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Dear readers,

We enjoy reaching you with our first issue. Our journal has set out with the aim of having the quality of an academic journal that academicians, researchers, those who want to publish their studies, career policy makers and career centers will follow carefully, publishing on time and being scanned in reputable indexes in a short time.

This issue consists of five articles, three of which are original research articles and two of which are review articles. We thank everybody for their voluntary support during the publication process. We will be happy to invite papers from all researchers studying in different fields of career.

Sincerely yours

Assoc. Prof. Dr. Doğan BOZDOĞAN & Dr. Lec. Aslı YERLİKAYA

Editor-in-Chief

CONTENTS

Yılmaz, V. (2020). Covid-19 and career shock. *TOGU Career Research Journal*, 1(1), 1-9.

Covid-19 and Career Shock

Dr. Veysel YILMAZ*

Abstract

The world health organization declared Covid-19, a contagious disease, as a pandemic on March 11, 2020. The Covid-19 pandemic significantly impacted all humanity, including the healthcare industry, economic units, and social relationships. The Covid-19 epidemic disease made it compulsory for economic units to innovate in management and business understanding. These business and managerial changes have revealed the need for people who want to improve their career planning and careers to review their career planning. It is clear that the Covid-19 epidemic is an extremely destructive and extraordinary event. Currently, Covid-19 continues to make a profound impact on individuals' careers. Covid-19 epidemic causes career shock in the career development of individuals who want to steer their career. In this sense, career shock can be defined as destructive and extraordinary events caused by factors beyond the control of the individual and triggering a deliberate thought process about one's career. In this study, it was evaluated that Covid-19 was a career shock, and career shock was defined by addressing its potential effects on the career. In terms of career, the biggest effect of Covid-19 is its uncertainty. If Covid-19 cannot be brought under control, its effects will continue increasingly like a snowball in career and all other life areas. Therefore, this study will be able to offer an important perspective to individuals who want to evaluate career opportunities in the Covid-19 process. It is thought that the study may offer suggestions for future researches on career shock.

Key Words: Covid-19, Career Development, Career Shock, Year 2020.

Introduction

Human resources management has reached its current state as a result of modern developments. Modern management techniques arising from scientific and technological developments continue with a human focus. Successful organizations motivate their employees as human-centered. These organizations can become productive and effective as long as they meet the expectations of their employees. If economic units and organizations want to achieve their goals, they can motivate their employees by using career management effectively. In addition to motivating, the qualifications, skills and competencies of employees are also important. Today, companies will attach great importance to career issues. Business organizations that provide employment, adopt career management practices as a function of organizational strategy in order to direct their employees' desire for promotion and development to the goals and objectives of the organization. Career, which is important in business life, enables individuals to see before and after work and to keep their desire for improvement alive. Undoubtedly, every person wants to choose a good profession that suits his or her talent. Everyone will have the desire to work in a suitable status in this profession, and to pursue a career in this job. Having a career gives a person a personal identity as well as a social status.

Labor markets are also important in the career development process. Career is a concept that emerged in the labor market. Here it is useful to explain some concepts related to labor market and labor market. Economic indicators such as employment, unemployment and wages are also socially important. The labor market is

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concerned with the human element operating in the fields of production of goods and services of any economic structure. Labor, which is the subject of purchase and sale in production, is one of the basic production factors. The active population means the working age population and is the group of people between the ages of 15 and 65. Labor force consists of the total of employed and unemployed. It is necessary to define employment broadly and narrowly. In a broad sense, employment is the inclusion of all production factors (labor, capital, entrepreneurial and land) in production. In a narrow sense, it is the participation of the labor factor into the production process. Unemployment is that labor is not fully used in the production process. Unemployment is one of the most important sources of welfare loss and income injustice. Wage is the wage paid to the worker in exchange for labor power. These defined concepts occupy an important place in the labor market structuring of every economic understanding and thus in the career process. In short, these words are concepts that touch the human element individually and socially (Kesici, 2013:13-20).

Today, companies attach great importance to career issues. They carry out some managerial activities so that their employees can make careers. These activities are also within career management and planning. Career management is an application that enables planning and management of the career to meet both the needs of the organization and the preferences and capacities of the employees (Öge, 2017:48-49). It makes sense to look at the concept of career management in terms of organization and individually. In terms of organization, career management can be achieved through a four-step approach. This is firstly determining the personnel to be recruited in terms of career planning, and secondly, drawing the career path. The career path is the process of raising for a higher position by determining the functional features of positions within the organization and the common directions and relationships between different positions. Third is the provision of career counselors. Finally, it is the development of individual plans. From an individual point of view, career management is shaped based on the person's knowledge, skills, interests and goals. There are internal and external factors that orient the individual in career choice and formation (Kaynak et al., 1998:239-244).

The concept of career dealt with in terms of organization and individual reflects a common perspective on which the parties will agree. The success of career management is important in the proper functioning of this union. In career planning, which has two aspects: individual and organizational, the individual makes choices regarding the job paths that he / she will proceed with (Özgen et al, 2001:194-195). One of these ways is career steps. Organizations must request labor force in order to have career steps. Organizations that demand labor offer the labor force individually to the market for a price. Many factors such as individual preferences, family decisions, wage, non-wage income market conditions that affect the decisions such as working or not working time for the individual are effective (Kesici, 2013:48).

For individuals, important career-related decisions and crises can be either at the beginning of the career or after starting their career. It is likely that crises will occur depending on the career entry and after career. For example, losing or changing a person's job can be seen as a career obstacle. These obstacles can affect the person and undermine his career.

Factors that lead the continuation of the individual career process, mostly being individuals, but outside the individual also affect the career positively or negatively. There are factors that are expressed as career obstacle, problem and shock and cause deviations in the individual career plan in the career of the individual, in the development of his career. These can be either individual or originated from the organization, social structure and extraordinary situations (Bozkurt, 2019: 63).

One of these extraordinary situations may be epidemics worldwide or in the country of residence. These epidemics can affect labor markets, and therefore career planning. Finally, like the Covid-19 epidemic that occurred in the last month of 2019. With the emergence of Covid-19 epidemic disease, the sectors that produce and are the locomotive of economic activities has had to stop their activities either completely or largely. Thus,

various changes occurred in the world economy and the economic structure of the countries. International trade and capital flows started to decline substantially. In this context, huge decreases started in the demand of companies and institutions.

The World Trade Organization (WTO, 2020) predicts that world trade will drop by 13% to 32% due to the Covid-19 (new type of corona virus) epidemic by 2020. In fact, the WTO (World Trade Organization) economists believe that this decrease will likely be more than the declines in terms of trade caused by the 2008-2009 global financial crisis. Governments are taking a variety of measures to deal with the Covid-19 epidemic. It appears that Covid-19 virus has been meticulously and consistently monitored worldwide government responses and compared to the business world. Affecting the business world deeply affects those who want to pursue a career indirectly. In addition to the threat to public health, Covid-19 briefly threatens economic and social disruption, as well as long-term livelihoods and the well-being of millions. Thus, Covid-19 had a shock effect for those who wanted to pursue a career. Career shock is when people do not encounter an environment they always expect in working life because of their high goals and expectations at the beginning of their careers. It emerges as a problem for the person in the early stages of his career (Dündar, 2009: 291).

In this study, the shocks caused by Covid-19 epidemic disease, which came across people as a career obstacle and shock of individuals making career plans, were evaluated and their potential effects on career were discussed.

Literature Search

Although the literature on career is very old, the literature describing Covid-19 and career shock together is new. Because Covid-19 epidemic disease occurred in the last month of 2019.

Akkermans et al. (2020) evaluated the Covid-19 crisis in terms of professional behavior as a career shock. They provided information about career shocks from the literature. They saw the Covid-19 epidemic as a career shock, and stated that business and career outcomes are an issue that needs to be understood and dealt with. In this context, they examined the effect of Covid-19 on individual careers by dividing it into three. First, the effects of career shock are directly affected by the interaction between contextual and individual factors. Second, the impact of career shocks varies with time. It can have different effects in the short and long term and at different career stages. Finally, negative career shocks can lead to positive career results.

It is possible to see the career shocks of some experts caused by Covid-19 in newspaper news. Like Professor Richardson's article of April 18 in Canberra Times. Richardson (Richardson, 2020) stated that Covid 19 is a career shock, a large, unexpected and unplanned event that directly affects short- and long-term career opportunities and experiences. He stated that this epidemic would potentially cause long-term damage to people's careers. He emphasized the ability of individuals to transfer the existing skill set in order to accept such career shocks as they are and to cope with their difficulties.

Akkermans, Seibert and Mol (2018) discussed a study to define and conceptualize career shocks, as well as to provide an agenda for future research on this issue. In this study, career shocks have been defined, and they wanted to provide an integrative definition and conceptualization by bringing together the existing literature.

Mahmud et al. (2020) investigated the effect of Covid-19 fear on career anxiety due to the outbreak of Covid-19. A questionnaire developed on three different scales for Covid-19 fear, depression and career anxiety has been developed. The fear of Covid-19 reveals that individuals have become anxious about their future careers. They feared that Covid-19 fear causes Covid-19 depression and has a long-term negative impact on human psychology as people are depressed and worried about their future careers.

Rudolp and Zacher (2020) conducted a study on how Covid-19 and Covid-19 will affect career and career development in relation to career. In the study, they determined how individuals of different ages were affected by

the Covid-19 outbreak and how they reacted to them, and identified them as a condition that characterizes the new generations.

Career Shocks in Career Development

Programs, actions and activities implemented to help individuals achieve their career goals throughout their careers are called career development. Career development is an effective way to protect the human resources of organizations as well as individuals. (Bingöl, 2003: 257-264). An effective career development is extremely important as it gives the individual opportunities for development and progress. In addition, it will increase the individual's independence, gain spiritually and reduce irritability. In addition to all these, the quality of working life will increase, trained qualified employees will stay in the institution, cause them to work in jobs appropriate to them, they will have equal opportunities for women and men (positive discrimination), and will be more effective both for the organization and the individual in achieving career planning goals (Öge, 2017: 294). There are also difficulties that individuals can experience in career development. The main reason for this difficulty is that it is a future-oriented process**.**

When it is not known what the future will bring and the path contemplated changes unexpectedly, it may make sense to follow a different portfolio of options rather than stick to one idea. Unexpected events and shocks spoil the routine life people are accustomed to. People can no longer be as comfortable as before and begin to ask questions about what is important (Ibarra, 2020). Given the need of individuals to make a career, at the same time, while effectively responding to the opportunities and challenges created by the environment, obtaining career opportunities becomes an important issue (Savickas & Porfeli, 2012: 663). In short, individuals may be affected by their environment in their efforts to build their careers, and these environmental factors can interact with the individual's career opportunities. Person-environment interactions offer restrictions and opportunities that affect attitudes and behavior in the context of realizing careers (Blokker et al, 2019: 174). In terms of the individual, this is called career shocks. Career shock is an external event outside the individual.

