Empirical and Theoretical Studies in ECONOMICS AND FINANCE

Editors

Rahmi YAMAK Banu TANRIÖVER











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PREFACE

This book, named "*Empirical and Theoretical Studies in Economics and Finance*" includes theoretical and applied studies in the fields of Economics, Finance, Banking, Public Finance, Econometrics and Labor Economics. The book consists of 13 chapters falling within the scope of economic and administrative disciplines. However, it also offers an interdisciplinary perspective, based on the fact that these fields are integrated with each other. This book, which consists of important contributions and findings of distinguished scientists, also holds an important place in terms of academic contribution values at the international level. In this respect, we would like to thank all the chapter authors who contributed to the study, the Referee Committee, Editorial Board of Livre de Lyon and the Layout Editor who contributed to the publication of the book.

We hope that the book will be useful to all our readers, as it is to academic world.

October 2023 Prof. Dr. Rahmi YAMAK Assoc. Prof. Dr. Banu TANRIÖVER

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CHAPTER I

ENVIRONMENTAL KUZNETS CURVE AND POLLUTION HAVEN/HALO HYPOTHESES: A STUDY ON THE EU-15 COUNTRIES

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1. Introduction

In the last century, climate change and global warming have emerged as among the most significant issues capturing the attention of societies worldwide. Technological and technical advancements unquestionably play a substantial role in the development of humanity. However, these advancements have led humanity to encounter various challenges, particularly in recent years as global temperatures rise and the effects of climate change are increasingly felt. In the literature, there are numerous studies investigating the relationship between environmental pollution and economic growth. These studies mostly examine the existence of a U-shaped relationship between environmental pollution and economic growth, and they often have limitations in terms of their temporal dimension.

This study possesses certain characteristics that distinguish it from similar research in the literature. The number of studies that jointly examine the environmental Kuznets curve and pollution haven/halo hypotheses for the EU is quite limited, and these studies often have restricted temporal dimensions. This study aims to make a significant contribution to the literature, particularly for EU countries, by simultaneously investigating the validity of three important hypotheses over a wide time span from 1971 to 2021. On the other hand, existing studies often focus on carbon emissions (CO2) as a measure of environmental pollution, whereas this study adopts a more comprehensive approach by including per capita ecological footprint (EF) as the dependent variable in the model. An important difference of this study from others is that it uses the CS-ARDL model, which takes cross-sectional dependence and heterogeneity into consideration. While some studies in the literature incorporate the classical panel ARDL approach, our study aims to effectively address two fundamental issues frequently encountered in panel data (cross-sectional dependence and heterogeneity) by using the CS-ARDL model.

The study consists of four sections, including the introduction. The first section introduces the subject and importance of the study. The second section comprehensively covers the theoretical background and relevant literature. The third section introduces the data set and econometric methodology. The final section evaluates the validity of the environmental Kuznets curve and pollution halo/haven hypotheses based on empirical findings.

2. Theory and Literature

The Environmental Kuznets Curve hypothesis stands out as a noteworthy theory by revealing the dynamics between economic growth and environmental pollution. According to this theory, in the initial stages of economic growth (when technological advancement is limited), production and developmental goals often progress while disregarding environmental impacts. Industries can contribute to environmental pollution by utilizing resources more extensively. However, after surpassing a certain threshold, industries and societies become more environmentally aware and transition to more sustainable production methods. During this period, the relationship between economic growth and environmental pollution evolves into a stage where investing in more environmentally friendly technologies supports economic growth. In summary, this theory suggests that in the early stages of economic development, environmental harms are overlooked, but after reaching a certain turning point, more sustainable and environmentally friendly approaches are adopted (Grossman and Krueger 1991, Dinda 2004).



Figure 1. Classical (Inverted U) Environmental Kuznets Curve and Pollution Haven/Halo Hypothesis Source: Saqib et al. 2023

According to Grossman and Krueger (1991), economic growth affects the environment through three different channels. These are as follows:

• Scale Effect: This refers to an increase in environmental pollution due to factors such as the expansion of economic growth and trade, leading to higher input use without altering the existing production structure (such as keeping

technology constant). In this context, an increase in economic activities can result in greater energy and resource consumption, thereby increasing environmental damage.

• **Composition Effect:** Changes in countries' trade policies, often for international competitive advantage, can influence the environment based on the conditions of the countries. Particularly in industries or sectors with weak environmental regulations, environmental pollution can increase. However, if factor abundance and technology-based advantages are more influential, the composition effect may have an uncertain impact on the environment.

• Technological Effect: Trade liberalization and increased foreign investments can reduce environmental pollution stemming from the production process, especially in less developed countries (LDCs). This occurs in two ways. Firstly, direct capital investments can lead to the widespread use of more environmentally friendly production tools and machinery. Secondly, with trade liberalization, an enriched population's environmental awareness may increase. In such a scenario, policymakers can enact legal regulations to make production conditions more environmentally friendly.

As observed, when evaluating the aforementioned effects, it's important to consider direct foreign capital investments as well. Direct capital investments play a significant role in both the composition and technological effect processes. According to Cole (2004), studies investigating the validity of the environmental Kuznets curve should also take direct foreign investments into account to obtain more reliable findings. This way, the impact of direct foreign investments on scale effect, composition effect, and technological effect can be better understood.

The Pollution Haven Hypothesis proposes the existence of a positive relationship between environmental pollution and direct foreign investments. Many studies indicate that this hypothesis is particularly valid to economies with low environmental regulations and dependent on foreign exchange income, as well as developing countries (Solarin, et al., 2017; Cole et al., 2006; Chung, 2014). Desbordes and Vauday (2007) state that multinational corporations with polluting production processes invest in countries (especially those facing foreign exchange constraints) after gaining specific advantages in political and environmental aspects. This situation indicates that such corporations tend to invest more in countries with low-cost production and more flexible environmental regulations.

Although the Pollution Haven Hypothesis may seem to be founded on strong grounds at first glance, many studies in the literature present evidences to the contrary (Lui et al., 2019; Rafique et al., 2020; Pradhan et al., 2022). Therefore, the Pollution Halo Hypothesis has emerged, suggesting that direct foreign investments do not always lead to environmental pollution; rather, these investments can have a positive impact on improving environmental quality (Balsalobre-Lorente et al., 2019). As Grossman and Krueger (1995) express, this hypothesis is based on the scale, technological, and composition effects. As shown in Figure 1, along with the composition and technological effects that emerge at a certain threshold of economic growth, environmentally friendly production strategies of direct foreign investments can reduce environmental pollution.

Numerous studies examining the relationship between environmental pollution and economic growth are present in the literature. These studies generally focus on the Environmental Kuznets Curve hypothesis, which suggests an inverted U-shaped relationship between environmental pollution and GDP (Grossman and Krueger, 1991; Selden and Song, 1994; Ike et al., 2020). At the same time, some studies demonstrate that this relationship can appear in forms other than an inverted U-shape, such as an N-shaped curve or different patterns (Allard et al., 2020; Churchill et al., 2018; Gyamfi et al., 2021). On the other hand, the relationship between environmental pollution and direct foreign investments is also a frequently researched topic in the literature. In this context, we can broadly say that when direct foreign investments have an exacerbating effect on environmental pollution, the "Pollution Haven Hypothesis" is valid, and when they have a mitigating effect, the "Pollution Halo Hypothesis" is valid. When examining the literature, we observe that all three hypotheses are frequently investigated using various econometric methods for different country groups and periods. In line with the objective of our study, we summarize studies that predominantly investigate all three hypotheses together in Table 1.

Authors	Methods	Period- Country	Dependent Variables	E.K.C.	P.Hav.H.	P.Hal.H.
Tamazian et al. (2009)	Standard Reduced-form Modelling Approach	1992-2004, BRIC	CO2 (carbon emissions per capita)	YES	NO	YES
Pao and Tsai (2011)	Panel Data Analysis, OLS and VECM Estimators	1980-2007, BRIC	CO2 (carbon emissions metric tons)	YES	YES	NO
Kasman and Duman (2015)	Panel Data Analysis, FMOLS estimator and Granger Causality	1992-2010, EU Members	CO2 (carbon emissions in metric tons)	YES	-	-
Bakirtas and Cetin (2017)	Panel Data Analysis, System GMM and PVAR Granger Causality test	1982-2011, MIKTA	CO2 (carbon emissions metric tons per capita)	NO	YES	NO
Liu et al. (2019)	Panel Data Fixed Effects Estimators	1996-2015, China 29 Provinces	CO2 (carbon emissions per capita)	YES	NO	YES
Hanif et al. (2019)	Panel ARDL Analysis	1990- 2013, 15 Developing Asian Countries	CO2 (carbon emissions metric tons)	YES	YES	NO
Elshimy and El-Aasar (2019)	Panel Data Analysis, FMOLS and DOLS Estimator with Dumitrescu-Hurlin casualty test	1980-2014, 6 Arap Countries	CF (carbon footprint)	YES	-	-
Destek et al. (2019)	Panel Data Analysis, FMOLS, DOLS and CCE Estimator	1980-2013, EU-15	EF (ecological footprints)	YES	-	-
Balsalobre- Lorente et al. (2019)	Panel Data Analysis, FMOLS and DOLS Estimators	1990-2013, MINT Countries	CO2 (carbon emissions metric tons)	YES	YES (at the first stage)	NO
Saqib and Benhmad (2021)	Panel Data Analysis, FMOLS and DOLS Estimator with Dumitrescu and Hurlin casualty test	1995-2015, EU-22	EF (ecological footprints)	NO	-	-
Sabir et al. (2020)	Panel Data Analysis, Panel ARDL	1984-2019, South Asian Countries	EF (ecological footprint)	YES	YES	NO

Table 1. Literature Summary

Rafique et al. (2020)	Panel Data Analysis,	1990-2017, BRICS	CO2 (carbon emissions metric tons)	YES	NO	YES
Guzel and Okumus (2020)	Panel Data Analysis, CCEMG and AMG Estimators	1981-2014, ASEAN-5	CO2 (carbon emissions metric tons)	YES	YES	NO
Dogan and Inglesi-Lotz (2020)	Panel Data Analysis, OLS(FE) and FMOLS Estimator	1980-2014, EU-7	CO2 (carbon emissions metric tons)	YES	-	-
Khan et al. (2021)	Panel Data FMOLS and DOLS Estimators and Dumitrescu-Hurlin Causality	1970-2016, China, İndia and Pakistan	EF (ecological footprints)	YES	YES	NO
Shaheen et al. (2022)	Panel Data ARDL Analysis	1976-2019, GÜ	CO2 (carbon emissions metric tons per capita)	YES	YES	NO
Pradhan et al. (2022)	Panel Data Analysis, FMOLS and DOLS Estimator	1992-2014, BRICS	CO2 (carbon emissions metric tons per capita)	NO	NO	YES
Dkhili (2022)	Panel Data Analysis, FMOLS estimator	1990-2018, MENA Countries	CO2 (The ratio of carbon emissions)	YES	YES	NO
Bekun et al. (2023)	Time Series Analysis, ARDL, DOLS Estimator and VECM Causality test	1970-2016, Turkey	CO2 (carbon emissions metric tons per capita)	YES	YES	NO
Wencong et al. (2023)	Panel Data Analysis, CS-ARDL and Panel Quantile regressions	1998-2019, Resource-rich Transition Economies	CO2 (carbon emissions metric tons per capita)	NO	YES	NO
Saqib et al. (2023)	Panel Data Analysis, CS-ARDL and Dumitrescu-Hurlin casualty test	1990-2020, EU-16	EF (ecological footprint)	YES	NO	YES
Firoj et al. (2023)	Time Series Analysis, ARDL analysis	1986-2018, Bangladesh	CO2 (carbon emissions)	NO	NO	-
Abbasi et al. (2023)	Panel Data Analysis, Panel PMG Approach	1985-2020, Asian Countries	CO2 (carbon emissions metric tons per capita)	YES	YES (in some countries)	YES (in some countries)

3. Data, Methodology, and Empirical Results

The study investigates the validity of the Environmental Kuznets Curve, Pollution Haven/Halo hypotheses for 15 EU countries for the period of 1971-2021. These countries are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Malta, Netherlands, Portugal, Spain, Sweden, and the United Kingdom¹. The reason for starting the study in 1971 is the unavailability of direct foreign capital investment data for Germany in 1970, and the reason for ending it in 2021 is the lack of ecological footprint data for subsequent years. Another significant limitation of the study is the absence of data for other EU countries between the relevant years. Equation 1 displays the estimation model of the study.

$$EF_{it} = \alpha_0 + \alpha_1 Y_{it} + \alpha_2 Y^2_{it} + \alpha_3 Y^3_{it} + \alpha_4 FDI_{it} + \epsilon_{it}$$
(1)

Here, *t*, *i*, and \in_{it} represent the time, country, and error term, respectively. EF_{it} represents the dependent variable, which is the per capita ecological footprint, Y_{it} stands for per capita GDP, Y_{it}^2 represents the square of per capita GDP, Y_{it}^3 represents the cube of per capita GDP, and FDI_{it} represents the ratio of foreign direct investment (FDI) to GDP. The ecological footprint is composed of the sum of land footprints for cropland, grazing land, fishing grounds, forest land, and built-up land, along with the carbon demand on land. Per capita GDP is measured in constant 2015 US dollars. We obtain ecological footprint data from the Global Footprint Network database and other variables from the World Bank database. In this study, we based our model on Dinda (2004)'s framework, allowing us to test various forms of environmental and economic growth relationships. These forms are listed as follows:

- $\alpha_1 = \alpha_2 = \alpha_3 = 0$: There is no relationship between the variables.
- $\alpha_1 > 0 ve \alpha_2 = \alpha_3 = 0$: There is a monotonically decreasing relationship.
- $\alpha_1 > 0, \alpha_2 < 0 ve \alpha_3 = 0$: There is an inverted U-shaped relationship.
- $\alpha_1 \langle 0, \alpha_2 \rangle 0 ve \alpha_3 = 0$: There is a U-shaped relationship.

• $\alpha_1 \langle 0, \alpha_2 \rangle 0 ve \alpha_3 > 0$: There is a N-shaped (cubic polynomial) relationship.

¹ Even though the United Kingdom officially left the EU in 2020, we include it in the study as it was a long-standing EU member and recently separated from the union.

• $\alpha_1 \langle 0, \alpha_2 \rangle 0 ve \alpha_3 < 0$: There is the inverse of a N-shaped curve relationship.

Due to the acceleration of globalization in recent years, researchers frequently employ the test for cross-sectional dependence in panel data analysis. Panel data analyses conducted without considering cross-sectional dependence can yield unreliable results (Hsiao, 2014). Therefore, as a first step, we apply the Breusch and Pagan (1980) LM, Pesaran (2004) CD_{LM} , and Pesaran et al. (2008) bias-adjusted LM tests to determine the presence of cross-sectional dependence among the countries. All three tests provide reliable results both in balanced panels and when T > N. The test statistics for the respective tests are obtained through Equations 2, 3, and 4. Additionally, table 2 provides the result of these tests' results.

$$CD_{lm} = T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{p}_{ij}^{2} \quad (2)$$

$$CD = \sqrt{\frac{2T}{N(n-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{p}_{ij} \right) \quad (3)$$

$$LM_{adj} = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \frac{(T-K)\hat{p}_{ij}^{2} - \mu_{T_{ij}}}{v_{T_{ij}}} \quad (4)$$

Test	Statistics	p-value
LM	1006	0.0000
LM adj*	216	0.0000
LM CD*	28.16	0.0000

Table 2. The results of cross-section dependency tests

Table 2 indicates that all three tests reject the null hypothesis of no cross-sectional dependency. In conclusion, our model exhibits cross-sectional dependence among the units.

We need to determine the homogeneity status of the slope coefficient to choose the appropriate estimation methods in the next step. For this purpose, we apply the delta homogeneity test developed by Pesaran and Yamagata (2008). This test has two test statistics: $\hat{\Delta}$ test developed for large samples and $\hat{\Delta}_{adj}$ developed for small samples. The null hypothesis of this test implies that the

slope coefficients are homogeneous. The test statistics are calculated as shown in Equation 5 (Pesaran and Yamagata, 2008).

$$\hat{\Delta} = \sqrt{N} \left(\frac{N^{-1}\hat{s} - k}{\sqrt{2k}} \right), \hat{\Delta}_{adj} = \sqrt{N} \frac{\left(N^{-1}\hat{S} - 2k \right)}{\sqrt{var(\hat{z})_{iT}}}$$
(5)

Test	Statistics	p-value
Â	26.083	0.0000
$\hat{\Delta}_{_{adj}}$	27.767	0.0000

Table 3. Homogeneity test results

The results of the Pesaran and Yamagata (2008) homogeneity test in Table 3 indicate that the null hypothesis is not valid. According to these findings, the slope coefficients are heterogeneous. In the following sections, we use tests that take this situation into account.

In cases where there is cross-sectional correlation among units, classical panel unit root tests may yield biased results. Therefore, in the literature, second-generation panel unit root tests that are robust to cross-sectional dependency are used. We also apply the cross-sectionally augmented ADF and IPS tests developed by Pesaran (2007), which are widely used in the literature. The null hypotheses of these tests indicate that the series is non-stationary. CADF unit root test is conducted based on the Equation 6.

$$\Delta Y_{it} = y_i + y_i Y_{i,t-1} + y_i \bar{X}_{t-1} + \sum_{i=0}^p Y_{it} \Delta \overline{Y_{t-i}} + \sum_{i=0}^p Y_{it} \Delta Y_{i,t-1} + \epsilon_{it}$$
(6)

$$\widehat{CIPS} = \frac{1}{N} \sum_{i=1}^{n} CADF_i$$
⁽⁷⁾

Here, $Y_{i,t-1}$ represents lag of cross-sectional averages, and $\Delta Y_{i,t-1}$ represents the lag of first difference of cross-sectional averages. In addition, the CIPS test statistic is calculated as shown in equation 7.

Here, the Cross-Sectionally Augmented IPS and Cross-Sectionally Augmented ADF are denoted as CIPS and CADF, respectively. Table 4 displays the results of the CADF and CIPS unit root tests.

Variables	CIPS			CADF				
	Con	istant	Constan	t + Trend	Con	stant	Constan	t + Trend
	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
EF	-2.17*	-6.19***	-3.22***	-6.41***	-1.47	-5.66***	-2.09	-5.75***
FDİ	-3.61***	-	-4.19***	-	-2.55***	-	-2.95***	-
Y	-0.87	-4.69***	-1.16	-5.06***	-1.29	-3.39***	-1.16	-3.73***
Y ²	0.18	-3.87***	0.13	-4.54***	-0.41	-2.39***	-0.10	-2.99***
Y ³	1.48	-2.87***	0.77	-3.45***	0.95	-1.53	0.42	-1.95

Table 4. The results of the CIPS and CADF unit root tests

The symbols ***, **, and * represent significance levels of 1%, 5%, and 10%, respectively. The CADF test statistic refers to the t-bar statistic used in balanced panels.

According to the CIPS test results, the variables, Y, Y^2 , and Y^3 are nonstationary, while *FDI* and *EF* are stationary at the level values. When we take the first difference of the non-stationary series, they become stationary. According to CADF test results, other series are non-stationary except for *FDI*. When we take the first difference of the non-stationary series, they also become stationary according to CADF test results. The results of unit root tests for EF include varying outcomes. However, different panel unit root tests may yield varying outcomes. The fact that the differenced series become stationary is sufficient to conclude that the series are integrated of order one, I (1) (Rao and Kumar, 2009; Singh, 2013). Therefore, we can accept that *EF* is I (1).

We employ the cointegration test proposed by Gengenbach et al. (2016) to detect the presence of a long-term relationship among first-order integrated series. This test is based on the error correction model and is robust against cross-sectional dependency and heterogeneity. This test utilizes the common factor structure based on the vector form provided in Equation 8.

$$\Delta y_{i} = d\delta_{y,x_{i}} + \alpha_{y_{i}}y_{i,-1} + \omega_{i,-1} + \nu_{i}\pi_{i} + \varepsilon_{y,x_{i}} = \alpha_{y_{i}}y_{i,-1} + g_{i}^{d} + \varepsilon_{y,x_{i}}$$
(8)

The vector form in Equation 8 is used to derive the panel test statistic by averaging unit-specific statistics through various modifications. Equation 9 demonstrates the calculation of the panel test statistic.

$$\bar{t}_c = \frac{1}{N} \sum_{i=1}^{N} t_{c_i} \tag{9}$$

The null hypothesis of this test is H_0 : There is no long-term relationship.

Model: $EF = f(Y, Y^2, Y^3)$					
<i>d</i> . <i>y</i>	Coefficients	T-bar Statistics	P-value		
Y (t-1)	-0.709	-4.218	<=0.01	CONSTANT	
Y (t-1)	-0.739	-4.396	<=0.01	TREND	

Table 5. The result of the co-integration test

In Table 5, when examining the significance of the coefficient of Y(t-1) for the panel cointegration test, we observe that the probability value is <0.01 in both the constant and trend models. This situation indicates the rejection of the null hypothesis, implying the existence of a long-term relationship among the variables.

