy starts to rise in a general sense. However, after a while, with the depletion of innovations in the economy, making innovation becomes difficult. In the third stage, a new equilibrium arises through "creative destruction". At this stage, on the other hand, the motivators created by innovative activities that will keep the economic dynamism alive fail to satisfy to provide the continuance of the economic rise. The economy that experiences a downturn causes most firms to be eliminated from the economic system. At this stage, in a sense, the process of economic selection begins; while the old routines or ways of doing business are changing or disappearing, companies that make innovation can continue their economic lives. The competitive destruction process destroys old firms while ensures the survival of innovative firms. At the end of the

stage, thus, a routine of an economic system as in the first stage but renewed and formed at a higher level emerges. In the last stage, an economic evolution realizes as part of the "creative destruction" process. In the economic system that has become routine in this process, a series of equilibrium that became routine and data-based accepted economic routines are accompanied by disruptions created by innovation. At the end of the stage of economic evolution that emerged in the context of "creative destruction", it is thought that socio-political events shall occur that will radically change the functioning of the economy (Andersen, Dahl, Lundvall and Reichstein, 2006, p. 5,6).

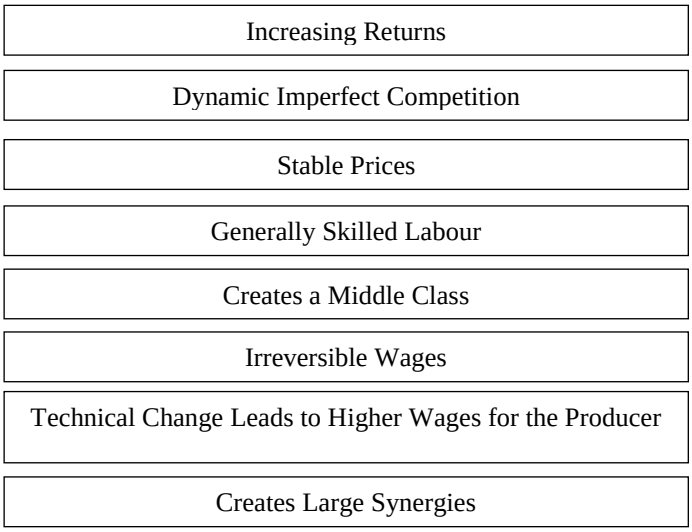

Figure 2. Characteristics of Schumpeterian Economic Activities
Source: (Reinert, 2013, p. 10)

Schumpeter's innovation approach takes place at the core of the "creative destruction" process. Innovations in Information and Communications Technology destruct the structure technologically dependent on the previous technological paradigm and initiate a new process that will lead to the emergence of new firms and companies. Indeed, such a cycle has the characteristics to prevent stagnation in economic life. From this viewpoint, it can be mentioned that the theory of creative destruction developed by Schumpeter basically centers two factors: Innovation and Business Cycles. Compared to Karl Marx, it can be clearly seen that the views of the two great theorists on capitalism differ significantly, such that, according to Schumpeter, the accumulation and annihilation of wealth under capitalism realized in consequence of "the gale of creative destruction". In the process of Schumpeterian "creative destruction", the entrepreneur creating innovations disturbs the equilibrium in economic life and destructs all economic structures established based on old technology, the product of the previous economic paradigm. As can be seen, innovation in Schumpeter's world takes place at the center; moreover, the "creative destruction" process directly has the same meaning as innovation activities. Today, economic development is associated with innovative activities. As a matter of fact, the prominence of knowledge-based economies reveals the importance of innovation activities, as also Schumpeter claimed in his thoughts. The neoclassical economic paradigm's economic development model based on capital accumulation has lost its significance, and economies with innovative capacity have come to the fore. Economic fluctuations resulting

from business cycles shatter the current economic system. In his famous work "Capitalism, Socialism and Democracy" and in his "Business Cycles", Schumpeter defines this situation as "railroadization"[5] and explicitly revealed that how a sector changes with the construction of railroads. As a matter of fact, the situation shows the same tendencies today. The companies in the photography sector such as "Xerox" and "Polaroid" also faced such a process and disappeared from existence due to significant transformation in the industry. The fact that the companies appearing before the relevant firms generate more advanced products using new technologies and reduce production costs caused the profit rates of these companies to fall first, and then put an end to the market dominance of these firms within the industry. This can be seen much more clearly if one looks at the music industry. The devices known as cassette tapes first turned into a quadraphonic 8-track cartridge, then these devices became CDs known as Compact Disc. The fact that CD technologies fell behind the emerging technologies paved the way for the emergence of the MP3 format, while MP3 formats to lose their values against the existing technologies led to the development of web or program-based music streaming applications.[6] This stated situation explicitly shows the transformation of an industry through radical innovations. Innovations, thus, become dominant in the economy when they emerge, and change and transform radical thoughts. In this way, innovations in different fields, after a while, spread to the entire economy and combines with original ideas in different fields, moreover, radical innovations put forward in this way lead to the emergence of a new economic fluctuation. In this emerging economic expansion process, non-preexisting new industries are created and radical structural changes come into question in the economy. In the depletion phase of the new wave, economic growth decreases, and crises occur. Innovations create economic cycles and the system is reshaped structurally with the innovation-led crises. Today, the exchange of information rather than selling a product, and the "data" to come into prominence has become one of the most important features of advanced industrial societies. This process shows itself most clearly in the USA. The transformation expressed as "visiting Silicon Valley instead of visiting California to prospect for gold" in the USA illustrates the embodiment of the "disruptive" economy.[7] The stated situation is experienced today in the context of "Artificial Intelligence" technologies. It is claimed that companies using Artificial Intelligence technologies have clearly strengthened their competitive capacity against non-using companies.

[5] With this concept (*railroadization*), Schumpeter wanted to express the change experienced after the railway constructions in the 19th century and showed creative destruction over this concept. In this period, which can be considered as a pioneering period in terms of creative destruction, the change of horse carriage and the industry and sectors related to this transportation method is quite remarkable. The number of towns constructing railroads increased dramatically and railway towns emerged, besides, numerous new industries linked to railways have been established. The innovations to become routine created financial crises and old company structures gave way to early modern firms. The construction of railroads, depending on the adaptation of economic structures to this method, has brought about a great irreversible change. For further information, see; (Andersen, 2002, p. 41).