Is possible to define career shock in many different ways. It is appropriate to define career shock as follows. "It is a devastating and extraordinary event caused by factors beyond the control of the individual and triggering a deliberate thought process about one's career." Career shocks differ in terms of controllability and predictability. It is considered to be relatively rare and extraordinary events that can be considered negative or positive by the individual (Akkermans et al, 2018: 4). Many individuals experience career shocks in their careers, and career shocks can significantly affect the career development process. Career shocks should be divided into two as positive and negative shocks. Negative career shocks weaken the indirect relationship between career resources and employability. Positive career shocks strengthen the indirect relationship between career resources and employability. Career shocks play an important role in the career development of young professionals (Blokker et al, 2019: 175-177). An unexpected promotion, salary increase, promotion or a professional reward are examples of positive career shocks. Positive career shocks change the career for the better. A serious accident, illness, disaster, termination of contract and unexpected dismissal can be classified as negative career shocks. It often puts the career process in a worse situation (Richardson, 2020). Career shocks have shown that it encourages people to reflect critically in career development processes and to change in evaluating future career opportunities. Unlike positive career shocks, negative career shocks weaken the individual's decision-making process and career development (Seibert et al, 2013). So it should be no surprise that many people rethink their career in the current epidemic Covid-19 process (Ibarra, 2020).

Covid-19 and Career Shock

Although it is often difficult to predict and prevent a career shock, coping with these shocks requires individual effort. For example, there may be efforts such as being prepared for shocks, developing career competencies during the shock period, being flexible to cope with shock barriers, and developing a wide variety of psychological and

behavioral strategies (Blokker et al, 2019: 173). Many individuals encounter career shocks in their careers, and career shocks can significantly affect the career development process (Bright et al, 2009: 15). Studies show that certain career shocks affect the individual in different ways depending on his condition (Kraimer et al, 2019).

The World Health Organization (WHO) officially declared Covid-19, which emerged in Wuhan, China in December 2019, as a universal epidemic on March 11, 2020 (WHO, 2020). Governments have begun taking a series of measures to stop the spread to stop Covid-19 from infecting people to people. This new global epidemic stopped public life and severely overturned the global economy. In the crisis caused by Covid-19 epidemic disease worldwide, almost all of the industries and businesses closed shutters. With this closing, there have been many layoffs. In addition, people often started to face the risk of losing their jobs (Bakker & Wagner, 2020: 2).

The economic actors in the world had to lay off hundreds of thousands of people to survive for their future without suffering economic losses. Those who lost their jobs felt that Covid-19 was a very bad epidemic. Because their income is either very low or limited income or loss of income completely. As a result, Covid-19 has created a shock that deeply affects individuals who have real career goals, make career planning, are less satisfied with their careers and want to make an effective career.

Epidemic diseases such as Covid-19 create not only an epidemiological crisis but also a psychological crisis (i.e. anxiety, depression, insomnia, trauma, anger, psychosis, panic and boredom) like other epidemics in the past (Özdin & Bayrak Özdin, 2020: 5). People tend to be afraid of their lives in the first place in epidemics such as Covid-19. Then the fear of things arises. As fear deepens, it causes depression. Fear and depression are related to different forms of anxiety (Mahmud et al, 2020: 2).

Regarding Covid-19, even though governments are managing with short-term solutions, they will have a serious impact on economic and social consequences in the long run. Career experiences, opportunities and changes in career trajectories of individuals in terms of their careers will be directly effective in the short and long term. For example, while healthcare professionals work to provide 24-hour service, the vast majority of other employees will have to work in the home office. Some of the employees will face job loss as the customer demand decreases and the institutions decrease their terms of service. Small businesses and employers also face significant financial challenges to keep up with costs (Akkermans et al, 2020).

Covid-19, which took more than 400 thousand lives in the first half of 2020, caused the most serious humanitarian, economic and social crisis of the modern world. It is necessary to accept Covid-19 as a career shock. Before moving on to the effects that this virus will have on individuals' careers, it is useful to briefly review the effects of the career in the business world.

The virus made a devastating effect, making the business and businesses vulnerable. According to ILO (International Labor Organization) estimates, Covid-19 caused large-scale workplace closings around the world, with 10.7% of hours worked worldwide in the second quarter of this year. (ILO, 2020: 2). According to WTO (World Trade Organization), it is determined that it will decrease between 13% and 32% in 2020 due to the Covid-19 outbreak in world trade. While it was the Asia and Pacific region, which was the worst affected in terms of expansion, Europe, America continent and Central Asia turned into the epicenter. The future trajectory of the virus remains uncertain. From a medical point of view, the virus continues on its way without discrimination. According to WTO, almost all regions of the world in trade volumes will experience double digit declines in 2020. The regions most affected by this situation are in North America and Asia, and exports will decrease sharply. As a sector, the decrease in sectors with complex value chains, especially electronic and automotive products, is expected to be higher compared to other sectors. Service trade is most directly affected by Covid-19 due to transportation and travel restrictions (WTO, 2020). On the other hand, wholesale and retail trade, vehicle repair, vehicle manufacturing, accommodation, catering services, real estate and administrative activities that are at risk of losing their jobs due to the virus will be deeply affected. Micro, small and medium-sized enterprises with very

few reserves face great uncertainty (ILO, 2020: 2). It is useful to state that. There was a slowdown in the world trade in 2019 without viruses in 2019.

Six out of ten people in the world work in the informal economy. This means that 1.6 billion of all working workers in the world ensure their livelihood in this way. With Covid-19, there was a 60% decrease in the informal economy. This is a sign that there will be a significant increase in poverty. At the same time, Covid-19 affected women more than men in working life. Because women work in the prominent professions and in the service sector most affected by the virus. The effects of Covid-19 on the young population, which is an important stage of life in career development, can be explained as follows: Those who are educated experience delays in completing their courses and graduating after the education is interrupted. According to the ILO data, 50% of the young people completed the education, and 10% stated that they could not complete the situation. These delays also delay the careers of young individuals. Those who have completed their education cannot participate in the labor market under the influence of the virus and face a hopeless situation. One-sixth of the youth working before the epidemic are no longer working with Covid-19. On the other hand, there is a 23% decrease in working hours (ILO, 2020). In short, Covid-19 faced the labor markets with significant challenges and deeply affected individuals' career planning, acquisition and development.

Effect of Covid-19 on Career Development

Career, which has shown a rapid and multi-faceted development in recent years, has become a concept that affects social and all other life aspects of the individual as well as his life at work. This concept, which developed in 2020, unexpectedly faced shock. This shock is very different from previous shocks on the career. This shock Covid-19 epidemic, which individuals experienced in career development in the beginning of 2020. Rich, poor has affected individuals all over the world. In terms of career, Covid-19 is a career shock. It should be perceived as a long-term shock, as it is not known when the disease will end. Covid-19 has a positive and negative effect on the career.

As a career shock, the possible potential effects of Covid-19 epidemic disease on the career are as follows:

- Since it is unknown when it will end, it creates career uncertainties (Rudolph & Zacher, 2020).
- The intergenerational effect varies (Rudolph & Zacher, 2020).
- The decreases, contractions and worsening of the trade that seems to continue will cause individuals to struggle to get into work (WTO, 2020).
- Increasing unemployment rates since the beginning of the epidemic constitute a career barrier (ILO, 2020).
- There were restrictions on working times (ILO, 2020).
- Even if the career continues, important events affecting the career such as promotion, wage increases and professional development opportunities will disappear (Richardson, 2020).
- In this process, some individuals may have to end their careers at the beginning, continuation and development of their careers.
- Anxiety of individuals who end their career may increase.
- Some individuals with careers may lose income.
- There may be decreases in the experience accumulated in the career process.
- Not being able to find a job for a long time may create job insecurity in the individual who wants to pursue a career.
- It affects young people and other age groups in different ways.
- While it affects some sectors negatively, it may affect others positively. In terms of career, while many sectors were affected negatively, some sectors were affected positively. For example, the healthcare sector, logistics sector, IT sector and to a lesser extent textile, medical and chemical sectors have been

positively affected. For example, positive developments have occurred in areas such as mask making and hand disinfectant production.

- New study ideas can come to the fore. Such as working from home, distance education.
- Some professions may come to a finishing point.
- Some individuals may develop new careers, even if they lose their current careers. Like a cook having a career in carpentry.
- It may cause someone who may be gifted in the usual life to not show their talents. This can be called a waste of talent.
- Long-term psychological effects may occur in individuals with a loss of career.
- It can offer opportunities to some individuals in a positive way.
- More flexible working order can be started.
- Some companies may report dissatisfaction with the working order, and some companies may benefit from this in terms of cost.
- It has raised concerns about looking safely into the future.

These and similarly, it is possible to increase the number of Covid-19's effects on career. While individuals need to struggle with negative career shocks, they should also know how to benefit from positive career shocks. In addition to accepting Covid-19 as it is, it is promising to know that some things will be done.

Conclusion

By specifying the corona virus as an epidemic, all countries have made an effort to limit the spread of Covid-19. In this process, the sectors that produce and are the locomotive of economic activities had to stop their activities almost completely or largely. This global virus epidemic was deeply affected by the business world. It made some changes in working order. In addition to the country-specific changes, there were also changes in the order the world used to. In addition to threatening public health, short and long-term different economic and social disruptions emerged. The level of welfare of millions of people has been affected. If Covid-19 cannot be taken under control, its effects seem to continue increasingly like a snowball.

The individual may face a number of negative situations while trying to carry out career planning in business life. This can be a problem, an obstacle, a crisis or a shock. Individuals are influenced by their environment while creating their careers. These environmental factors can interact with the individual's career opportunities. Person and environmental interactions offer restrictions and opportunities that affect attitudes and behavior in the context of realizing careers. For the individual, these constraints and opportunities are career shocks. Career shock can occur at all stages of an individual's career. Career shock is an external event that occurs outside the individual. However, this external event may originate from the organization or it may be in an extraordinary situation. For example, the Covid-19 epidemic, which affects the world. The Covid-19 epidemic is a special career shock. This shock has different effects for different individuals. For this, it is necessary to consider individual and contextual factors. The effects that may be negative according to the duration of the shock may turn into positive effects later. Therefore, both companies and individuals need to look at redefined, reworked flexible career and job opportunities. Businesses must make a number of systemic changes for the future. While dealing with jobs such as business continuity, changes in production volume, security risks, workforce efficiency and real-time decision-making, leaders should establish long-term strategies and ensure that companies continue their lives. Because the priority is to stay alive and seek opportunities for development. Thus, the career shock, which can be considered negative by the Covid-19 pandemic, can be overcome much more lightly.