The ARDL method can be used when variables are stationary at different levels. The classical ARDL method is not robust to both heterogeneity and crosssection dependency. Therefore, we use CS-ARDL method, which is robust to both heterogeneity and cross-section dependency. Equation 10 demonstrates the CS-ARDL method.

$$Y_{it} = c_{yi}^* + \sum_{l=1}^{p_y} \mu_{il} y_{i,t-l} + \sum_{l=0}^{px} \beta_{il}^{'} X_{i,t-l} + \sum_{l=0}^{p\bar{z}} \phi_{il}^{'} \bar{z}_{t-l} + e_{it}^*$$
(10)

Variables	LR coefficients	SR coefficients
FDI	-0.0554**	-0.018***
Y	0.0003	0.0004
Y^2	-1.26e-08	-1.14e-08
Y ³	2.33e-13	1.73e-13
ECM	-	-1.2618*
CD-Statistics = 0.21 (0.83)	Prob >F 0.01	$R^2 = 0.52 \ \overline{R}^2 = 0.51$

Table 6. CS-ARDL results

*, **, and *** represent the significance levels of 1%, 5%, and 10%, respectively.

According to the results of the CS-ARDL model in Table 6, we do not find statistically significant evidence supporting the validity of the environmental Kuznets curve for the 15 EU countries. This result is consistent with the findings obtained in the study by Saqib and Benhmad (2021). However, studies supporting the validity of the environmental Kuznets curve specifically for EU countries exist in the literature. Examples of these include: Destek et al. (2018), Saqib et al. (2023), Dogan and Inglesi-Lotz (2020). These different results could be attributed to variations in the methods and differences in the time periods covered by the studies. Another conclusion of the findings is the negative and statistically significant coefficient of the FDI in both the short and long run. These results support the existence of the Pollution Haven Hypothesis, suggesting that increasing foreign direct investments do not increase environmental pollution in the EU; instead, they have a mitigating effect on pollution. This result is consistent with numerous studies such as Saqib et al. (2023), Abbasi et al. (2023), Liu et al. (2019), Rafique et al. (2020), and Abbasi et al. (2023).

4. Conclusion

This study investigates the relationships between economic growth, foreign direct investments, and environmental pollution within the frameworks of the environmental Kuznets curve, pollution haven and hale hypotheses. In the literature, numerous studies explore the existence of these three fundamental hypotheses. Some studies provide findings supporting the validity of these hypotheses, while others present evidence of their invalidity. The reason for obtaining different results in these studies could be attributed to variations in the time periods, the inclusion of different countries, and the use of different methods. We believe that there is a limited number of studies also have limitations in terms of the time periods. For these reasons, we believe that our study contributes to the literature by investigating the validity of the three fundamental hypotheses over an extended time period, both in the short and long run.

Although the findings of the study imply the existence of a N-shaped environmental Kuznets curve, the insignificance of the coefficients renders the Environmental Kuznets Curve hypothesis statistically insignificant. On the other hand, the coefficient of FDI is negative and statistically significant in both the short and long run. According to this result, a one unit increase in FDI reduces per capita ecological footprint by -0.018 units in the short run and

-0.055 units in the long run. Based on these results, the pollution halo hypothesis is valid in the 15 EU countries. In brief, increases in foreign direct investments reduce environmental pollution. We believe that one of the main reasons for the validity of the pollution halo hypothesis in the EU is the stringent legal regulations implemented by the Union to protect the environment. These legal regulations have had their intended effect, resulting in the expected outcome. However, today, both less developed and developing countries do not embrace the strict legal regulations and laws seen in the EU. The most significant reason for this is the high demand for foreign capital investments in these countries due to fundamental macroeconomic issues such as foreign exchange shortages or high unemployment. Furthermore, there is significant competition among these countries in attracting foreign direct investments. For all these reasons, there should be an overarching authority established to regulate foreign capital movements. This organization should oversee foreign direct investments worldwide, ensuring compliance with specific environmental regulations and legal frameworks, regardless of the country in which they occur. This way, it can promote clean production processes without the need for pollution-intensive production methods to shift from one country to another.

One of the main reasons for the statistically insignificant presence of the environmental Kuznets curve in the study could be the fact that the study's period does not cover the periods when the 15 EU countries began industrialization. Another reason could be that, despite the European Union's recent efforts to develop effective policies against climate change and environmental pollution, global developments can still adversely affect these policies. For example, as a result of the conflict between Russia and Ukraine, the EU reactivated thermal power plants instead of using Russian gas. On the other hand, other significant developments over time, such as economic crises, can also influence this situation. At this point, our recommendation to future researchers would be to collect data from the years when EU countries began industrialization up to the present day and to encompass a broader period in their studies. This way, a clear relationship between production and environmental pollution in the EU from the beginning of the industrialization process to the present day can be established.

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CHAPTER II

THE IMPACT OF WORLDWIDE COVID-19 CASES ON BIST 100: ARDL BOUNDS TESTING APPROACH

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1. Introduction

The Covid-19 outbreak, which is accepted that the first patient was seen in Wuhan city of China's Hubei province on December 1, 2019, spread rapidly despite all the measures taken and was declared as a pandemic by the WHO (World Health Organization) on March 11, 2020. Pandemics are both a global health problem involving emergencies and a global economic problem involving economic measures (Contuk, 2021: 102). It has been seen in the Covid-19 pandemic that the dramatic increase in cases due to the rapidly spreading Corona virus has led to the situation that hospitals cannot fight with the patient density after a certain point and the risk of death in cases has increased. In order to prevent this, governments have implemented strict quarantine policies (such as curfews, bans on transit between cities, and even bans on entering and leaving the country) in order to prevent the spread of the illness, risking a halt in economic activities.

From an economic chronological perspective, the environment of uncertainty in commodity and financial markets that emerged with the first emergence of the virus in 2019 started to increase as the virus started to spread rapidly (Mhalla, 2020; Zhang et al., 2020). In 2020, as a result of the dramatic increase in deaths and cases as the virus spread worldwide and the pandemic was declared, commodity and stock investors avoided taking more risks and abandoned their positions, resulting in serious declines in world stock markets (Corbet et al., 2020; Harjoto et al., 2021, He et al., 2020). With the COVID-19 vaccines developed towards the end of 2020, the world economy recovered from its wounds in 2021 and made up for the 3.1% contraction in 2020 and closed the year with a growth of 5.9% (IMF, 2021: 5-6). Today, the coronavirus does not pose a risk to the health sector thanks to drugs, vaccines, immunization and mutations that reduce its impact. However, the economic effects that emerged due to the lockdown measures taken by countries to prevent the spread of the virus at the beginning of the pandemic have become stronger due to the global and interrelated economies (Hatmanu and Cautisanu, 2021: 2).

The aim of this study is to analyse the impact of the Covid-19 pandemic on the Turkish stock market. The analysis of stock movements is an important tool that provides information about the development of countries. Especially during global crisis periods such as Covid-19, the movements of economies have a significant impact on the level of development of countries. In this context, the movements of BIST 100 in the pre-pandemic period, at the beginning of the pandemic, during the spread of the disease, when the vaccine was found and after the use of the vaccine are important.

In this study, the data are daily and cover the period when the pandemic was announced. The dependent variable of this study is BIST 100 and the independent variables are macroeconomic factors (brent oil, ounce, usd) and the number of daily Covid-19 cases. Time series analysis was performed by using ARDL bounds test, which is the most appropriate model to look at the cointegration relationship as a result of the stationarity test, was applied. The study consists of 6 sections: introduction, effects of Covid-19, literature review, data set and methodology, analysis findings and conclusion.

2. Effects of Covid-19

According to the official website of the WHO, the total number of covid-19 cases observed worldwide as of September 13, 2023 was 770,563,467 and the number of deaths was 6,957,216. As of September 9, 2023, the number of covid-19 vaccines used worldwide was determined as 13,501,307,588. In Turkey, according to the data obtained from the official website of the Ministry of Health, the total number of covid-19 cases observed as of March 2023 was 17,232,066, the number of deaths was 102,174 and the number of vaccines administered was 152,725,390. In Graph 1, data on the number of daily cases between March 12, 2020 and May 29, 2022 are presented. As can be seen from the graph, the pandemic formed waves in different periods and the largest and last wave occurred between December 2021 and January 2022, followed by a rapid decline and a significant decrease in the number of cases.



Source: World Health Organization (WHO), 2023

This major pandemic has undoubtedly had great challenges and negative impacts for the health sector. In order to prevent the collapse of the health system, governments had to implement strict policies (such as curfews, bans on crossing between cities, and even bans on entering and leaving the country), especially during the wave periods when the epidemic peaked periodically. These policies had negative effects on the economy. In economic terms, from the beginning of the pandemic to the present day, there have been serious declines in capital markets, increases in unemployment rates, problems in food supply due to panic stockpiling, and the sustainability of businesses, especially in the tourism and transportation sectors, has been at risk. According to the world data bank website, while the global unemployment rate was calculated as 5.5% at the end of 2019, this rate increased by 26% to 6.9% by the end of 2020.

Graphic 2 shows the economic growth rates of Turkey and the world between 2010 and 2022 in percentages.



Graphic 2: Economic growth rate for Turkey and the World 2010-2022

Source: World Data Bank, 2022

As can be seen from the graph, serious contractions were observed especially on a global scale in 2020, the beginning of the pandemic, and the world economy experienced a total decline of 3.2%. According to IMF chief K. Georgieva, the impact of the pandemic on the global economy is estimated to be 12.5 trillion dollars by the end of 2023 (Reuters, 2022: 1). When we take Turkey's 2022 annual revenues (905 billion dollars) as a basis, this figure is approximately equivalent to 14 years of national income. The effects of this huge loss for the world economy are still being felt economically today and countries are struggling with hyperinflation.

3. Literature Review

When the literature is analysed, it is observed that there are many studies in which the dependent variable is stock prices and the independent variables are selected some macroeconomic factors. Again, it has been observed in some studies that the dependent variable is stock prices and the independent variable is the number of cases or deaths during the epidemic period. However, there is no study in which the dependent variable is stock prices and the independent variables are macroeconomic factors and the number of Covid-19 cases during the epidemic period and the co-integration relationship of these variables is analysed.

Ashraf (2020) investigated the impact of the Covid-19 pandemic on the stock market movements of 64 countries and concluded that stock market values decreased depending on the number of confirmed cases between January 22, 2020 and April 17, 2020.

Skare et al. (2021) examine the worldwide tourism impact of Covid-19 using a heterogeneous Panel Structural Vector Autoregressive (PSVAR) model and show that the pandemic has a long-run negative impact on tourism.

Liu et al. (2020) concluded that Covid-19 has a negative impact on the stocks of countries affected by the pandemic, especially between the onset of the disease (December 1, 2019) and the announcement of the pandemic (March 11, 2020).

Korkut et al. (2020) examined the impact of covid-19 on the tourism sector. In this context, using the ARDL bounds test, the impact of daily Covid-19 cases and deaths on the BIST Tourism index was analysed and it was found that the pandemic has a strong integrated relationship with tourism.

Yang et al. (2020) conducted a study on the impact of epidemics on the tourism sector and used time series and economic analysis as well as DSGS (Dynamic Stochastic General Equilibrium) analysis. According to the results of the analysis, they concluded that the use of the DSGS model is more appropriate in epidemic periods when uncertainty is intense.

İşler and Güven (2022) conducted a multiple linear regression analysis and found a negative relationship between the number of cases and stock market prices in April 2021.

Şenol and Otçeken (2021) investigated the impact of the pandemic on sectors in their study and conducted Johansen cointegration analysis and found that there is a relationship between the financial and industrial sectors and the number of cases and deaths.

Ngwakwe (2020) investigated the impact of Covid-19 on global stock indices (SEE Composite Index, Dow Jones, Euronext 100). In this context, using data for 50 days before and 50 days during the pandemic, he found that the pandemic had different effects on global equity markets.

4. Data Set and Methodology

As mentioned before, the first case in Turkey was observed on March 12. However, since the outbreak is a pandemic outbreak, its impact on BIST will be analysed based on global case data. It is accepted that the first case of the outbreak was observed on December 1, 2019. However, when the data shared by the World Health Organization (WHO) are examined, it will be seen that the number of cases did not reach a meaningful indicator value during the period from the beginning of the pandemic until January 17, 2020, and some days no cases were detected. For this reason, the study data will take January 17, 2020 as the starting value. Since BIST data and the values of brent oil (USD), gold (ounce), usd(tr) to be used in the study can be obtained daily for 5 weekdays, the data will be based on 47 weekdays between 17.01.2020 and 3.23.2020. The graph of BIST, brent oil, gold ounce price and dollar exchange rate values are shown below.



In order to reduce the variations in the variances of the data to be used in the study, a log-log model was created by taking the logarithm of all variables.

$$lbist_t = \delta_0 + \delta_1 lbrent_t + \delta_2 lusd_t + \delta_3 lons_t + \delta_4 lcase_t + u_t$$
(1)

Cointegration analysis will be performed to obtain the short-run and longrun relationship between the dependent and independent variables of this model. In order to use the ARDL bounds test for cointegration analysis within the scope of the study, the dependent variable should be I(1) and the independent variables should be I(0) or I(1), that is, none of the variables should be I(2). For this reason, the unit root test will be applied to all variables and the stationarity levels of the variables will be determined.

4.1. Augmented Dickey-Fuller (ADF) Unit Root Test

A stochastic process whose mean and variance do not change over time and the value of the covariance between two different time points depends on the distance between these two different times independently of the period being calculated is called stationary (Gujarati, 1992, 381).

According to the method proposed by Dickey Fuller (DF) in 1979, whether the series contains a unit root or not is examined with the following three models.

1. Model without constant and trend

$$\Delta y_t = \delta y_{t-1} + \varepsilon_t \tag{2}$$

2. Model with constant and without trend

$$\Delta y_t = a_1 + \delta y_{t-1} + \varepsilon_t \tag{3}$$

3. Model with constant and trend

$$\Delta y_t = a_1 + \delta y_{t-1} + a_2 t + \varepsilon_t \tag{4}$$

Ignoring the autocorrelation problem in the error terms limits the use of the Dickey Fuller test, so the correlogram of the error terms is tested for autocorrelation. If there is stationarity in the error terms, the Augmented Dickey-Fuller (ADF) test, which was introduced by Dickey and Fuller in 1981, is applied to determine the stationarity of the series by including lagged values in the model (Yıldırım, 2013). The models of the ADF test are shown as follows.

1. Model without constant and trend

$$\Delta y_t = \delta y_{t-1} + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + \varepsilon_t \tag{5}$$

2. Model with constant and without trend

$$\Delta y_t = a_1 + \delta y_{t-1} + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + \varepsilon_t \tag{6}$$

3. Model with constant and trend

$$\Delta y_t = a_1 + \delta y_{t-1} + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + a_2 t + \varepsilon_t \tag{7}$$
In DF and ADF, the null hypothesis is expressed as $\delta=0$, indicating the presence of a unit root. The test statistic is compared with the critical values in the Dickey-Fuller table to determine whether there is a unit root in the series.

4.2. Phillips Perron (PP) Test

Phillips and Perron (1988) claimed that the DF test would give erroneous results if the error terms are autocorrelated and developed the PP test.

$$y_{t} = a_{0}^{*} + a_{1}^{*} y_{t-1} + \varepsilon_{t}$$

$$y_{t} = \tilde{a}_{0} + \tilde{a}_{1} y_{t-1} + \tilde{a}_{2} (t - \frac{T}{2}) + \varepsilon_{t}$$
(8)

PP test is performed using the model given above. Here, T denotes the observation value and ε_t denotes the distribution of error values with zero expected value (E(ε_t)=0).

4.3. ARDL Bound Test

In the ARDL bounds test developed by Pesaran et al. in 2001, I(1) for the dependent variable is a prerequisite for I(0) or I(1) for the independent variables. The raw form of the logarithmic linear relationship to be analysed for the ARDL bounds test approach is given below, and this test approach also yields successful results in studies with small sample sizes.

$$lbist_t = c + \beta lbrent_t + \theta lons_t + \eta lusd_t + \mu lcase_t + e_t$$
(9)

The above equation examines the cointegration relationship between the variables lbist, lbrent, lons, lusd, lcase, where, c is the constant term and β , θ , η , μ are the coefficients of the variables. The equation below shows the error correction coefficient formulated to estimate the cointegration relationship in the first step.

$$\Delta lbist_{t} = c_{0} + \pi_{b} lbrent_{t-1} + \pi_{o} lons_{t-1} + \pi_{USD} lusd_{t-1} + \pi_{c} lcase_{t-1} + \sum_{t=1}^{p} \emptyset' \Delta lbist_{t-p} + \sum_{t=0}^{p_{1}} \pi_{b}' \Delta lbrent_{t-p_{1}} + \sum_{t=0}^{p_{2}} \pi_{o}' \Delta lons_{t-p_{2}} + \sum_{t=0}^{p_{3}} \pi_{USD}' \Delta lusd_{t-p_{3}} + \sum_{t=0}^{p_{4}} \pi_{c}' \Delta lcase_{t-p_{4}} + u_{t}$$
(10)

In equation (10), the parameters π_b , π_o , π_{USD} ve π_c correspond to the long-run coefficients, while \mathcal{O}' , π_b' , π_o' , π_{USD}' ve π_c' parameters correspond to the short-run coefficients. The cointegration analysis is performed with the help of an F statistic calculated under the null hypothesis that the long-run coefficients are simultaneously zero.

5. Analysis Findings

Before looking at the long-run and short-run relationship between the dependent and independent variables of the model, unit root analysis of all variables and the degree of stationarity of the time series of these variables should be determined. Since the Augmented Dickey Fuller test will also be used for the stationarity analysis, the presence of autocorrelation in the error terms is also examined by correlogram test.

ADF test and Philips Perron test were used for stationarity analysis and the results of the stationarity analysis of the variables are given in Table 1.

		ADF				PP				
		Inter	cept	Trend and Int.		Intero	Intercept		Trend and Int.	
Varial	ble	t-sta	р	t-sta	р	Т	р	Т	р	
lbist	I(0)	1,33	0,99	-1,00	0,93	1,56	0,99	-1,00	0,93	
	I(1)	-7,07	0,0			-7,06	0,0			
lcase	I(0)	-4,30	0,01	-4,42	0,01	-4,30	0,00	-4,34	0,01	
lons	I(0)	-1,86	0,34	-1,83	0,66	-2,08	0,25	-2,03	0,56	
	I(1)	-4,94	0,00			-4,94	0,00			
lusd	I(0)	-0,29	0,91	-1,84	0,67	-0,38	0,90	-1,84	0,66	
	I(1)	-4,56	0,00			-4,43	0,00			
lbrent	I(0)	0,56	0,98	-1,07	0,92	0,76	0,99	-0,95	0,94	
	I(1)	-7,58	0,0			-7,55	0,0			

Table 1: ADF and PP unit root analysis results

According to the unit root test results, the dependent variable BIST 100 is stationary at the 1st order, i.e. I (1), the independent variables Brent oil, gold ounce price, dollar parity are I (1), and the number of cases is I (0). It is determined that the error terms of the series of the variables in the study model, whose stationarity is determined by taking the difference or at the level, do not contain autocorrelation problems. The correlogram results of the error terms of the BIST 100, which is stationary at the first order, and the series of the number of cases, which is stationary at the level, are presented below. Here, there is no value exceeding the limits of Barlett's test. Also, the prob. values do not show a value smaller than 0.05. Therefore, no autocorrelation problem is detected in the error terms of the variables.