[6] Today, in areas that technology companies, which are leading in the communication sector, call the application market, this program takes place.

[7] It should be remembered that companies such as Apple and Microsoft originally emerged as two or three-person garage companies. Thanks to the innovations they have brought against existing technologies, these companies have caused a great change in their sectors. For example, when Apple launched its first touchscreen phone, "Nokia", one of the leading brands of the era, was hit hard. The "Kodak" brand, which was a leader in its sector, also experienced this situation, as a result of failure to digitalize and to make innovations, it desperately lost its leading position in the face of new technologies. When we consider the changes and transformations experienced in our age, it is possible to increase the examples regarding this situation.

Companies like Google, Facebook, and Uber have most of the opportunities they don't physically have in the virtual environment, they store data of billions of users and process them with Artificial Intelligence technology (Moloi and Marvala, 2020, p. 89-92).[8]

3. The Relationship Between the Theory of Creative Destruction, Innovation Activities, Entrepreneurship and Economic Growth

In the process of "creative destruction" developed by Schumpeter, the roles of entrepreneurs are of vital importance. Activities carried out by entrepreneurs lead to unbalances in the balanced economic system and pave the way for economic opportunities to emerge. These thoughts declared by Schumpeter have been handled by most researchers today and the effects of innovations on the economy and economic development have been tried to be measured or determined. In other words, the question of whether there is a connection between innovation and economic growth was sought. Therefore, various indicators such as R&D expenditures or the numbers of patent applications have been the subject of these studies and the effects of these on economic growth have been tried to be revealed (Wong, Ho and Autio, 2005, p. 336).

Large-scale study of Cipolla has revealed that the fact that humanity, thanks to the Industrial Revolution, acquired the necessary technologies to make the world's resources available has ushered in a new age (Cipolla, 2005, p. 215). The study conducted by Solow (1957) on technological change and economic growth tried to measure the rate of technological change in the US economy between 1909-1949.[9] Solow was followed by a study carried out by Fabricant (1954).[10] While there is undoubtedly an important link between economic growth and technological change, the first studies for revealing this link focused on the data for R&D activities and tried to show the connection of this relationship on the economy (Masfield, 1972, p. 477). Indeed, later focused on another variable and the patent numbers were brought to the forefront. The neutrality of data on the numbers of patents and its accessibility compared to other data enabled patent numbers to be accepted as an economic indicator in terms of being the main evidence of the creative process (Griliches, 1990, p. 1661). In his study investigating innovations and the spread of innovations, Nadiri focused on the investments in R&D activities and examined the relationship between these activities and productivity, besides, he revealed that there is a very strong relationship between R&D investments and total factor productivity and that R&D as a production factor also affects demand and input prices (Nadiri, 1993, p. 1-2).

The studies on the link between entrepreneurship activities and economic development, on the other hand, have come to the fore within the Schumpeterian approaches. In their study emphasizing the link between entrepreneurship and economic development, Thurik and Wennekers pointed out that entrepreneurial activities are very important in economic growth, in making the economy competitive, and in employment creation (Thurik and Wennekers, 2004, p. 140). Audretsch and Zoltan stated that, in the 21st century, entrepreneurial activities constitute the most fundamental activities for economic development in terms of the modern economy and

[8] Google has a large library, however, there is no such library physically. Although Uber is a taxi app, it doesn't have only one taxi. Facebook connects 2 billion users virtually. The laws on data adopted in order to make this situation legally appropriate are just one example of the enormous influence of the economic paradigm on social structures.
[9] For related study, see: (Solow,1957, p. 312-320).
[10] For related study, see: (Fabricant, 1954).

have a great connection with economic development, they also expressed that new companies and structures formed through entrepreneurship have contributed to economic development by competitively mobilizing their old rivals (Acs and Audretsch, 2010, p. 1). The number of previous studies conducted related to the EU in the context of the theory of creative destruction is quite low. However, the theory of "creative destruction" is one of the most widely used and applied theories in the context of innovation-based development and economic growth. In this regard, the most prominent study was carried out by Aghion and Howitt (1992), later, the study was reviewed and updated by Aghion, Howitt, and Akciğit (2013). In the study carried out in 1992, Aghion and Howitt discussed the creative destruction approach put forward by Schumpeter and created a model by simply correlating innovation processes with patent data (Aghion and Howitt, 1992, p. 324).[11] The following study conducted by Aghion, Howitt, and Akcigit focuses on the relationship between the industrial organization, firm dynamics, institutions[12], technological cycles, and growth in the context of the Schumpeterian Growth model (Aghion, Akcigit and Howitt, 2013, p. 1). Related studies gain importance as they are pioneering and guiding studies in this field. However, there are also studies conducted in this context. Hence, the study carried out by Segerstrom, Anant, and Dinopoulos (1990) created a model based on Research and Development data within the scope of product innovation suggested by Schumpeter (Segerstrom et al., 1990, p. 1077). In another study carried out by Corriveau (1994), it was stated that economic growth and economic outputs in the long-term resulted in endogenous growth results. Designing a model where decisions are taken by entrepreneurs, Corriveau focuses on the actions of entrepreneurs seeking profit opportunities resulting from long-term innovation on the basis of Schumpeter's "Theory of Economic Development" (Corriveau, 1994, p. 1-2).

In terms of the Schumpeterian, that is, the technical change-oriented economic change paradigm, one of the main factors of economic development is innovation, and innovations made by entrepreneurs push existing technologies out of the market, creating a huge wave of innovation (Aghion, 2008, p. 1).

As seen in the existing literature, it was stated that there are significant links between the indicators used in the measurement of innovation and economic development, these different data were associated with various models and the link between them was tried to be revealed. In this context, the relationship between patent data, R&D investments, productivity rates, entrepreneurial activities, and economic growth has been tried to be measured. Unlike related studies, this study aims to discuss the relationship between economic development and innovation in the EU in the framework of a Schumpeterian approach under GERD (Gross Domestic Expenditure on R&D), BERD (Business Expenditure and R&D), and PAEOP (Patent Applications European Patent Office) data, which are associated with the theory of creative destruction and can be regarded as data showing the technical change, and to evaluate the situation of innovation activities in the EU. In this regard, the performances of the EU member countries have been tried to be indicated through the data provided by Eurostat. The data discussed have been presented via charts indicating the overall situation in the EU between 2008 and 2018.

