Socio-Economic Structure and An Empirical Application on the Unemployment-Economic Growth Nexus: The Case of Denmark

Sosyo-Ekonomik Yapı ve İşsizlik-Ekonomik Büyüme İlişkisi Üzerine Ampirik Bir Uygulama: Danimarka Örneği

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Abstract

Macroeconomic indicators are the basic indicators that reveal the economic performance of a country. Economic growth and unemployment status are among the most important macroeconomic indicators that show the economic performance of countries. While economic growth is among the priority targets of every country, unemployment is among the most significant problems faced by countries as it negatively affects individuals and the society economically, socially and psychologically. Denmark is a highly developed country with a high standard of living and well-being. Therefore, the aim of this study is to reveal the socio-economic performance of Denmark by examining the socio-economic structure with various macroeconomic indicators, and then to analyze empirically the relationship between unemployment and economic growth. In the study, which takes into account the period 1980-2021, Granger causality analysis was applied to test the causal relationship between the variables, and then regression analysis was performed with the least squares method. Empirical findings obtained from Granger causality analysis showed that there is a bidirectional causality relationship between unemployment and economic growth. Besides, according to the results obtained from the regression analysis performed with the least squares method, a 1% increase in economic growth in Denmark reduces unemployment by 6.32%.

Keywords: Macroeconomic ındicators, economic growth, unemployment, Denmark.

Öz

Makroekonomik göstergeler, bir ülkenin ekonomik performansını ortaya koyan temel göstergelerdir. Ekonomik büyüme ve işsizlik durumu da ülkelerin ekonomik performansını gösteren en önemli makroekonomik göstergeleri arasında yer almaktadır. Ekonomik büyüme her ülkenin öncelikli hedefleri arasında yer alırken, işsizlik olgusu bireyleri ve toplumu ekonomik, sosyal ve psikolojik yönden olumsuz etkilediği için, ülkelerin karşı karşıya olduğu en önemli sorunlar arasındadır. Danimarka, yaşam standartları ve refah seviyesi yüksek, oldukça gelişmiş bir ülkedir. Dolayısıyla bu çalışmada amaç, öncelikle Danimarka'nın sosyo-ekonomik yapısını çeşitli makroekonomik göstergelerle inceleyerek sosyo-ekonomik performansını ortaya koymak, daha sonra işsizlik ile ekonomik büyüme arasındaki ilişkiyi ampirik olarak analiz etmektir. 1980-2021 dönemini dikkate alan çalışmada, değişkenler arasındaki nedensel ilişkiyi test etmek amacıyla Granger nedensellik analizi uygulanmış, ardından en küçük kareler yöntemi ile regresyon analizi yapılmıştır. Granger nedensellik analizinden elde edilen ampirik bulgular, işsizlik ile ekonomik büyüme arasında çift yönlü nedensellik ilişkisinin olduğunu göstermiştir. Bununla birlikte, en küçük kareler yöntemiyle gerçekleştirilen regresyon analizinden elde edilen sonuçlara göre, Danimarka'da ekonomik büyümede meydana gelen %1'lik bir artış işsizlik oranını %6,32 azaltmaktadır.

Anahtar Kelimeler: Makroekonomik göstergeler, ekonomik büyüme, işsizlik, Danimarka.

Introduction

Economists and policy makers typically take into account variables such as economic growth, unemployment, inflation, balance of payments and public finances when they set goals for a country's economic policy (Biede, 2015, p. 17). The main purpose of economies is to achieve price stability, increase purchasing power, reduce unemployment, and increase sustainable economic growth through the formulation and implementation of prudent and efficient macroeconomic policies (Khalid et al., 2021, p. 2). As is known, the primary goal of every country is to attain economic growth and development, and when determining the level of development of a country, per capita income is usually taken into account. However, quantitative criteria such as economic growth rate and per capita income are not alone enough to evaluate the country's level of development. In addition to these, it should be considered in a broader way to include social, cultural, artistic and political criteria. Besides, starting especially from the 1970s, the concept of sustainable development, which aims not only to develop but also to provide a human-nature balance has become a significant subject.

Economic growth can be defined as the rise in the production volume of an economy over periods (Özel, 2012, p. 64). Unemployment, which can be defined as the existence of a workforce that is willing and able to work but cannot find a job despite being willing to work at the current wage level (Uyar Bozdağlıoğlu, 2008, p. 46) is a big problem faced by countries as it negatively affect both individuals at the micro level, and the whole society and country at the macro level in many aspects such as economic, psychological and social. As a matter of fact, a person who is unemployed will suffer a loss of income, so the standard of living will drop drastically. This situation can lead to various psychological problems. If the unemployment situation lasts for a long time, the risk of engaging in criminal activities may increase, which will negatively affect the society and the country.

Economic growth (GDP) and unemployment rate are relevant indicators for economists and policy makers in order to measure and monitor whether a country's economy is in a healthy structure. Regardless of the structure of the economy, the phenomenon of unemployment is among the biggest problems of both developed and developing countries (Zanin and Marra, 2012, p. 91; Kanca, 2012, p. 2). Attaining higher and stable economic growth is one of the major solutions to eliminating unemployment. This economic growth is important both in terms of improving the earnings of the currently employed and providing job opportunities for the unemployed (Adarkwa et al., 2017, p. 1). It is a commonly accepted view that economic growth directly affects employment. When the rate of economic growth increases, then employment will rise and the unemployment rate will decrease. Many studies confirm that there is a trade-off between economic growth and change rates of unemployment prevailing in the economy (Khrais and Al-Wadi, 2016, p. 19). In macroeconomic theory, the inverse relationship between unemployment and economic growth is known as Okun's Law. Okun's Law which states that "the change in economic output is inversely proportional to the change in unemployment" is a theory developed by the American economist Arthur Melvin Okun in the early 1960s (Serawitu, 2020, p. 16; Obodoechi and Onuoha, 2019, p. 137; Larsen, 2022, p. 3).

The goal of this study is firstly to reveal the socio-economic performance of Denmark by examining the socio-economic structure of the country with selected various macroeconomic indicators. The study also aims to analyze the nexus between unemployment and economic growth in Denmark with the help of Granger causality analysis and regression analysis using annual data 1980-2021, and thereby contribute to the literature on the subject. This study differs from the previous studies as it both considering the socio-economic structure of Denmark and examining the relationship between the variables in question, as well as the period taken into account and the method used to perform the analysis. This study is important in point of drawing the picture of the economic performance of Denmark and determining the nexus between unemployment and economic growth, thus being a guide for macroeconomic policies to be implemented. From this point of view, after the introduction, the Danish economy will be mentioned. Then, a literature review will be made. After the data set is explained, the findings obtained from the analysis will be presented. The study will be completed with the conclusion section.