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The causality relationship between R&D expenditures and Unemployment in Turkey and Azerbaijan

Teslime YILDIRIM*

Abstract

Innovations resulting from R&D activities directly affect the production process positively. The improvement in R&D activities will increase efficiency and productivity, leading to an increase in the total output level. Therefore, developing countries are increasing their expenditures on R&D activities day by day in order to achieve their economic growth targets. However, although it is stated in the literature that increasing R & D activities positively affect growth, there is no consensus on the relationship between R & D expenditures and unemployment. The interaction between R&D and unemployment varies depending on the type of innovation countries experience. In this study, the causality relationship between R&D expenditures and unemployment in developing countries such as Turkey and Azerbaijan is analyzed by Emirmahmutoğlu and Kose (2011) panel causality test. According to the results of the analysis, a statistically significant one-way causality relationship between R&D expenditures and unemployment is determined at the significance level of 5% in Turkey. In Azerbaijan, a statistically significant one-way causality relationship is determined from unemployment to R&D expenditures at the significance level of 5%.

Keywords: R&D Expenditures, Unemployment, Panel Causality

Introduction

The first creative contribution to technological progress was made by Schumpeter (1942). The effect of increasing information stocks on economic growth and hence unemployment as a result of R&D activities was examined by Romer (1986) and Lucas (1988) and the New Growth Theory was introduced. Since then, economists have worked on this topic. Until the growth model developed by Solow (1956), technology has been accepted externally in growth models and capital accumulation has been shown as the main source of economic growth. With the Solow growth model, technology has now become endogenous. However, since this model does not explain the reason for technological progress, Romer developed the relevant model and included the content of the technology element in the model (Romer, 1990). According to Romer, an economy consists of three different sectors, intermediate goods, final goods and research. In his study, Romer (1990) says that the research sector creates innovations in the markets by using human capital and existing knowledge. These innovations in the research sector are used in the production of intermediate and final goods. From this point, directing more human capital to research and development activities leads to an increase in innovations and total output in the economy. Research and development activities increase productivity and efficiency, leading to an increase in the total output level. Countries having difficulties in producing innovation can increase their production levels by advancing technology transfer from developed countries. The technological progress resulting from the competition will lead

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to an increase in the output level. Because the new product or production process that emerges as a result of a successful innovative movement causes the researcher firm to gain profit by giving monopoly power. OECD (2012) defines R&D activities as creative works that include activities such as basic research, applied research and experimental development.

Even though it is stated in many academic literature that R&D activities affect production positively, there are different ideas about the relationship between R&D and unemployment. These differences of opinion are explained by the type of innovation in the literature. In product innovation, existing goods are improved and new goods are introduced to the market. The increase in demand for these goods causes the establishment of new companies and sectors and the decrease in unemployment (Oberdaberning, 2016). On the other hand, process innovation, on the other hand, leads to an increase in productivity, but a negative impact on employment, as it usually produces the same amount of output with less capital and/or labor. Here, the negative impact on unemployment varies depending on the marginal technical substitution rate. Today, there is the possibility of revealing this kind of unemployment problem in the positive developments experienced in the field of Industry 4.0, which is the subject of discussion in the economic literature.

The aim of this study is to analyze the relationship between R&D expenditures and unemployment for Turkey and Azerbaijan. Unemployment is seen as an important economic and social problem that is becoming serious for Turkey. Countries are now increasingly focusing on R&D activities to overcome such macroeconomic problems. It is important to make clear the impact of these activities on unemployment in terms of producing effective policies.

Short Literature Review

The studies in the literature are mostly focused on the relationship between R&D and economic growth. Few studies in the literature examine the relationship between R&D and unemployment. The first study on this subject was Brouwer et al. (1993). The study was carried out on 859 firms operating in the Netherlands using the least squares (OLS) method. As a result of the study, it was determined that there is a negative relationship between R&D expenditures and employment. Kirchhoff et al. (2007) stated that in their analysis on companies in the USA using the two-stage OLS and SUR model, the R&D expenditures made by universities make a positive contribution to employment. Bogliacino and Vivarelli (2010), using the GMM-SYS panel method, reached the conclusion that R&D expenditures positively affect employment in the manufacturing-service sector, in their analysis of 25 manufacturing and service sectors for 16 European countries. Coad and Rao (2010) analyzed industrial firms operating in the USA with the OLS method, and as a result of the analysis, there is a strong relationship between the sales of firms and increases in employment during the t + 1 period and the R&D expenditures in the t + 1 period. Bogliacino et al. (2014) analyzed 677 firms operating in Europe using the OLS method. As a result of the analysis, it was concluded that R&D studies positively affect employment in the high-tech manufacturing and services sector. Tamayo and Huergo (2016) applied the two-stage OLS method by classifying the companies operating in Spain. As a result of the analysis, there is a positive relationship between R&D and qualified employment. In their study, Piva and Vivarelli (2017) applied the corrected dummy variable OLS method for 674 European companies and found that R&D spending had a positive effect on employment. However, this effect was detected in high-tech firms, but not in low-tech firms. Agovino et al. (2018), in their studies, which included 879 R&D activities in their analysis, indicate that technological changes and R&D activities have significant effects on the employment of companies using the panel data method. In their study, Baş and Canöz (2020) examined 15 developed countries with the secret cointegration method and asymmetric causality tests, and although there was an opposite observation, the results of asymmetric causality analysis found that there was a causal relationship from R&D expenditures to unemployment. Çiftçioğlu and Sokhanvar (2020) investigated the effects of changes in R&D intensity on unemployment and economic growth in the short and long term. As a result of the ARDL border test and PMG estimator methods on the five selected European countries, it was concluded that in four of the five countries surveyed, there was a long-term relationship between R&D, unemployment rate and economic growth. In addition, it was emphasized that although an increase in R&D decreases unemployment in the long term, it does not have any effect in the short term.

Methodology

The variables and data sources used in this study, in which the relationship between R & D expenditures and unemployment is examined empirically for the countries of Turkey and Azerbaijan, are shown in Table1.

The econometric model used in the analysis is included in Equation 1.

$$U_{it} = \beta_0 + \beta_1 RD + \varepsilon_{it} \quad (1)$$

Table 1: Variables Used in Analysis and Data Sources

Variables	Data Period	Data Sources
R&D Expenditures (% GDP) (RD)	1996-2019	World Bank Development Indicators Database
Unemployment Rate (U)	1996-2019	World Bank Development Indicators Database

The U symbol in Equality 1 refers to unemployment, the β_0 parameter refers to the constant term, the β_1 parameter refers to the slope coefficient, the RD variable refers to R&D expenditures, and the $\boldsymbol{\varepsilon_{it}}$parameter refers to the error term. Panel data analysis will be used as a method in the study. The advantage of panel data analysis in data with low time dimension has been effective in choosing this method. The main reason why the countries of Turkey and Azerbaijan are included in the analysis is that they generally accept that they are a single nation, even though they appear to be two separate states. These two countries, which are very close in cultural and socio-economic terms, have strengthened their friendship in the global world and have increasingly commercial relations. These trade relations should not be thought of as just goods and services. Recently, technology transfer from Turkey to Azerbaijan is also taking place. Increasing international trade and sharing of information and technology brings globalization (Şimşek and Yiğit, 2019: 170). The increasing economic relations in the globalized world lead to the spread of a cyclical fluctuation in one country to other countries. In Panel data analysis, cross-section dependence testing is performed to detect such interactions. This test results also determine the techniques that should be used to determine the relationship between variables correctly. CD_{LM1} developed by Breusch and Pagan (1980), CD_{LM2}-CD_{LM3} developed by Pesaran (2004) and LM_{adj} tests developed by Pesaran et al. (2008) are used. If the probability values calculated as a result of the tests are less than 0.05, it is decided that there is a cross-section dependency among the countries that make up the panel. Homogenity tests developed by Pesaran and Yamagata (2008) are used to determine whether the slope coefficients in the model are the same. Here, while $\tilde{\Delta}$ test is recommended for large samples; It is stated that $\tilde{\Delta}_{adj}$ test can also be used for small samples. If the probability values calculated as a result of these tests are less than 0.05, it means that the slope coefficients are different from each other (Gerceker et al., 2019: 424). In case of cross-section dependency and heterogeneity, panel causality test developed by Emirmahmutoğlu and Kose (2011) can be used.

Findings

Table 2 shows the results of the cross-section dependence test, which is primarily used to test the relationship between R & D expenditures and unemployment. (The symbols *, **, *** show statistically significant levels of 10%, 5%, and 1%.)

Table 2: Cross Section Dependence and Homogeneity Tests Results

Cross-Section Dependence Tests	Statistics	Probability Value
CD_{LM1}	13,209	0,000***
CD_{LM2}	8,633	0,000***
CD_{LM3}	8,590	0,000***
LM_{adj}	3,634	0,000***
Homogeneity Tests	**Statistics**	**Probability Value**
$\tilde{\Delta}$	4,525	0,000***
$\tilde{\Delta}_{adj}$	4,877	0,000***

As a result of the cross-section dependence tests, the probability values of all the tests were statistically significant at 1% significance level. In other words, it has been concluded that there is an economic interaction in the countries of Turkey and Azerbaijan that constitute the panel and that there is a cross-sectional dependence. As a result of homogeneity tests, it is observed that slope coefficients differ between horizontal sections. In this case, the second generation unit root tests, which take into account the cross-section dependence, should be applied when examining the stability of the country's data (Şimşek and Destebaşı, 2020: 815). Table 3 below shows the results of the Cross Section Augmented Dickey Fuller Test (CADF), a second generation unit root test developed by Pesaran. (The symbols *, **, *** show statistically significant levels of 10%, 5%, and 1%.)

Table 3: Pesaran CADF Unit Root Test Results

		Variables	***CADF***		***Variables***	***CADF***
Level	*Constant*	RD	2,583 (0.629)	*First Differences*	RD	23.219*** (0.000)
		U	4,168 (0.383)		U	14,512*** (0.001)
	Constant + Trend	RD	6,903 (0.1411)		RD	16,198*** (0.002)
		U	4,040 (0.400)		U	13,523*** (0.001)

When Table 3 is examined, the research and development expenditures and unemployment data included in the analysis are not stationary at the level; they are stationary when the first degree differences are taken. All series are statistically significant at 1% significance level.