[11] The beginning of the studies carried out by Aghion and Howitt dates back to MIT University in 1987. For further information, see the related article.
[12] Institutions and policies contributing to economic growth have been meant.

4. Analysis of Innovation Performance in the European Union in the Context of Creative Destruction

Along with the 2000s, to increase its global competitiveness and its share in the global economy, the EU determined a significant road map towards the challenges posed by globalization. Thanks to this paper known as the Lisbon Strategy[13] and adopted in March 2020 in Lisbon, the development strategy of the EU rests on three pillars. The economic pillar pursues a goal for the development of the EU economy in a dynamic and knowledge-based manner, while the social pillar discusses the importance of the correct use of human resources socially in the EU, and the environmental pillar aims to support economic growth from the use of natural resources (Eurostat, 2013). However, while entering the 2000's, the Lisbon Strategy failed to address the essential points related to the development of the EU and remained only a well-prepared road map, moreover, the difficulty of implementing this strategy was foreseen as of the first day it was launched.[14] Along with the Lisbon Strategy, the EU aimed to create a dynamic and innovative economic development structure, and going beyond neo-liberal policies, the EU focused on adapting its economic structure to Schumpeter's evolutionary dynamic economy. But, the most serious problem of the Lisbon Strategy has been to ignore the problem in the economic structure of the EU. Economic policies based on the "creative destruction" approach applied in EU member states at the end of the 1990s could not initiate the change in the industrial structure, besides, a serious disparity occurred and the industrial structure did not change. As a matter of fact, this situation was followed by the enlargement of the EU in 2004 and the texture incompatibility increased more. Having been coerced to update in 2005, the Lisbon Strategy remained as a "goodwill" list that does not mention any other point than the weaknesses and existing problems of the EU. Therefore, the EU needs to create a road map that takes precedence over the Lisbon Strategy, sets out stronger development strategies, and focuses on the consequences of technology and innovation on employment and wages within the EU economic structure (Reinert, 2006, p. 2, 3, 5, 28).

As we enter the 2000s, the main economic problems of the EU appear clearly when compared with the USA. As a matter of fact, the EU is losing power economically against the USA and other rivals on a global basis. The main reasons for this power loss can be listed as follows: the seizure of economic institutions by trade unions and companies, experiencing oil shocks, the end of the Bretton Woods system, and failure to implement measures aimed at sustaining economic growth in Europe (for the purpose of not falling behind against rivals) (Temin, 2002, p. 8-9).

Failure of the Lisbon Strategy to achieve the desired results led to updates on the strategy become a current issue. However, economic developments that occurred in the USA in 2008 caught the EU quite unawares. The 2008 financial and economic crisis first caused a serious liquidity crisis, interbank transactions halted at the same pace, and credit risk premiums increased. Concern about financial institutions' insolvency towards the problem faced by banks in rolling over their short-term liabilities also increased. As a matter of fact, this economic situation that emerged in the USA has seriously affected a structure such as the EU, which is at the core of the global economy. Following the bankruptcy of one of the largest investment banks in the USA, the situation in the global markets rapidly deteriorated and the EU economy

[13] For further information, see; (European Commission, 2010a).
[14] For an assessment of the Lisbon Strategy, (Günar, 2017).

was seriously damaged. While the USA experienced a serious financial collapse, the EU member states quickly took measures to maintain the stability of the financial system. On the other hand, due to its weak regulatory coverage for financial structures, the Lisbon Strategy did not mitigate the effects of the crisis, on the contrary, it was criticized for this reason (Natali, 2010, p. 8-9).

It was thought that the economic damage caused by the global financial and economic crisis to the EU could be overcome with the adoption of a new development strategy, and instead of the Lisbon Strategy, which expired in 2010, the "EU 2020" development plan was adopted.The EU 2020 Strategy can be defined as a strategy focused on the growth and employment policies of the EU, valid between 2010 and 2020. Differently from the Lisbon Strategy, the EU 2020 stays focused on "smart, sustainable, and inclusive growth" goals and focuses on the aim of improving the EU's global efficiency and competitiveness. The EU 2020 Strategy has set goals, which are expected to be achieved by 2020, in five main areas (Employment, Research and Innovation, Climate Change and Energy, Education, and Combating Poverty and Social Exclusion) (Eurostat, 2020a).

It can be clearly seen that also the EU 2020 Strategy places importance on innovation activities; it was aimed to increase R&D activities, one of the areas where the strategy gives priority, in the public and private sectors to 3% in total, and to establish an "Innovation Union" initiative (European Commission, 2010b, p. 3). However, also the EU 2020 Strategy was unable to reach the goal set out for R&D. In the EU-27, the rate of R&D expenditures in GDP between 2008 and 2018, which remained within the scale of the study, increased from 1.87% to 2.18% as of 2018 (Eurostat, 2020b). Like the Lisbon Strategy, also the EU 2020 Strategy has been evaluated as inaccurate and weak in some of its aspects. Failure of the EU and EU institutions to have sufficient authority over nation-states for the Lisbon Strategy seen in the Schumpeterian structure and its subsequent strategies is shown as the reason why the desired economic momentum could not be gained, and excluding the leading basic policy areas of the EU such as the common agricultural policy has seriously complicated the implementation of such policy reforms in a *sui generis* actor like the EU (Erixon, 2010, p. 34).

In order to better show the effects of EU strategy documents on the EU, this study will make an analysis of the innovation activities in the EU by examining the effects of the data selected in the context of the creative destruction approach on the EU.

4.1. Gross Domestic Expenditure on Research & Development Performances of the European Union Member States

In the EU-27, the effect of R&D activities on GDP was 1.81% in the 2000s. Between 2000 and 2008, GERD increased from 1.81% to 1.87%, and by 2010, this rate increased to 1.97% at most (Eurostat, 2020b). In this context, it can be clearly seen that the Lisbon Strategy has failed. As can be seen in Chart 1, the EU member states with the highest rate in terms of GERD are Finland and Sweden. While GERD was 3.54% in Finland in 2008, this rate was 3.47% in Sweden. The countries mentioned were followed by Denmark, Germany, Austria, France, the Netherlands, and Luxembourg, respectively. Cyprus was the country with the lowest GERD rate.