2. An Overview of the Danish Economy

Denmark, which is an advanced, modern and democratic country is located in the Nordic region (Marinov, 2020, p. 3). With a population of 5.856.733 in 2021, Denmark covers a total area of 42.952 km² and is largely an island country. Zealand (Sjælland), North Jutlandic Island (Nørrejyske Ø) and Funen (Fyn) are the largest islands of Denmark. The capital of Denmark is Copenhagen (København) and Copenhagen is located in Zealand. Denmark, which is a Scandinavian country borders Sweden to the East and Germany to the South and Germany is the only land border connection to Denmark (https://www.norden.org; Danmarks Statistik, 2023a). However, both Greenland (Grønland) and the Faroe Islands (Færøerne) belong to Denmark but

have a high degree of autonomous rule. Denmark has the world's oldest flag called 'Dannebrog' (https://www.statista.com). Denmark is a member of the European Union (EU) since 1973 and the country's currency is Danish Krone. Denmark's transport and communications infrastructures are quite efficient, and the country is among world leaders in high-tech industries. Exports are among the main drivers of economic growth in Denmark, and is highly dependent on foreign trade and investment (https://www.state.gov; https://www.danskindustri.dk). Besides, tourism is also of great importance to Denmark. With its natural areas and coasts, Denmark is becoming attractive in terms of tourism. It also contributes to economic growth and creates employment, as well as trade, restaurants etc. has a positive impact on other sectors of tourism. The foreign tourists' consumption in Denmark reached 61.5 billion Danish Kroner to 4.5% of total Danish export in 2019. This has made tourism one of Denmark's largest export industry (Erhvervsministeriet, 2022, p. 5-6). The education level is high in Denmark and ranks among the best in the business climate worldwide. Moreover, Denmark ranked 1st in the Legatum Prosperity Index in 2023 (IMF, 2019, p. 4; Legatum Institute, 2023).

The rise in oil prices in the 1970s severely affected the Danish economy. As a matter of fact, the Danish economy at that time could be characterized by persistent fiscal deficits, significant and growing foreign debt, continuing high inflation, and slow growth. However, Denmark had achieved a notable economic adjustment by the end of the 1980s (Pedersen, 1994, p. 395). Today, Denmark, which has a stable economy is a country with high per capita GDP, well-developed social services, a high level of welfare and a high standard of living but a high cost of living. Denmark has an important place in the world economy. The country's economy is based on the service sector, trade and manufacturing, and a small percentage of the population is engaged in agriculture and fishing (https://www.britannica.com; Lundvall, 2009, p. 6). Denmark, which has state-of-the-art infrastructure, stands with its healthy economy with high employment, low structural unemployment, highly skilled labor force, low public debt and healthy public finances. However, the country has a strong social security system and flexible labor market (Pedersen, 2020, p. 42; https://www.trade.gov). The taxation system in Denmark is high taxation and the implementation of a progressive taxation system. The welfare state implemented in the country is characterized as universal as it covers all citizens and guarantees medical care, educational opportunities and equal access to social security for all Danish residents (Marinov, 2020, p. 3).

Graph 1: Economic Growth Rates (GDP) of Denmark, 2010-2021
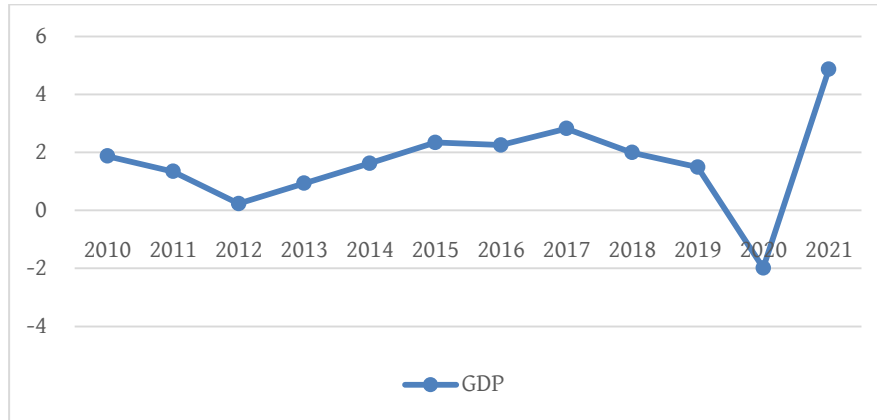
Source: https://data.worldbank.org (Accessed: 02.03.2023).

In 1973, Denmark and many other industrialized countries experienced massive oil price increases that marked the end of the strong economic growth of the 1960s and the transition to a long period of stagnation in production. Having experienced a strong growth period in production after 1993, the growth process of Denmark was interrupted by the economic crisis in 2008 (Grell and Rygner, 2018, p. 13). The COVID-19 pandemic that occurred in 2019 left a deep mark on the Danish economy, as in other countries, and there was a great decline in economic activity (Finansministeriet, 2021, p. 3). Graph 1 shows the annual economic growth rates of Denmark for the years 2010-2021. When the graph is examined, the growth rates of Denmark varied approximately between -2% and 5% on average in the period in question. Denmark's growth rates declined from 2010 to 2012. It increased from 2012 to 2015, decreased slightly in 2016 and then increased again. The country's growth rates started to decrease as of 2017 and became negative in 2020. In 2021, the growth rates increased again and realized as 4.86%.

Graph 2: Denmark's GDP Per Capita (US$), 2010-2021
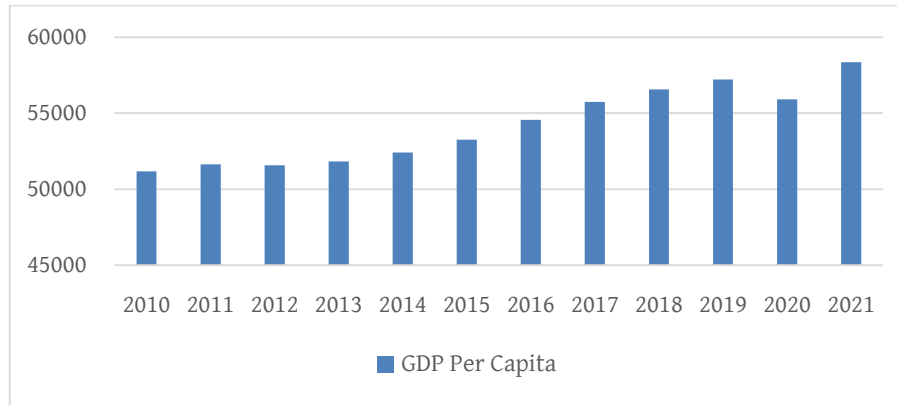
Performing well in per capita income, Denmark was the 6th most prosperous among 38 OECD countries measured in GDP per capita in 2021 (https://cepos.dk). Graph 2 shows the GDP per capita of Denmark. As is seen from the graph, Denmark's GDP per capita increased from 2010 to 2021.

Table 1: Inflation Rates in Denmark, 2010-2021

| 2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
2.31	2.76	2.40	0.79	0.56	0.45	0.25	1.15	0.81	0.76	0.42	1.85

It can be said that inflation rates in Denmark are generally moderate (IMF, 2019, p. 5). Table 1 shows the evolution of the annual inflation rate in Denmark for the period 2010-2021. Accordingly, although the inflation rate has followed a slightly fluctuating course, it has decreased from 2010 to 2021.