Date: 09/26/23 Time: 08:49 Sample: 1/17/2020 3/23/2020 Included observations: 45				Date: 09/26/23 Tim Sample: 1/17/2020 3 Included observation	ie: 08:55 3/23/2020 ns: 46							
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob	Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
111	1 1 1 1	1	0.001	0.001	3.E-05	0.995	101	1	1 -0.067	-0.067	0.2188	0.640
· 🗖 ·	1 1 🔲 1	2	0.196	0.196	1.8927	0.388	i 🗐 i 🗌	「「「」」「「」」	2 0.129	0.125	1.0581	0.589
1 1 1	1 I I I I	3	0.031	0.032	1.9411	0.585	1 1 1	1 () (3 0.032	0.049	1.1106	0.775
· •		4	-0.099	-0.143	2.4430	0.655	1 🗐 I	1 i 🗐 i	4 0.159	0.151	2.4455	0.654
- P -	1 1 1	5	0.100	0.092	2.9697	0.705	1 1 1	1 (1)	5 -0.096	-0.089	2.9407	0.709
· 📃 ·	1 🔟 1	6	0.164	0.227	4.4201	0.620	1 🗖		6 0.328	0.292	8.8720	0.181
a pa		7	0.009	-0.029	4.4244	0.730	0 🗐 ()) (U) (7 -0.133	-0.113	9.8723	0.196
.		8	-0.063	-0.195	4.6545	0.794	a 🏚 a	1 1 1	8 0.085	0.010	10.288	0.245
- ()		9	-0.055	-0.037	4.8309	0.849	1.1.1	1 (1)	9 -0.048	-0.038	10.426	0.317
	1 🔲 I	10	0.031	0.168	4.8881	0.899	1 1 1	1 (1)	10 0.003	-0.096	10.427	0.404
	1 1 1 1	11	0.034	0.031	4.9607	0.933	1 1 1	1 (1)	11 -0.105	-0.028	11.124	0.433
1 目 1	1 1 1 1	12	0.113	-0.021	5.7835	0.927	1 b 1		12 0.109	-0.008	11.894	0.454
1 🗐 1	1 D D D	13	0.100	0.105	6.4413	0.929	1 (1)	1 () () () () () () () () () () () () ()	13 -0.048	0.067	12.047	0.524
1 1 1	1 a 🏚 a 👘 a	14	-0.019	0.052	6.4666	0.953		ിവിറ	14 -0.052	-0.102	12.234	0.588
n por la composición de la composi Composición de la composición de la composición de la composición de la composición de la composición de la comp	1 D 1 D	15	0.086	0.048	6.9862	0.958	0 🔤 0 👘		15 -0.232	-0.230	16.070	0.377
1 🖬 1	1 1	16	-0.129	-0.211	8.2014	0.943	a 🗱 a 👘	1 01 0	16 -0.060	-0.075	16.331	0.430
(1)	1 1 1 1	17	0.027	-0.019	8.2559	0.961	i 🖬 👘	1 (1)	17 -0.188	-0.151	19.024	0.327
i 🔟 i	1 1 1 1	18	-0.129	-0.079	9.5508	0.946	i 🗐 i 🗌	1 (b)	18 0.143	0.194	20.642	0.298
1 1		19	-0.002	0.004	9.5511	0.963	i 🖬 i i	i uni e	19 -0.167	-0.109	22.919	0.241
1.1.1	1 1 1 1	20	0.022	0.042	9.5939	0.975	i di t	1 (1)	20 -0.045	-0.020	23.094	0.284

Graphic 4: Lbist's and lcase's correlogram result

In the study, time series analysis is performed using the dependent variable BIST 100 and independent variables brent oil price, gold ounce price, usd/tr parity and daily number of cases. Before looking at the cointegration relationship between the variables, Augmented Dickey-Fuller (ADF) and Philips Perron unit root analysis were applied and since the dependent variable is I(1) and at least one of the independent variables is I(O), the ARDL bounds test was determined as the most ideal cointegration test. For this reason, ARDL bounds test was applied and the model was determined as ARDL (1,4,0,0,0,0).

According to this model, before looking at the long-run and short-run relationships between the dependent and independent variables, it would be useful to check whether the model meets the necessary assumptions. First of all, the Ramsey Reset test was used to check whether there was a model fitting error or not and as can be seen in the table below, since the calculated F statistic is not statistically significant, no model fitting error was found.

	Value	Probability
t-statistic	1.5552	0.1297
F-statistic	2.4189	0.1297

Table 2: Ramsey reset test result

Other important assumptions are that the error values of the series are normally distributed, there is no autocorrelation and heteroskedasticity. The related statistics are also shown in Table 3. When we look at the probability values of the obtained results, it is seen that all values are greater than 0.05. In other words, it is determined that there is no specification error in the model.

	Value		Probability
LM test F-statistic	0,314	F(2,31)	0,7322
Breusch-Pagan-Godfrey	0,90358	F(9,33)	0,5335
Jarque-Bera Normality Test	2,645567		0,2663

 Table 3. Serial correlation LM Test, BPG heteroskedasticity test and JB histogram normality test results

Since the ARDL(1,4,0,0,0,0) model meets all assumptions, the Table 4 presents long-run coefficients of the independent variables.

Table 4: ARDL bound	l test and	long rung	coefficients
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ARDI (1 4 0 0 0)

11112 E(1,1,0,0,0)				
F-statistic k=4	4,4642*			
Finite sample n=45	1%	5%	10%	
I(0)	3,29	2,56	2,2	
I(1)	4,37	3,49	3,09	
Variables	Coefficients	t-statistics		
lbrent	0.263	2,807		
lcase	-0,016	-2,336		
lons	0,133	0,663		
lusd	-2,1659	-3,384		

EC=lbist-(0,2631*lbrent-0,0161*lcase+0,1331*lons-2,1660*lusd+8,8044

$$lbist_t = 8,8044 + 0,2631lbrent + 0,1331lons - 2,1660lusd - 0,0161lcase + u_t$$
(11)

As can be seen in Table 4, firstly, it is checked whether there is a long run relationship between the dependent and independent variables. It is observed that the F-statistic value is greater than the critical values published by Narayan in 2005 at 5% significance level, that is, it is determined that there is a long-run relationship between the variables. Then, the coefficients of the model were obtained according to the long-run relationship. Since the study model is a logarithmic model, comments can be made on percentage changes. Since the main focus of the study is to read the impact of the pandemic on the BIST 100, the coefficient and sign of the number of cases (lcase) variable are important. Looking at the results obtained in Table 4, it will be seen that when the number of cases increases by 1 percent, the bist 100 index decreases by 0.016 percent. This shows that the increase in the number of cases worldwide between the

beginning of the pandemic and the period when the pandemic was declared reflected negatively on the Turkish stock market.

The error correction coefficient value is important when obtaining the short-term relationship of the model. Because the error correction coefficient obtained should be a value between 0 and -1 and the prob. value should be less than 0.05. The values showing the short-run relationship of the variables of the study are shown in Table 5.

Variables	Coefficients	Prob.		
d(lbrent)	0,2099	0,0		
dlbrent(-1)	0,0614	0,073		
dlbrent(-2)	-0,047	0,162		
dlbrent(-3)	0,137	0,000		
CointEq(-1)	-0,438337	0,0		

Table 5: ARDL short term relationship

The error correction coefficient is -0.438337, which is a significant value. According to this value, a deviation occurring between variables in the long run is reduced by 43% in the next period and deviation is eliminated in approximately 2.3 periods.

In order to determine whether the short and long run coefficients obtained in the ARDL model are stable, i.e. whether there are structural breaks in the coefficients, the CUSUM and CUSUMSQ tests developed by Brown et al. in 1975 were applied and the results are shown below. When the results are analysed, it is seen that there is no out-of-bounds value for both tests at 5% significance level. This indicates that the short-run and long-run coefficients of the model are stable and there is no structural break.



Graphic 5: Cusum and CusumSQ test

6. Conclusion

In this empirical analysis, the short-run and long-run relationship between independent variables (the number of Covid-19 cases, brent petrol prices (USD), gold ounce prices (USD) and USD currency) and dependent variables (the BIST 100) is analysed using the ARDL bounds test. According to the results of the co-integration analysis, it was determined that the Covid-19 outbreak was in a long-run relationship with the BIST 100 within the time period from the beginning of the disease to the period when the pandemic was declared. In this period, there were decreases in Borsa Istanbul stock prices depending on the number of cases. Again, it has been determined that a shock between the dependent variable and independent variables in one period can be eliminated in approximately 2.3 periods.

For the next studies, this work can be inspiring for investigating more countries relationship for the long periods. Also, it can be used any other co-integration methods to investigate relationship between countries' stock exchange and pandemics or any other global issues.

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CHAPTER III

THE NUMBER OF ENTERING AND EXITING FIRMS AND ECONOMIC GROWTH

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1. Introduction

T is a widely accepted that entrepreneurship, which has gained value with the transition from the industrial society to the information society, is very important in terms of economic growth and employment creation. Therefore, in economies, entrepreneurial activities are supported by both the state and many private institutions and organizations. Nowadays, firm establishments are increasing with the policies implemented to support entrepreneurial activities. When the data on firm entry and exit in the Turkish economy is examined, it is seen that although both series follow a fluctuating course, there is an increasing trend in the number of entering firms, especially in the last 10-year period. On the other hand, it is understood that the number of exiting firms is parallel to the number of entering firms. Namely, high number of entries generally coincide with high number of exits.

Studies on firm entry and exit have revealed that rates of entry and exit are interrelated (Geroski, 1991, 1995; Baldwin, 1995; Dunne et al., 1988; Bartelsman et al., 2005). Entries can affect exits by increasing competitive pressure in the market. Schumpeter (1942) states that the entry of new efficient firms with better technology will force established businesses to exit the market and calls this phenomenon "creative destruction". On the other hand, companies leaving the market may make room for new entries. Carve and Porter (1976) state there is a symmetric relationship between entry barriers and exit barriers. The correlation

between entry and exit may also reflect the short life expectancy of new firms, the so-called "revolving door" process. According to the "revolving door" phenomenon, many small firms exit the market just a few years after they were founded (Audretsch, 1995). These entry-exit interactions are called competition effects by Johnson and Parker (1994).

Undoubtedly, it is expected that the increase in the number of enterprises operating in the economy will cause an increase in output, and the increase in the number of exiting firms will cause a decrease in output. Therefore, it is normal for the number of entering (exiting) firms to have a positive (negative) effect on real gross domestic product (GDP). Also, GDP is also likely to have an effect on the number entering and exiting firms. Two hypotheses are put forward regarding the effect of the general economic climate on firm entry. According to the so-called "pull" hypothesis, entrepreneurs tend to enter a market where demand is high and the state of the economy is expected to remain positive. Thus, the "pull" hypothesis states that a high growth rate of GDP improves the expected profitability of companies that are likely to enter the market, thereby increasing the number of entering firms. The second approach, called the "push" hypothesis, has the opposite results of the "pull" hypothesis. According to this hypothesis, a decline in economic activity actually increases the number of new firms because a higher unemployment rate reduces the potential entrepreneur's opportunity cost of starting a new business. On the other hand, it is expected an increase in GDP reduce the number of exiting firms. Because the increase in total demand will increase the profitability of companies and thus prevent exits. However, the effect of GDP on exit is likely to be more complex, as aggregate demand is assumed to have an effect on entry, and entry and exit are also strongly correlated. (Ilmakunnas and Topi, 1999, pp.286-287).

The aim of this study is to investigate the short and long-run interactions of the number of entering and exiting firms with each other and with the gross domestic product for the Turkish economy. For this purpose, in the following part of the study, empirical literature on the relationship between firm entry-exit and GDP is included. In the third section, information is given about the data set and econometric method used in the research, in the fourth section, the findings are presented, and in the last section, the results obtained from the study are presented.

2. Empirical Literature Review

In the applied literature, there are many studies on firm entry and exit. Especially researchers in the field of business management have examined entry and exit within the scope of entrepreneurship and business life cycle. However, the number of studies investigating the relationship between entry/ exit and macroeconomic variables is relatively less. The number or rate of newly established firms has been used as an indicator of entrepreneurship in some of the studies conducted to determine the relationship between entrepreneurship and economic growth. For example; Audretsch and Fritsch (2002), Audretsch and Keilbach (2004), Mueller (2007), Zycher (2013), Audretsch et al. (2015), Karagöz (2016).

In their studies for the West German region, Audretsch and Fritsch (2002) and Audretsch and Keilbach (2004) found that the increase in new firm establishment rates resulted in high growth rates. Mueller (2007) concluded that entrepreneurship positively affected regional economic growth in West Germany. Zycher (2013) investigated the effect of firm setups on output in his study for the US economy. The results showed that new firm formations had a positive effect on output. Another study that uses firm setups as an indicator of entrepreneurship is the study of Audretsch et al. (2015). In the study conducted on 127 European cities, it was determined that entrepreneurship positively affected economic growth.

Ilmakunnas and Topi (1999) investigated the microeconomic and macroeconomic determinants of entry and exit in the Finnish manufacturing industry. The findings showed that GDP growth affects positively entry and negatively the exit. Andersen et al. (2018) investigated the relationship of entry and exit at the firm level with business cycles in the Danish economy. Both GDP levels and GDP growth were used in the empirical analysis. When looking at the relationship between GDP levels and the number of entry and exit, it was determined that the firm entry was pro-cyclical while the exit was counter-cyclical. However, it has been found that this result is generally not valid when GDP growth is taken into account. Especially, firm exit becomes pro-cyclical. On the other hand, when the measurement is made according to GDP levels, both firm entry and exit positively affect the cycle. However, considering GDP growth rates, entry and exit are synchronized with the cycle.

Shapori and Khemani (1987) tested the hypothesis that there is a symmetric relationship between entry barriers and exit barriers for the Canadian economy. The results showed that entry barriers and exit barriers exhibited a symmetrical relationship, thus it was concluded that entry and exit interacted. Roh (2018) examined the effects of macroeconomic variables on firm entry and exit in the US and Canada. As a result of empirical analysis, it was determined that

entry and exit do not affect each other in both economies. It has been found that Canadian firms are more sensitive to interest rate and real GDP, while US firms are sensitive to growth rate and unemployment. Cala (2018) investigated the sectoral and regional determinants of firm dynamics in the Argentine economy. The results indicated that entry and exit influence each other.

Kaya and Üçdoğruk (2002) investigated the main determinants of entry and exit in the Turkish manufacturing sector. It has been identified that the sector growth rate (sectoral output growth) has an effect on entry and exit. Günalp and Cilasun (2006), in their study investigating the determinants of entry in the manufacturing industry in Turkey, determined that the sector growth rate positively affects entry. Additionally, the results showed that the exit did not make room for the entrance. Ertaş and Çetin (2009) examined the interaction between corporatization and macroeconomic variables. The number of entering and exiting firms were used as a measure of corporatization. A bidirectional causal relationship was determined between the number of entering and exiting firms. Another study investigating the determinants of entry and exit in the Turkish manufacturing industry was conducted by Öztürk and Kılıç (2012). As a result of the study, a positive relationship was determined between the rates of entry and exit. It has been concluded that the sector growth rate does not affect entry and exit. Karagöz (2016), who examined the relationship between entrepreneurship and economic growth in Turkey, used the number of newly established firms as an entrepreneurship indicator. It has been determined that entrepreneurship has a positive but limited effect on economic growth. According to the causality test results, no causal relationship was detected between the two variables.

3. Data and Methodology

In the study, the short and long-run interactions of the number of entering and exiting firms in the Turkish economy with each other and with the gross domestic product were investigated by using the Autoregressive Distributed Lag (ARDL) model and the Toda-Yamamoto (1995) causality test. The data set used in the econometric analysis is monthly and covers the period 2011:01-2023:03. All data come from the Electronic Data Delivery System of the Central Bank of the Republic of Turkey and were seasonally adjusted by using the Census X-13 method. Abbreviations and definitions of the variables are given in Table 1, and the letter L in front of the variables indicates that the logarithm of the relevant variable is taken.

Abbreviation of Variable	Definition of Variable			
LGDP	Real Gross Domestic Product			
LENTRY	The Number of Entering Firms			
LEXIT	The Number of Exiting Firms			

Table 1. Abbreviations and Definitions of Variables

Since the first stage in time series analysis is to examine the stationarity properties of the series, before starting the analysis, the level and/or difference at which the series are stationary was determined by using Augmented Dickey-Fuller -ADF (1979, 1981) and Phillips Perron -PP (1988) unit root tests. Following unit root tests, the short and long-run interactions of the number of entering and exiting firms with each other and with GDP were investigated with the ARDL bounds test approach. In the ARDL model, first of all, the unrestricted error correction model is set up as in equation (1) to detect the co-integration relationship between two variables.

$$\Delta LX_t = \alpha_0 + \sum_{i=1}^p \beta_i \Delta LX_{t-i} + \sum_{i=0}^q \delta_i \Delta LY_{t-i} + \gamma_0 LX_{t-1} + \gamma_1 LY_{t-1} + e_t$$
(1)

In equation (1), β_i and δ_i coefficients indicate the short-term dynamics, γ_0 and γ_i coefficients denote the long-term relationship, p_i is the error term, Δ is the difference operator, and p and q are the optimal lag lengths. In order to test the presence of a co-integration relationship between the variables related to equation (1), the following hypothesis (2) is established.

$$\begin{split} H_0: \gamma_0 &= \gamma_1 = 0 \\ H_1: \gamma_0 &\neq \gamma_1 \neq 0 \end{split} \tag{2}$$

The F-statistic calculated for hypothesis (2) is compared with the lower and upper critical values of the table of Pesaran et al. (2001). If the null hypothesis is rejected, it is concluded that there is a co-integration relationship between the variables. After the presence of a co-integration relationship is identified, the long-run relationship between the variables is examined with the ARDL model (3).

$$LX_t = \alpha_0 + \sum_{i=1}^p \beta_i LX_{t-i} + \sum_{i=0}^q \delta_i LY_{t-i} + e_t$$
(3)

Then, the error correction model in equation (4) is estimated to investigate the short-run relationship between the variables. The error correction term (EC_{t-1}) coefficient in equation (4) is expected to be negative and statistically significant.

$$\Delta LX_{t} = \alpha_{0} + \varphi EC_{t-1} + \sum_{i=1}^{p} \beta_{i} \Delta LX_{t-i} + \sum_{i=0}^{q} \delta_{i} \Delta LY_{t-i} + e_{t} \quad (4)$$

In the study, the causal relationships between the variables were detected by utilizing extended Granger causality test developed by Toda and Yamamoto (1995). In the Toda-Yamamoto causality approach, a vector autoregressive (VAR) model is first estimated with the level values of the variables, regardless of whether the variables are co-integrated or not. Following the model is estimated, linear and non-linear constraints on the coefficients are tested with the Wald statistic, and thus causal relationships between the variables can be determined. This approach is based on an extended VAR model estimation. The extended VAR model includes two types of lag lengths. The first of these lags is the optimal lag length (k) of the standard VAR system, and the second is the highest degree of integration (d_{max}) of the variables in the system. The twovariable VAR (k+d_{max}) system that needs to be estimated in the Toda-Yamamoto causality test is shown as in equations (5) and (6).

$$LX_{t} = \delta_{0} + \sum_{i=1}^{k} \delta_{1i} LX_{t-i} + \sum_{i=k+1}^{k+\alpha_{max}} \delta_{2i} LX_{t-i} + \sum_{i=1}^{k} \alpha_{1i} LY_{t-i} + \sum_{i=k+1}^{k+\alpha_{max}} \alpha_{2i} LY_{t-i} + e_{1t}$$
(5)

$$LY_{t} = \gamma_{0} + \sum_{i=1}^{k} \gamma_{1i} LY_{t-i} + \sum_{i=k+1}^{k+d_{max}} \gamma_{2i} LY_{t-i} + \sum_{i=1}^{k} \phi_{1i} LX_{t-i} + \sum_{i=k+1}^{k+d_{max}} \phi_{2i} LX_{t-i} + e_{2t}$$
(6)

After estimating the VAR system, the Wald test is applied to the first k coefficients of the explanatory variables on the right side of the equations, using the standard $\chi 2$ test statistic. Null hypotheses (7) and (8) are established to be tested regarding equations (5) and (6), respectively. As a result of the Wald test, if the null hypothesis that the coefficients are equal to zero as a group is rejected, it is decided that a causal relationship exists (Yamak and Erdem, 2017, pp.200-201).

$$H_0: \forall_i \alpha_{1i} = 0 \tag{7}$$

$$H_0: \forall_i \phi_{1i} = 0 \tag{8}$$

4. Empirical Results

In the study, before investigating the short and long-run interactions of the number of entering and exiting firms with each other and the gross domestic product, descriptive statistics of the series were examined and the findings are given in Table 2.

	GDP (Thousand TL)	ENTRY	EXIT
Mean	136669253.44	6614	1323
Maximum	206742954.90 (2022:12)	15264 (2022:12)	4891 (2022:12)
Minimum	81038364.57 (2011:02)	2393 (2012:08)	427 (2020:04)
Stand.Dev.	27122262.21	2759	679

Table 2. Descriptive Statistics

As seen from Table 2, for the period considered, GDP had its maximum value in the 12th month of 2022 and its minimum value in the 2nd month of 2011. On average, 6614 companies were established during the examined period. The period when the number of entering firms is maximum is the 12th month of 2022, when the GDP value is maximum. In this period, 15264 firms were established. The period in which the number of entering firms is minimum is the 8th month of 2012, and 2393 firms were established in this month. When the statistics regarding the number of exiting firms are examined, it is seen that the average number of exiting firms is 1323. The period when the number of exiting firms is maximum value. In this period, 4.891 firms exited. In this case, the period in which the GDP value is maximum is also the period in which both the number of entering and exiting firms are maximum. The period with the minimum the number of exiting firms is the 4th month of 2020, and 427 firms exited in the relevant period.

4.1. Unit Root Test Results

The stationarity properties of the variables were determined by ADF and PP unit root tests and the calculated test statistics were presented in Table 3.

Variabla	ADF-t	statistics	PP-t statistics			
variable	Intercept	Intercept-Trend	Intercept	Intercept-Trend		
LGDP	-0.9948	-5.9019***	-1.7868	-11.5656***		
LENTRY	-2.1127	-7.2129***	-2.3677	-7.1316***		
LEXIT	-6.0153***	-6.1629***	6.3190***	-6.4813***		

Table 3. ADF and PP Unit Root Tests Results

Note: ***, ** and * indicate that the series is stationary at the 1%, 5% and 10% significance level, respectively.