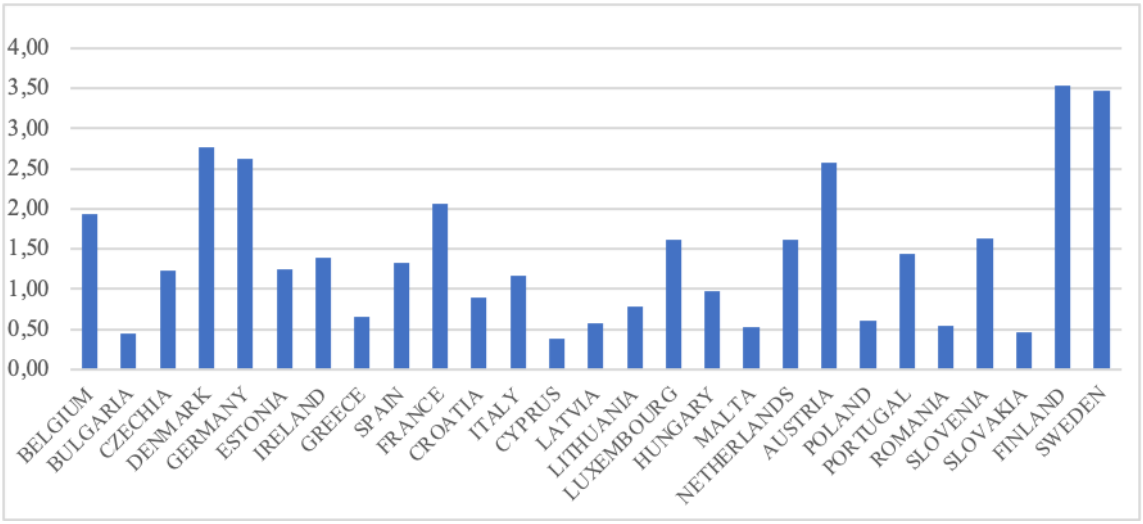

Chart 1. Ratio of R&D Activities to Gross Domestic Expenditure in EU Member States in 2008
Source: (Eurostat, 2020b).

GERD shows an overall increase in the EU-27 in 2018 compared to 2008. When 2018 examined, it is seen that Sweden has the highest rate in the EU-27 with 3.32% again, but Germany, Austria, and Denmark have also caught a significant trend of upward. As can be seen in Chart 2, Finland experienced a decrease compared to 2008 and its rate decreased to 2.76%. Although Cyprus is not the country with the lowest rate in the EU-27 at 0.63%, it did not show a significant increase, too. In 2018, Romania displayed the lowest performance with 0.5%.

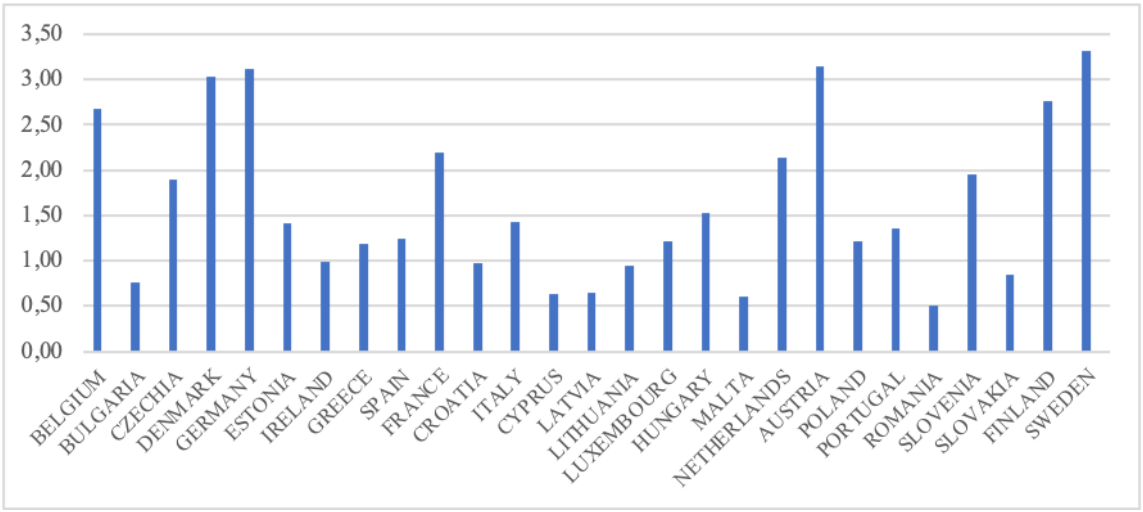

Chart 2. Ratio of R&D Activities to Gross Domestic Expenditure in EU Member States in 2018
Source: (Eurostat, 2020b).

Considering the overall situation of the EU-27 between 2008 and 2018, it is seen that in the EU-2, GERD was realized as 1.87% in 2008. According to Chart 3, there was a very low increase in this ratio between the relevant years. It is observed that this rate has increased to 2.18% in the EU-27 as of 2018. As per the Lisbon Strategy and the EU 2020 Strategy papers,

GERD was aimed to increase to 3%. However, it is clearly seen that neither strategy has been successful in the relevant field.[15]

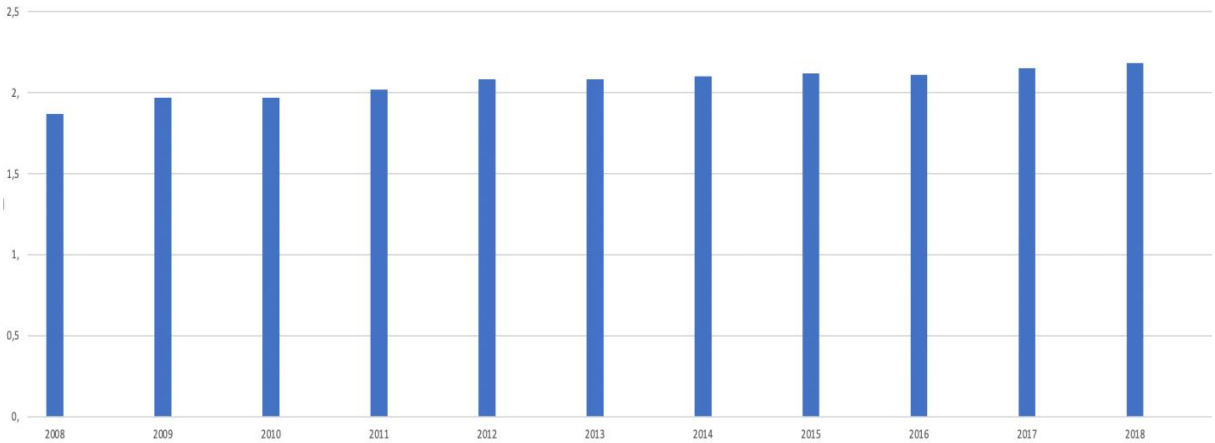

Chart 3. Ratio of R&D Activities of the EU to Gross Domestic Expenditure between 2008-2018
Source: (Eurostat, 2020b).