Graph 3: Foreign Direct Investment Inflows in Denmark, 2010-2021
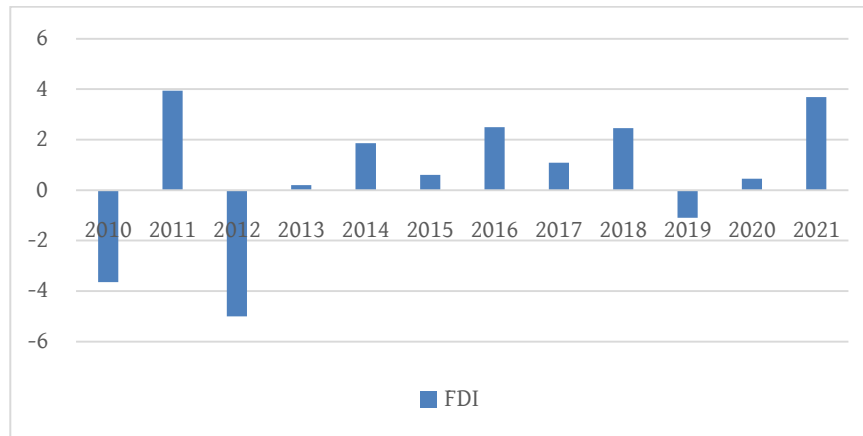
Almost half of foreign direct investment in Denmark passes through transit countries before reaching the country. Danish companies mostly invest in EU countries (Danmarks Nationalbank, 2019, p. 1-2). Graph 3 shows the net inflows of foreign direct investment as a percentage of GDP in Denmark between the years 2010-2021. As seen from the graph, Denmark's foreign direct investment in the period taken into account in the study, followed a fluctuating course. It is observed that there was a sharp decrease in foreign direct investment net inflows in 2010. It can be said that this decrease is due to the effect of the 2008 global financial crisis. There was an increase in 2011, but a sharp decrease again in 2012. Although not very high, net inflows in Denmark followed a positive and fluctuating course between 2013 and 2018. Because of the COVID-19 pandemic, there was a decrease in 2019, and an increase in foreign direct investment occurred again in 2020 and 2021.

Graph 4: Total Unemployment in Denmark, 2010-2021
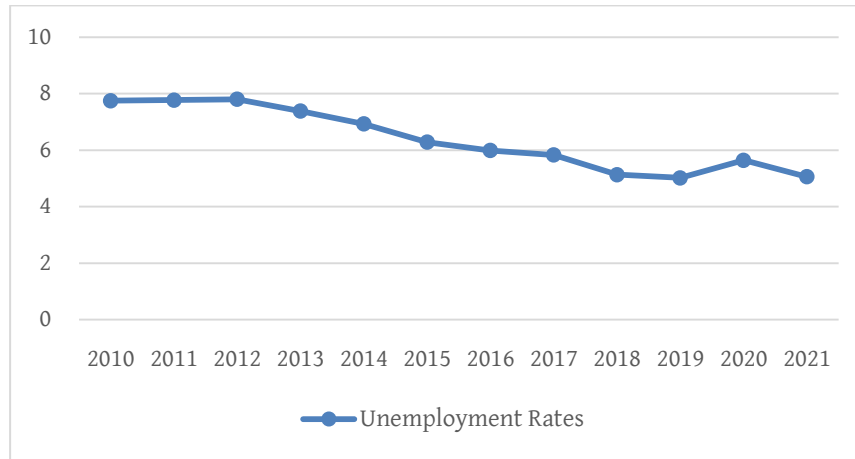
An important feature of the Danish labor market model is flexicurity. Flexicurity is a concept that refers to flexibility and security. As a matter of fact, flexicurity, which is a combination of the flexibility and security words, is an integrated strategy aimed at simultaneously enhancing flexibility and security in the labor market. The flexicurity model is based on three parts: flexible labor law, a flexible unemployment insurance system and an active labor market. Flexicurity denotes to the Danish work model according to which the citizens living in Denmark possess a great degree of mobility between various jobs that are simultaneously financially secured in case they lose their jobs (Marinov, 2020, p. 3; https://ec.europa.eu; Andersen and Svarer, 2006, p. 28). In other words, flexicurity, which is a combination of job, employment and income security, provides high degree of flexibility especially for employers in hiring or firing people; but at the same time it includes economic security in the form of a relatively high daily allowance in case of unemployment (Greve, 2016, p. 130).

Severely affected by the financial crisis, Denmark's total production fell by 6.5% from 2007 to 2009, and employment fell by 170.000 full-time employees towards 2010 (Linaa and Smidt, 2014, p. 12). Graph 4 shows the unemployment rate as percentage of total labor force in Denmark between 2010 and 2021. According to the graph, the unemployment rate has decreased steadily, in particular from 2012 to 2019. However, a slight increase in unemployment is observed in 2020. In 2021, there was a decrease in unemployment again.

Graph 5: Exports and Imports of Goods and Services in Denmark, 2010-2021
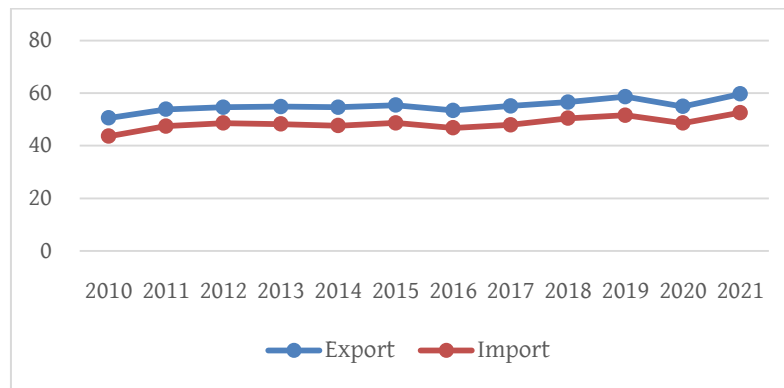
Trade is a substantial indicator for understanding how a country's economy is performing, and it shows how a country interacts with other countries (https://ec.europa.eu). Due to the financial crisis, the decline in world trade was extremely strong at the end of 2008 and the beginning of 2009. This has entailed a deterioration in Danish export opportunities. The financial crisis and the international recession also caused dampening in private consumption and domestic investment (Sørensen, 2010, p. 29). Trade is of paramount importance for Danish prosperity. Compared to 1970 with 28%, Denmark's exports account for more than 50% of its GDP today (Jeppesen et al., 2018, p. 4). In graph 5, the ratio of exports and imports to GDP in Denmark between the years 2010-2021 is given. As seen in the graph, although exports and imports move in parallel, the ratio of export to GDP is higher than the ratio of import to GDP. This means that Denmark has a surplus in foreign trade balance.

When we look at Denmark's main sectors, the agricultural sector of Denmark contributes for 0.9% of the GDP and is a significant exporter of agricultural products such as fish, meat and dairy products. Denmark's agricultural revenue which is almost 90%, comes from livestock production. Organic food accounts for 12.8% of the total retail food market in the country. The industrial sector contributes 19.3% of GDP in Denmark. Niche industries in renewable energy and biotechnology, as well as the chemical, pharmaceutical and biotechnology industries are the main operating sectors. The country is also among the leading countries in the world in terms of wind turbine manufacturers. The service sector in Denmark contributes 66.7% of GDP and the largest share of the population employs in this sector. Also, the banking sector in Denmark is strong. In addition, other important sectors for the country's economy are tourism, trade and transportation (https://www.lloydsbanktrade.com). Denmark's main trading partners are Germany, the U.S. and Sweden and its main export products include dairy products, foodstuffs, sugar, fish, meat, furniture, machinery, leather, chemicals, oil and gas, while its main import products include raw materials, machinery, equipment, foodstuffs, grain and consumer goods. In addition to these, the country is home to many multinational companies such as Lego, Tuborg, Carlsberg and Arla (Danmarks Statistik, 2023b; https://www.justlanded.com).