As observed from Table 3, according to both ADF and PP test statistics, it was determined that the LGDP and LENTRY series are non-stationary at the level in the intercept form, but are stationary in the intercept-trend form. However, when the graphs of the relevant series are observed, it is seen that these series contain trends. Therefore, it would be appropriate to consider the intercept-trend form in identifying the stationarity of LGDP and LENTRY series. When the unit root test results for the LEXIT series are examined, according to the statistics of both tests, it is seen that this series is stationary at its level in both intercept and intercept-trend form. In this case, the results of both ADF and PP tests indicate that all series to be used in the analysis are stationary at the level.

4.2. ARDL Model Results

After determining stationarity properties of the series, the short and longrun interactions of the number of entering and exiting firms with each other and with GDP were investigated by utilizing the ARDL model. As known, according to the ARDL bounds test approach, the presence of a co-integration relationship between variables can be tested regardless of the stationary level or first difference of the series. Therefore, this model also allows the investigation of the possible long-run relationship between variables that are found to be stationary at their level. In order to investigate the short and long-run interactions of the three variables discussed within the scope of the study, six models were set up and each was estimated separately. Akaike information criterion was used to determine the optimal lag length of the models.

Firstly, the models set up to investigate the short and long-run interaction between gross domestic product and the number of entering firms were estimated with the ARDL bounds test approach. The results of the ARDL models are reported in Table 4.

Dependent Var	iable: LGD	Р		Dependent V	Variable: LH	ENTR
ARDL (4,4)				ARDL (1,2)		
Short-Run Coefficient Estimates				Short-Run (Coefficient E	stimat
	Coeff.	t-statistic			Coeff.	t-stat
$\Delta LENTRY_{t}$	0.2662	18.5115***		$\Delta LGDP_t$	2.5916	18.97
$\Delta LENTRY_{t-1}$	0.0509	1.9701*		$\Delta LGDP_{t-1}$	0.7350	5.373
$\Delta LENTRY_{t-2}$	0.0599	2.3957**				
$\Delta LENTRY_{t-3}$	0.0399	1.6662**				
Long-Run Coef	ficient Esti	nates		Long-Run C	Coefficient E	stimate
Constant	15.1000	38.9218***		Constant	-30.5905	-9.31
LENTRY	0.4204	9.4021***		LGDP	2.0982	11.97
Diagnostic Test	Results	<u>~</u>		Diagnostic T	Test Results	
F-stat.	5.7326***			F-stat.	10.5475***	
ECM _{t-1}	-0.1532	-4.1781***		ECM _{t-1}	-0.2930	-5.66
LM	0.4970			LM	4.6323*	
BPG	17.7989**			BPG	6.9435	
Adjusted R ²	0.968			Adjusted R ²	0.937665	
CUSUM	Stable		1	CUSUM	Stable	

Table 4. ARDL Estimation Results on the Interaction Between LGDP and LENTRY

Note: LM refers to the Breusch-Godfrey LM test; BPG, Breusch-Pagan-Godfrey test; ***, ** and * indicate the significance level of 1%, 5% and 10%, respectively. The table's lower (I0) and upper (I1) critical values of the calculated limit F-statistics at 1%, 5% and 10% significance levels are (5.157 - 5.917), (3.74 - 4.303) and (3.113 - 3.61), respectively.

Looking at the diagnostic test results of the ARDL models presented in Table 4, it is seen that there is no autocorrelation problem in the model with LGDP as the dependent variable. The $\chi 2$ statistic calculated as a result of the Breusch-Godfrey LM test was not greater than the critical value, and the null hypothesis stating that there was no autocorrelation problem between the error terms was not rejected at an acceptable level of significance. However, as a result of the Breusch-Pagan-Godfrey (BPG) test performed to detect the heteroscedasticity problem, the null hypothesis was rejected at the 5% significance level. Therefore, a heteroscedasticity problem was detected in the model. In the model with the dependent variable LENTRY, the $\chi 2$ statistic calculated as a result of the autocorrelation LM test was greater than the critical value of the table and the null hypothesis was rejected at the 10% level. In this case, an autocorrelation problem was identified in the model. On the other hand, according to the result

of the BPG heteroscedasticity test, the null hypothesis that the variance of the error terms is constant was not rejected at an acceptable level of significance. This result shows that there is no heteroscedasticity problem in the model. Both the heteroskedasticity problem in the first model and the autocorrelation problem in the second model were taken under control by using the HAC (Newey-West) estimator. The results of the CUSUM test, which examined the stability of the parameters in the estimated models, indicated that the parameters in both models were stable.

As a result of the co-integration test of the ARDL model, whose dependent variable is GDP, the calculated F-statistic was greater than the lower critical value of Pesaran et al.'s (2001) table at the 1% significance level. Therefore, the null hypothesis stating that there is no co-integration relationship between the variables was rejected at the 1% level. In this case, the presence of the long-run relationship between LGDP and LENTRY variables was identified. The long-run elasticity coefficient of the LENTRY variable was estimated at 0.4204 and was found to be statistically significant at the 1% level. According to this coefficient, 1% increase (decrease) in the LENTRY variable causes 0.42% increase (decrease) in the LGDP variable. According to the results of the error correction model in which the short-run relationship was examined, the t, t-1, t-2 and t-3 period coefficients of the LENTRY variable were estimated as 0.2662, 0.0509, 0.0599 and 0.0399, respectively. These coefficients are statistically significant at least at the 10% level. This finding shows that the LENTRY variable has a positive effect on the LGDP variable both in the current period and with a 3-period lag. The coefficient of the error correction term in the model was estimated at -0.1532 and found to be statistically significant at the 1% level. This means that deviations from equilibrium in the short-run approach equilibrium in the long-run.

According to the bounds test result of the ARDL model, whose dependent variable is LENTRY, the calculated F-statistic was greater than the lower critical value of the table at the 1% significance level. Therefore, it has been determined that there exists the long-run relationship between the variables. The long-run elasticity coefficient of the LGDP variable was estimated as 2.0982. According to this coefficient, which is statistically significant at the 1% level, 1% increase (decrease) in the LGDP variable leads to 2.10% increase (decrease) in the LGDP variable leads to 2.10% increase (decrease) and after a period. The coefficients for the relevant periods were estimated as

2.5916 and 0.7350, respectively, and were found to be statistically significant at the 1% level. According to the estimated coefficients, 1% increase (decrease) in the LGDP variable causes an increase (decrease) of 2.59% and 0.74% on the LENTRY variable in the current period and the next period, respectively. The sign of the error correction term coefficient of the model was estimated to negative, as expected, and was found to be statistically significant.

ARDL estimation results of the models set up to investigate the short and long-run interaction between gross domestic product and the number of exiting firms are given in Table 5. Since the trend variable was found to be statistically significant in the model in which the LGDP variable is the dependent variable, the mentioned model was estimated in trend form.

Dependent Variable: LGDP			Dependent Variable: LEXIT					
ARDL (2,1)				ARDL (2,2)				
Short-Run Coefficient Estimates				Short-Run Co	efficient Estin	nates		
	Coeff.	t-statistic			Coeff.	t-statistic		
$\Delta LEXIT_t$	0.1217	7.3827***		$\Delta LGDP_t$	1.8881	7.3413***		
				$\Delta LGDP_{t-1}$	1.1184	3.9866***		
Long-Run C	Coefficient Es	stimates		Long-Run Coo	efficient Estin	nates		
				Constant	-1.2883	-0.1836		
LEXIT	0.0620	1.2985		LGDP	0.4494	1.1951		
Diagnostic T	est Results			Diagnostic Test Results				
F-stat.	8.8407***			F-stat.	5.2410**			
ECM _{t-1}	-0.5006	-5.1869***		ECM _{t-1}	-0.2722	-3.9937***		
LM	4.7687*			LM	2.1150			
BPG	40.5918***			BPG	18.5529**			
Adjusted R ²	0.9287			Adjusted R ²	0.5140			
CUSUM	Stable			CUSUM	Stable			

Table 5. ARDL Estimation Results on the Interaction Between LGDP and LEXIT

Note: LM refers to the Breusch-Godfrey LM test; BPG, Breusch-Pagan-Godfrey test; ***, ** and * indicate the significance level of 1%, 5% and 10%, respectively. The table's lower (I0) and upper (I1) critical values of the calculated limit F statistics at 1%, 5% and 10% significance levels are (5.157 - 5.917), (3.74 - 4.303) and (3.113 - 3.61), respectively.

As seen from Table 5, autocorrelation and heteroskedasticity problems were detected as a result of LM autocorrelation and BPG heteroscedasticity tests in the model with LGSYH as the dependent variable. It is seen that there is no autocorrelation problem in the model whose dependent variable is LEXIT, but there is a heteroscedasticity problem. Autocorrelation and heteroscedasticity problems detected in the models were controlled by using the HAC (Newey-West) estimator. As a result of the CUSUM test of both models, it was determined that the parameters in the model were stable.

According to the co-integration test result of the model in which the effect of LEXIT on LGDP was tested, the calculated F-statistic was found to be statistically significant at the 1% level. Therefore, it has been determined that there is the long-run relationship between the LGDP variable and the LEXIT variable. The long-run coefficient of the LEXIT variable was estimated as 0.0620, but this coefficient was not found to be statistically significant at an acceptable level. According to the short-run coefficient estimates of the model, the t-period coefficient of the LEXIT variable was estimated as positive and was found to be statistically significant at the 1% level. This finding shows that the change in the number of exiting firms has an effect on gross domestic product only in the current period. According to this coefficient, which is estimated as 0.1217, 1% increase (decrease) in the LEXIT variable causes 0.12% increase (decrease) in the LGDP variable in the current period. The error correction term coefficient of the model was estimated at -0.5006 and was found to be significant at the 1% level.

As a result of the co-integration test applied to the model in which the effect of the LGDP variable on the LEXIT variable was tested, it was determined that there is a co-integration relationship between the variables. The F-statistic calculated as 5.2410 was greater than the lower critical value of the table at the 5% significance level. However, the long-run elasticity coefficient of the independent variable was not found to be statistically significant at an acceptable level, as in the other model. When the short-run effect of the LGDP variable on the LEXIT variable is examined, it is seen that the coefficients of the t and t-1 period in the model are estimated positively. These coefficients, which were statistically significant at the 1% level, were estimated at 1.8881 and 1.1184, respectively. According to these findings, a change in the LGDP variable has a positive effect on the LEXIT variable both in the current period and the next period. The estimated error term coefficient also indicated that deviations from equilibrium in the short-run approach equilibrium in the long-run.

Finally, models set up to investigate the short and long-run interaction between the number of entering and exiting firms were estimated and the results were reported in Table 6. Since the trend variable was found to be statistically significant in the model in which the LENTRY variable is the dependent variable, the mentioned model was estimated in trend form.

According to the diagnostic test results of the models reported in Table 6, it was determined that there is no autocorrelation problem in both models, but there is a heteroscedasticity problem. Therefore, HAC (Newey-West) estimator was used to control the heteroscedasticity problem detected in the models. CUSUM test results of both models showed that the parameters were stable.

As a result of the co-integration test of the model with the LENTRY variable as the dependent variable, the F-statistic was calculated as 13.6243 and was found to be significant at the 1% level. In this case, the existence of the long-run relationship between the LENTRY variable and the LEXIT variable was determined. The long-run elasticity coefficient of the LEXIT variable was estimated as 0.3800. According to this coefficient, which is statistically significant at the 5% level, 1% increase (decrease) in the LEXIT variable causes 0.38% increase (decrease) in the LENTRY variable. According to the results of the error correction model in which the short-run relationship is examined, it is seen that the LEXIT variable has an effect on the LENTRY variable in periods t, t-1, t-2 and t-3. However, among the estimated coefficients, only the coefficients for periods t and t-3 were found to be statistically significant. These coefficients were estimated at 0.4158 and -0.1471, respectively. These findings show that the LEXIT variable affects the LENTRY variable positively in the current period and negatively after 3 periods. The error correction term coefficient of the model was estimated at -0.4526 and was found to be significant at the 1% level.

Dependent Variable: LENTRY			
ARDL (1,4)			
Short-Run Coefficient Estimates			
	Coeff.	t-statistic	
$\Delta LEXIT_t$	0.4158	7.3746***	
$\Delta LEXIT_{t-1}$	-0.0462	-0.7667	
$\Delta LEXIT_{t-2}$	-0.0433	-0.7105	
$\Delta LEXIT_{t-3}$	-0.1471	-2.5287**	
Long-Run Coefficient Estimates			
Trend			
LEXIT	0.3800	2.7420**	
Diagnostic Test Results			
F-stat.	13.6243***		
ECM _{t-1}	-0.4526	-6.4404***	
LM	0.3197		
BPG	33.3824***		
Adjusted R ²	0.8659		
CUSUM	Stable		

Table 6. ARDL Estimation Results on the Interaction Between LENTRY and LEXIT

Note: LM refers to the Breusch-Godfrey LM test; BPG, Breusch-Pagan-Godfrey test; ***, ** and * indicate the significance level of 1%, 5% and 10%, respectively. The table's lower (I0) and upper (I1) critical values of the calculated limit F statistics at 1%, 5% and 10% significance levels are (5.157 - 5.917), (3.74 - 4.303) and (3.113 - 3.61), respectively.

In the model with LEXIT as the dependent variable, the F-statistic calculated for the co-integration test was greater than the lower critical value of the table at the 5% level. Therefore, as in the other model, the presence of the long-run relationship between the variables was identified. However, the long-run coefficient of the LENTRY variable, estimated at 0.2126, was not found to be statistically significant at an acceptable level. According to the short-run coefficient estimates of the model, the LENTRY variable has an effect on the LEXIT variable in the t and t-1 periods. These coefficients, estimated as 0.6402 and 0.1734 respectively, show that the LENTRY variable positively affects the LEXIT variable both in the current period and the next period. The error correction term coefficient of the model was estimated as expected. This means that deviations from equilibrium in the short-run approach equilibrium in the long-run.

4.3. Toda-Yamamoto Causality Test Results

In the study, after examining the short and long-run interactions of the number of entering and exiting firms with each other and with the gross domestic product by using the ARDL model, the Toda-Yamamoto Granger causality test was employed to determine the causal relationships between the variables and the results were given in Table 7.

	Lag				
H ₀ Hypothesis	Length	X ² -statistic	R/A	Result	
LGDP → LENTRY	4	13.9166***	R	LGDP> LENTRY	
LENTRY ->> LGDP	4	2.9739	А		
LGDP → LEXIT	8	13.9722*	R	LGDP ↔ LEXIT	
LEXIT ->> LGDP	8	14.2283*	R		
LENTRY ->> LEXIT	8	18.4137**	R	LENTRY 🔸 LEXIT	
LEXIT> LENTRY	8	22.8576***	R		

Table 7. Toda-Yamamoto Causality Test Results

Not: ***, ** and * indicate the significance level of %1, %5 and %10, respectively. The symbols of \rightarrow and \rightarrow represent existence causal relationship and non-existence of the causal relationship, respectively. Letters R and A denote "reject" and "accept", respectively.

As seen from Table 7, in the equations set up to determine the causal relationship between the LGDP variable and the LENTRY variable, the null hypothesis stating that LGDP is not the cause of LENTRY was rejected at the 1% significance level. On the other hand, the null hypothesis stating that LENTRY is not the cause of LGDP could not be rejected at an acceptable level of significance. This finding shows that the causal relationship between the LGDP variable and the LENTRY variable is one-way and the direction of the relationship is from LGDP to LENTRY. In the equations set up to identify the direction of the causal relationship between the LGDP variable and the LEXIT variable, both null hypotheses were rejected at the 10% significance level. Therefore, it was concluded that there is a two-way causality between the LGDP variable and the LEXIT variable. Finally, in the equations set up to detect the causal relationship between the LENTRY variable and the LEXIT variable, both null hypotheses were rejected at least a 5% significance level. In this case, the existence of a two-way causal relationship between the LENTRY and LEXIT variables was determined.

5. Conclusion

In this study, the short and long-run interactions of the number of entering and exiting firms in the Turkish economy with each other and with the gross domestic product were investigated by utilizing the ARDL model and Toda-Yamamoto (1995) causality test. In order to examine the possible interactions of the three variables discussed in the analysis covering the period 2011:01-2023:03, six models were set up and each model was estimated separately.

The results of ARDL bounds testing indicate the presence of the longrun relationship between gross domestic product and the number of entering firms. According to the estimated long-run coefficients, 1% increase (decrease) the number of entering firms causes a 0.42% increase (decrease) in the gross domestic product. 1% increase (decrease) in gross domestic product leads to 2.10% increase (decrease) in the number of entering firms. This result shows that gross domestic product and the number of entering firms have a mutual positive effect on each other. According to the ARDL bounds test results of the models investigating the interaction between the number of entering and exiting firms, there is the long-run relationship between these variables. However, while the long-run coefficient of the number of entering firm variable is statistically significant, the long-run coefficient of the number of entering firm variable is not statistically significant. Accordingly, 1% increase (decrease) in the number of exiting firms leads to 0.38% increase (decrease) in the number of entering firms.

The results of the error correction model in which the short-run relationship is examined indicate that the change in the number of entering firms has a positive effect on the gross domestic product both in the current period and with a 3-period lag. The change in gross domestic product has a positive effect on the number of entering firms in the current period and the following period. This finding implies that the effect of the number of entering firms on GDP lasts relatively longer. On the other hand, the number of exiting firms has a positive effect on the gross domestic product only in the current period. Gross domestic product has a positive effect on the number of exiting firms both in the current period and the next period. The number of exiting firms affects the number of entering firms positively and negatively, respectively, in the current period and after 3 period. The number of entering firms has a positive effect on the number of exiting firms both in the current period and the next a period.

According to the results of the Toda-Yamamoto causality test, there exists a one-way causal relationship between gross domestic product and the number of entering firms, from GDP to the number of entering firms. There is a two-way causal relationship between gross domestic product and the number of exiting firms, and between the number of entering and exiting firms. In conclusion, there is both a short and long-run relationship between gross domestic product and the number of entering firms. At this point, it can be said that increases in gross domestic product are perceived as a positive signal for investors and this increases firm establishments. Another important finding from the study is that the number of entering and exiting firms are in mutual interaction.

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CHAPTER IV

FISCAL POLICY AND INFLATION UNCERTAINTY UNDER OIL PRICE CHANGES AND FINANCIAL CRISIS: A SMALL OPEN ECONOMY

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1. Introduction

nflation is an undesirable economic phenomenon that increases costs for both the economy and society. However, price increases may contribute to Leconomic development by stimulating economic activity. Since increased inflation uncertainty caused by high and unstable inflation has negatively affects real economic activity, ensuring sustainable development with low and stable inflation is among the main objectives of macroeconomic policy makers. Inflation is evaluated by measuring price increases, market mechanisms, inflationary expectations, and national economic structures. In the Turkish economy, crises, uncertainty, and inflation, as fundamental indicators of instability in dynamic structures, are intertwined concepts. Imbalances between public revenues and expenditures, debt repayment through borrowing, and the banking system's irrational behaviour generated inflation in Turkey's economy both during and after 1980. Since monetary quantity, selected as an intermediate target, no longer served as a nominal anchor for inflation and current income, the country adopted an inflation-targeting regime, a monetary policy that does not require an intermediate target. The implementation of an inflation-targeting regime requires good fiscal dominance criteria and a financial infrastructure. In developing countries, despite intense fiscal dominance, the insufficient development of financial markets and credibility issues arising from political

and economic instability have affected the success of this policy. Turkey sought to meet, at least partly, the necessary pre-conditions before switching to an inflation-targeting regime; therefore, an implicit inflation-targeting regime was enacted. This regime was defined as a fiscal policy, implemented in conjunction with structural reforms, to ensure fiscal discipline and avoid fiscal dominance. The inflation rate fell below 10% during the period 2002–2005, falling to single digits at the end of 2005, when the country switched to an inflation-targeting regime. Turkey, which shifted to an inflation-targeting regime during a period of unfavourable international conditions but favourable internal dynamics, was exposed to permanent shocks after 2005.

Few studies have evaluated the success of inflation-targeting regimes in developing economies. Although previous papers have compared either the adoption or non-adoption of such a regime and its feasibility, this paper focuses specifically on the inflation-targeting regime in Turkey. This choice was influenced by both the European Union (E.U.) accession process and the status of developing countries. This paper compares economic performance before and after the regime was implemented to determine whether targets were achieved and to identify differences that might have arisen due to inflation uncertainty. Different relationships exist between inflation uncertainty and macroeconomic variables in countries with varying inflation rates and distinct fiscal policy regimes and that are at different stages of financial development. Since the primary aim of an inflation-targeting regime is to stabilize inflation and may have different results depending upon whether the strategy is a success, the aim of this paper is to examine its effectiveness. Stimulus packages implemented after the global financial crises influenced the macroeconomic variables affecting inflation and therefore could have affected economic stability. Moreover, oil prices can have a significant influence on inflation and output growth. Therefore, financial crises and oil price variables are also added to the model structure as dummy variables to better capture the inflation structure. This paper seeks to contribute to the literature by focusing on the effects of inflation uncertainty, using selected macroeconomic variables during low- and high-inflation episodes to fill the gaps between inflation processes, economic performance, and fiscal policy instruments. Moreover, it attempts to reveal whether changes in inflation uncertainty affect fiscal policy and output growth and, if so, how a change in uncertainty affects these variables using impulse response analysis. The remainder of this paper is organized as follows. Section 2 presents an analysis of the relationship among inflation, inflation uncertainty, and selected macroeconomic variables. Section 3 provides information on the methods used to obtain the indicators of inflation uncertainty. Section 4 reports the results of the model established to connect inflation uncertainty and the variables of interest, and Section 5 presents the analyses and recommendations.