4.2. Business Expenditure and Research & Development

R&D expenditures of enterprises constitute another important indicator in terms of innovation activities. Considering 2008, it is seen that Germany has the highest rate in the EU-27. With 46 million Euros, Germany is the leading country in BERD among EU-27 members. Germany is followed by France, Italy, Spain, Sweden, Finland, Austria, the Netherlands, and Belgium. Chart 4 explicitly shows that the central countries of the EU are ahead in BERD. It can be seen that there is a serious fiscal cliff between the EU member countries and the central countries of the EU in 2004 and later on.

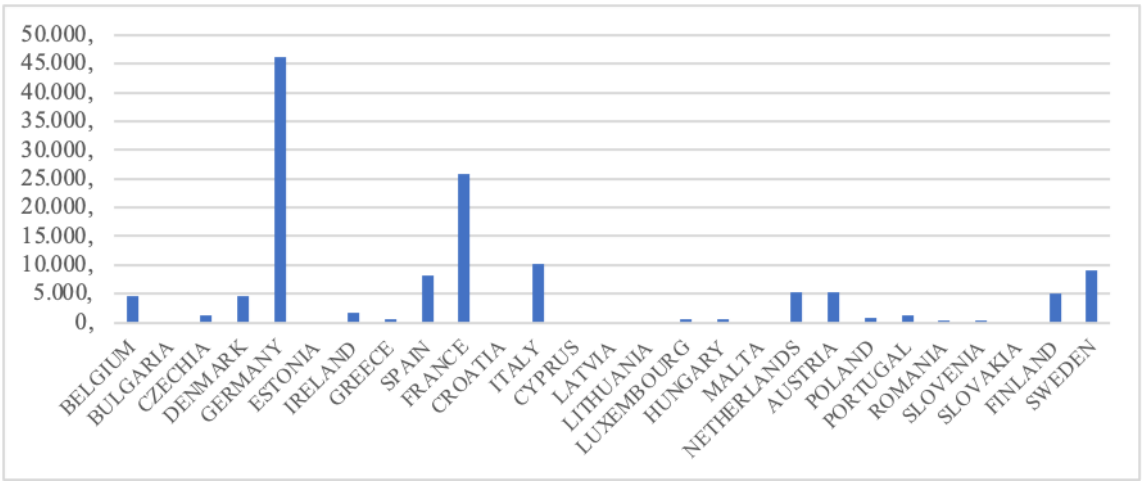

Chart 4. 2008 EU-27 BERD Rate (Million Euros)
Source: (Eurostat, 2020d).

[15] For the Lisbon strategy goals, see; (European Commission, 2010c, p. 9); For the EU 2020 strategy goals see; (Eurostat, 2020c).

It is seen that there is an overall improvement in the BERD rate in all member countries in the EU-27 in 2018, and the EU central countries continue to lead compared to 2008. According to 2018 data, the expenditure of enterprises in Germany for R&D activities was around 70 million Euros. France, Italy, the Netherlands, Sweden, Austria, Belgium, and Denmark follow Germany. Also, in BERD, the leadership of the central EU countries within the EU-27 shows itself.

Germany be ahead of other EU member countries in the analyzed data levels explicitly shows why the country is more competitive in most industrial areas. As a matter of fact, Germany be specialized in "medium-sized technological products" and produce quality products are among the main reasons why the German economy made its industry competitive compared to other EU members during the 2008 global financial crisis. Studies conducted by Germany in the context of R&D activities in terms of price and cost in some technology products contribute to Germany's global prominence in industrial products and to become competitive. When GERD data analyzed globally, this situation of Germany can be explicitly understood when compared with the USA, Japan, the People's Republic of China, and South Korea. In terms of hi-tech data, South Korea and Japan are leaders, while the USA and Germany follow these two countries. As a matter of fact, BERD for Japan, the USA, and South Korea constitutes more than 70% of GERD data, while this rate is 60% for Germany and the People's Republic of China (Foders and Vogelsang, 2014, p. 1, 12).

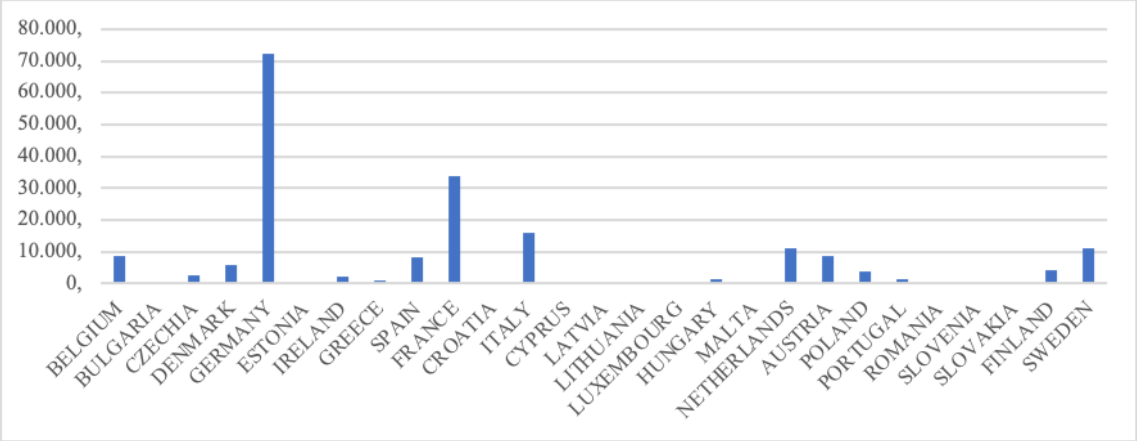

Chart 5. 2018 EU-27 BERD Rate (Million Euros)
Source: (Eurostat, 2020d).