Table 2: Researchers in R&D in Denmark, 2010-2020

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
6739,18	7017,94	7143,29	7071,14	7310,66	7528,26	7846,66	7669,91	7636,13	7739,42	7691,89

Source: https://data.worldbank.org (Accessed: 02.03.2023).

Denmark can be said to be well positioned for innovation in Europe, and the country also has high levels of R&D intensity, which supports a favorable environment for attracting start-ups and qualified personnel (Hansen and Goosse, 2020, p. 4). When table 2, which includes the data of researchers in R&D (per million people) between 2010-2020 in Denmark is examined, an increase is observed in researchers in R&D as of the period under consideration.

Graph 6: R&D Expenditures in Denmark, 2010-2020
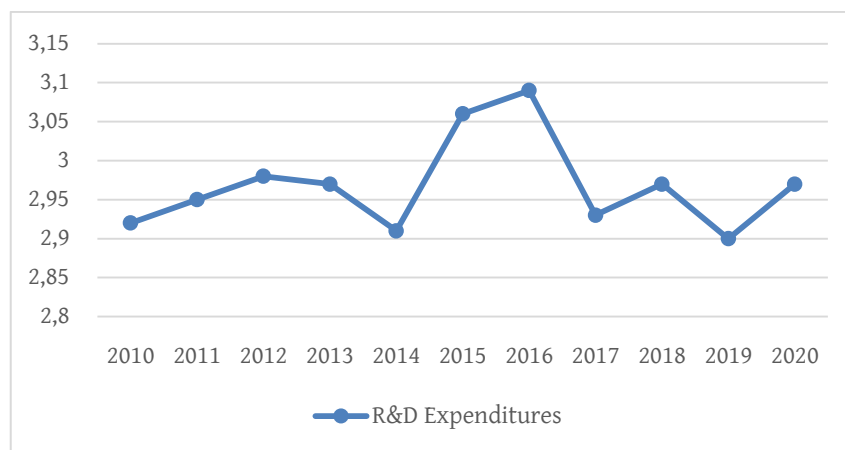
Source: https://data.oecd.org (Accessed: 17.04.2023).

The share of Denmark's R&D expenditures in GDP for the period 2010-2020 is given in graph 6. Although Denmark's share of R&D expenditures in GDP between the period in question has fluctuated, it is seen that there is a slight increase from 2010 to 2020.

Graph 7: Gini Index of Denmark, 2010-2019
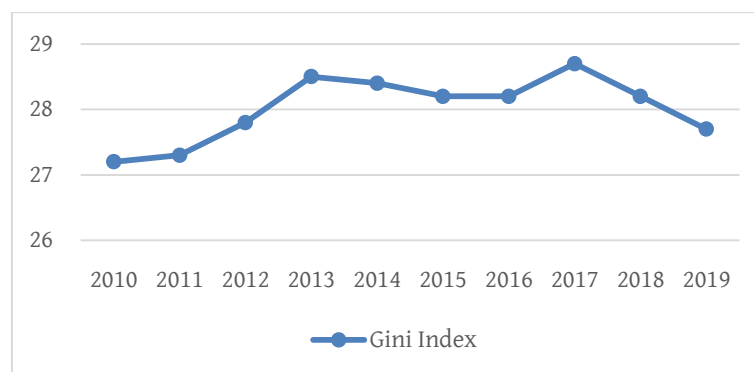
Source: https://data.worldbank.org (Accessed: 02.03.2023).

The Gini coefficient is one of the most widely used measures of total income differences in a population. A higher Gini index refers to a greater inequality. Generally, Denmark is characterized by small income differences seen in an international perspective. However, since the mid-1990s, income differences measured by the Gini coefficient have increased significantly (Finansministeriet, 2020, p. 26-27). In order to examine income inequality in Denmark, considering the years 2010-2019, the Gini coefficient was examined and this situation is given in graph 7. As can be seen from the graph, while the Gini coefficient was 27.2 in 2010, the Gini coefficient increased to 27.7 in 2019. As a result, based on these data, the income inequality slightly increased in Denmark between 2010 and 2019.

Graph 8: Human Development Index of Denmark, 2010-2021
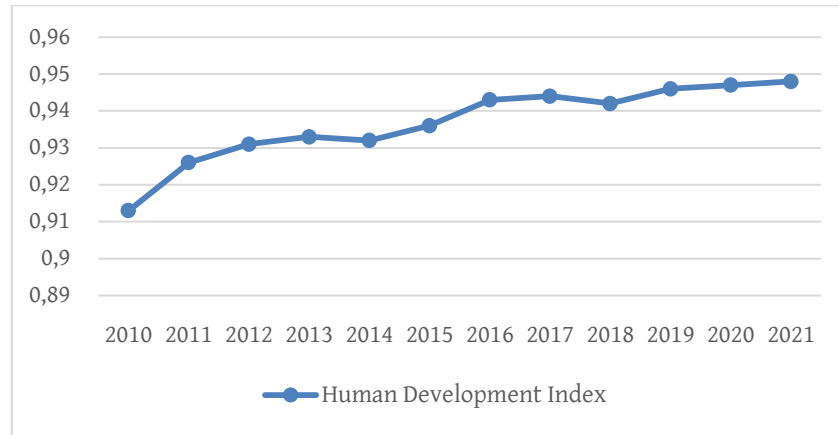
Source: https://hdr.undp.org (Accessed: 02.03.2023).

The human development index consists of three main dimensions. These are: long and healthy life, knowledge and a decent standard of living (https://hdr.undp.org). Looking at the human development index in graph 8, it is seen that there has been a rise in the human development index from 2010 to 2021. The human development index of Denmark increased from 0.834 to 0.948, respectively, from 1990 to 2021, a positive change of 13.7%. In terms of the human development index of Denmark, which is in the category of 'very high human development', the country ranked sixth with 0.948 in 2021 (https://hdr.undp.org/data-center/specific-country-data#/countries/DNK).

Graph 9: CO_2 Emissions in Denmark, 2010-2019
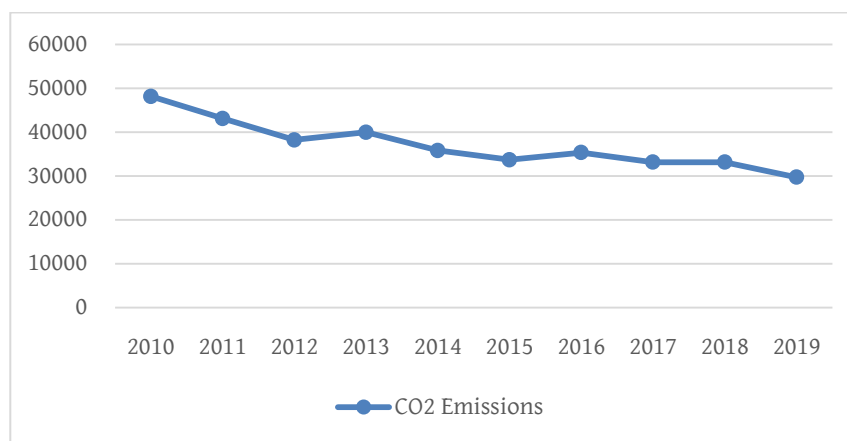
Source: https://data.worldbank.org (Accessed: 02.03.2023).