2. Literature

Okun (1971) was the first to examine the relationship between inflation and its variability. Gordon (1971) stated that since the relationship between inflation and inflation variability is influenced by the choice of sample period, it cannot be generalized. Friedman (1977) reported that higher inflation rates might result in higher uncertainty about future inflation due to varying policy responses to increasing inflation rates. Cukierman and Meltzer (1986) utilized Barro and Gordon's theory (1983) and stated that a positive relationship between the average inflation rate and inflation uncertainty can result from a positive causal effect of inflation uncertainty on the inflation rate. Pourgerami and Maskus (1987) and Ungar and Zilberfarb (1993) emphasized that during periods with higher inflation, inflation uncertainty decreases because agents may invest more resources in making inflation projections. Demetriades (1988) suggested a positive relationship between inflation and inflation uncertainty in the presence of asymmetric information. Devereux (1989) argued that the variability of real shocks influences the positive relationship between inflation and inflation uncertainty and could also increase these variables. Ball (1992) offered an asymmetric framework wherein economic agents create uncertainty regarding the inflation tolerance of policy makers. Holland (1995) introduced the hypothesis that higher inflation uncertainty may be associated with lower average inflation. The more independent the central bank of a country is, the more likely it is to favour this hypothesis (Ndou and Mokoena 2011). Baillie et al. (1996) found evidence for the Cukierman-Meltzer hypothesis, albeit only in high-inflation countries. Azariadis and Smith (1996) suggested that higher inflation rates lead to higher uncertainty in the presence of information disputes in credit markets. Grier et al. (2004) emphasized that inflation uncertainty reduces the inflation rate and also reported asymmetry. Fountas et al. (2004) reported that while increased inflation uncertainty lowered inflation in some E.U. countries, it increased inflation in others. Fountas et al. (2006) stated that greater inflation uncertainty encourages central banks to unexpectedly increase inflation. Yalçın (2008) reported that inflation uncertainty in Turkey during the period 1983-2006 did not affect inflation in the short term but increased it in the long term. Karahan (2012) argued that despite the inflation-targeting regime, inflation was an important determinant of inflation uncertainty during the period 2002–2011. Bhar and Mallik (2013) concluded that inflation uncertainty has a reduced effect on inflation in an inflation-targeting regime. Additionally, Samut (2014) emphasized that the effect of inflation uncertainty varies the price of sub-items, which constitute overall price levels. Buth et al. (2015) indicated that inflation led to inflation uncertainty in Cambodia and Vietnam, whereas inflation uncertainty led to inflation in Laos. Fuest and Schmidt (2017) showed that inflation uncertainty is positively related to inflation expectations and the inflation rate. Varlık, Ulke and Berument (2017) found that the relationship between inflation and inflation uncertainty is time-variant.

Friedman (1977) reported that as the information available about price movements increases, the inflation uncertainty associated with long-term contracts decreases output growth and investment potential. Pindyck (1990) argued that inflation uncertainty postpones investment, which affects output growth since inflation uncertainty increases the uncertainty associated with investment returns. Caballero (1991) suggested that the effect of inflation uncertainty on output growth, which operates through investments, can be determined by the model's structure. Tommasi (1994) observed that higher inflation uncertainty leads to less output. Grier and Perry (2000) found that inflation uncertainty decreases real output growth, depending on the sample size and model selection. Dotsey and Sarte (2000) emphasized that in the case of precautionary savings and risk aversion, higher inflation uncertainty has a positive impact on economic growth due to increased savings. Fountas et al. (2002) reported that high inflation and inflation uncertainty lead to less output. Wu et al. (2003) argued that depending on its formation, inflation uncertainty has a different impact on real gross domestic product. Wilson (2006) argued that increased inflation uncertainty is associated with high inflation and low average growth. Hasanov (2008) reported that inflation uncertainty affects contract durations, changes price adjustment speeds, and leads to decreased output levels. Chang and He (2010) found that during periods of high inflation uncertainty, the negative effect of inflation uncertainty on growth is larger than that during periods of low inflation uncertainty. Fountas (2010) emphasized that inflation uncertainty does not have a detrimental effect on output. Jiranyakul and Opiela (2010) demonstrated that increased inflation uncertainty decreases output. Furthermore, Bhar and Mallik (2013) reported that inflation uncertainty decreases inflation targeting and subsequent growth rates. Shah, Baharumshah,

Habibullah and Hook (2017) found that nominal uncertainty positively affects output growth.

Bailey (1956) emphasized the shortcomings of an inflationary financing process by studying welfare losses caused by an inflation tax, whereas Phelps (1973) emphasized that an optimal combination of taxes and inflation can be achieved in seigniorage framework. Olivera (1967) suggested that longer tax collection periods during periods of high inflation could increase inflation and that a budget deficit with inflationary financing could decrease the real value of taxes. Tanzi (1977) found that inflation has a negative impact on tax revenues in developing countries. Tanzi (1978) discussed the negative impact of an inflationary financing process on tax revenues. Tanzi (1989) suggested that in a decreased inflation scenario, the Tanzi effect may work in reverse. Dixit (1991) found that an optimal combination of inflationary financing and taxation is possible and that the negative effects of inflationary financing can be mitigated by adjusting tax rates. Tanzi (1992) suggested that it is not possible to implement the optimal combination of financing and taxation in terms of tax practice and the preferences of politicians who influence tax laws. Damankeshideh and Taleghani (2015) indicated that inflation and inflation uncertainty are negatively correlated with tax revenues. Conrad (1997) observed a reverse relationship between inflation and public expenditures based on delays in public expenditures. Çavuşoğlu (2005) and Patinkin (1993) observed an inverse relationship between inflation and public expenditures in the Israeli economy. Previous studies have typically examined the relationships among inflation, tax revenues, and public expenditures in industrialized countries; however, almost no studies have examined the effects of inflation uncertainty on tax revenues and public expenditures in both developing and developed countries.

3. Methodology

As volatilities and numerical risk criteria tend to be clustered together over time, it is necessary to examine the dependency of joint movements of economic variables to reveal the true nature of relationships in an economic system. Since volatility cannot be directly observed, estimations and forecasts are susceptible to the selection of volatility models. By allowing variances in past conditions to appear in the current conditional variance equation, Bollerslev (1986) generalized the parametrization of conditional variance used by Engle (1982). The generalized autoregressive conditional heteroscedasticity (GARCH) model is generalized to the multivariate GARCH (MGARCH) structure, which defines how covariances behave over time and provides an internal analysis of the regressors. These regressors are produced by examining variable behaviours simultaneously. MGARCH models allow variances and covariances to be connected to the data set in the form of a vector autoregressive moving average (VARMA), thereby permitting the analysis of multivariate financial models that require modelling both variances and covariances.

Extending the univariate GARCH model to an n-variate model requires allowing the conditional variance-covariance matrix of the n-dimension zero mean random variables (ε_t) to depend on elements of the information set. Letting H_t be measurable with respect to \mathcal{F}_{t-1} , the sigma field, the multivariate GARCH model can be written as $\varepsilon_t | \mathcal{F}_{t-1} \sim N(0, H_t)$. The parameterization for H_t as a function of the information set \mathcal{F}_{t-1} chosen here allows each element of H_t to depend on q-lagged values of the squares and cross products of ε_t and p-lagged values of the elements of H_t (Engle and Kroner 1995).

While an MGARCH structure provides better decision-making tools, it has difficulties when modelling and convergence and contains identification uncertainty because of its reduced structure. In model selection, to obtain appropriate estimates and capture the dynamic nature of the conditional covariance matrix, it is important to have a low number of parameters while not overly limiting flexibility. This makes the covariance matrix (H_l) positive at each point in time and finds weak stability in the process. In terms of applicability, structures in the form of a diagonal parameter matrix can be added to the model. To describe time dependence, Bollerslev et al. (1988) expanded GARCH models to multivariate models under the name of VEC parameterization. The VEC model has problems regarding viability because it requires a large number of parameter estimations, and positive definiteness of the covariance matrix cannot always be provided.

A new parameterization called the Baba-Engle-Kraft-Kroner (BEKK) model is proposed, which eliminates the problem of positively definited conditional covariance estimation in the VEC model and is a general quadratic estimate, where C_0^* , A_{ik}^* and B_{ik}^* $n \times n$ define parameter matrices, C_0^* triangle, $C_{1k}^* j \times n$ parameter matrices, and the summation limit K determines the generality of the process. The BEKK(1,1,K) model can be written as

$$\begin{aligned} H_t &= C_0^{*\prime} C_0^* + \Sigma_{k=1}^K C_{1k}^{*\prime} x_t x_t^{\prime} C_{1k}^* + \Sigma_{k=1}^K \Sigma_{i=1}^q A_{ik}^{*\prime} \varepsilon_{t-i} \varepsilon_{t-i}^{\prime} A_{ik}^* + \\ \Sigma_{k=1}^K \Sigma_{i=1}^p B_{ik}^{*\prime} H_{t-i} B_{ik}^* & | \end{aligned}$$
 (1)

The C, A and B prefixes identify the constant, lagged squared residual and lagged variance terms in BEKK models. Equation (1) is defined as being positive under poor conditions. However, the model is general enough since it contains all positively defined diagonal representations and almost all positively defined VEC representations. In this model's structure, as the number of estimated parameters increases, it becomes difficult to fully interpret a parameter coefficient. Engle et al. (1990) and Alexander (2000) demonstrated the use of factor GARCH (FGARCH) models in the estimation of large covariance matrices. Although this approach decreases the number of parameters to be estimated, it has limitations both because of the difficulty of interpreting coefficients in GARCH models and its poor performance in systems with weak relationships. When a conditional covariance matrix is divided in two, as with a conditional standard deviation and a conditional correlation matrix, it can be indirectly determined by a conditional correlation matrix. Bollerslev (1990) demonstrated a constant conditional correlation (CCC) determination, which ensures that the estimator is positively defined by requiring each conditional variance to be non-zero and the correlation matrix to be full rank. In this model, while conditional correlation is assumed to be constant over time, only conditional variances are assumed to depend on time (Orskaug 2009). Because correlations for variables change over time, the assumption that the conditional correlation is constant over time is not satisfactory. Engle (2001) proposed a dynamic conditional correlation (DCC) model, which is a generalized form of the CCC model that allows correlations to vary over time while maintaining the ease of estimation in the constant correlation model. In the DDC model, which is a non-linear combination of GARCH models, the parsimony principle of the univariate GARCH models in individual volatility is satisfied, and the number of parameters is reduced by using maximum likelihood, in contrast to both VEC and BEKK models. In addition, the DCC model includes conditions that make the covariance matrix positive at all points in time and make the process covariance stationary (Peters 2008). Although they are not linear, they can be calculated with either onestep or two-step methods based on a likelihood function. The DCC model is a generalized form of the CCC estimator,

$$H_t = D_t R_t D_t \tag{2}$$

where R_t is the conditional correlation matrix of the standardized disturbances ε_t , $\varepsilon_t = D_t^{-1}r_t$ and $D_t = diag\{\sqrt{h_{i,t}}\}$. The parameterization
of R_t has the same requirements as H_t , except those conditional variances are in an integration. Within the scope of the paper, the DCC model estimation process is taken as a single step of all interactions analysed simultaneously by using a full information maximum likel hood method. The relationship between inflation uncertainty and macroeconomic variables is susceptible to a variety of factors, including the sample period, model classification, and inflation uncertainty. Although MGARCH structures are generally used in financial modelling, some applications also apply in the macroeconomy.

4. Application

To examine the effect of inflation uncertainty on Turkey's consumer price index, real GDP, public expenditures, tax revenues, and quarterly data for the period 1987:Q1-2021:Q2 were used. The relationship between inflation uncertainty and public expenditures was considered in terms of non-interest expenses because the share of domestic and foreign debt interest payments in the total public expenditures in Turkey has risen continuously since 1980. Data on different base years in the data set obtained from the CBRT electronic data distribution system (EDDS) were organized according to the base year, i.e., 1987. The trend structure of all the variables, and the seasonal structures of the variables of real GDP, public expenditures, and tax revenues were determined. Seasonal influences were removed from the series using the Tramo/Seat method. The public expenditures and tax revenues series, on the other hand, were divided by seasonally adjusted nominal GDP and multiplied by 100. To compensate for any exponential increase or decrease that may appear in the series, the series were expressed in linear form by using a series' logarithm. Utilizing the logarithmic firstorder differences of the consumer price index and real GDP variables and multiplying them by 100, growth measures expressed as percentage changes were obtained. While the logarithmic first-order difference of the consumer price index was used to express inflation, the logarithmic first-order difference in the real GDP variable was used to express output growth. For stationary testing of adjusted variables, under intercept and trend model, the augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests were performed. When the ADF and PP test results for all the variables in Table 1 were evaluated, it was found that the inflation, output growth, tax revenues and public expenditures series did not include a unit

root. The summary statistics and the correlation matrices are presented in Table 2 and Table 3, respectively, for three periods.

The first condition that had to be fulfilled before dealing with the general structure of the variance equation was that the series should be a white noise vector process. In addition to residuals being serially uncorrelated individually, they also need to have zero correlation with the delays of other components. A low-grade VAR model eliminates this interwoven autocorrelation structure. The lag length for the model's mean equation was determined to be 1 for the Schwarz criterion (SC), 2 for the Quinn (HQ) and Akaike information criterion (AIC), and 4 for the final prediction error (FPE) criterion. VAR (1) process was established to model the relationship between inflation uncertainty and selected variables. In the established model structure, a multivariate ARCH effect test was conducted a priori to ascertain the presence of an ARCH effect. Table 4 shows that the absence of an ARCH effect was completely refuted. Since the presence of autocorrelation was detected in the errors and/or error frames within the framework of established VAR (1) models, MGARCH models were used.

Within the scope of this paper, the impact of inflation uncertainty on inflation, output growth, and selected fiscal policy variables was investigated by establishing a four-dimensional model structure. An MGARCH-M model structure was designed to examine the direct effect of the changing conditional variance of the inflation variable, not through an error term but through the main equation. To identify the factors influencing the inflation series, depicting a fluctuation in 2003 due to the transition to an inflation-targeting regime, a dummy variable (D_{ν}) taking value 1 for quarters in the 2003–2021 period and 0 for other periods was added to the model. The dummy variable (D_{c}) for the financial crisis took value 1 for the years 1982, 1991, 1994, 1997, 2001, 2008 and 2011 and 0 for other periods. The dummy variable for oil price (D_{oil}) was also introduced into the model structure. It took values of 1 when the oil price in the local currency increased by more than 4% for three consecutive periods, -1 when the oil price in the local currency decreased by more than 4% for three consecutive periods and 0 for other situations, similar to the approach in Bhar and Mallik (2013).

Level	Inflation (π_t)	Output Growth (og_t)	Tax Revenues (rtr_t)	Public Expenditures $(rgst_t)$
ADF Stat.	-2.199**	-7.599**	-6.332**	-7.304**
P-P Stat.	-9.539**	-12.743**	-6.332**	-7.654**

Table 1. Unit Root Test Results

		Pre-	2003			Pos	t-2003			Within 4	All Perio	od
	π_t	og_t	rtr _t	rgst _t	π_t	og_t	rtr _t	rgst _t	π_t	og_t	rtr _t	$rgst_t$
Mean	13.12	1.26	14.78	15.26	2.12	1.19	1.01	0.54	8.19	1.23	8.62	8.67
Std. Dev.	4.99	20.34	15.60	24.51	1.54	9.49	20.33	28.97	6.70	16.33	19.07	27.48

Table 2. Summary Statistics of Selected Variables

Table 3. Correlation Matrices of Selected Variables

		Pre-	2003			Post-	2003		Wi	ithin All	Period	
	π_t	og_t	rtr _t	$rgst_t$	π_t	og_t	rtr _t	$rgst_t$	π_t	og_t	rtr _t	rgst _t
π_t	1				1				1			
og_t	-0.38**	1			-0.55**	1			-0.22***	1		
rtr _t	0.08*	0.42**	1		0.08*	0.35**	1		0.33**	0.33**	1	
rgst _t	0.02*	0.09*	0.58**	1	0.05*	0.27**	0.63**	1	0.28 *	0.13**	0.64**	1

Table 4. Determination of the Presence of a Priori ARCH Effects for the Model

	Multidimensional a Priori ARCH Effect Statistic	P - value
Model	781.26	0.000

***, **, * indicate statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

The parameter estimation results obtained with the BEKK model structure are shown in Table 5. The coefficients of the variance-covariance equation, showing the presence of a strong ARCH and GARCH effect on the inflation, output growth, tax revenues, and public expenditures series, are significant for individual and cross shocks and for individual and cross-volatility distributions. The matrix A(i,j) measures the model's ARCH effect, and each element in the matrix B(i,j) represents the continuity in conditional variance from the variable "i" to the variable "j", while C(i,j) represents the constant terms. The estimated ARCH and GARCH parameter coefficients are significant at the rates of 56% and 44%, respectively. The effects of individual shock distributions were within the range of 0.221 (public expenditures) and 0.571 (inflation), expressed as A (3,3) and A (1,1), respectively. The shock distribution of the inflation series was found to be high and significant. When cross shocks in the inflation series were examined, the significance effect of public expenditures, expressed as A (1,3), was 0.247. When cross shocks in the output growth series were examined, public expenditures with a coefficient of -0.553 and tax revenues with a coefficient of 0.513 were found to be significant, expressed as A (2,3) and A (2,4), respectively. With a coefficient of 0.010, the effect of output growth on public expenditures was significant. In contrast, the effect of output growth on tax revenues was

significant with a coefficient of 0.083. In the GARCH series parameters, the effects of delayed volatility distribution on inflation, output growth, and tax revenues were 0.774, 0.898, and 0.507, respectively and were expressed as B (1,1), B (2,2) and B (4,4).

While the inflation series' effect on future volatility was self-caused due to inflation and public expenditures, expressed as B (1,1) and B (1,3), respectively, output growth had the most significant effect on future volatility, which was solely self-caused and is expressed as B (2,2). Past volatility shocks were a more effective measure of the future volatility structure of inflation and output growth. While the effect of public expenditures on future volatility was determined by output growth and tax revenues, the effect of tax revenues on future volatility was determined by output growth. The dummy variable used for inflation targeting was found to be statistically significant for inflation and tax revenues, but it was statistically insignificant for output growth and public expenditures. Prior to 2003, the effect of inflation uncertainty was positive and statistically significant for inflation, positive and statistically significant for output growth, negative and statistically insignificant for public expenditures, and negative and statistically significant for tax revenues. Conversely, after 2003, while the effect of inflation uncertainty was positive and statistically significant for inflation, it was positive and statistically insignificant for output growth, negative and statistically insignificant for public expenditures, and positive and statistically significant for tax revenues. In a multivariate model, errors should be serially uncorrelated and should not present a residual ARCH effect. At the identification test stage, either univariate or multivariate tests can be used. Onedimensional tests apply the same test pairs for each variable. Table 5 indicates no autocorrelation issue in the variables other than inflation, which is significant at the 5% level. Additionally, no residual ARCH effect was observed for any of the variables. Although one-dimensional standardized residuals produce series with approximate uniform variances, they ignore the fact that the correlation changes between periods. In contrast, in a multivariate case, the white noise vector process should be investigated. Unlike univariate tests that produce standardized errors in every time unit, multivariate tests require a full set of simultaneously produced errors.In Table 5, the multivariate Q statistics were found to be insignificant, and the presence of a multivariate ARCH effect was observed in the model. The diagnostic tests applied in the BEKK model suggest that there might be shortcomings in the model's determination. Additionally, since the null hypothesis that the constant and all other delayed parameters

were equal to zero was rejected, it was determined that there was no constant correlation. Furthermore, given the possibility of a strong time-dependent correlation between the selected variables, it was concluded that a dynamic structure exists. Therefore, to determine the impact of inflation uncertainty on the economic variables, the model structure was also examined through a DCC model.

The DCC model established in this paper suggests that the series examined for conditional correlation had inconstant interactions and that this correlation affected the correlations of timing and delays. Table 6 reports the estimation results of the DCC parameter obtained for the model structure. Table 6 also presents the correlation parameter estimates and the GARCH model parameter estimates. Most of the resulting parameter estimates were statistically significant. According to the multivariate Q statistics results, there was no serial correlation in the residuals, and the ARCH effect was eliminated. When the autocorrelation function of the residuals and the square of the residuals was examined, no autocorrelation problem was observed. The DCC model more precisely demonstrated the dynamic structure of the correlation among inflation uncertainty, inflation, output growth, and fiscal policy. Considering these results, the effect of inflation uncertainty can be evaluated using the DCC model. The dummy variable used for inflation targeting was found to be statistically significant for inflation, output growth, public expenditures, and tax revenues. The oil price and financial crisis dummies were also found to significantly influence inflation and output growth. Energy has an important impact on economic policies because it is a mandatory input. Changes in the price of oil, which ranks first in terms of consumption, have a direct or indirect impact on economies, regardless of their development level.