As a result of the panel cointegration tests, there is no long-term co-integrated vector between research and development expenditures and unemployment for the countries of Turkey and Azerbaijan included in the analysis. Emirmahmutoğlu and Kose (2011) panel causality test results are given in Table 4, considering cross-section dependence and heterogeneity to determine the possible short-term causality relationship between the two variables. (The symbols *, **, *** show statistically significant levels of 10%, 5%, and 1%.)

Table 4: Emirmahmutoğlu and Kose Panel Causality Test Results

Country	Lag	RD=>U Wald	p-value	U=>RD Wald	p-value
Turkey	3	9.113	0.027**	0.958	0.811
Azerbaijan	2	2.583	0.274	8.984	0.011**
Fisher		9.747	0.044**	9.402	0.051*

When the panel causality test results in Table 4 were examined, the length of delay is determined as 3 for Turkey and 2 for Azerbaijan. In general, a causality relationship with a 5% significance level is determined from R&D expenditures to unemployment. In addition, a causality relationship of 10% significance level has been determined from unemployment to R&D expenditures. Looking at the country results, a statistically significant causality relationship from R&D expenditures to unemployment in Turkey is determined at a significance level of 5%. There is no causal relationship from unemployment to R&D expenditures. Azerbaijan is the opposite of the findings for the findings in Turkey. While there is no causality relationship from R&D expenditures to unemployment in Azerbaijan, a statistically significant causality relationship has been found at 5% significance level from unemployment to R&D expenditures.

Conclusion

In the Global World, firms must improve themselves in competition in order to maintain or increase their current position in the markets. This situation can only arise from companies pursuing strategies with innovations compatible with the market by increasing their R&D expenditures. R&D activities and expenditures are increasingly important in the world in order to reveal innovations. It is seen that countries that attach sufficient importance to innovation have achieved a significant economic growth rate. Technological developments, R&D activities and innovation are now among the driving forces of economic growth. When the effects of R&D activities on unemployment are analyzed, it is seen that there is no consensus in the literature yet. This study is intended to analyze the relationship between R & D expenditures and unemployment for the countries of Turkey and Azerbaijan based on annual data from 1996-2019.In accordance with this purpose, Emirmahmutoğlu and Kose panel causality test is applied. Since it takes into account the heterogeneity and cross-section dependency, this test allows the variables included in the analysis to produce more reliable results. According to the findings, a one-way causality relationship is determined from R&D expenditures to unemployment in Turkey, while a one-way causality relationship is determined from unemployment to R&D expenditures in Azerbaijan. As a result, it is seen that there is an interaction between R&D expenditures and unemployment. Countries need to improve their production techniques to achieve their economic goals. This development will only accelerate with R&D studies. In order for innovative activities not to create unemployment problems, the population should be subjected to a quality education by paying attention to the organic composition of the capital and to ensure efficiency in resource-income distribution.

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Career Application and Research Centers in Universities: Black Sea Region

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Abstract

With the increase in education opportunities of individuals, the number of individuals graduating from universities increases. The competition for limited job opportunities has become even tougher in the face of this increase. It is important for individuals to train themselves in order to exist in a competitive environment. Being aware of this situation, graduates and students attend various courses, seminars or trainings with their individual efforts. Universities, on the other hand, have started to form career centers in order to support their graduates or existing students in a competitive environment. Career centers are career counseling services that enable individuals to realize their potential and career opportunities, make career plans and realize these plans. Today, career centers in both state and foundation universities operate as career application and research centers and career coordinators. In this study, it is aimed to examine career application and research centers in terms of general characteristics and services provided. This study is a descriptive study that expresses the current situation. Universities in the Black Sea Region constituted the sample of the study. For this purpose, document analysis was made by examining the web pages of the career application and research centers of universities. According to this analysis, it was determined that some career application and research centers work very actively, but some centers do not use web pages actively. In order to increase the role of career application and research centers supporting students in the competitive environment, some suggestions have been made for the improvement of career application and research centers.

Keywords: Career Planning, Career Center, Career Application and Research Center

Introduction

With the increase in education opportunities of individuals, the number of individuals graduating from universities increases. The competition for limited job opportunities has increased more in response to this increase. It is important for individuals to train themselves in order to exist in a competitive environment. Being aware of this situation, graduates and students attend various courses, seminars or trainings with their individual efforts. However, in today's rapidly developing and changing conditions, competition continues not only in recruitment but also in business life. In business life, it is considered a necessity for individuals to be more participatory and to have skills such as solving problems in the shortest and most advantageous way (Kara, Güler, Tuna, & Hitay, 2016). In order to have these skills, it is very important for individuals to set career goals, create a career plan and provide career development as well as self-training. It is obvious that one of the institutions that can make this process widespread and effective in today's conditions is universities. In this context, universities have started to form career centers in order to support their own graduates or existing students in a competitive environment.

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Although there is no source in the literature for the first use of the concept of career center (Demir, 2016), it was stated that the concept of career developed with the concept of civil service in the 16th century and began to be studied scientifically in the 1970s (Erdoğan, 2009). According to the Turkish Language Association (2020), career is expressed as "the stage, success and expertise achieved in a profession with time and work". Looking at this definition, it is seen that the process after getting a job is expressed more. However, in order for individuals to direct their careers, they need to realize that their career processes have started before entering the business life. Career centers were needed to raise this awareness and provide comprehensive consultancy services to individuals (Smith, 1978). The career center is one of the career counseling services that enable individuals to realize their potential and career opportunities, to make career plans and to realize these plans. They aim to increase the awareness of individuals and direct their careers through activities such as various interviews, fairs, trainings and business trips. These centers can also support individuals and organizations at the point of meeting supply and demand by establishing links with the business world. In this context, first operational in the career centers are centers in Turkey's Middle East Technical University and Bilkent University (Zeren et al., 2017).

Career fairs are organized under the auspices of the Presidency together with career centers, the first of which is in 2019 Human Resources Office of the President of Republic of Turkey [HRO] (2020a). The main goal of the fairs organized under the leadership of the Presidency Human Resources Office was expressed as to make all young people feel that they are talent, regardless of the university name. The purposes of these fairs are;

- Providing equal opportunities in employment for university students in every region of our country,
- Strengthening the relations with employers by activating the career centers of our universities,
- Increasing public institutions' awareness among qualified workforce and employer brand value, and bringing qualified students and graduates to public institutions,
- Increasing the awareness and capacity of our SMEs, which constitute the majority of employment in our country, about human resources and talent acquisition processes.

The first fair organized in 2019 was organized in 8 provinces in different regions with the cooperation of 87 universities. Within the scope of this fair organized in 2019, more than 70.000 university graduates and members met with 1.315 employers, 351 of which are public institutions. Career fairs, which started to be organized on different dates in every region with the theme of "Talent Everywhere" this year, participate in the fair in order to activate the career centers of universities, to ensure equal opportunity for university graduates and members of the university, and to provide first-hand access to employers. This fair is organized in 10 different cities in cooperation with 130 universities. The calendar of the fair is given in Figure 1. According to this calendar, Trakya Career Fair, Southeast Career Fair, East Anatolia Career Fair and East Black Sea Career Fair have been completed, South Career Fair, Aegean Career Fair, Western Black Sea Career Fair, Central Anatolia Career Fair, Eastern Mediterranean Career Fair and İpekyolu Career Fair is planned to be realized.

Students are required to register to the fairs through the talent gate system and enter the fair with these QR codes (HRO, 2020b). Thanks to this system, it is expected that the resumes of the students will be registered in the system and the relevant data will be reached at what rate these graduates and members are recruited through fairs. Thus, it is planned to benefit from technology in order to determine the effectiveness of the fair. In addition, social media tools are effectively used by the Presidency Human Resources Office as well as the host and stakeholder universities within the scope of the announcement of fairs and events.

In addition to the fair, training, conversation, etc. its activities are tried to be carried out by career centers in both state and foundation universities. Career centers within universities operate either as career application and research centers or career coordinators as a general framework. Although centers with various names were established, in this study, it was aimed to examine the universities in the Black Sea Region only in terms of the general characteristics of the career application and research centers and the services provided.

Figure 1. "Talent Everywhere" Exhibition Program (HRO, 2020c)

Method

Research Pattern

The study, which aims to examine the universities in the Black Sea Region only in terms of the general characteristics of the career application and research centers and the services provided, was carried out with a qualitative approach. One of the research designs in qualitative approach is case study. Case studies aim to express the existing situation with a realistic picture (Creswell, 1998). Therefore, the design in this study has been expressed as a case study.

Working Group

Universities in the Black Sea Region constituted the sample of the study. State and foundation universities operating in the cities of the Black Sea Region are listed on the website of the Council of Higher Education (2020).

Data Collection Tool and Process

Since corporate web pages are used to collect data, document analysis has been performed. For this reason, firstly the cities in the Black Sea Region were listed, and then the state and foundation universities listed by YÖK in these cities were determined. It has been tried to determine whether there are career centers by examining the corporate websites of the universities in question. Universities that are career application and research centers were determined among these centers, and then the availability of web pages was checked. Those who actively use the web page were used as data.

Data analysis

Data analysis was performed for the corporate websites of the career application and research centers of universities. Content analysis was performed while analyzing the data. In order to express the distribution of the data, a table was created by coding as 0 if the variables determined in the data obtained from the corporate web pages, and 1 if they were. The data of the study were analyzed according to the following criteria:

- Universities in the Black Sea Region and career center status
- Cities, universities and founding years that are career application and research centers
- Information on web page
- Career consultancy services provided
- Activities carried out by career application and research centers

Validity, Reliability and Limitations

For the reliability of the study, the data were coded by each researcher and a common decision was reached. However, the codes were re-checked at different times by the researchers and it was found that the coding was the same. However, the themes were determined after taking the opinions of two experts other than the researchers. For the validity of the study, all data were accepted as a whole. A computer screen image was directly included in the findings. Researchers' role in the study; data collection is limited to analyzing and interpreting the findings. The activities on the web pages of career application and research centers that actively use the web site at universities in the Black Sea region have been identified as the limitation of the study.

Findings

Within the scope of the research, it was determined that 22 universities are located in the cities of the Black Sea Region in the YÖK system. Universities that are career centers are determined among these universities. The cities in the Black Sea Region and the number of career centers in those cities are shown in Figure 2.

Figure 2. Numbers of Cities and Career Centers in the Black Sea Region

In Table 1, cities, universities located there and status of career centers are expressed. When looking at the names of career centers within these universities, it was determined that some were named as application and research centers, some as centers and some as coordinators. It is seen that some coordinatorships and centers deal not only with university members but also with their graduates.