Graph 9 shows Denmark's CO_2 emission in kiloton (kt) for the period of 2010-2019. In general, it has been observed that CO_2 emission follows a decreasing course by years. It can be said that this is due to the increase in the use of renewable energy sources which accounts for more than 80% of electricity generation. Between 1990-2019, Denmark reduced its greenhouse gas emissions by 36%, largely thanks to renewable energy (OECD, 2021, p. 10).

Graph 10: Renewable Energy Consumption in Denmark, 2010-2019
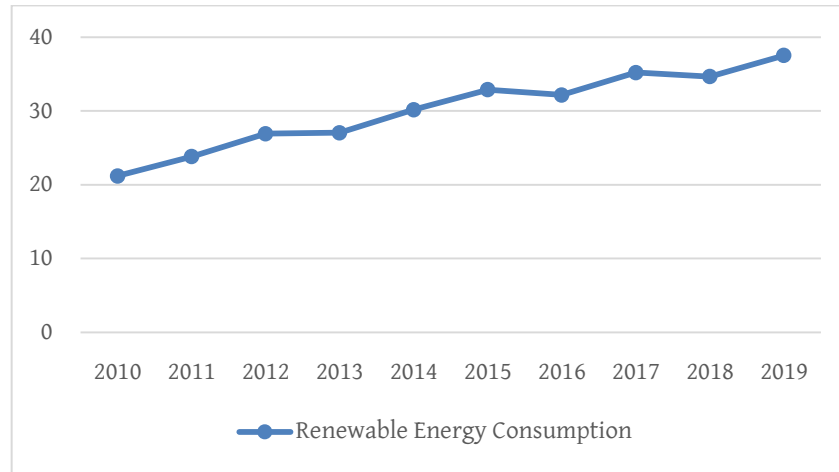
Denmark, which has an important position in the world's renewable energy market has made huge progress toward renewable energy (Dansk Energi, 2016, p. 3; OECD, 2021, p. 11). When graph 10, which shows the renewable energy consumption as a percentage of total final energy consumption for the 2010-2019 period is evaluated, Denmark's renewable energy consumption has increased by years. This situation can be interpreted as a positive development because the use of renewable energy consumption instead of fossil fuel energy is important for the protection of the environment and the sustainability of life.

Graph 11: Health Spending in Denmark, 2010-2020
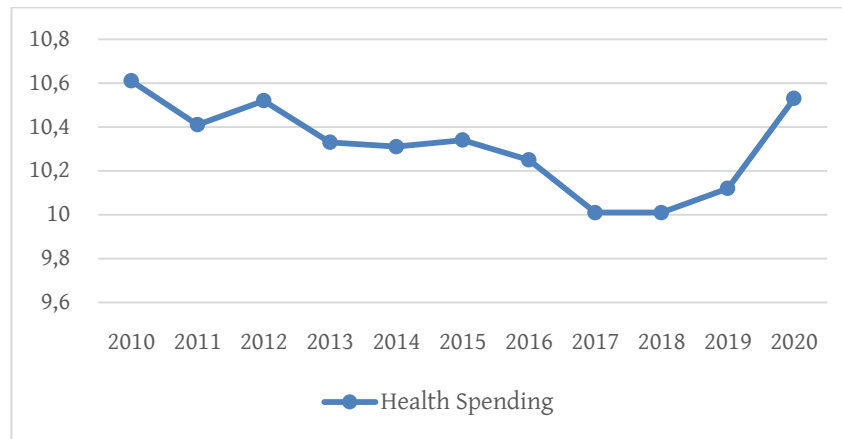
Health is indispensable for anyone. Good health is important for quality of life and for achieving one's goals in many areas, including education and the labor market, as well as in private life (Finansministeriet, 2020, p. 13). In the literature, it is revealed that health spending make significant contributions to economic growth, development and social progress by increasing the health level of the individual and society (Ağır and Tıraş, 2018, p. 1558-1573; Boyce and Brown, 2019, p. 3). The rise in health spending has a positive effect on the life expectancy and life quality of people (Şahin and Temelli, 2019, p. 949). Graph 11 shows the health spending as a percentage of GDP in Denmark for the years between 2010 and 2020. When we look at the ratio of total health spending to GDP, while there was a decreasing trend between 2010 and 2018, it is seen that there was an increasing trend after 2018. While health spending was 10.61% in 2010, it made up a share of 10.53% in 2020. The share of health spending has increased in 2020 and 2021. According to Statistics Denmark (Danmarks Statistik), the ratio of Denmark's health spending to GDP was 10.8% in 2021 (Danmarks Statistik, 2023c).

Graph 12: Health Spending in Denmark, 2011-2022
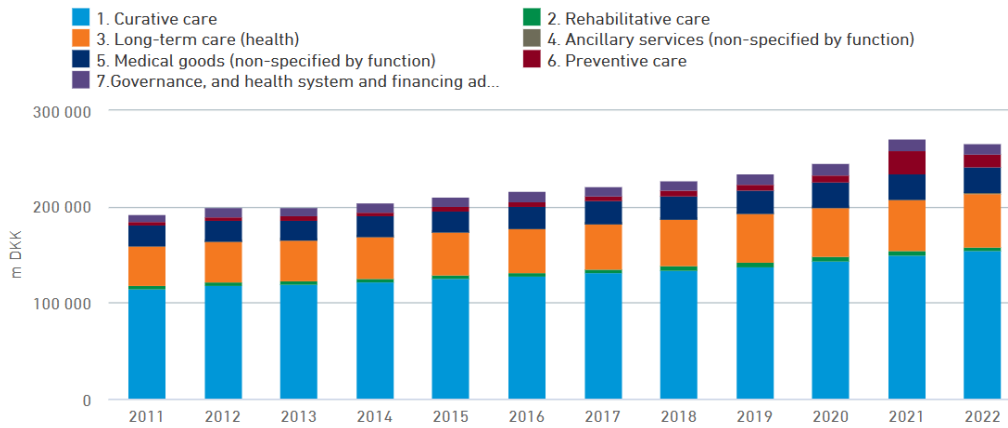
Graph 12 shows the development in total health spending from 2011 to 2022 in million Danish kroner, along with which health services the country consumes and how they are financed. As seen in the graph, the largest share is reserved for curative care. This is followed by long term care (health). In spite of that, the minimum share is reserved for ancillary services.