Where inflation uncertainty is represented by $h_{\pi t}$, the mean equation of the VAR-MGARCH-in-mean model structure was formed as follows:

$$\begin{aligned} \pi_{t} &= \alpha_{0} + \alpha_{1} D_{k} + \Sigma_{i=1}^{p} (\alpha_{2i} + \tau_{1i} D_{k}) \pi_{t-i} + \Sigma_{i=1}^{p} \alpha_{3i} o g_{t-i} \\ &+ \Sigma_{i=1}^{p} \alpha_{4i} r g s_{t-i} + \Sigma_{i=1}^{p} \alpha_{5i} r t r_{t-i} + \delta_{1} \sqrt{h_{\pi_{t}}} \\ &+ \gamma_{1} D_{k} \sqrt{h_{\pi_{t}}} + \alpha_{6} D_{fc} + \alpha_{7} D_{oil} + \varepsilon_{1t} \end{aligned}$$

$$\begin{split} og_{t} &= b_{0} + b_{1}D_{k} + \Sigma_{i=1}^{p}(b_{2i} + \tau_{2i}D_{k})\pi_{t-i} + \Sigma_{i=1}^{p}b_{3i}og_{t-i} \\ &+ \Sigma_{i=1}^{p}b_{4i}rgs_{t-i} + \Sigma_{i=1}^{p}b_{5i}rtr_{t-i} + \delta_{2}\sqrt{h_{\pi t}} \\ &+ \gamma_{2}D_{k}\sqrt{h_{\pi t}} + b_{6}D_{fc} + b_{7}D_{oil} + \varepsilon_{2t} \\ rgs_{t} &= c_{0} + c_{1}D_{k} + \Sigma_{i=1}^{p}(c_{2i} + \tau_{3i}D_{k})\pi_{t-i} + \Sigma_{i=1}^{p}c_{3i}og_{t-i} \\ &+ \Sigma_{i=1}^{p}c_{4i}rgs_{t-i} + \Sigma_{i=1}^{p}c_{5i}rtr_{t-i} + \delta_{3}\sqrt{h_{\pi t}} + \gamma_{3}D_{k}\sqrt{h_{\pi t}} \\ &+ c_{6}D_{fc} + c_{7}D_{oil} + \varepsilon_{3t} \\ rtr_{t} &= d_{0} + d_{1}D_{k} + \Sigma_{i=1}^{p}(d_{2i} + \tau_{4i}D_{k})\pi_{t-i} + \Sigma_{i=1}^{p}d_{3i}og_{t-i} \\ &+ \Sigma_{i=1}^{p}d_{4i}rgs_{t-i} + \Sigma_{i=1}^{p}d_{5i}rtr_{t-i} + \delta_{4}\sqrt{h_{\pi t}} \\ &+ \gamma_{4}D_{k}\sqrt{h_{\pi t}} + d_{6}D_{fc} + d_{7}D_{oil} + \varepsilon_{4t} \end{split}$$

and the variance equation

$$\varepsilon_{1t} = \sqrt{h_{\pi_t}} * Z_t \tag{3}$$

where h_{π_t} is defined as the BEKK (Equation 1) and DCC (Equation 2) representation.

The volatilities of the variables considered in this paper were limited within the scope of the BEKK and DCC model structures. The share of expenditures allocated to oil in the national income and the possibility of accessing other energy sources are determinants of the impact of oil price changes on the economy. When oil prices increase, the export revenues of an oil-exporting country increases, positively affecting its national income. Additionally, protection against the deleterious effects of inflation, resulting from increases in the production costs of industrial products, is reflected in product prices. The acquisition of income transfers from oil-importing countries creates problems in achieving the growth objectives of developing countries such as Turkey. In addition to affecting the import cost of crude oil due to oil price increases, additional expenditure is also allocated to industrial products in Table 5. BEKK Model Parameter Estimation Results

	-tr _t	-1.478***	1.233	0.102	0.859*	-0.597***	-0.105***	4.056*	3.749***	-1.236*	-2.738	0.266*
	1	Constant	π_{t-1}	$D_k \ast \pi_{t-1}$	og_{t-1}	rgs_{t-1}	rtr_{t-1}	D_k	h_t	$D_k * h_t$	D_{fc}	D_{oil}
	gs _t	-1.117***	-0.052*	0.101	-0.283	-0.125	-0.544*	-5.933	-0.979	-0.778	2.500	-0.020
	r	Constant	π_{t-1}	$D_k \ast \pi_{t-1}$	og_{t-1}	rgs_{t-1}	rtr_{t-1}	D_k	h_t	$D_k * h_t$	D_{fc}	D_{oil}
	g_t	-1.800***	-1.323*	-0.091**	-0.198**	-0.203	0.339***	1.819	4.743***	1.674	-0.193*	-0.209*
an Estimates		Constant	π_{t-1}	$D_k * \pi_{t-1}$	og_{t-1}	rgs_{t-1}	rtr_{t-1}	D_k	h_t	$D_k * h_t$	D_{fc}	D_{oil}
onditional Me	π_t	2.274	0.344*	0.120	0.073	0.020	-0.076	-1.274**	0.063***	0.344	1.913*	0.007**
Panel A: C		Constant	π_{t-1}	$D_k * \pi_{t-1}$	og_{t-1}	rgs_{t-1}	rtr_{t-1}	D_k	h_t	$D_k * h_t$	D_{fc}	D_{oil}

Panel B: C	onditional Var	iance-Cova	riance Estimate	es			
C (1,1)	-0.089	A (1,2)	-1.087	A(4,1)	-0.036	B (2,4)	0.050
C (2,1)	-1.236	A(1,3)	0.247***	A (4,2)	0.083*	B (3,1)	-0.017
C (2,2)	-0,477	A (1,4)	0.741*	A (4,3)	-0.751	B (3,2)	-0.131^{***}
C (3,1)	-0.966***	A (2,1)	-0.064	A(4,4)	0.242^{***}	B (3,3)	0.173
C (3,2)	-0,320	A (2,2)	0.085	B (1,1)	0.774***	B (3,4)	-0.695***
C (3,3)	0,523	A (2,3)	-0.553^{***}	B (1,2)	0.167	B (4,1)	-0.040
C (4,1)	0.764	A (2,4)	0.0513*	B (1,3)	-0.553*	B (4,2)	-0.107*
C (4,2)	0.039	A (3,1)	0.039	B (1,4)	-0.014	B (4,3)	-0.138
C (4,3)	-1.514	A (3,2)	0.010^{*}	B (2,1)	-0.012	B (4,4)	0.507***
C (4,4)	-0.001	A (3,3)	0.221^{***}	B (2,2)	0.898***		
A(1,1)	0.517^{**}	A (3,4)	0.727	B (2,3)	0,035		

Panel C: Eligibility of Parameter Est	timates (Or	le-Dimen	isional)		
	Q (10) St	atistics	P-value	ARCH-LM (10)	P-value
Inflation	30.4	62	0.007	1.257	0.996
Output Growth	17.7	81	0.058	8.117	0.422
Public Expenditures	4.52	5	0.920	9.877	0.273
Tax Revenues	5.76	3	0.834	2.475	0.962
Panel D: Eligibility of Parameter Es	timates (M	ulti-Dime	ensional)	-	
Multivariate Q(10) Statistic		163	.892	P-value	0.122
Multivariate ARCH Effect Statistic		516	5.75	P-value	0.000

***, **, * indicate statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

developing countries, such as Turkey, by providing a large part of the imports of crude oil. In Turkey, while increasing the price of petroleum products resulted from an increase in crude oil prices, a decrease in crude oil prices is not reflected in the same level for petroleum products being used, which depends on the applied high tax rates and shows the effect of oil price on inflation. The effect of inflation uncertainty prior to 2003 was positive and statistically significant for inflation, positive and statistically significant for output growth, positive and statistically significant for tax revenues. In contrast, for the post-2003 period, while the effect of inflation uncertainty was positive and statistically significant for inflation, it was negative and statistically significant for output growth, negative and statistically significant for output growth, negative and statistically significant for output growth, negative and statistically significant for output growth, negative and statistically significant for output growth, negative and statistically significant for output growth, negative and statistically significant for output growth, negative and statistically significant for output growth, negative and statistically significant for public expenditures, and positive and statistically significant for tax revenues.

From the mean inflation equation in Table 6, the coefficient of lagged inflation (π_{t-1}) is positive and significant pre-2003, and the coefficient $(D_k * \pi_{t-1})$, which refers to the post-2003 period, is negative and significant. Their sum is negative and significant, suggesting that inflation declined under inflation targeting. The positive estimate of the inflation uncertainty coefficient (h_i) implies that inflation uncertainty increases inflation. The negative and significant estimated value of the $(D_k * h_t)$ coefficient indicates that inflation uncertainty has a negative effect after an inflation-targeting period, suggesting that the inflation-targeting regime eliminated inflation inertia. In other words, the inflation-targeting regime has had a detectable influence in lowering the effect of inflation significantly for the whole period, and the effect was reduced after inflation targeting. In contrast, the mean equation of output growth suggests that inflation uncertainty reduces growth significantly after the inflation-targeting period.

Sims (1980), Impulse response analysis conducted to analyse volatility shocks, was generalized, due to similarities between the GARCH and VARMA models, to uncover the volatility dynamics operating between the involved variables in a given multivariate parametric volatility model (Hafner and Herwartz, 2006). Gallant et al. (1993) proposed defining a baseline and evaluating the impact of a deterministic shock, either observable or estimated, added to the initial conditions (Le Pen and Sevi, 2009). Koop et al. (1996) proposed a generalized impulse response function (GIRF) for conditional expectations using the mean of the response vector conditional on history and a present shock, which is then compared with a baseline that depends only on history (Hafner and Herwartz, 2006).

Table 6. DCC Model Parameter Estimation Results

	rtr_t	2.861	0.807	-0.951*	0,0852	0.580^{***}	$0,318^{***}$	$-1,224^{**}$	-0.635**	0.736^{*}	0,765	0.001^{*}
		Constant	π_{t-1}	$D_k \ast \pi_{t-1}$	og_{t-1}	rgs_{t-1}	rtr_{t-1}	D_k	h_t	$D_k * h_t$	D_{fc}	D_{oil}
	ISt	1.503*	-0.748**	0.751*	0.427	-0.121***	0.646**	1.664^{**}	0.182*	-0.885**	-0,981*	-0.509
	rg	Constant	π_{t-1}	$D_k * \pi_{t-1}$	og_{t-1}	rgs_{t-1}	rtr_{t-1}	D_k	h_t	$D_k * h_t$	D_{fc}	D_{oil}
	t	1.9913	-0.841^{*}	0.987*	0.019**	0.221^{*}	0.166*	-1.691*	0.216*	-0.856**	-1,056*	-0.002**
eter Estimates	60	Constant	π_{t-1}	$D_k \ast \pi_{t-1}$	og_{t-1}	rgs_{t-1}	rtr_{t-1}	D_k	h_t	$D_k * h_t$	D_{fc}	D_{oil}
odel Parame	t _t	3.154*	0.625***	-0.780**	-0.0841^{**}	0.022**	-0.040**	-0.745**	0.995*	-0.547*	0,862**	0.101**
Panel A: N	1	Constant	π_{t-1}	$D_k \ast \pi_{t-1}$	og_{t-1}	rgs_{t-1}	rtr_{t-1}	D_k	h_t	$D_k * h_t$	D_{fc}	D_{oil}

Panel B: GA	RCH Parameter Est	imates			
C (1)	1,202*	A (1)	0.258***	B (1)	0.119***
C (2)	0,173**	A (2)	0.524**	B (2)	0.207*
C (3)	2,235*	A (3)	0.109*	B (3)	0.602**
C (4)	0,150**	A (4)	0.072*	B (4)	0.874*

Panel C: Correlation Parameter	Estimates		
DCC (1)	0.397*	DCC (2)	0.581**
Multivariate Q (10) Statistic	154.584*	Multivariate ARCH Effect Statistic	527.93*

***, **, * indicate statistical significance at the 0.01, 0.05, and 0.10 level, respectively.



Figure 1. Volatility Impulse Response Functions

Impulse response functions in nonlinear models must be estimated through simulation because they are history-dependent, non-homogenous to any degree, non-symmetrical and generally do not have an analytical expression (Pen and Sevi,2009). Hafner and Herwartz (2006) proposed a volatility impulse response function (VIRF) in which random shocks are drawn from the estimated data generating process and a baseline scenario is not included. In the present paper, Hafner and Herwartz's (2006) definition was used to perform the impulse-response analysis. The impulse response results are presented in Figure 1. In response to a one standard deviation shock to inflation uncertainty resulted in a rise in tax revenues while its' first response was negative. Following one standard deviation shock to the inflation uncertainty, the public expenditures and output growth appeared to decline after responded positively for the first few periods.

5. Conclusion

Although monetary policies were employed to reduce inflation prior to the transition to inflation targeting, this approach had only limited success due to crises caused by political and macroeconomic imbalances, price instability, and poor risk management. In developing countries that have experienced inflation problems, such as Turkey, it is important to analyse the interactions between the real economy and inflation in periods of uncertainty when shaping economic policies. In this paper, the impact of inflation uncertainty on economic performance and selected fiscal policies was examined under the inflationtargeting regime that has been in place in Turkey since 2003. This paper specifically focused on the success of the inflation-targeting regime and the effect of inflation uncertainty on tax revenues and public expenditures in Turkey, which can serve as a template for developing countries and countries involved in the E.U. accession process. This paper sought to contribute to the literature by focusing on the effects of inflation uncertainty, using selected macroeconomic variables during low- and high-inflation periods, to fill the gaps between inflation processes, economic performance, tax revenues and public expenditures. Since the coefficients of the defined dummy variable and the interaction term obtained by multiplying the dummy variable by inflation uncertainty were statistically significant, this analysis concluded that the effects of inflation uncertainty differed across real economic indicators and that structural changes occurred in the Turkish economy both before and after 2003. It was found that the inflationtargeting regime was successfully implemented in Turkey.

As inflation uncertainty increased, inflation also increased both before and after 2003. This supports studies conducted by Cukierman and Meltzer (1986) and Bhar and Mallik (2013). An increase in inflation uncertainty leads to an increase in unexpected inflation. Since realized inflation is the sum of expected inflation and unexpected inflation, higher unexpected inflation increases inflation. Additionally, regarding the interaction term, the impact of inflation uncertainty on inflation was smaller after inflation targeting.

The finding that before 2003, inflation uncertainty had an increasing effect on output growth is consistent with the results presented by Dotsey and Sarte (2000). During this period, since consumption expenditures contributed to savings, the increase in inflation uncertainty increased the demand for goods and services (i.e., total demand) due to high inflation. In other words, during periods of high inflation, the return on real assets increased, and the substitution relationship between money in the hands of individuals and real assets was high. In this situation, individuals rapidly channelled excess money to commodity markets.

The finding that after 2003, inflation uncertainty had a decreasing effect on output growth is consistent with most previous studies. During this period, the gradual and continuous decrease in inflation made the prices of goods observable to economic actors. Furthermore, the fact that the prices did not increase as they had earlier and most prices remained nearly at the same level became common for economic actors. In this regard, consumption expenditures were not determined consistently with the goal of obtaining higher savings. Thus, money became a substitute for financial assets rather than real assets. In other words, during periods of increased inflation uncertainty, individuals rapidly channelled their excess money into financial markets rather than into commodity markets. Consequently, total demand decreased, reducing economic growth.

Before 2003, while inflation uncertainty decreased the real value of tax revenues, it boosted public expenditures. A high public debt burden can make it difficult to meet inflation targets because it influences inflation expectations, the harmonious operation of fiscal policy, and public debt management, which are important for realizing inflation targeting. After the 1990s, an imbalance between income and expenditures was observed in the Turkish economy due to the government's inability to collect tax revenues to meet expenditures. This was the result of financing problems in the industrial and service sectors, increases in taxes and input costs, and reduced efficiency in the agricultural sector. During this time, depending on the tax structure, the limited price flexibility of taxes and long terms given for tax payments caused inflation uncertainty, thereby eroding the real value of tax revenues. Additionally, the penalties for negligent delays were lower than inflation, causing taxpayers to purposefully delay their tax payments.

The inflationary effects of monetized public deficits were neglected. As a result of applying both seigniorage and higher domestic and foreign borrowing with more intense fiscal dominance, a shallow capital market formed. The balance was upset due to the transition to higher tariffs for upper-income tax brackets. Individuals attempted to increase their real incomes by reducing the negative impact of price increases on spending patterns, in effect spending more than they earned. This increase in public expenditures led to inflation, which, in turn, led to a further increase in public expenditures, thus creating a vicious cycle. Moreover, inflation uncertainty caused inflation, which increased tax revenues prior to 2003. While the Tanzi effect (Tanzi, 1977) was observed during this period, no reverse Tanzi effect was observed. In contrast, after 2003, the reverse occurred; i.e., due to lower inflation rates than in the pre-2003 period, tax revenues rose, and public expenditures decreased, observations consistent with Tanzi's (1989) findings. The fact that the rate of inflation uncertainty did not erode tax revenues but instead increased them during this period can be attributed to the temporary tax application implemented in 1999. This application was an important measure to avoid the Tanzi effect because it restricted tax collection after the end of a calendar year. Collections were changed to a quarterly basis, which decreased the time between accrual and collection. Additionally, tax amnesties issued after 2003 increased tax revenues; measures were implemented to register uncollectable tax receivables as revenue and combat bureaucratic informality. During this period, rather than making investments, public financing deficits were reduced. Hot money, the density of which increased with capital movements, made holding large reserves necessary in response to speculative capital. This situation caused scarce financial resources to be withdrawn passively from the system, thereby preventing them from being used for savings and investment. Due to the increased external debt and aggravated debt interest burden on the budget, monetary authorities postponed public investments or failed to implement investments to discharge these debts.

The relationships among inflation uncertainty, tax revenues, and public expenditures are important during periods not only of high inflation but also low inflation. Within the framework of the decreasing inflation experienced recently in the Turkish economy, obtaining tax revenues primarily through indirect taxes may not provide the same positive effect on tax revenues that could be realized with decreased inflation. If the effect of inflation uncertainty on public expenditures is more tangible than its effect on tax revenues, decreased inflation in an economy already experiencing decreasing inflation could boost the real value of tax revenues.

Simultaneously, inflation uncertainty may adversely affect real budget balances by causing an increase in the real value of public expenditures. In addition to budget deficits and the debt burden, economic contraction and difficulties in implementing fiscal policy can make the execution of effective debt policy difficult. Thus, monetary and fiscal policies should be implemented in coordination. Fiscal policies must move towards a goal of providing stability in the medium term rather than in the short term. Another important issue is the independence and reliability of central banks. Central banks should attempt to keep inflation stable and low. An independent central bank that is free from political influence may be able to exhibit predictable behaviour and policy in achieving domestic economic stability and reducing the risk premium on real interest rates.

Inflation targeting in Turkey decreased the inflation rate and volatility, improved expectations, and largely resolved inflation inertia. In a system with corrupt fiscal policies, even if financial discipline is attempted, it cannot be permanent. However, although an inflation-targeting regime results in lower inflation, it is possible to achieve price stability by harmonizing monetary and fiscal policy. In this context, future studies should examine the effects of inflation uncertainty on the economic system, along with the interactions of monetary and fiscal policy variables, to stimulate the formation of more effective policies.

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CHAPTER V

DOES FINANCIAL STRUCTURE MATTER FOR LONG RUN ECONOMIC GROWTH IN TÜRKİYE?

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1. Introduction

For more than a hundred years, economists have engaged in discussions regarding the relative advantages of systems centered around banks versus those centered around stock markets in terms of mobilizing resources and promoting economic growth. The discussions unfold in the following manner: Does the financial structure (FS) have significance for economic growth (EG)? Is a market-oriented FS of greater importance for EG compared to a structure centered around banks, or is it the other way around? Do markets and banks compete with each other, or do they complement one another? The results are contradictory.

Specifically, this research examines whether a financial system primarily centered on markets contributes more to EG compared to a system focused on intermediaries (and vice versa) in Turkiye. Several factors contribute to the selection of Turkiye as the primary focus of this study. Firstly, following the repercussions of the 2008 financial crisis, Turkiye experienced significant inflows of foreign capital at affordable rates. Through loans granted by banks or investments in the stock market, Turkish residents were able to benefit from Turkiye's foreign resources. The swift expansion of credit within the Turkish economy in recent times, coupled with the rise in the stock market's proportion to the Gross Domestic Product (GDP), has additionally amplified the influence of the FS on diverse macroeconomic factors. Secondly, while existing literature indicates that market-based financial systems tend to have a stronger impact on EG in advanced nations, and bank-based financial systems are more influential in less developed countries, establishing a consistent pattern for the influence of FS on EG in developing nations, particularly in upper-middle-income countries like Turkiye, remains challenging. Finally, the literature indicates a noticeable connection between financial development (FD) and EG, yet it's important to highlight the scarcity of studies focusing on the relationship between FS and EG. Moreover, to the best of my knowledge, the effect of FS on EG for Turkiye has not been studied.