As seen in Chart 5, BERD in the EU-27 has increased moderately. The data, which was 129 million Euros in 2008, increased to 195 million Euros by 2018. It should be emphasized that the only country that stands out in the context of BERD is Germany and the central EU countries. It can be seen that the situation of the EU member states in 2004 and later on is quite weak.

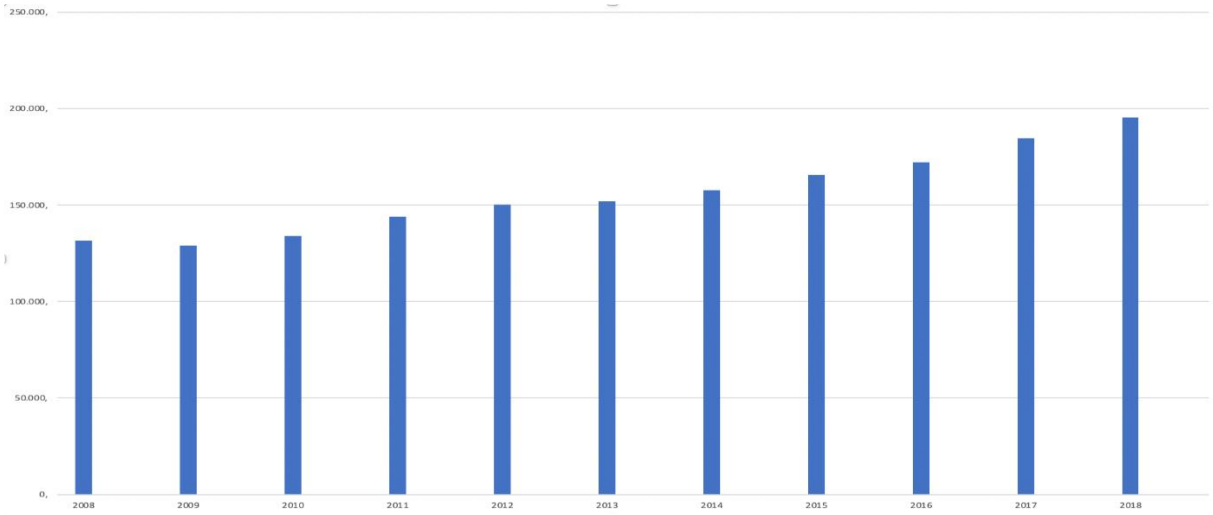

Chart 6. EU General 2008-2018 EU-27 BERD Rate (Million Euros)
Source: (Eurostat, 2020d).

4.3. Patent Applications to the European Patent Office

The numbers of patents are considered as another data indicating the technical changes in the economies of the countries and it is stated that there is a direct relationship between the increase in the number of patents and economic growth. According to the World Intellectual Property Organization (WIPO), the number of patents can be accepted as basic data in terms of economic activity indicators (Moran, 2006).

Chart 7 explicitly shows that, when compared to other EU member states, Germany is ahead of the EU-27 in terms of the number of patents. In 2008, Germany applied for 26,667 patents and was followed by France, Italy and the Netherlands. Considering the data on numbers of patents, it is observed that the performances of other central EU member states other than Germany and France are also significantly low.

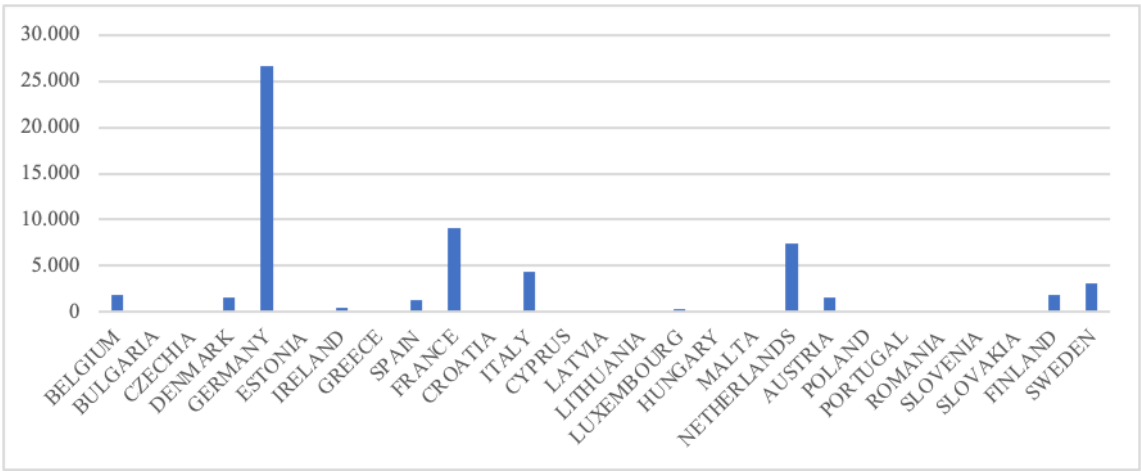

Chart 7. Number of Applications Made to the European Patent Office in 2008 (in numbers)
Source: (Eurostat, 2020e)

In 2018, the number of patent applications increased moderately at the EU-27 level, and the number of applications of some countries increased. However, Germany is again the leading EU member state in the number of patent applications within the EU-27 in 2018, too. In 2018, Germany applied for 26,663 patents in total. Germany was followed by the central EU member states, while the performances of the EU member states after 2004 remained quite low compared to the central EU member states.

It should be noted that Germany is among the leading countries in the world in terms of patent numbers. As a matter of fact, two-thirds of the patent applications registered all over the world between 1970 and 2000 were made by the USA, Germany and Japan (World Intellectual Property Organization [WIPO], 2019, p. 9).