Graph 13: Education Expenditure in Denmark, 2010-2020
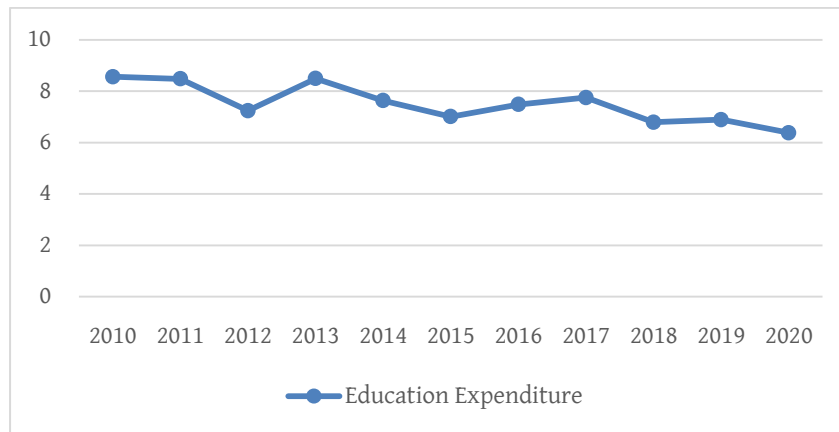
Education expenditure is too important an investment to ignore. Education has a vital role in the growth and development of countries and is a cornerstone in the progression of societies (Zolfaghari, 2015, p. 3380). Education expenditure in Denmark is split across primary, secondary and higher education. 128.5 billion Danish Kroner was spent on education in 2020 (Danmarks Statistik, 2020). In graph 13, where the total government education expenditure as a share of GDP between 2010-2020 in Denmark is examined, it is observed that it generally decreases and follows a horizontal course. Education expenditure made by the government decreased from 8.56% in 2010 to 6.38% in 2020.

When we make a general evaluation in the light of the tables and graphs above; the Gini coefficient has slightly increased. This can be considered a negative, as it means that income inequality is increasing. As a matter of fact, income inequality can lead to social problems as well as economic problems like reducing productivity and economic growth in the economy. Moreover, the healthier and better educated a citizen of a country is, the more productive the citizen can be; can contribute to the development and growth of the country. From this point of view, it is seen that the share of Denmark in education expenditures has decreased, albeit slightly.

3. Literature Review

There are many studies examining the relationship between unemployment and economic growth in the economics literature by considering different methods, periods, variables and country/country groups. However, it can be said that the number of applied studies on the subject is increasing day by day. In this section, studies that econometrically analyze the

relationship between the variables aforementioned are summarized in order of years.

Uysal and Alptekin (2009) who tested the relationship between economic growth and unemployment in the Turkish economy for 1980-2007 using Granger causality analysis, found a Granger causality relationship running from unemployment to economic growth.

Abbas (2014) examined the long run influence of economic growth on unemployment in Pakistan with the help of ARDL bounds testing approach to cointegration, taking into account the years 1990-2006. According to the empirical results, economic growth showed a significant negative impact on unemployment level in the long run. In spite of that, no relationship was found in the short run. It was concluded that a 1% increase in economic growth is associated with a reduction in the unemployment level by 1.665% in the long term.

Göçer (2015) analyzed the link between unemployment rate and economic growth for Turkey by considering the period 2001:Q2-2015:Q1. According to the findings, it was pointed out that every 1% point growth rate surplus 4.3% decreases the unemployment rate by 0.11% point. Therefore, Göçer concluded that the Okun's Law is valid for Turkey. In addition, according to the Granger causality test results, a one-way Granger causality relationship running from economic growth to unemployment was determined.

Acaroğlu (2018) examined whether there is a trade-off between output and unemployment for G20 countries considering the data from 1991 to 2014. From the Hodric-Prescott, Christiano-Fitzgerald and Butterworth filtering techniques which were used for the analysis, an inverse relationship between output and unemployment in most of the countries was determined. Besides, it was found that the Okun's coefficient do not satisfy with at the least one of these filtering techniques in China, Indonesia, Saudi Arabia and Turkey, and the G20 countries displayed different Okun's coefficients.

Soylu et al. (2018) analyzed the relationship between unemployment and economic growth in the context of Eastern European countries based on the years 1992-2014. It was stated in the study in which panel data analysis was used that unemployment was positively affected by economic growth. In other words, the unemployment rate will be reduced by 0.08% when GDP increases by 1%. In addition, a cointegration relationship between the variables was determined.

Srinivas (2018) investigated the output-unemployment nexus in the context of India, taking into account the years from 1990 to 2017. As a result of the econometric analysis, it was found that there is a two-way correlation between real output and unemployment and unemployment affects real output directly and indirectly. Besides, a long-run relationship between real output and unemployment was found.

Üzar and Akyazı (2018) used Dumitrescu and Hurlin causality test in order to analyze the relationship between economic growth and unemployment for 34 OECD countries between 2000 and 2016. As a result of the analysis, a bilateral causality relationship was found between economic growth rate and unemployment rate, and thus, the researchers stated that Okun's Law is valid for the countries taken into account in the analysis.

Bhat et al. (2019) examined whether the Okun's Law is valid in the Indian economy or not, using the data 1983-2013. They concluded that growth has a negative and significant impact on the unemployment rate. The researchers reported that a 1% increase in GDP will reduce the unemployment rate by 0.4 percentage point.

Tumanoska (2019) analyzed the relationship between GDP growth and unemployment rates (youth and total) in North Macedonia between 1991-2017 with the help of ARDL method. As a result of the study, a statistically significant long-run relationship was found between the GDP growth and total unemployment. Besides, Tumanoska stated that a 1% increase in economic growth will reduce total unemployment by 2.57%. On the other hand, no short- or long-run relationship was found between GDP growth and youth unemployment.

Karadzic et al. (2020) examined the short and long run relationships between economic growth and unemployment rate in terms of Montenegro for the years 2007-2019. They concluded that for every 1% rise in economic growth rate will lead to a reduction of unemployment by 0.275534% in the short run and by 1.46794% in the long run.

Korkmaz (2020) analyzed the relationship between unemployment and economic growth in 8 selected OECD countries, using data for the period between 2016:01-2019:02. It was pointed out in the study in which panel Granger causality test was used that there is a one-way causality relationship from unemployment to economic growth.

Özçelik and Erdem (2020) examined the relationship between unemployment and economic growth in Turkey. The study covered the period 1990-2019. The result obtained from the regression analysis showed that unemployment reduced by 0.07 per unit change for the short run. Thus, they concluded that the Okun's Law is valid for Turkey. According to the results of

Granger causality analysis, no causal relationship was observed between the variables by the researchers.

Louail and Benarous (2021) investigated the influence of real GDP on unemployment rates for Algeria with the ARDL bounds testing technique using data between 1991-2019. As a result, the researchers determined that the Okun's Law operates in the Algerian economy.

Vang (2021) who assessed whether the Okun's Law is valid for five Nordic countries and analyzed the relationship between output and unemployment found that there is a significant statistical relationship.

Maraui and Faramarzi (2022) investigated the validity of Okun's Law in four Nordic countries (Denmark, Norway, Sweden and Finland), taking into account the years from 1989 to 2018. As a result of the study, a negative correlation between unemployment rate and output was found and thus the researchers concluded that Okun's Law is valid in the case of Nordic countries.

4. Data Set, Empirical Analysis and Results

In this section, the unemployment-economic growth nexus has been empirically analyzed for Denmark. Granger causality analysis for the causality relationship between the variables and the least squares method for regression analysis have been performed, taking into account the years 1980-2021. The data used in the study are annual data. The logarithms of the variables which have been accessed from the World Bank (WDI) database were taken and the econometric analysis was made with the Eviews program. In the study, the unemployment rate variable is the dependent variable, and the economic growth variable is the independent variable. In the analysis, U represents unemployment, and GDP represents economic growth.