Table 1. Cities, Universities Located There and Status of Career Centers

City	University	Career Center Status
Amasya	Amasya University	-
Artvin	Artvin Coruh University	Career Center
Bartın	Bartin University	Career Planning Application and Research Center
Bayburt	Bayburt University	Career Services Center
Bolu	Abant İzzet Baysal University	Bayburt University Career Services Center
Çorum	Hitit University	Business and Human Resources Center
Düzce	Düzce University	Career Development and Graduate Tracking Coordinator
Giresun	Giresun University	Career Guidance and Information Center
Gümüşhane	Gumushane University	-
Karabük	Karabuk University	Career Development Office
Kastamonu	Kastamonu University	Youth and Career Development Application and Research Center
Ordu	Ordu University	Career Development Application and Research Center
Rize	Recep Tayyip Erdogan University	Career Development Application and Research Center
Samsun	Ondokuz Mayıs University	Career Center
Samsun	Samsun University	-
Sinop	Sinop University	Career Development and Alumni Coordinator
Tokat	Tokat Gaziosmanpasa University	Career Application and Research Center
Trabzon	Eurasia University	Career Center
Trabzon	Karadeniz Technical University	Career Center
Trabzon	Trabzon University	-
Zonguldak	Zonguldak Bulent Ecevit University	Career Center

The status of the application and research centers among the centers in Table 1 has been examined within the scope of the study. Accordingly, no career center was found in Amasya University, Gümüşhane University, Samsun University and Trabzon University. The centers within Bayburt University, Hitit University, Ondokuz Mayıs University, Eurasia University, Karadeniz Technical University and Zonguldak Bülent Ecevit University are career centers; Düzce University, Karabük University and Sinop University act as coordinators. Considering the application and research centers within the universities, it was determined that there are career center

application and research units within 7 universities (31.82%) among 22 universities (100%). Although the directives of the career application and research unit of Recep Tayyip Erdogan University among these universities were published in the official newspaper, the corporate web page is not operational. Therefore, web pages of 6 universities (27.27%) were examined in this study.

Table 2. Cities, Universities with Career Application and Research Centers and Years of Foundation

City	University	Foundation Year
Bartın	Bartın University	2016
Bolu	Abant İzzet Baysal University	2019
Giresun	Giresun University	2012
Kastamonu	Kastamonu University	2014
Ordu	Ordu University	2019
Tokat	Tokat Gaziosmanpaşa University	2019

When Table 2 is examined, universities that are career application and research centers in cities in the Black Sea Region and their establishment years are given. According to the table, it was determined that Giresun University started its activities in 2012, and the Career Application and Research Center of Bartın University, Ordu University and Tokat Gaziosmanpaşa University was established in 2019.

When the general information on the web pages of the Career Application and Research Centers of the universities was analyzed, information on mission and vision, instructions, management, career representatives, contact information, job-internship announcements, consultancy services, talent gate and career days were examined on the web pages. Table 3 shows the findings for this. According to the table, it was found that the most information was on the website of Tokat Gaziosmanpaşa University and the least information was on the web page of Giresun University and Kastamonu University. Although information on career days, consultancy services, management and directives can be found on the corporate web page of each career application and research center, the mission-vision, career representatives, contact information, job-internship announcements and information about the talent door are missing.

Table 3. Information on Web Pages

University	Mission and Vision	Instruction	Administration	Career Representatives	communication	Job-internship announcement	Consultancy services	Talent Gate	Career Days
Bartın University	1	1	1	0	1	1	1	1	1
Abant İzzet Baysal University	0	1	1	1	1	1	1	1	1
Giresun University	0	1	1	0	1	0	1	0	1
Kastamonu University	0	1	1	0	0	0	1	1	1
Ordu University	1	1	1	0	1	1	1	1	1
Tokat Gaziosmanpaşa University	1	1	1	1	1	1	1	1	1

Table 4 shows the findings regarding the consultancy services stated in the corporate web pages of the Career Application and Research Centers of universities. According to the table, information on CV preparation, interview, time management, job search, career choice and entrepreneurship was found in universities. According to the table, it has been revealed that Tokat Gaziosmanpaşa University Career Application and Research Center is the most intense web page to inform about career consultancy services. However, there is no information on career consultancy services provided on the corporate web page of Kastamonu University Career Application and Research Center. Information on job search skills and career choice can only be found on the corporate web page of Tokat Gaziosmanpaşa University Career Application and Research Center.

Table 4. Career Counseling Services Provided

University	**Preparing a CV**	**Interview**	**Time management**	**Job Search**	**Career Choice**	**Entrepreneurship**
Bartın University	1	1	0	0	0	0
Abant İzzet Baysal University	1	1	1	0	0	0
Giresun University	0	0	0	0	1	1
Kastamonu University	0	0	0	0	0	0
Ordu University	1	1	0	0	0	1
Tokat Gaziosmanpaşa University	1	1	1	1	1	1

The activities announced on the corporate web pages that they are carried out by the Career Application and Research Centers are given in Table 5. When the table is examined, it is revealed that the centers concentrate especially on training and interviews. Fair advertisements are for the announcement of the "Talent Everywhere" 2020 fair program, which is organized under the leadership of the Presidency Human Resources Office. When the web pages were examined, it was determined that the only university that announces that it organizes a fair within its own structure (Career Fair in Health), Tokat Gaziosmanpaşa University Career Application and Research Center. No announcement or news was found on the web page of the Abant Izzet Baysal University Career Application and Research Center, other than the announcement for the ongoing "Talent Everywhere" 2020 fair, organized under the leadership of the Presidency Human Resources Office.

Table 5. Activities Performed by Career Application and Research Centers

University	**Fair**	**Education**	**Interview**	**Panel**	**Seminar**	**Forum**	**Visit**
Bartın University	1	1	1	0	1	0	0
Abant İzzet Baysal University	1	0	0	0	0	0	0
Giresun University	0	0	1	0	0	0	0
Kastamonu University	1	0	0	0	0	0	0
Ordu University	1	1	1	0	0	0	0
Tokat Gaziosmanpaşa University	1	1	1	1	0	1	1

Discussion and Conclusion

Within the scope of the research, it was determined that 27.27% of the universities in the Black Sea Region use the Career Application and Research Center corporate web page. In this context, the corporate web pages of Career Application and Research Center of 6 universities were analyzed. According to the findings obtained, it was determined that some career application and research centers work very actively, but some centers do not use web pages actively. According to this study, Tokat Gaziosmanpaşa University Career Application and Research Center is the center that most effectively uses the corporate website in terms of both information and announcement. This situation, of course, is not the result of other centers not operating effectively. For example, the first announcement on the websites of some universities is "6. Career and Employment Day ". Considering these findings, it can be said that universities' web pages are not used effectively. However, it is obvious that effective use of corporate web pages is important in the face of rapidly developing technology and social media usage. In addition, there is no activity calendar on the web pages of career application and research centers, which have a busy schedule. It is thought that effective use of web pages and other social media channels is important for increasing the role of career application and research centers supporting students in the competitive environment. For this reason, it is recommended to improve the corporate web pages and other social media channels of universities, to add necessary information, to create an event calendar, to make announcements and news.

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The Effect of Innovation and Foreign Trade on Economic Growth in Selected Countries: Panel Causality Test

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Abstract

Countries competing with each other in the Globalizing World are using innovative activities to expand their economies. Innovations emerging in the markets stimulate competition and increase the total output level. The next aim of the countries that achieve the targeted economic growth will be to increase the welfare of the society. For this purpose, they developed foreign trade relations to increase income. With the impact of globalization, the transfer of information and technology from one country to another is easy, economic integrations are gaining momentum, and the conveniences experienced in logistics and payment transactions increase the foreign trade volume of the countries. The important thing here is that the innovation process does not negatively affect the marginal technical substitution rate in the economy. If the technological development increasing as a result of innovation activities affects the production process positively, leaving people unemployed due to machining, this will lead to a loss of welfare through the economy. Therefore, the effects of innovation and foreign trade on economic growth need to be investigated well. For this purpose the study year of 2000-2017 annual data with Turkey, Brazil, Russia and India on Emirmahmutoğlu and Kose (2011) developed by the panel causality test was applied. As a result of the analysis, while a one-way causality relationship from innovation to economic growth at 1% significance level in Brazil and India is determined; In Turkey and Russia, a one-way causality from economic growth to foreign trade is determined. The findings show that innovation is an important factor in the sustainability of economic growth. Taking policy decisions by taking into account this situation will increase the level of welfare of the economy.

Key Words: Innovation, Foreign Trade, Economic Growth, Panel Causality

Introduction

In general, innovation can be expressed as the activities of a business that provide more gains. According to the OSLO Guide, a joint publication of OECD and Eurostat, innovation, new or significantly modified product (goods or services) or process; a new marketing method; or the application of a new organizational method in business practices, workplace organization or foreign affairs (OECD and EUROSTAT, 2005). Innovation takes a very important position in terms of competition in the markets. Countries need to develop innovation and turn new ideas into technical and commercial success so that they can continue their economic growth and compete. As stated in the Oslo guide, innovation types are examined under 4 headings. The first is product innovation. Product innovation involves significant improvements in the components or materials of the good or service, their technical features, software, ease of use, or other functional features. New products must contain significant differences from the products that were previously produced in terms of their use and properties (Alegre and Chiva, 2005). The second is process innovation. Process innovation is the delivery of a new or significantly improved delivery or production method using new technology and knowledge. The main goal in this innovation is to increase quality and reduce production or delivery costs. Apart from this, ensuring the emergence of a new or significantly improved product may also be a part of process innovation (Güleş and Bülbül, 2004). In process innovation, it is necessary to control and supervise by management in order not to fail the processes (Altunışık et al., 2016: 349). Another type of innovation is Marketing innovation. Marketing innovation includes important differences such as

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product design and packaging, positioning, marketing communication or payment methods. Marketing innovation is the fact that the new product can respond to customer tastes and preferences better than before and is a method that has not been used before. The aim is to provide a higher-than-ever service to customers in the target audience and to gain competitive advantage against other businesses that do the same job (Altunışık et al., 2016: 344). The fourth and last one is organizational innovation. This type of innovation includes innovations or improvements in the workplace organization or the relationships that the firm has established with companies and institutions abroad. The organization deals with issues such as coordination, project management and optimization (Altunışık et al., 2016: 347). The purpose of this type of innovation is to increase the productivity of the workers with workplace satisfaction, to reduce the costs of tools, equipment and equipment used in the process, administrative and firm and thus to access new information from external sources (Kurt, 2010: 69). Innovation plays an important role in internal growth models. The most well-known works are the works of Romer, Grossman-Helpman and Aghion-Howitt. Romer model stated the importance of innovation and technological developments for economic growth (Romer, 1986: 1002). In addition, Romer's work in 1990 has been described as the first innovation-based economic model (Jones, 1998: 2). According to the Grossman - Helpman Model, it will be easier for a country to achieve economic growth with the incentives for innovation. Grossman-Helpman especially examined the relationship between foreign trade and technology and emphasized that there is an important relationship between new and different products in the countries and the foreign trade policies of that country (Grossman and Helpman, 1991: 43). In their study, Aghion and Howitt (1992), although technology is an internal phenomenon, has a purpose to increase the quality of the product. With the increase in quality, better and new products will be released due to innovation support and will replace the old ones as time goes on.