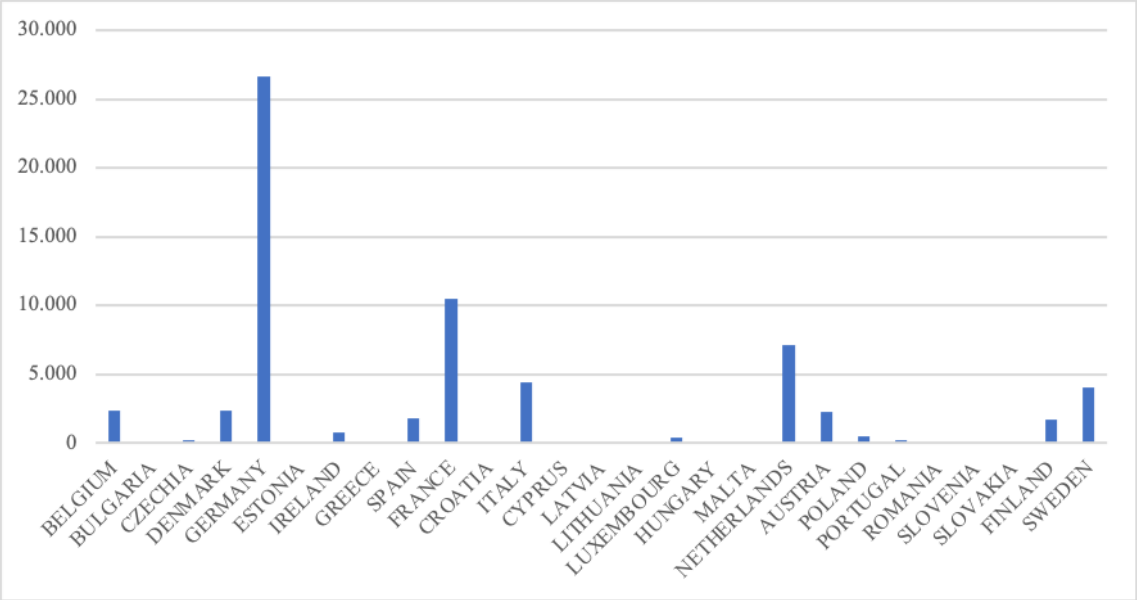

Chart 8. Number of Applications Made to the European Patent Office in 2018 (in numbers)
Source: (Eurostat, 2020e).

Considering the number of patent applications in the EU-27 between 2008 and 2018, a wavy trend draws attention. While the total number of patent applications in the EU-27 was 60,401 in 2008, it increased to 66,181 by 2018. As seen in Chart 9 although performance increased over the respective years, the level across the EU remained significantly lower. When Germany's performance examined, the performance of the country's patent applications almost corresponds to one-third of the EU-27.

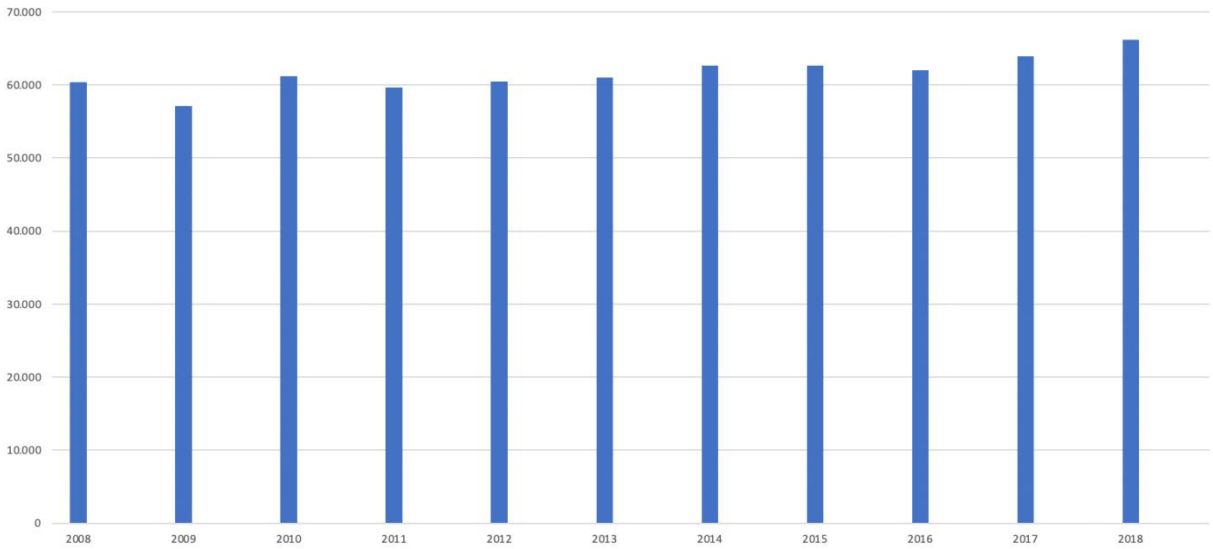

Chart 9. EU-27 Patent Applications Between 2008-2018 (in numbers)
Source: (Eurostat, 2020e).

5. Conclusion

The concept of innovation can be expressed briefly as the introduction of something new. The distinction between innovation and invention is important for understanding the concept. While the invention can refer to something new originated after an experiment, innovation has economic output. In this respect, among the studies on the concept of innovation, there has not been another study that stands out as much as Schumpeter's study, and no other theorists other than Schumpeter have expressed such striking thoughts about the understanding of capitalism through innovation. Schumpeter defined innovation as the "change that occurs in the production function" and came to the fore as the theorist stating that capitalism provides economic development as a result of innovation activities. In line with his definition, Schumpeter also listed the activities that should be considered as innovation. Activities such as "introduction of new goods", "finding a new production process", "opening up new markets", "conquest of new supply sources", and "reorganization of the firms" are regarded as innovations in the Schumpeterian sense.

In the Schumpeterian economic system, apart from innovations, the entrepreneur is also very important. The entrepreneur at the center of the Schumpeterian economic change model and the role assigned to him are quite remarkable, and an entrepreneur acts as an economic growth triggerman. In the Schumpeterian economic approach, the entrepreneur disturbs the economic system in equilibrium and functions like an agent that breaks down old structures. With the profits they gain, entrepreneurs pay the credit they use to perform the innovation activity. As can be seen, Schumpeter has given certain roles to all structures within the economic change model. This importance given to innovation, entrepreneur and entrepreneurial profits by Schumpeter lets him reach the process/theory that he calls "creative destruction". Along with the concept introduced by Schumpeter in 1942, Schumpeter has remarkably expressed the mechanism for capitalism to change itself. According to Schumpeter, innovations made by entrepreneurs cause changes in capitalism that can be considered revolutionary, which are called "business cycles". This emerging wave of change completely destructs and rebuilds

the existing and accepted structures within the economic system. Within this process, new technologies go old technologies out of play and the economic system reaches a new dimension of equilibrium.