The functional form of the model included in the analysis can be written as follows:

$$U_t = f(GDP_t)$$

The relationship between these two variables is expected to be negative. One of the major macroeconomic problems of the world countries is the unemployment phenomenon. As a matter of fact, unemployment is one of the biggest problems to be solved because it affects people in different ways and dimensions, especially economic, psychological and social. Economic growth is among the primary objectives of the countries, and is also considered to be one of the most important macroeconomic indicators. Generally, it is expected that economic growth will reduce unemployment. The argument that economic growth will reduce unemployment is called "Okun's Law" in the macroeconomics literature. However, when we look at the literature, it is seen that different results are obtained in studies examining the relationship between the mentioned variables.

The methodological structure and the steps of the study in this section, which consists of econometric application is presented in figure 1 below.

Figure 1: Methodological Structure of Econometric Analysis
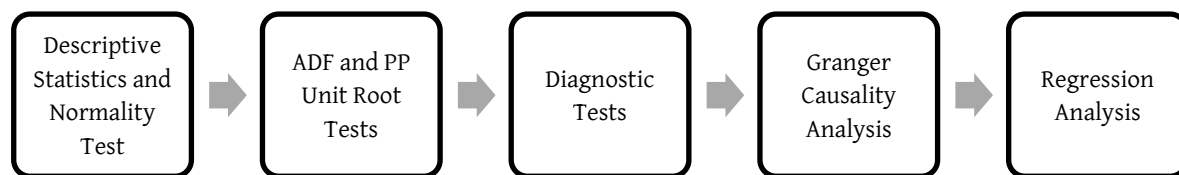
Before examining the unemployment-economic growth nexus in Denmark for the period from 1980 to 2021, the normal distribution of the variables was checked. In this context, descriptive statistics and normality test results are given in table 3. The table shows that Jarque-Bera probability values for both unemployment and economic growth are greater than 0.05. From this point of view, it can be said that all the variables are normally distributed.

Table 3: Descriptive Statistics and Normality Test Results

	LOGU	LOGGDP
Mean	1.846842	26.22849
Median	1.847615	26.29926
Maximum	2.372111	26.55748
Minimum	1.302913	25.81836
Std. Dev.	0.282939	0.216532
Skewness	-0.099511	-0.356928
Kurtosis	2.112282	1.897151
Jarque-Bera	1.448391	3.020263
Probability	0.484714	0.220881
Sum	77.56736	1101.596
Sum Sq. Dev.	3.282233	1.922326
Observations	42	42

The graphs of the variables used in the analysis are shown in figure 2. Firstly, looking at the unemployment variable, the unemployment rate increased between 1980 and 1982, decreased after 1983, but increased again in 1989. Besides, as of the period covered in the study, it is seen that 1993 was the year that Denmark had the highest unemployment rate with 10.72%. It is observed that the unemployment rate, which gradually decreased after 1994, increased again after 2000. Then, the unemployment rate increased again in 2009. It can be said that the reason for this increase is because of the 2008 global financial crisis and the effect started to be felt even more deeply in 2009. The unemployment rate increased again in 2020. This situation can be attributed to the COVID-19 pandemic that emerged in 2019 and affected the whole world. In 2021, unemployment rates in Denmark showed a downward trend. When the economic growth rate is examined, it can be said that there is an upward trend in general between the years 1980-2021. However, it is observed that there is a slow growth and decrease in growth, in particular during the crisis years. It is seen that the economic growth rates of Denmark tend to increase again in 2021.

Figure 2: Graphical Display of Variables Included in the Analysis
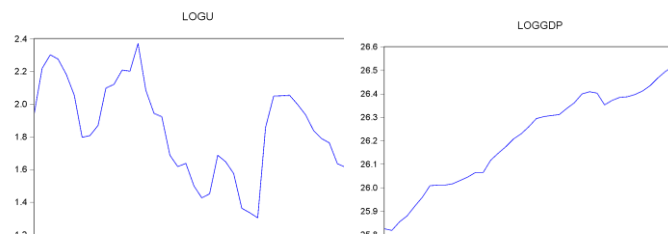
Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests, which are widely used in the literature were conducted to check whether the variables in the analysis are stationary or not, that is, whether they contain a unit root or not. In this context, when the ADF unit root test results are examined in table 4, it has been determined that both unemployment and economic growth variables are not stationary at level, on the contrary, they are stationary after taking the 1st difference. Therefore, the ADF unit root test results show that both the variables taken into account in the analysis are stationary at I(1).

Table 4: ADF Unit Root Test Results

Intercept						
Variables	**ADF Test Statistic**		**Test Critical Values**			**Conclusion**
	t-Statistic	Prob.	1%	5%	10%	
U	-1.695426	0.4260	-3.600987	-2.935001	-2.605836	
D(U)	-5.086893	0.0002	-3.605593	-2.936942	-2.606857	I(1)
GDP	-	0.5890	-	-	2.605	

| | 1.366869 | | 3.600869 | 2.935001 | 836 | |
| D(GDP) | -5.086418 | 0.0002 | -3.605593 | -2.936942 | -2.606857 | I(1) |

Intercept and Trend						
Variables	ADF Test Statistic		Test Critical Values			Conclusion
	t-Statistic	Prob.	1%	5%	10%	
U	-2.079944	0.5412	-4.198503	-3.523623	-3.192909	
D(U)	-5.022821	0.0011	-4.205004	-3.526609	-3.194611	I(1)
GDP	-1.640244	0.7592	-4.198503	-3.523623	-3.192902	
D(GDP)	-5.267428	0.0006	-4.205004	-3.526609	-3.194611	I(1)

After applying the ADF unit root test, the PP unit root test has been performed and the test results are presented in table 5. It is seen from the table that PP unit roots test results show a parallelism with the ADF unit root test results. For this reason, in results of both ADF and PP unit root tests, it can be concluded that all the variables included in the analysis are integrated series of order I(1).

Table 5: PP Unit Root Test Results

Intercept						
Variables	PP Test Statistic		Test Critical Values			Conclusion
	Adj. t-Statistic	Prob.	1%	5%	10%	
U	-1.695426	0.4260	-3.600987	-2.935001	-2.605836	
D(U)	-5.037237	0.0002	-3.605593	-2.936942	-2.606857	I(1)
GDP	-1.320608	0.6109	-3.600987	-2.935001	-2.605836	
D(GDP)	-5.105913	0.0001	-3.605593	-2.936942	-2.606857	I(1)
Intercept and Trend						
Variables	PP Test Statistic		Test Critical Values			Conclusion
	Adj. t-Statistic	Prob.	1%	5%	10%	
U	-2.079944	0.5412	-4.198503	-3.523623	-3.192902	
D(U)	-4.964641	0.0013	-4.205004	-3.526609	-3.194611	I(1)
GDP	-1.730604	0.7193	-4.198503	-3.523623	-3.192902	
D(GDP)	-5.280749	0.0005	-4.205004	-3.526609	-3.194611	I(1)

In order to identify the relationship between unemployment and economic growth, it is necessary to determine the optimal lag length. Thus, the optimal lag length was determined as 1 based on the information criteria. Table 6 below shows this result.