This study looked into the short and long-term influences of FS on EG in Turkiye between 1993 and 2020. For this aim, "Autoregressive Distributed Lag (ARDL)" model based on bound testing is employed. The decision to use the ARDL cointegration test was based on its numerous advantages over other cointegration tests. The key discovery of this research is that the composition of the financial system plays a crucial role in shaping both the short-run and long-run EG in Turkiye. Empirical results show that the financial system is more bank-based in Turkiye. Moreover, there is bidirectional causality between FS and EG in the long run.

The subsequent sections of this paper are structured in the following manner: The succeeding section provides a concise overview of the theoretical framework and relevant literature. In Section 3, details about the data and variables are outlined. The econometric approach and outcomes are presented in Section 4. The paper concludes with Section 5.

2. A Brief Theoretical and Literature Review

In his research titled "*Financial Structure and Development*," Raymond W. Goldsmith (1969) aimed to accomplish three distinct goals: "How do FS alter as economies develop?"; "How overall financial development impact on economic growth?" and "Does FS influence the pace of economic growth?". Many subsequent studies have contributed theoretically and empirically to Goldsmith's second research question.¹ However, there have been a limited number of research efforts focused on examining the influence of FS on the growth of the economy.

¹ See for detailed literature review Bijlsma et al. (2018), Valickova et al. (2015), Bijlsma and Dubovik (2014), and Ang (2008).

A variety of competing theories of FS can be considered in order to understand the relationship between FS and EG. These include the bank-based, market-based, financial services, and law and finance perspectives.²

The *bank-based perspective* emphasizes the beneficial role of banks in "(i) acquiring information about firms and managers and thereby improving capital allocation and corporate governance (ii) managing cross-sectional, intertemporal, and liquidity risk and thereby enhancing investment efficiency and economic growth (iii) mobilizing capital to exploit economies of scale" (Levine, 2002).

Additionally, it underscores the limitations of market-based financial systems.

• Advanced markets quickly reveal information, reducing incentives for individual investors to seek more data. Banks address this by forming long-term relationships with firms and avoiding immediate public disclosure of information (Stiglitz, 1985).

• Banks are more efficient than markets in providing financial support for industrial expansion, particularly for underdeveloped countries (Gerschenkron, 1962).

• Banks outperform uncoordinated markets in monitoring firms and mitigating post-lending moral hazard (Boot & Thakor, 1997)

Some of the first studies to emphasize the importance of the bank-based financial system for economic growth are as follows: Gerschenkron (1962), Diamond (1984), Stiglitz (1985), Boyd & Prescott (1986), Bencivenga & Smith (1991), Bhide (1993), and Stulz (2002).

By contrast, the *market-based theory* emphasizes the benefits of efficient markets in fostering successful economic performance while pointing out the drawbacks of bank-based financial systems (Luintel et al., 2008). It highlights in "(i) fostering greater incentives to research firms since it is easier to profit from this information by trading in big, liquid markets (ii) enhancing corporate governance by easing takeovers and making it easier to tie managerial compensation to firm performance, and (iii) facilitating risk management" (Levine, 2002). The market-based perspective also emphasizes the shortcomings of banks.

² This study focuses on the first two perspectives.

• Dominant banks have the ability to hinder innovation by extracting profits from information and shielding established companies, with whom they have strong ties, from competitive pressures.

• Influential banks operating with limited regulatory constraints may collaborate with firm managers to the detriment of other creditors, obstructing effective corporate governance. (Levine, 2002, and Beck & Levine, 2004).

• Competitive capital markets play a constructive role in consolidating dispersed information cues and efficiently conveying them to investors, resulting in advantageous outcomes for firm financing and overall economic performance (Boot & Thakor, 1997).

• The market-based perspective emphasizes that markets will alleviate the inherent inefficiencies linked to banks and promote economic growth (Luintel, 2008).

Some of the earlier studies to emphasize the importance of the marketbased financial system for economic growth are as follows: Jansen & Murphy (1990), Holmstrom & Tirole (1993), Boot & Thakor (1997), Levine (1997), Wenger & Kaserer (1998), and Boyd & Smith (1998).

The *financial service perspective* actually aligns with both the bank and market-oriented perspectives. However, it downplays the significance of the debate between bank and market-based approaches, and highlights that the significance of financial services themselves outweighs the manner in which they are provided. This view stresses that "financial arrangements – contracts, markets, and intermediaries – arise to ameliorate market imperfections and provide financial services. That is, financial arrangements arise to assess potential investment opportunities, exert corporate control, facilitate risk management, enhance liquidity, and ease savings mobilization. By providing these financial services more or less effectively, different financial systems promote economic growth to a greater or lesser degree" (Levine, 2002). The concern lies not in the origin of funding but in establishing a conducive atmosphere for the effective delivery of financial services. The focus is on establishing well-functioning banks and markets, rather than fixating on the specific financial arrangement (Luintel, 2008).

Lastly, *the law and finance perspective* underscore the significance of the legal system in shaping a financial sector that fosters economic growth.

La Porta, Lopez-de-Silanes, Shleifer & Vishny (1998) describes the process through which countries of various legal backgrounds formulate unique regulations that oversee contracts involving debt and equity. Experts have identified four primary legal groups: "English Common Law, French Civil Law, German Civil Law, and Scandinavian Civil Law" (Demirgüç-Kunt & Levine, 2001). These legal groupings handle equity and debt contracts in distinct manners. The resulting variations in the contractual atmosphere have had significant effects on the development of intermediaries and securities markets. Nations with a Common Law tradition are more prone to possess financial systems that are based on markets, in contrast to countries with alternative legal origins. Less developed financial systems tend to be associated with French Civil Law legal systems more frequently than with legal systems originating from other sources. La Porta et al. (1998) demonstrates that in Common Law countries, there is a tendency to emphasize the rights of minority shareholders, leading to positive effects on the development of securities markets. On the other hand, nations following a French legal heritage do not prioritize the rights of minority shareholders, resulting in unfavorable impacts on the operation of equity markets ((Demirgüç-Kunt & Levine, 2001).

Assessing the advantages and disadvantages of bank-based financial systems compared to market-based financial systems have an extensive history. However, there is little agreement on both the theoretical and empirical level. The discussions have mainly centered around four nations: Germany, Japan, England and United States. Germany and Japan are characterized by a financial structure centered around banks, as most financial transactions are conducted primarily through banking institutions whereas England and the United States are described by market-based financial structures. However, there is a significant gap in the comparisons of market-based and bank-based financial systems. They concentrate on a limited range of nations possessing comparable GDP per capita, ensuring that these countries exhibit closely aligned long-term growth rates. If one acknowledges that these countries share remarkably similar long-term growth rates, it suggests that the significance of financial structure might have been relatively insignificant (Demirgüç-Kunt & Levine, 2001). This fundamental critique has also motivated researchers to investigate individual countries as well as various groups of nations. The general framework of the studies on financial structure and economic growth can be summarized as follows:

• Studies that differ in terms of econometric methodology, that is, time series or panel data approaches and using micro-scale data at the firm level.

Arestis, Demetriades & Luintel, (2001) and Luintel (2008) indicate that relying on panel estimates could lead to deceptive results when examining countries, industries, and individual firms. Overlooking variations in parameters among firms, industries, and nations could introduce bias into the estimates. Given that countries around the world are in various phases of economic advancement, it is not prudent to presume that the effects of financial services are uniform or consistent across all nations (Liu & Zhang, 2020). Levine & Zervos (1996) assert that panel regressions hide significant distinctions between countries and are plagued by issues related to measurement, statistics, and conceptual aspects

• Studies that establish a relationship between only one dimension of financial structure (market or bank) and economic growth.

Certain economies have undergone notable growth in their stock markets, whereas others have witnessed advancements in their banking sectors. This circumstance has prompted researchers to analyze the components of financial structure independently within the production function. Put differently, research focusing solely on the impacts of either the stock market or the banking market on economic growth has arisen.

• Studies showing that financial structure does not matter for economic growth.

Within this realm of research, a subset of studies concludes that financial services do not significantly influence economic growth (e.g., Beck et al., 2000; Beck & Levine, 2002; La Porta, Lopez-de-Silanes, Shleifer & Vishny, 2000; Levine, 2002) Instead, they contend that factors such as financial development (FD) and legislative frameworks dictate the pace of economic growth.

• Studies focusing on the short and long-run causality between financial structure and economic growth.

There are studies available that explore the connection between financial structure and economic growth using a perspective other than regression models or the concept of cointegration specifically, through the lens of causality. Nevertheless, it can be observed that there are fewer of such studies. The purpose

of these studies to show whether a certain financial system is a good predictor of economic growth, or vice versa.

• Studies establishing a relationship between financial structure and other macroeconomic variables such as poverty, income inequality etc.

While studies have explored the connection between FS and EG, limited research has been undertaken to examine if systems centered around banks are more prone to causing poverty and income inequality compared to systems based on markets.

• Studies showing that banks and markets are complementary in providing financial services

Newly conducted studies have determined that economic performance relies on both banks and stock markets, and these two components are interdependent and supportive of each other. From the perspective of financial services, whether the financial system is primarily centered around banks or focused on stock markets holds minimal significance for economic results.

An examination of research concerning Turkiye indicates that while there are numerous studies exploring the link between FD and EG (Kar & Pentecost, 2000; Aslan & Küçükaksoy,2006; Kandır, İskenderoğlu & Önal, 2007; Altunç, 2008; Özturk, Barışık & Darıcı, 2010; Özcan & Ari, 2011; Hayaloğlu, 2015; Çeştepe & Yıldırım, 2016) it is noteworthy that there hasn't been any research conducted on the relationship between FS and EG. Table 1 displays a selection of some studies from the literature.

Review
Literature
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Table

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Ergungor (2008)	46 Countries	1980-1995	Two-stage least	The finding supports bank-based view.
			squares with	
			heteroscedasticity-	
			consistent standard	
			errors	
Luintel, Khan, Arestis &	14 Countries	1978-2005	FMOLS	In a majority of countries, the FS plays
Theodoridis (2008)			and Dynamic	a significant role in elucidating output
			Heterogeneous	levels.
			Panel Estimator	
Wu, Hou & Cheng (2010)	13 EU Countries	1976-2005	Panel Cointegration	There exists a long-run equilibrium
				relationship
				among banking market development,
				stock market development and economic
				development.
Cooray (2010)	35 Developing	1992-2003	OLS and GMM	The stock
	Countries			market enhance growth.
Ahmed & Wahid (2010)	7 African	1986-2007	Panel Cointegration	Both market-based and bank-based
	Developing			financial systems are important for
	Countries			explaining
				output growth.
Baum, Schäfer & Talavera	30,000 firms	1989-2006	Panel Data	FS matter. Bank-based financial system
(2011)			Regression	offers restricted companies a more
				accessible pathway to external funding.

Kpodar & Singh (2011)	47 Developing	1984-2008	System GMM	Bank-based systems are better for
	Countries			poverty reduction with weak institutions,
				while market-based systems work as
				institutions strengthen.
Lee (2012)	U.S., U.K., Japan,	Different sample	Granger Causality	The stock market played an important
	France, Germany	periods for each		role in financing economic growth in the
	and South Korea	country		U.S., the U.K., and Japan, whereas the
				banking sector played a more important
				role in Germany, France, and Korea.
Cheng (2012)	Taiwan	1973-2007	Time Series	There is a substitution effect between
			Cointegration	credit and equity markets.
Demirgüç-Kunt, Feyen, &	72 Countries	1980-2008	Quantile Regression	Economic activity and bank
Levine (2013)				development tend to fall as economies
				grow, whereas economic activity and
				securities market development tend to
				rise.
Ujunwa, Salami, Nwakoby	Nigeria	1992-2008	STO	Bank-based system enhances economic
& Umar (2012)				growth.
Deltuvaitė & Sinevičienė	22 Countries	1990-2011	ARDL Bound Test	Unidirectional and bidirectional
(2014)				causality results were found between FS
				and EG.
Gambacorta, Yang $\&$	41 Countries	1989-2011	Panel Data	The banks and markets both foster
Tsatsaronis (2014)			Regression	economic growths.

Castro, Kalatzis & Martins-	404 Brazilian Firms	1998-2006	System GMM	The structure of the financial system
Filho (2015)				impacts a firm's investment behavior.
Kim, Lin & Chen (2016)	33 Industries in 42	1980-1990	OLS and IV	A financial system based primarily on
	Countries			banks accelerates the growth of small
				businesses.
Brei, Ferri & Gambacorta	97 Countries	1989-2012	System GMM	Market-oriented funding increases
(2019)				income inequality, while bank lending
				increases inequality.
Liu & Zhang (2020)	29 Chinese	1996-2003	Panel Quantile	Market-based financial system is more
	Provinces		Regression	helpful than a bank-based system.
			and GMM	
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Note: FMOLS, OLS, IV, GMM and 1FP refer fully modified ordinary least squares, ordinary least squares, instrumental variable, generalized method of moment and total factor productivity, respectively.

3. Data and Variables

This study utilizes time series data that encompasses the years from 1993 to 2020. Real gross domestic product per capita (GDP), based on constant 2015 US\$, is the dependent variable. In line with Arestis et al. (2001) and Arestis et al. (2010), as a proxy of FS, this study uses the ratio of the size of stock markets to the size of the banking system (SBR). To measure stock market size, stock market capitalization, defined as the "total value of all listed shares in a stock market as a percentage of GDP" is used. The size of the banking system is represented by private credit by deposit money banks to GDP (%). The significance of the parameter of SBR is crucial rather than its sign. A significant (insignificant) coefficient implies that FS matters (does not matter). The market-based financial system is represented by a negative and significant.

Fivecontrolvariables are used in the study: Physical capital stock, government expenditure, education, trade and structural break dummy. To represent physical capital stock (K), the ratio of gross fixed capital formation (measured in constant 2015 US\$) to the population is applied. General government final consumption expenditures as a share of GDP (GOV) represent all government purchases of goods and services. The gross school enrollment ratio (EDU) is the ratio of the total enrollment of secondary education, regardless of age, to the population of the age group. Exports and imports of goods and services as a percentage of GDP (TRADE) measure trade openness. The structural break dummy variable is constructed as 0 for pre-2001 and 1 for other years. GDP, GOV, EDU, and TRADE variables are acquired from World Bank World Development Indicators Database, while stock market capitalization and private credit by deposit money banks World Bank Global Financial Development Database. All of the variables used in the model are converted into natural logarithms. Summary statistics of data are shown in Table 2.

Variables	Mean	Std. Dev.	Min.	Max
GDP	8.986	0.264	8.589	9.398
SBR	-0.240	0.610	-1.195	0.998
K	0.508	0.342	-0.191	1.039
GOV	2.579	0.103	2.362	2.750
EDU	4.426	0.192	4.059	4.663
TRADE	3.885	0.143	3.497	4.138

Table 2. Descriptive Statistics

4. Econometric Methodology

It is applied a generalized Cobb-Douglas production function as follows:

$log (Q/L)_{t} = \beta_{0} + \beta_{1} log (K/L)_{t} + \beta_{2} log (SBR)_{t} + x_{tj} \beta + u_{t}$ (1)

where Q, L, K and SBR are output, labour, capital stock and FS, respectively. $\hat{a} = (\beta_3, ..., \beta_k)'$ be the $(k+1) \times 1$ vector of parameters of all control variables, and $x_{ti}, j = 3, ..., k$, are control variables.

This study employed the ARDL approach developed by Pesaran et al. (2001) to test whether FS influences economic growth. Since the end of the 1990s, several econometric methods have been developed to reveal longrun ties among time series. A number of earlier procedures were conducted by Engle & Granger (1987), Phillips & Hansen (1990), Johansen & Juselius (1990), and Johansen (1992). However, these methods have some limitations. For example, Engle & Granger's (1987) approach is not useful for multivariate cases; Johansen & Juselius's (1990) and Johansen's (1992) methods require all variables must be non-stationary and integrated in the same order, I (0) or I (1). ARDL is superior to these other strategies in several ways. First of all, irrespective of whether the underlying regressors exhibit pure I(0), pure I(1), or mutual cointegration characteristics, this approach examines the presence of a connection between variables at their original levels (Pesaran, Shin & Smith, 2001). Secondly, it circumvents issues related to serial correlation and endogeneity (Ghatak & Siddiki, 2001). Thirdly, the model being analyzed enables the concurrent estimation of both long-run and short-run parameters (Halicioglu, 2008). In conclusion, the estimates demonstrate higher efficiency and consistency, particularly when dealing with small sample sizes (Narayan, 2004).

ARDL consists of several steps. *Initially*, the process involves testing the stationarity of the time series. The ARDL model does not permit the inclusion of I(2) series in the analysis. Conventional Augmented Dickey-Fuller (ADF) (1979,1981) and Phillips Perron (PP) (1988) unit root tests are employed. *The next stage* involves identifying and analyzing structural breaks within the time series. The Zivot & Andrews (2002) unit root test is used to determine structural breaks. *The third step* is testing the cointegration between the variables. Equation (1) can be written as an ARDL formula as the model with intercept and trend. Let $z_t = (GDP_t, SBR_t, K_t, GOV_t, EDU_t, TRADE_t) = (GDP_t, x_t)$. Then ARDL model can be written as

$\Delta GDP_t = \beta_0 + \beta_1 t + \beta_2 D2001 + \beta_3 GDP_{t-1} + \pi x_{t-1} + \sum_{i=1}^l \theta_i' \Delta GDP_{t-i} + \sum_{i=0}^l \psi_i' \Delta x_{t-i} + \varepsilon_t$ (2)

where π , θ , and ψ are vector of parameters. The ARDL approach follows several steps. First, Equation (2) estimates with ordinary least squares to show a long-run relationship between variables. The parameters θ and ψ are the short-run coefficients and π is the corresponding long-run coefficients. Joint significance of the coefficients lagged levels of variables show whether cointegration exists. According to test, null hypothesis is H₀ : $\pi = 0$ against the alternative hypothesis H₁ : $\pi \neq 0$. Decision rule is based on the F test. Based on a given significance level, Pesaran et al. (2001) calculated two sets of critical values. In one set, all variables are assumed to be I(0) (*lower bound*), while in the other, all variables are assumed to be I(1) (*upper bound*). However, Narayan (2004) and Narayan (2005) discussed that critical values obtained by Pesaran et al. (2001) are incompatible with small sample sizes. Thus, he calculated new critical values for sample sizes ranging from 30-80 observations. Considering 28 observations, it is taken into account Narayan's critical values in the present study.

There are three cases. First, if the estimated F statistic exceeds the upper bound critical value I(1), the null hypothesis will be rejected. It implies that there is a cointegration relationship among variables. Second, if the estimated F statistic is less than the lower bound critical value I(0), the null hypothesis will not be excluded. It implies that there is no cointegration link among variables. Third, if the computed F statistic falls into the bounds, then the test becomes inconclusive. Optimal lag l in Equation (2) is chosen based on model selection criteria such as Akaike (AIC) or Schwarz (SIC). The minimum information criteria imply optimal l.

If there is a cointegration, *the fourth stage* of the analysis estimates the coefficient of the long-run relationship determined in the third step. Long-run selected ARDL (h, l) model (3) as follows:

$GDP_t = \beta_0 + \beta_1 t + \beta_2 D2001 + \sum_{i=1}^h \theta_i' GDP_{t-i} + \sum_{i=0}^l \psi_i' \boldsymbol{x}_{t-i} + \varepsilon_t$ (3)

To select lag values h and l in Equation (3), model selection criteria such as AIC or SIC, as done in the third step, are used.

Finally, the error correction model (ECM) is estimated to provide for short-run coefficients of the ARDL model. Equation (4) is below:

$\Delta GDP_t = \beta_0 + \beta_1 t + \beta_2 D2001 + \sum_{i=1}^l \theta_i' \Delta GDP_{t-i} + \sum_{i=0}^l \psi_i' \Delta x_{t-i} + \lambda ECM_{t-1} + \varepsilon_t$ (4)

where λ is the speed of adjustment coefficient, and ECM is the residuals provided from the estimated cointegration model of Equation (2).