The creative destruction process causes uncertainty in the economic system, while prices and interests increase with the expansion of credits. This situation causes the equilibrium of the economy to be disturbed and results in an increase in risks and uncertainties, besides, the process of establishing a new equilibrium begins with the depletion of innovation activities. During the establishment of the new economic balance, the economy undergoes a reorganization process and in this reorganization process, a new equilibrium is established that is even higher than the old one. In this process, along with the recession, a decrease is observed in the rates of loan, interest and prices, however, the aggregate economic output increases compared to the previous period.

Studies to measure innovation activities have been carried out through various data over a long period of time. Thus, initial data used to measure technological change and evaluate its effects on economies were for R&D activities, while the number of patents, which is another important indicator besides R&D activities, is preferred in terms of most studies as it shows the effects of technical change on economies. Models created to measure Schumpeter's "creative destruction" process dealt with R&D activities and the numbers of patents, and tried to measure the effects of the Schumpeterian approach on economies.

The EU is a *sui generis* international actor that is different from nation-states and ensures political integration through economic integration. This structure of the EU necessitates it to be evaluated separately from nation-states. In fact, this structure has entered into a serious period of change in the 2000s; moreover, starting to lose its competitive position as a result of the economic pressure caused by globalization, the EU has initiated an economic innovation process to increase its strength against its rivals in the international arena. In this context, through the Lisbon Strategy adopted in 2000, the Union aimed to transform into the world's most competitive and dynamic economic system, however, the difficulties experienced in implementing the strategy and the global crisis that occurred in 2008 have prevented the EU from achieving its goals specified in the strategy paper. Following the failure of the Lisbon Strategy, in 2010, the EU adopted a new strategy document named the EU 2020. As well the specified strategy document, and especially the Lisbon Strategy, has the characteristics of Schumpeterian structure, these are documents that highlight innovation activities remarkably and they have aimed to transform the economic system of the Union into an innovation-oriented quality; however, the expected targets were not achieved and the EU could not be transformed into a knowledge-based dynamic structure.

In the context of the findings obtained in the study, when the EU's Schumpeterian creative destruction and innovation activities are evaluated, the following results have been reached:

- Germany's high performance within the scope of GERD, BERD and PAEPO given as innovation data in the study is remarkable. Germany has a more stable and higher innovation capacity than most central EU member states. Indeed, as a result of this situation, the German economy has achieved great success after the 2008 global financial crisis, the economic devastation that took place in the periphery EU member

states and central EU member states did not make itself felt very strong in Germany. The compatible structure of the German economic system with the EU, and as shown in the study, the fact that Germany makes its economy competitive through innovations can be regarded as one of the most solid indicators of this situation.

- In the data considered as an indicator of innovation activities in the study, the central countries are quite strong among EU member states. Six founding states (Germany, France, the Netherlands, Luxembourg, Belgium, and Italy) and the leading countries of the EU (Finland, Sweden, and Denmark) have a higher performance in terms of innovation activities than the neighboring countries. This situation can be associated with the weaknesses of the strategy papers adopted by the EU. The factors such as the weakness of strategy papers in terms of authorizing the EU, failure of the EU to have the sanction power on member states' national reform programs (using non-binding convergence tools, such as the open method of coordination), exclusion of the EU from basic policy areas such as agricultural policy, and failure to confer power to the EU bodies in the eyes of nation-states render the EU helpless in this sense, and the EU is losing power over its rivals economically in general terms.
- The EU economy draws a profile where the central countries are strong in terms of innovation activities, but the peripheral countries are weak. As a matter of fact, in the 1990s, the economies of the countries, which the EU accepted as miracle economies, were severely devastated by the 2008 global financial crisis and later on and they were unable to make their economic structures innovative (Spain, Ireland, and Greece).
- Although the failure to achieve the targets set for innovation activities in the EU is related to the structure of the EU, the *sui generis* structure of the EU prevents the emergence of disruptive and "creative" structures such as Silicon Valley in the USA. While the EU empowers the bureaucracy in its economic system, similar to nation-states, it remains helpless in the implementation of the economy and economic output is low in terms of innovations across the EU.
- Although the Lisbon Strategy and the EU 2020 Strategy enabled the EU to develop in terms of innovations, they failed to achieve the economic transformation needed by the EU. As a matter of fact, strategies implemented in states joined the Union after 2004 (enlargement of the EU) have devastated the industries of the countries, but the creative part of this destruction has failed. This situation caused an economic texture incompatibility in the economic structures of EU member countries.
- The 2008 global financial crisis seriously affected the EU due to its integration into global markets and the EU integration has faced an enormous economic shock. Failure of strategy papers to make the necessary financial arrangements and to make national economies competitive has led to economic devastation for most EU member countries.
- As can be seen in the data discussed within the scope of the study, Germany has an important superiority. The importance given by Germany to GERD and BERD has enabled it to keep its economy competitive globally, in this way, Germany has also managed to transform its innovation activities into economic output, and today it remains competitive against the leading countries of the global economy such as the USA, Japan, South Korea, and China.

The data handled in the study clearly show the weakness of the EU in the EU-27 in terms of innovation activities. Although the strategy papers provided a moderate improvement in the member countries in terms of innovations, these action plans were not enough to overcome the industrial texture incompatibility of the EU. Thus, it can be argued that Schumpeterian "creative destruction" does not fully serve the purpose within the EU. As a matter of fact, as it is known that the most serious economic weakness of the EU is the difficulty it experiences in transforming scientific activities into economic output, it would be much more rational for the EU to quickly adopt a more efficient and innovative development system; moreover, the fact that the EU should act with a strategy that is not just about intent and well-defined goals will enable the Union to settle into an innovative, competitive, and value-added economic model that it is seeking, and thus, the way will be paved for political integration, too.

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