Table 6: Determination of the Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	130.8615	NA	3.24e-06	-6.965489	-6.878412	-6.934790
1	139.3074	15.52217*	2.55e-06*	-7.205807*	-6.944577*	-7.113711*
2	142.1114	4.850161	2.72e-06	-7.141159	-6.705775	-6.987666
3	142.6170	0.819858	3.31e-06	-6.952271	-6.342734	-6.737381
4	144.4488	2.772426	3.76e-06	-6.835070	-6.051380	-6.558783

The inverse roots of the AR characteristic polynomial gives an idea whether the predicted model satisfies the stability condition or not. Figure 3 and table 7 show that there is no problem in the model because all the inverse roots of the AR characteristic polynomial lie within the unit circle and at the same time, when we look at the numeric values, the modulus values are all less than 1.

Figure 3: Inverse Roots of the AR Characteristic Polynomial
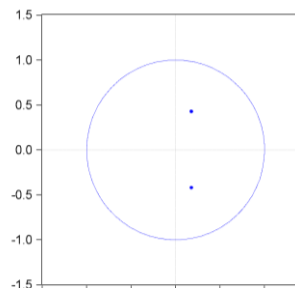
Table 7: Values of the Inverse Roots of the AR Characteristic Polynomial

Root	Modulus
0.181255 − 0.423454i	0.460616
0.181255 + 0.423454i	0.460616

In order for the estimated model to be consistent, there must not be an autocorrelation problem in the model. When we look at the autocorrelation test results, it can be seen that the probability values are all greater than 0.05 and therefore, the result suggests that there is no autocorrelation problem in the model. Table 8 reveals this situation.

Table 8: Autocorrelation Test Results

Lag	LRE stat	Prob.	Rao F-stat	Prob.
1	4.825160	0.3057	1.231360	0.3058
2	2.188881	0.7011	0.547935	0.7011

Lag	LRE stat	Prob.	Rao F-stat	Prob.
1	4.825160	0.3057	1.231360	0.3058
2	6.186189	0.6264	0.773824	0.6270

After performing the autocorrelation test, the heteroscedasticity test has been applied and the results are given in table 9. Heteroscedasticity test results show that the probability value is 0.08. This value is greater than 0.05. Thus, it has been determined that there is no heteroscedasticity problem. Ultimately, since there is neither autocorrelation nor heteroscedasticity problem in the estimated model, it can be said that the established model is stable.

Table 9: Heteroscedasticity Test Results

Chi-sq	df	Prob.
19.10413	12	0.0860

Granger causality analysis, which is an analysis that became popular and started to be used widely after being developed by Granger in 1969, is used to determine the causal link between the variables (Granger, 1969). Granger causality analysis has been conducted in order to analyze the causal relationship between unemployment and economic growth and the results are

presented in table 10. The findings show that there is a bidirectional Granger causality relationship between unemployment and economic growth.

Table 10: Granger Causality Analysis Results

Dependent Variable: D(U)					
Excluded	Chi-sq	df	Prob.	Decision	Direction of Causality
D(GDP)	8.924313	1	0.0028	H_0 Rejection	GDP ▢ U
All	8.924313	1	0.0028	H_0 Rejection	
Dependent Variable: D(GDP)					
Excluded	Chi-sq	df	Prob.	Decision	Direction of Causality
D(U)	6.225815	1	0.0126	H_0 Rejection	U ▢ GDP
All	6.225815	1	0.0126	H_0 Rejection	

In the last step of the econometric analysis of the study, regression analysis has been applied with the least squares method to determine how and how much the independent variable affects the dependent variable. The results obtained from the analysis are given in table 11. The table shows that R-squared is 0.63. This result reveals that the independent variable explains the dependent variable by 63%. In order to determine the general significance of the model, the probability value of the F statistic should be checked. The fact that the probability value of the F statistic is less than 0.05 indicates that the model is generally significant. Besides, according to the findings, a 1% increase in economic growth reduces the unemployment rate by 6.32% in Denmark.

Table 11: Results of Regression Analysis with Least Squares Method

Dependent Variable: D(U)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP)	-6.324896	0.775305	-8.157950	0.0000
C	0.105074	0.020391	5.153059	0.0000
R-squared: 0.630514		Mean dependent variable: -0.007916		
Adjusted R-squared: 0.621040		S.D. dependent variable: 0.155657		
S.E. of regression: 0.095822		Akaike info criterion: -1.805100		
Sum squared resid: 0.358092		Schwarz criterion: -1.721511		
Log likelihood: 39.00455		Hannan-Quinn criterion: -1.774661		
F-statistic: 66.55215		Durbin-Watson stat: 1.569735		
Prob(F-statistic): 0.000000				

The findings that show that the increase in economic growth reduces the unemployment rate mentioned in the literature review appears to correspond to Abbas (2014), Göçer (2015), Soylu et al. (2015), Bhat et al. (2019), Tumanoska (2019), Karadzic et al. (2020), Özçelik and Erdem (2020) and Louail and Benarous (2021). Besides, it can be said that the conclusion that there is a two-way causality relationship between unemployment and economic growth is in parallel to the results of Srinivas (2018) and Üzar and Akyazı (2018).

Conclusion

In this study, the performance of Denmark was evaluated by considering the socio-economic structure, and then the nexus between unemployment and economic growth, which are two important macroeconomic indicators was analyzed empirically. When the socio-economic performance of Denmark is examined, economic growth rates, GDP per capita, foreign direct investment, export and import rates, R&D, human development index and renewable energy consumption increased, and inflation rates and CO_2 emission decreased. However, the Gini index increased slightly, while education expenditures decreased. When Denmark's performance is evaluated in general, it can be said that it performs well generally in both economic and social parameters in the light of the graphs and tables. Denmark is an important country in the Scandinavian region and comes to the fore especially with its strong welfare system. Denmark, which has a universal and inclusive welfare system, has a high dependence on foreign trade. The socio-economic structure of Denmark can be characterized like this: in Denmark, the service sector is at the forefront, innovation is important, technological and productivity levels are high, high taxes are paid, flexicurity is applied in the labor market and the cost of living is high.

The unemployment-economic growth nexus in the context of Denmark for the period 1980-2021 was analyzed in the

econometric part of the study. In this regard, first of all, after it was determined that all series included in the analysis were stationary at the first order and diagnostic tests were carried out, Granger causality analysis and then regression analysis were conducted. The results of Granger causality analysis show that there is a bidirectional relationship between the variables. Moreover, the findings from the regression analysis using the least squares method reveal that a 1% increase in economic growth decreases the unemployment rate by 6.32%. The results obtained from the applied econometric analysis show that it is important to ensure economic growth in order to decrease the unemployment in Denmark. For this reason, it is significant for policy makers to take this situation into account when shaping and establishing employment policies.

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Araştırma ve Yayın Etiği Beyanı

Araştırmacılar verilerin toplanmasında, analizinde ve raporlaştırılmasında her türlü etik ilke ve kurala özen gösterdiklerini beyan ederler.

Yazarların Makaleye Katkı Oranları

Makale tek yazarlı olarak hazırlanmıştır.

Çıkar Beyanı

Yazarın herhangi bir kişi ya da kuruluş ile çıkar çatışması yoktur. Ayrıca herhangi bir potansiyel çıkar çatışması bulunmamaktadır.