In the study, population, geographical area, market size and the range of applications because they have similar characteristics in terms of economic growth rates, Brazil, India, China, Turkey countries have preferred. The data for the years 2000-2017, which were not a problem in terms of obtaining data, were used. In the study, the impact of innovation and foreign trade on economic growth was applied to the panel causality test developed by Emirmahmutoğlu and Köse (2011).

Literature

When the literature is examined, there are many studies examining the relationship between innovation and economic growth. The literature will be briefly reviewed here. Lichtenberg (1993) examined the relationship between public and private sector-funded R&D spending for 74 countries and economic growth and productivity between 1964 and 1989. As a result of the study, it was stated that R&D expenditures financed by the public sector had no effect on economic growth, but there was a positive relationship between Research and Development expenditures and economic growth and efficiency. Goel and Ram (1994) studied the relationship between R&D spending and economic growth for 52 countries between 1960 and 1980. As a result of the study, they stated that there is a long-term relationship between economic growth and R&D expenditures, but the direction of causality in this relationship is not clear. Freire-Serén (1999) examined the relationship between R&D investments and economic growth for 21 OECD countries between 1965 and 1990. As a result of the study, it was concluded that there is a strong positive relationship between R&D and economic growth, and that 1% increase in R&D expenditures will provide an increase of 0.08% in real gross domestic product. Guellec and Potterie (2001) stated that there was a positive correlation between R&D expenditures and growth efficiency in the panel data analysis using the data of 16 OECD countries. Ülkü (2004) examined the relationship between economic growth and innovation for 20 non-OECD and 10 non-OECD countries between 1981 and 1997. As a result of the study, there is a positive relationship between innovation and economic growth in both OECD and non-OECD countries. However, innovation investments do not cause a continuous increase in economic growth. Nasab and Aghaei (2009) conducted Panel Data Analysis for OPEC Countries from 1990 to 2007. As a result of the study, they stated that there is a one-way causality relationship from R&D to economic growth. Korkmaz (2010), 1990 - Turkey between the years 2008 to Johansen Cointegration test done. As a result of the study, it has identified a one-way causality relationship from R&D to economic growth. Petals and Scott (2010), 1980 - applied Granger causality

test for Turkey from 2008 years. As a result of the study, they detected a bidirectional causality relationship between R&D and economic growth. Bozkurt (2015), 1998 - Johansen has applied for Turkey between 2013 Cointegration test. As a result of the study, it has identified a one-way causality relationship from economic growth to R&D. Szarowska (2017) conducted Panel Data Analysis for 20 EU member countries between 1995 and 2013. As a result of the study, it has identified a one-way causality relationship from R&D to economic growth. Yazgan and Yalçınkaya (2018) conducted Panel Data Analysis for 29 OECD countries between 1996 and 2015. As a result of the study, they identified a one-way causality relationship from R&D to economic growth. Özkan and Bayar (2019) conducted Panel Data Analysis for 16 countries between 2000 and 2015. As a result of the study, they identified a one-way causality relationship from economic growth to R&D. Chawla (2020) conducted Panel Data Analysis for 18 OECD countries between 1981 and 2012. As a result of the study, they identified a one-way causality relationship from R&D to economic growth. Young and Tandon (2020), between 1990 - 2017 fourier the impact on economic growth for Turkey's R & D-based stains were examined by cointegration test approach. As a result of the study, they determined that there is a bidirectional causality between R&D and economic growth. Canbay (2020), 2004 - Between 2017 and examined the effects on exports of R & D expenditure for Turkey. As a result of the study, it was found that R&D expenditures increased exports in the short and long term.

Methodology

In the study, population, geographical area, market size and the range of applications because they have similar characteristics in terms of economic growth rates, Brazil, India, China, Turkey countries have preferred. The data for the years 2000-2017, which were not a problem in terms of obtaining data, were used. In the study, the impact of innovation and foreign trade on economic growth was applied to the panel causality test developed by Emirmahmutoğlu and Köse (2011).The variables and data sources used in this study are shown in Table 1.

Table 1. Variables Used in Analysis and Data Sources

Variables	Data Period	Data Sources
Real GDP (GDP)	2000-2017	World Bank Development Indicators Database
R&D Expenditures (% of GDP) (INO)	2000-2017	World Bank Development Indicators Database
Share of Exported Goods and Services in GDP (FT)	2000-2017	World Bank Development Indicators Database

The econometric model used in the analysis is included in Equation 1.

$$GDP_{i,t}=\alpha i+\mu t+\beta 0+\beta 1INO_{it}+\beta 2FT_{it}+\varepsilon it \qquad (1)$$

While the αi parameter in Equation 1 shows the country-specific effect, the μt parameter refers to the time-specific effect. Choosing the appropriate method in the analysis is closely related to these two parameters. The shortage of data in the study experienced smoking Brazil, Russia, India and Turkey, covering the period between 2000-2017 samples were made with an annual panel data analysis. In order to obtain reliable results in the analysis, it is necessary to investigate the dependence of the horizontal cross-section and first or second generation unit root tests are applied accordingly (Şimşek & Destebaşı, 2020: 815). In Table 2 shown below, the horizontal cross-section dependency is shown.

Table 2. Horizontal Cross Section Dependency Test Results

	GDP		FT		INO	
Test	**Statistic**	**Prob**	**Statistic**	**Prob**	**Statistic**	**Prob**
Breusch-Pagan LM	97.291	0.000	101.60	0.000	26.291	0.002
Pesaran scaled LM	26.353	0.000	27.595	0.000	5.857	0.000
Bias-corrected scaled LM	26.235	0.000	27.477	0.000	5.740	0.000
Pesaran CD	9.8608	0.000	10.077	0.000	-1.232	0.217

When Table 2 is examined, it is seen that GDP, FT and R&D variables have horizontal cross-section dependence. For this reason, Pesaran (2003), which is the second generation unit root test, was applied to variables. Unit root test results are shown in Table 3.

Table 3. Pesaran (2003) Panel Unit Root Test Results

		Variables	***CADF***		***Variables***	***CADF***
Level	*Constant*	GDP	6.072 (0.639)	*First Differences*	GDP	20.1168 (0.009)
		FT	4,168 (0.383)		FT	24.4589 (0.002)
		INO	4.964 (0.762)		INO	19.9954 (0.011)
	Constant + Trend	GDP	8.013 (0.434)		GDP	16.512 (0.035)
		FT	4,040 (0.328)		FT	29.9055 (0.002)
		INO	10.785 (0.214)		INO	42.520 (0.000)

According to the Pesaran Unit Root Test results in Table 3, the variables included in the analysis are not stable at level, both in fixed and constant and trending situations. When the first degree difference of the variables is taken, it is seen that the variables become stationary in constant and constant-trend situations. After examining whether the model is stationary or not, there is a cointegration test to determine whether there is a long term relationship between the series. For this purpose, Kao Cointegration test analysis was done. The Table 4 below shows the results of the Kao Cointegration test.

Table 4. Kao Cointegration Test Results

Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
User-specified lag length: 1

	t-Statistic	Prob.
ADF	-0.855029	0.1963
Residual variance	0.000233	
HAC variance	7.66E-05	

As can be seen in Table 4, considering the p values resulting from the analysis, since it is greater than 0.05, the zero hypothesis that there is no cointegration is accepted. In other words, for Brazil, Russia, India and Turkey included in the analysis, no co-integrated vector could be detected in the long run between innovation, foreign trade and economic growth. Emirmahmutoğlu and Kose (2011) panel causality test, which takes into account the

cross-sectional dependency, was applied to determine the possible short-term causality relationship between them. Test Results are shown in Table 5.

Table 5. Emirmahmutoğlu and Kose Panel Causality Test Results

Country-specific (individual) results					
Country	Lag	INO=>GDP	p-value	GDP=>INO	p-value
Turkey	2.000000	4.278987	0.117714	0.753996	0.685917
Brazil	3.000000	31.43059	6.90E-07	7.466471	0.058426
Russia	3.000000	5.411466	0.144031	1.896770	0.594106
India	3.000000	15.84562	0.001220	0.265944	0.966301
Panel results	Fisher stat.	p-value			
RD=>GDP	49.94631	4.18E-08			
GDP=>RD	7.543931	0.479237			
Country-specific (individual) results					
Country	Lag	FT=>GDP	p-value	GDP=>FT	p-value
Turkey	1.000000	0.046403	0.829445	8.587791	0.003384
Brazil	1.000000	0.158818	0.690247	0.240019	0.624193
Russia	1.000000	3.007741	0.082868	6.178555	0.012931
India	2.000000	0.446612	0.799870	4.199399	0.122493
Panel results	Fisher stat.	p-value			
FT=>GDP	6.543040	0.586638			
GDP=>FT	25.21553	0.001429			

When Table 5 is analyzed in general, a one-way causality relationship has been found at the 1% significance level from innovation to economic growth. In terms of countries, Brazil and India for 1% level of significance when determining the true innovation from a unidirectional causal relationship to economic growth, Turkey and Russia it was not detected any causal relationship. Again, when looking at table 5, a one-way causality relationship was determined from economic growth to foreign trade in general. When it looks at Turkey and some countries in detecting the unidirectional causality from economic growth to foreign trade for Russia, Brazil and India could not find any causal relationship.

Conclusion

Today, with the rapid development of technology, economic competition and foreign trade are increasing among companies and countries and innovative activities are gaining importance. Work on innovation and foreign trade to economic growth over Turkey, Brazil, Russia and India, countries in 2000 - 2017 years using annual data from causality were examined. For this purpose, the horizontal cross-section dependency of the countries that were handled first was examined. After determining the cross-sectional dependency between countries, Pesaran CADF unit root test, which is the second generation panel unit root test, was applied. Since the long memory is also taken into account, the first degree difference of the variables included in the analysis was taken and the procedure was performed. As a result of the Kao Cointegration test conducted to determine the existence of long term relationship, no cointegrated vector was found. As a result of Emirmahmutoğlu and Köse (2011) Panel Causality Test, which constitutes the last stage of the analysis and takes into account the heterogeneity and a horizontal cross-section dependency, a one-way causality relationship from innovation to economic growth has been determined. In terms of countries, Brazil and India for 1% level of significance when determining the true innovation from a unidirectional causal relationship to economic growth, Turkey and Russia it was not detected any causal relationship. In addition, a one-way causality relationship has been determined from economic growth to foreign trade in general. In some countries, while Turkey and the detection of a unidirectional causality from economic growth in foreign trade for Russia, could not find any causal relationship with Brazil and India. As a result, in order to ensure that economic growth can be sustained, policy makers should carry out activities that encourage foreign trade and innovative activities.

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Industry 4.0 Journey and Key Resources

Yavuz ÖZKAYA*

Abstract

Contemporary industry development has continued for hundreds of years, and has undergone three major changes. Today, a new process, which is the fourth industrial revolution, Industry 4.0, has been introduced. Industry 4.0 is a goal and aims to bring information technologies and all vital systems together. Industry 4.0; It is a set of mechanisms consisting of three processes: internet services, internet of things and cyber physical systems. The fourth industrial revolution, which will bring the new world order, all of the production and living areas will have smart equipment and the systems will work in an integrated manner. It is inevitable for firms to apply the fourth industrial revolution to their organizations in order to protect and sustain their existence in the current competitive environment. In this context, in the study, information about the process leading to the fourth industrial revolution, the concept of Industry 4.0 was emphasized and brief information about the cyber physical system, internet of things, data analytics, big data and smart factories, which are used as important sources for the success of this revolution, are included.

Keywords: Intelligent Production, Industry 4.0, Industrial Revolution

Introduction

The concept of industry or industry is a branch of activity that has been constantly changing over the years. The techniques used in production and management in the production process continue to change over time. This change caused not only production processes or industry, but also the demographic structures, economic conditions, cultures of the countries, and even the borders of the countries. The beginning of the change in question is shown in the trend of change that started in England in the mid-18th century. Later, this trend spread across Europe and the world. Throughout history, there are two important changes that have led to economic growth, which has affected the lives of societies. These changes take place in the history of the economy as the agricultural and industrial revolution (Pamuk and Soysal, 2018: 42 ;Özsoylu, 2017: 42).

The agricultural revolution is the transition of societies that continue their lives with hunting and gathering, to the settled life and domestication and farming and livestock. This change has caused radical changes in the social and economic life of societies. As a result, settled life has begun, population growth has increased, leading to the development of architecture, art and culture, private property understanding has emerged, management style and administrative structuring have developed (Özsoylu, 2017: 42).

After this period, the industrial revolution, the second important development, started approximately 10 thousand years later. The industrial revolution that started in England in the late 18th century is the replacement of muscle power to machine power. With the presence of steam machines and ginning machines and entering business life, textile factories started production, production increased and became cheaper. For this reason, the invention of steam machines, the most important elements that started the industrial revolution, is considered as the prevalence of the production and use of textile and iron mine. The industrial revolution that started in England

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spread to other European countries and the USA in a short time, the level of wealth and prosperity has increased continuously. Industrialization has made the majority of the population in the agricultural sector producing in the industrial and service sectors (Ortaş, 2005 :2).

The industrial revolution that began in the late 18th century, the industrial age, has undergone four major revolutions until today with the change and development it has introduced. The first revolution started with the use of steam and water power and machinery in the factories, and the second revolution continued with the use of electricity and the wholesale production. The third revolution started with computers entering our lives. The industrial revolution, which radically changed life in the 1800s, has been transformed for the fourth time in itself, and Industry 4.0, a new revolution, appears before us. Industry 4.0 includes an industry that adds "intelligence" to the production stages with the connectivity and convenience provided by the internet. Businesses and factories are getting smarter with different technologies every day (Öztürk and Koç, 2017: 787).

The Industry 4.0 revolution brings a new standard of living to today's world. Intelligent production systems, the internet of things, the internet of systems, 3-D printers, three-dimensional printers, smart sensors, drones, robotic technologies, wearable technologies, big data, cloud computing, data transfer, artificial intelligence and many more technological concepts have not saturated before us stands as market opportunities. Firms need to be open to change and make good use of these opportunities. In this new revolution, it is predicted that individual entrepreneurs will be more in the foreground than rooted firms. Entrepreneurship will be important topics for companies that want to improve themselves, to master software languages, to focus on innovation, to learn continuously, to manage technology and innovation (Dirsehan, 2017: 1).

Expressed with different concepts such as the Digitized Industry, the Fourth Industrial Revolution and Digital Transformation, Industry 4.0 develops a flow and revolution that will affect all sectors of economies and companies of all sizes. Continuing industrial activities without taking part in this flow seems challenging. Industry 4.0 should be involved in all future policies, investments, plans and projects of institutions (Fırat and Fırat, 2017: 211-212).

In this study, it is aimed to explain the process leading to Industry 4.0, Industry 4.0 and its tools to the readers and to show the innovations and privileges brought by Industry 4.0 in the globalizing world. In the following sections, the definition of Industry 4.0 has been explained in detail and the necessary tools have been introduced and emphasis has been emphasized.

The Process That Leads to the Fourth Industrial Revolution

Before the fourth industrial revolution, producers continued their production with the understanding of production in the second stage of the industry. The main goal here is to make life easy. Machinery and equipment developed in different fields from transportation to household appliances have always been aimed at this purpose. However, with the gaining weight of electronic and information technologies, which started to be commercialized and entered daily life in the early 1970s, automation of production has increased and its move to advanced stages has brought different and new dimensions (Özsoylu, 2017: 44).

Especially the years of 1980-1990 brought very different approaches to production processes. As the market grew, the competition increased at the same rate. With globalization, the economy of scale has been replaced by the economy of scope and the goal of all companies has been to open up to the world or to become a brand. With these developments, industries have turned to specialization and efficiency in production, to higher quality and cheaper production. During this period, developments in two areas were very determinant. The dazzling changes seen in the communication, information and communication sectors heralded the fourth industrial revolution. At the beginning of the 3rd industrial revolution, this sector experienced slow and weak developments, and there was a complete boom in a short time. Computers have developed and become so small that they can be used in pockets, they can be used by everyone and have become widespread. Undoubtedly, the acceleration of this

process has been achieved with the spread of the internet. By entering a new period, the world has shrunk and the concepts of time and space have gained new meanings (Görçün, 2016: 45).

After these new developments and changes, production patterns changed and supply chains gradually expanded. With the development of computers, design activities differed and diversified. Computer-aided production with advanced technology has become widespread and broke ground. In addition to this process, developments in other branches of science were added, interdisciplinary studies increased, mechanical devices were enriched with electronic elements and became smart.

When summarized finally, there have been changes in the structural features and all processes of the industry. The developments in communication, information and communication technologies before Industry 4.0 and the direct use of these developments in the industry point to the end of an era and a new era (Görçün, 2016: 45; Özsoylu, 2017: 45).

Industry 4.0

Industry 4.0 first appeared in 2011 with official documents and became the harbinger of a new industrial revolution. This system, which is tried to be developed in order to meet the basic needs, has become a serious mainstay as a result of the dimensions of the technology. To understand why this change is called Industry 4.0, the studies and developments in Germany should be examined. This trend emerged in Germany and spread over the world over time. First of all, in 2011, the German Ministry of Education and Research created 10 projects that they thought would contribute to the development and development of the future by evaluating the current situation of the country and these projects were published under the name of "Future Projects of 2020 in High Technology Strategy". The main purpose of this project was about the use of new energy sources, sustainability and smart technology. One of the projects published was Industry 4.0 and was first announced at the Hannover Fair (Fang, 2016: 326; Pamuk and Soysal, 2018: 44).

This change, referred to as Industry 4.0, includes a structure that will completely change the relations of production and consumption. On the one hand, it explains the production systems that adapt to the changing needs of the consumer instantly, and on the other hand, it describes automation systems that are in continuous communication and coordination with each other and encourages close cooperation between various disciplines in product development (Sinan, 2016: 22; Herter and Ovtcharova, 2016: 400).

Mrugalska and Wyrwicka (2017) describes the concept of Industry 4.0 “integration of complex physical devices and machines with networked sensors and software used to better predict, control and plan commercial and social outcomes” or “a new value chain organization throughout the lifecycle of products. and the level of management ”. Industry 4.0 has focused on optimization of value chains due to its autonomous control and dynamic production. It covers the design and implementation of competitive products, services, strong and flexible logistics and production systems. Batista et al. (2017) state that Industry 4.0 is an advanced development stage in the organization and management of the entire value chain process in the manufacturing industry, sensor and actuator infrastructures. Can and Kıymaz (2016) say that Industry 4.0 plans to work jointly with each other, directly or indirectly related to production, and envisages digital data, software and information technologies to work in integration with each other. According to Jian et al. (2016), Endütri 4.0 includes various factories, companies, suppliers, logistics, customers, resources, etc. means a complete communication network that will exist between. Here, each section optimizes real-time configurations based on the demand and condition of the relevant sections in the network. In other words, the future business network is being added by each collaboration department that can achieve self-organizing status and deliver real-time responses. Andreas et al. (2016) report that Industry 4.0 is the new technological developments that are the backbone of the internet and support technologies integrating physical objects, human actors, smart machines, production lines and processes across organizational boundaries.

In a globalizing world, the way to economic development and growth is possible with a steady increase in exports. The increase in exports brings with it competition and with the increasing competition, it is possible to use resources effectively (Şimşek and Yiğit, 2019: 175). In this context, Industry 4.0 revolution is seen as an important strategy for survival in the future competitive environment. This includes flexible logistics and production systems, as well as the design and implementation of competitive products and services. Industrial companies are currently focusing on the concept of industry 4.0 to tackle challenges such as increased individualization of products, increasing resource efficiency and shortening time to market (Rennung et al., 2016: 374). Another reason for focusing on Industry 4.0 is the change in consumer demands. Today, individuals have started to need to quickly access new products due to the globalization of the world and the amount and variety of products produced. Therefore, it is vital for companies to launch their new product as quickly as possible. In addition, the need to meet individualized customer demands is considered as one of the factors that trigger the last industrial revolution (Pamuk and Soysal, 2018: 45).

In smart factories emerging with the new revolution, technological devices connected with inretnet control the entire production chain and make their own decisions. New technologies bring the digital, physical and biological worlds together. These worlds, which are integrated with each other, change the ideas about the sectors, economies and markets. In order to adapt to Industry 4.0, it is not enough for companies to change production lines only. In order to be successful, all processes of both production and marketing must be re-planned (Öztürk and Koç, 2017: 788).

The objectives of Industry 4.0 are to provide mass customization of products produced by information technologies, to ensure automatic and flexible adaptation of production chains, to monitor parts and products, to facilitate communication between products, machines and parts, to apply human-machine interaction paradigms, to provide internet-enabled production optimization of objects in smart factories. and to provide new types of services and business models in terms of value. In addition, the importance of Industry 4.0, which transforms the world into a huge information system by connecting individuals, objects and systems on the road to value creation, and the positive effects it brings to production can be listed as follows (Öztürk and Koç, 2017: 788; Mrugalska and Wyrwicka, 2017: 470; Lu, 2017):

- Efficient use of energy resources
- More automation in production with Industry 4.0, more mass production depending on customer preferences, maximum production quality, fast innovation process and less resource usage
- Minimizing the cost of producing personalized products
- Manufacturing processes to allow more flexible and free systems and applications
- Facilitating logistics operations by increasing the data transmission speed and ensuring the production of products closer to the customer thanks to 3D printers.
- Eliminating the problems in the demand chain
- Optimizing decision making thanks to real-time end-to-end visibility
- Providing the highest output from a given resource volume and using the lowest amount of resources possible to achieve a specific output
- Innovative services, new forms of employment, enabling SME’s and new enterprises to develop

Industry 4.0 Tools

Industry 4.0 covers numerous technologies and associated paradigms. Some of these are Radio Frequency Identification, Enterprise Resource Planning, Internet of Things, Industrial Internet of Things, Cyber-Physical Systems, Cloud-Based Manufacturing, Smart Factory, Smart Product, etc. can be listed as. These features are not only highly associated with internet technologies and advanced algorithms, but also point out that Industry 4.0 is a value-added information processing and industrial value-added process. Industry 4.0 needs some important tools in order to achieve its goals. With these tools, the above-mentioned objectives can be achieved by

improving the information network and communication. Here, some of Industry 4.0 tools such as cyber-physical system, internet of things, data analytics, big data and smart factories are briefly summarized.

Cyber-Physical System

All the structures that involve the communication and coordination between the cyber world and the physical world are defined as Cyber-Physical Systems. In addition, Cyber-Physical Systems, which is an important part of the fourth industrial revolution, means controlling the machines with extraordinary intelligent and flexible software Pamuk and Soysal, 2018:46 ;Sinan, 2016: 27). The main role of Cyber-Physical Systems is to fulfill the agile and efficient requirements of production and to increase the efficiency and profitability of the entire industry. The fourth industrial revolution is characterized by an unprecedented connection called the Internet and Cyber-Physical Systems, which can be considered as systems that connect the physical and virtual world. More precisely, Cyber-Physical Systems is the integration of computation with physical processes. It is to provide a completely new degree of inspection, surveillance, transparency and efficiency at this production stage. Cyber-Physical Systems perform the integration of networks using multiple sensors, actuators, control process units and communication devices, as shown in figure 1 below. In Cyber-Physical Systems, previously programmed systems can operate without requiring any intervention by providing M2M† communication thanks to the software and sensors embedded in the built-in production factors. Therefore, with a programming to be made at the beginning of the system in a general framework, the entire process of the system can be performed automatically without any intervention or extra effort (Hofmann and Rüsch, 2017: 29; Oesterreich and Teuteberg, 2016:137; Lu, 2017).

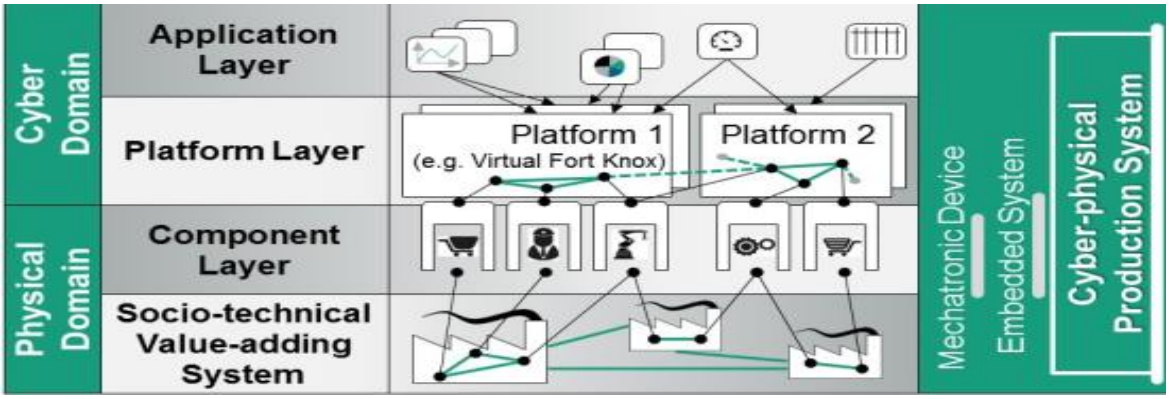

Figure 1: Cyber-Physical Systems (Landherr et al., 2016: 27)

One of the most distinctive features of Cyber-Physical Systems is that very difficult operations can be realized in a very short time with human intelligence and power. Since Cyber-Physical Systems are connected to the internet, they can access the data very quickly and process the obtained data and incorporate it into the production process. It can also adapt to external conditions as it can connect with the outside world (Görçün, 2016:50).

Internet of Things

While the Internet of Things is referred to as "The Lot", it includes the communication of physical devices with network connections and remote control of these objects. This system, which enables the communication of the machines among themselves, continues to develop rapidly (Gubbi et al., 2013: 1650; Roblek et al., 2016: 7). The Internet of Things is expected to open many economic opportunities and is considered one of the most promising technologies with great destructive potential. The expression of the Internet of Things was put

† M2M is the technology that enables companies to communicate wirelessly between information centers and machines.

forward by entrepreneur Kevin Ashton. The idea was formulated in 1999 to describe a system where the physical world communicates with computers and sensors located everywhere. With this formula, a system of everything was created by considering not only the objects but also processes, data, people and even animals or atmospheric phenomena as a variable Hofmann and Rüsch, 2017: 31; Witkowski, 2017: 766). The concept of "Internet of Things" became famous in the early 21st century and was considered as a technology that enables industries to move from Industry 3.0 to Industry 4.0 by adding information to products and processes in the supply chain Hofmann and Rüsch, 2017: 31; Trappey et al., 2017: 220).

Smart Factories

With each industrial revolution, the production stages of the factories have changed and the role of the human factor in production has changed with the introduction of automation. Employment growth and economic growth are among the main objectives of the fourth industrial revolution. With the fourth industrial revolution, new work stages in production are expected and a change in the required workforce profile is expected. It is estimated that the need for low-qualified workforce will decrease with the establishment of smart factories and the high-tech automation systems used with it. The new design aims to further reduce the rate of error in production, speed up the production process and further reduce production costs. The basic tools of creating smart factories are the automation systems we mentioned in our study. Providing M2M communication will ensure that the coordination in the production process is smooth and timely. For this to be created, the internet system of objects must be implemented without any problems, and communication between the machines must be supported by software and sensors. In addition, cyber-physical systems also play a major role at this stage (Pamuk and Soysal, 2018: 47).

The benefits of smart factories include mass customization that allows people to order a custom product, or to make their own design, in the prototyping process or just before the product reaches its final form. Another important factor is flexibility. M2M communication and creating cyber physical systems will add flexibility to the production stages and make it easier to make some changes in the process. In addition, it is crucial that the system inside smart factories acquire the ability to perform and perform big data analysis appropriately. In addition, the benefits of this system are not only within the factory, but will also help the supply chain network to have more information about these situations (Shrouf et al., 2014: 698; Tuominen, 2016: 380).

Data Analytics and Big Data

Large and complex datasets that are too large to be processed by existing information systems are called big data. In other words, the data that is larger than the known database management systems and software tools' ability to collect, store, manage and analyze is called "big data". Big data includes every action an internet user does on the internet. Every website entered during the day and every point clicked has the characteristics of a data. To date, all this information has been characterized as an information dump, as it is not possible to store data in existing databases and use it in reporting systems (Özsoylu, 2017: 51). In today's world, data is produced through devices and machines and stored in cloud infrastructure systems. Business management or consumers in normal life can access this data when needed. It is estimated that the size of the data in the existing networks will be much more in the coming years. So from an industry perspective, big data will play an important role for Industry 4.0. According to the German government, the fuel of the fourth industrial revolution is expected to be big data (Roblek et al., 2016: 9; Yin and Kaynak, 2015: 144).

Big data offers very important opportunities. First of all, there are three important values such as lowering costs, improving decision making, and improving products and services. When big data is analyzed with the right analysis methods, it will provide a basis for businesses to be more accurate in their decisions, manage their risks better, and encourage innovative breakthroughs. Considering that the right plans can be produced only from the right information, the importance of big data for Industry 4.0 is also clear. Companies that use big data correctly and purposefully will take the lead in a competitive environment, increase efficiency, decrease costs,

supply methods will improve, customer relations and marketing approaches will become more dynamic Davenport, 2014: 55; Özsoylu, 2017: 53).

Conclusion

Industry 4.0, which is accepted as the fourth revolution of the industrialization process, is the edible period that will affect all layers of the society with the public and private sectors. The informatics infrastructure that forms the fourth industrial revolution realizes smart production, new production prototypes emerge with smart production, and as a result, structural changes are expected in the processes ranging from daily life to work life, from the structure of products to supply and sales. Until the fourth industrial revolution, every industrial revolution prepared the ground for minor and important changes. With the internalization of communication, internet, informatics, automation, robots and data collection technologies in daily life and production phase, progress will be achieved in the fourth revolution of the industry.

The creation of industrialization value of countries with developed industries takes shape with the revolution called Industry 4.0, which is now the fourth stage of industrialization. This revolution follows the third industrial revolution that began in the 18th century and was based on electronics and information technologies to achieve a high level of automation in production.

The development for the fourth industrial revolution has now had a serious impact on the manufacturing industry and will continue to multiply in the future. For this reason, companies that want to increase their competitiveness in the future should apply the Industry 4.0 revolution to their production organizations and consequently use technologies such as smart robots, cyber-physical systems, and cloud-based manufacturing in their factories.

Finally, in order for countries to catch up with Industry 4.0 and to be among the leading countries, steps should be taken to facilitate the access of all industrial companies to digital technologies and to create digital platforms. In addition, policy makers and academics need to provide appropriate solutions for the widespread use of the smart industry, and all stakeholders need to focus on a common goal.

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