ARDL cointegration approach suggests five different models defined according to their deterministic features. These five models are the model with no intercept and no trend (case I), the model with the restricted intercept and no trend (case II), the model with unrestricted intercept and no trend (case III), the model with unrestricted intercept and restricted trend (case IV), and the model with unrestricted intercept and unrestricted trend (case V). (Pesaran et al., 2001). A null hypothesis rejected by the F-bounds test does not necessarily imply the existence of cointegration. For unrestricted models (Case I, III, and V), if the F-bounds test rejects the null hypothesis, the t-bounds test approach can be employed to examine whether cointegration actually exists. The null hypothesis for unrestricted models is as follows:

$$H_0: \beta_3 = \pi = 0$$

However, the alternative hypotheses appear in three different forms as follows:

$$H_{1A}: \beta_3 = 0, \ \pi \neq 0$$
$$H_{1B}: \beta_3 \neq 0, \ \pi = 0$$
$$H_{1C}: \beta_3 \neq 0, \ \pi \neq 0.$$

and

The first and second forms imply cointegration is nonsensical and degenerate, respectively. However, the third form indicates that cointegration is valid. Case V is selected to estimate models as it is mostly used and in line with the literature.

5. Empirical Results

5.1. Unit Root Tests for Stationary

It can be challenging to select the ideal unit root test when performing a practical application. Enders (1995) recommends employing both the ADF and PP tests cautiously. A higher level of confidence in the results is achieved when these tests agree with each other. Tables 3 and 4 show the results of the ADF and PP unit root tests for the intercept and intercept and trend models.

	Inte	rcept	Intercept	and Trend
Variables	Level	First Diff.	Level	First Diff.
GDP	0.0718	-5.369	-2.804	-5.183
	(0.957)	(0.000)***	(0.207)	(0.001)***
SBR	-0.890	-9.953	-3.332	-9.782
	(0.775)	(0.000)***	(0.082)*	(0.000)***
K	-4.909	-9.144	-5.281	-3.854
	(0.000)***	(0.000)***	(0.001)***	(0.034)**
GOV	-1.534	-7.596	-5.013	-7.433
	(0.501)	(0.000)***	(0.002)***	(0.000)***
EDU	-1.613	-4.798	-1.881	-4.869
	(0.462)	(0.000)***	(0.636)	(0.003)***
TRADE	-2.997	-4.624	-4.628	-4.609
	(0.047)**	(0.001)***	(0.005)***	(0.006)***

Table 3. ADF Unit Root Test Results

Table 4. PP Unit Root Test Results

	Inte	rcept	Intercept	and Trend
Variables	Level	First Diff.	Level	First Diff.
GDP	0.0718	-5.350	-2.892	-5.172
	(0.957)	(0.000)***	(0.180)	(0.001)***
SBR	-1.938	-10.285	-3.312	-10.388
	(0.310)	(0.000)***	(0.085)*	(0.000)***
K	-4.927	-21.855	-5.280	-24.304
	(0.000)***	(0.000)***	(0.001)***	(0.000)***
GOV	-1.257	-12.471	-5.020	-11.554
	(0.634)	(0.000)***	(0.002)***	(0.000)***
EDU	-1.624	-4.790	-1.881	-4.864
	(0.457)	(0.000)***	(0.636)	(0.003)***
TRADE	-3.041	-11.458	-4.176	-11.682
	(0.043)**	(0.000)***	(0.014)**	(0.000)***

The results show that GDP and EDU are non-stationary at the level and stationary at their first differences. The results obtained from different unit root approaches and different unit root equations support each other. However, the remaining variables show mixed stationary types depending on model selection and unit root tests. Overall, the ARDL model is applicable under these circumstances since the series presents I(0) or I(1).

If the series has a structural break, traditional unit root tests can detect a stationary series as non-stationary (Mert & Çağlar, 2019). In order to address this issue, we employ the structural break unit root test. The results are presented in Table 5.

]	Model A			Model B	
	(]	[ntercept)			(Trend)	
Sig. Level	1%	5%	10%	1%	5%	10%
Critical Value	-5.34 -4.93 -4.58			-4.80	-4.42	-4.11
Variables	t-Stat			istic		
GDP	-4.960(2001)**			-5.126(2002)***		***
SBR	-4.	277(1999)	-4	.120(2001)*

Table 5. Zivot and Andrews Unit Root Test Results

The null hypothesis posits that the series lacks structural breaks, whereas the alternative hypothesis suggests that the series is stationary, but with unidentified structural breaks occurring at some point. A structural break is observed in 2001 for both GDP and SBR variables. Consequently, when these variables serve as the dependent variable in the ARDL model, a dummy variable is introduced and incorporated.

5.2. Cointegration

The summary results of bound tests are presented in Table 6.

	Model 1
	$F(GDP_t SBR_t, K_t, GOV_t, EDU_t, TRADE_t D2001)$
ARDL	ARDL (1,2,0,2,2,1,0)
F-Stat.	36.895***
t-Stat.	-4.722***
Result	Cointegration
	Model 2
	$F(SBR_t GDP_t, K_t, GOV_t, EDU_t, TRADE_t, D2001)$
ARDL	ARDL (3,1,1,1,1,1)
F-Stat.	3.081
t-Stat.	-2.389
Result	No Cointegration

Table 6. Cointegration Results

In model 1, the computed F statistical values surpass the upper critical values, leading to the rejection of the null hypothesis that cointegration does not exist. The bounds test using F statistics suggests potential cointegration between the series, but it is crucial to verify the validity of this cointegration by examining the results of the t-bound test. The calculated t statistics are greater than the upper critical values for all levels of significance for model 1. It verifies the legitimacy of the cointegration relationship between the series.

5.3. Long Run Elasticities

The fourth stage of the analysis is to estimate the coefficients of the longrun relationship determined in the previous step. The results are reported in Table 7.

	Coeffi	cients
Variables	Model 1	Model 2
GDP	-	-3.009
		(0.023)**
SBR	-0.181	-
	(0.000)***	
K	-0.169	-0.860
	(0.005)*	(0.006)***
GOV	-1.473	-4.324
	(0.001)***	(0.085)*
EDU	-0.528	-1.076
	(0.038)**	(0.398)
TRADE	0.016	0.287
	(0.833)	(0.530)
D2001	0.205	0.773
	(0.024)**	(0.090)*

Table 7. Long-Kun Coemcients	Fable '	7. Long	g-Run Co	oefficients
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The long-run test results reveal that the SBR variable appears significant in model 1. Since the sign of SBR is negative, it shows that the financial system is more bank-based in Turkiye. In other words, financial structure significantly affects per capita GDP in the long-run in Turkiye.

The long-term elasticity of GDP concerning K is unexpectedly negative and highly significant for Turkiye. While a positive value for the elasticity of capital is more common and intuitive, a negative value is theoretically possible and may be observed in specific cases where production inefficiencies arise due to excessive capital usage. Government expenditure can have adverse effects on economic growth if it leads to the displacement of private entrepreneurs in the market, causes economic rent, and generates market distortions. Raising expenditure in the public sector, but directing it towards less productive sectors, can also yield detrimental consequences. While education is generally considered a key driver of economic growth and development, there are certain conditions or factors that can lead to adverse effects: Mismatch between skill and labour market, brain drain, educational debt burden, lack of market demand, quality of education and income inequality.³ The models show no effect of trade variables on economic growth.

5.4. Diagnostics

The appropriate ARDL model should not have serial correlation, heteroscedasticity, specification, or normality problems, and parameter estimates should be stable. If no diagnostic issues are present, it indicates that the goodness of fit criteria for ARDL models have been satisfied. A range of diagnostic and stability tests are conducted to attain this objective. Breusch (1978) and Godfrey's (1978) Lagrange Multiplier (LM) test for serial correlation; Ramsey's (1969) RESET test for functional form; Breusch & Pagan's (1979) test for heteroscedasticity; Jarque & Bera's (1980) test for normality are employed.

The diagnostic assessments of the models reveal the absence of autocorrelation, heteroskedasticity, and model specification error. The condition of normality assumption is also satisfied. Table 8 shows the diagnostic test results.

Diagnostic Tests	Model 1	Model 2
Serial Correlation (Breusch-Godfrey)	2.581	2.302
	(0.136)	(0.181)
Heteroskedasticity (Breusch-Pagan)	0.702	0.448
	(0.739)	(0.917)
Model Specification (Ramsey-Reset):	0.103	0.118
	(0.919)	(0.909)
Normality (Jarque-Bera):	2.212	1.527
	(0.330)	(0.465)

Table 8. Diagnostic Test Results

³ For detail discussions see Checchi (2006).
The test for parameter stability relies on two metrics: the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ). Figures 1 and 2 present the parameter stability test results.







Based on the stability tests, all coefficients demonstrate stability.

5.5. Short Run Elasticities

The *ECM* is utilized to estimate the short-run coefficients of the ARDL model. The findings are presented in Table 9.

Variables	Coefficients		
	Model 1	Model 2	
ΔSBR	-0.066		
	(0.000)***		
ΔSBR_{t-1}	0.023	0.252	
	(0.001)***	(0.000)***	
ΔSBR_{t-2}		0.135	
		(0.001)***	
ΔGDP		-5.362	
		(0.000)***	
ΔΚ		-1.116	
		(0.000)***	
ΔGOV	-0.470	-1.479	
	(0.000)***	(0.003)***	
$\Delta \text{GOV}_{\text{t-1}}$	0.165		
	(0.000)***		
ΔEDU	-0.034	0.502	
	(0.272)	(0.023)**	
ΔEDU_{t-1}	0.064		
	(0.058)*		
ΔTRADE	0.139	0.486	
	(0.000)***	(0.010)***	
Constant	7.219	20.013	
	(0.000)***	(0.000)***	
Trend	0.0218	0.045	
	(0.000)***	(0.000)***	
ECM _{t-1}	-0.501	-0.494	
	(0.000)***	(0.000)***	
\mathbb{R}^2	0.980	0.996	
F Statistics	87.246	356.070	
	(0.000)***	$(0.000)^{***}$	

The *ECM* is calculated as -0.501 in model 1. This coefficient must be negative and statistically significant for the ECM to function. Based on finding, the error correction coefficient is negative and statistically significant. It is anticipated that the deviations from the short-run equilibrium will improve after a 1/|-0.501|=1.99 period of time, meaning in 2 year, and reaching the long-run equilibrium in model 1.

5.6. Long Run Causality

A causal relationship between two time series might exist if some of the information in one series is derived from the other. The notion of causality requires examination from two distinct viewpoints. The first involves utilizing VAR models, while the second relies on causality derived from cointegration equations. Cointegration equations are used in this study to derive long-run causality.

To determine one or two-way long-run causality, it is conducted a bound test when SBR is dependent and economic growth is the independent variable (see Table 6, Model 2). The result indicates that there is no cointegration. It implies that there is unidirectional causality from SBR to GDP in the long run.

6. Conclusion

In this article, it has been analyzed the extensively discussed question of whether the arrangement of financial systems influences economic growth. A notable segment of recent empirical investigations focuses on analyzing datasets from numerous nations, taking into account corporations and industries. Nonetheless, concerns have been expressed regarding these studies conducted across multiple countries. These investigations overlook the differences between countries and parameters that are specific to each nation. Furthermore, creating a balanced panel dataset poses challenges when dealing with extensive sample sizes. This study aims to tackle these issues by focusing on a single country and employing time series methodologies. The differing theoretical perspectives on the financial structure in Turkey have been evaluated. An ARDL cointegration method was utilized to demonstrate that enhancing the significance of banks compared to markets within the financial system has positive effects on the Turkish economy. Furthermore, it is shown that there is a unidirectional causality from FS to EG in the long-run. The outcomes of this study offer opportunities for exploring various research domains in the future. There is potential to expand and enhance this study by examining the relationship between FS and additional macroeconomic variables within the context of Turkiye. Furthermore, this research exclusively concentrates on the magnitude of the financial system. Other factors such as the effectiveness, availability, and stability of the financial system could also be considered. Furthermore, as this study utilizes conventional time series methodologies, there's the potential to enhance and analyze it further by incorporating more contemporary time series techniques.

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CHAPTER VI

CARBON EMISSIONS OF AGRIFOOD SYSTEMS AND EXPORTS: ANALYSIS OF TÜRKİYE'S PER CAPITA EMISSIONS

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1. Introduction

Solution of the storm as a result of increasing global temperatures, but climate change increases the periodicity of such storms. Climate change has increased the world's temperature by approximately 1.41 °C from the pre-industrial period (1850–1900) to the present day (Anderson *et al.*, 2020). The global temperature increment has caused rising hot days and nights and decreasing cold days and nights. It also alters the number and seriousness of excessive weather incidents such as dryness and flooding on a regional basis. The development of industry was needed to provide the necessary living conditions for the globally increasing population. This has entailed increased land demand,

which in turn has led to the reduction of forests, resulting in significantly higher greenhouse gas (GHG) emissions.

GHG emissions are a global concern due to their impact on climate change (IPCC, 2021). Agricultural production contributes significantly to global GHG emissions. This causes producers and consumers to have a strong desire to understand the emissions associated with different foods and how they can be reduced. Global warming will negatively impact developing countries, more than developed countries, by sudden extreme weather events. However, these countries have limited resources to adapt to agricultural modifications. In order to ensure global food security in this new era, first attitudes, then the public, agricultural practices, and product types need to change (Anderson *et al.,* 2020).

Due to the importance of agrifood in the Turkish economy, the sector is directly or indirectly affected by developments in the world. Concerns about environmental issues, global warming, climate change, and their consequences, which are on the world's priority agenda, direct decision-makers to take concrete precautions. Natural events such as floods and storms, like those in Libya, which occur with increasing frequency, also raise awareness of the issue on the consumer side. Reducing increases in GHG emissions requires the world to tackle the issue from a holistic perspective.

The efforts to combat global warming have been concretized by classifying countries under the United Nations Framework Convention on Climate Change, the Kyoto Protocol, and later the Paris Agreement. Türkiye joined these efforts by signing the Paris Agreement in the developing country category. All stakeholders, public and private, need to take urgent precautions, as Türkiye is among the countries that will be most negatively impacted by global warming.

Türkiye has strategic commercial cooperation with the EU due to the Customs Union Agreement. Türkiye exports more than half of its exports to the EU. Changes in legislation and developments in consumer behaviour may negatively affect Türkiye's exports to the region. Compliance with EU legislation can both eliminate these setbacks and improve competitiveness around the world. In this context, the aim of the research is to investigate the change in per capita carbon emissions in agrifood systems between 1990 and 2020. Using FAO data, Türkiye's emissions are analysed by comparing them with different country groups. Since Türkiye is an important exporting country, it is clear that negative developments here will pose a threat to competition in the context of export marketing. Because country of origin emissions related to products have

the potential to be variables such as brand, origin, quality certificate, and image from a marketing point of view. The study will assist stakeholders in evaluating the issue from different angles.

2. Theoretical Framework

Global warming is an essential setback for the sake of humanity, threatening natural life and leading to a lack of welfare and security. Carbon dioxide (CO_2) emissions are the major element of GHGs. It accounts for roughly two-thirds of GHG emissions (Mundial, 2018). To achieve the Paris Agreement's target of lowering temperatures, global carbon emissions must be abated.

The agricultural sector, which is the basis and indispensable part of production, fulfills many functions in the economies of countries. But it has caused irreparable damage to the environment and brought about a large amount of carbon emissions, i.e., the agricultural sector is counted as the main source of global GHG and non-carbon dioxide (non-CO₂) GHG emissions. (Beach *et al.*, 2015). Vice versa, agricultural sector is extremely impacted by climate change while contributing significantly to it. Agriculture and land use change account for a quarter of total global GHG emissions (Laborde *et al.*, 2021).

The following is noteworthy regarding global anthropogenic GHG emissions in 2019 (FAO, 2021). The first and major contributor to global emissions was the energy sector, which expended fossil fuels with a total share of 70%. The second one was the agriculture, forestry, and other land use (AFOLU) sector, which comes together with the IPCC (Intergovernmental Panel on Climate Change) sectors, Agriculture and LULUCF (Land Use, Land Use Change, and Forestry) at 14% of total emissions. Industrial processes and product use (IPPU) were responsible for 9%, and waste for 5%. The balance belonged to the others, such as international transport.

On the other hand, local anthropogenic GHG emissions in 2021 (TUIK, 2023) are as follows: The largest share was recorded by energy-related emissions with 71.3%, followed by IPPU with 13.3%, agriculture with 12.8%, and the waste sector with 2.6%, as per CO₂ eq. in total GHG emissions in Türkiye.

Agrifood system activities that cause GHG emissions are classified in FAO records. In the literature, actions to be taken to combat GHG emissions have also been researched for product groups. Table 1 represents the classification of agrifood systems from IPCC to FAO categories. Here, it is shown what type of gas each activity produces.

IPCC		Agrifood Systems		GHG		FAO		
		Activity	CH ₄	N ₂ O				
	ĨŦ.	Net forest conversion	х	х	х	LAND USE CHANGE	AGRICULTURAL LAND	
		Tropical forest fires	х	х	Х			
	TULI	Peat fires	х		Х			
		Drained organic soils	х		Х			
		Burning – Crop residues	х	х				
		Burning – Savanna	х	х				
DLU	H	Crop residues		х				
FC	OF	Drained organic soils		х		TE		
		Enteric fermentation	х			FARM GA		
		Manure management	х	х				1S
	AGRI	Manure applied to soils		х				EN
		Manure left on pasture		х				LS/
		Rice cultivation	х					S
		Synthetic fertilizers		х				
		On-farm energy use	х	х	Х			FO
		Fertilizer manufacturing	х	х	Х			
GY		Processing	х	х	х			VV
ENER		Packaging	х	х	х			
		Transport	х	х	Х	ND POST UCTION		
		Household consumption	х	х	х			
		Retail – Energy use	х	х	Х			
INDUS	STRY	Retail – Refrigeration	х	х	х	E A OD		
ASTE		Solid food waste	х			PR		
		Incineration			х			
		Industrial wastewater	х	х				
M		Domestic wastewater	х	х				

Table 1: Tabulation of Agrifood Systems from IPCC to FAO Categories

Source: Tubiello et al., 2021

Agrifood systems emissions (FAO, 2021) were 17 Gt CO_2eq (31%) of total, formed of farm gate activities [7.2 Gt CO_2eq (13%)], land use change treats [3.5 Gt CO_2eq (7%)], and pre- and post-production treats [5.8 Gt CO_2eq (11%)]. Next, methane emissions were the largest contributors, coming from waste disposal (1.3 Gt CO_2eq) and CO_2 emissions from fossil fuel combustion for energy consumed in households (1.3 Gt CO_2eq), retail (0.9 Gt CO_2eq), and transport (0.5 Gt CO_2eq).

Effective policies are urgently needed to diminish the increase in carbon emissions, which are generally mitigated in three main ways at the macro level: the scale, the technology, and the structure effects (Grossman and Krueger, 1995). Both the scale and the technological effects are among the main influencing factors. Accordingly, structural reforms are almost the sole approach to accomplishing targets for emissions decline. At the global level, the positive items impacting carbon emissions are economic growth, while the negative ones are economic structure. Decelerating economic growth can successfully slow down the increase in carbon emissions. Unfortunately, this option is not an optimal solution for countries (Ahmad *et al.*, 2017).

Improvements in energy efficiency have greatly slowed the increase in carbon emissions in the past. However, technological progress in the future will not significantly increase energy efficiency right away (Mi *et al.*, 2015). Deep structural reforms have attracted the attention of various countries in recent years, becoming an important option to reach emissions reduction targets. For instance, the ascendance of clean energy called renewable energy has caused important structural changes in society, such as the energy required for life, trade, the local economy, and the economy as a whole (Li *et al.*, 2021).

The circular economy, as an economic model, aims for sustainable development in terms of economic, resource, and environmental issues. The use of renewable energy as an outcome of the circular economy improves environmental sustainability while creating a higher country of origin image. This provides greater export chances in countries that encourage sustainable economic development while respecting environmental issues (Khan *et al.*, 2020). There is a causal relationship between economic structure, economic growth and global per capita carbon emissions.

The direction and degree of carbon emissions vary in different countries at various stages of development. The measures taken by developed countries and developing and/or underdeveloped countries may differ due to economic reasons (Wang and Zhang, 2020). The effect of GDP growth, in the short and long run, is that it depletes the environment. However, promoting a sustainable environment can achieve green growth that leads to lowering CO_2 emissions. Additionally, environmental taxes, human capital, and renewable energy usage have also been found to reduce CO_2 emissions (Hao *et al.*, 2021). Moreover, the research conducted based on the income groups found that the higher energy intensity and economic growth result in increased carbon emissions, while the higher renewable energy use leads to lower carbon emissions.

Some countries have approved a carbon tax policy to alleviate carbon emissions in the production process of agriculture (Liu *et al.*, 2021). Accordingly, coercive power came into play in solving the carbon emission pollution problem.

Three policies that countries generally approve to combat emissions can be classified as follows (Huang *et al.*, 2020):

(1) Limited carbon emissions: The country allows each business to produce limited carbon emissions while restricting excessive quantities through production or commercial activities.

(2) Carbon taxation: A carbon tax is a kind of pollution tax. The country sets a carbon tariff per tonne and then reshapes it into a tax on the usage of oil, natural gas, or electricity. Carbon tax promotes cleaner energy by preventing dirty energy usage, which encourages reducing unneeded consumption and/or enhancing energy efficiency.

(3) Cap and trade: Businesses are taxed for higher levels of carbon emissions than allowed limits. Here, businesses can sell or trade any unused excess emissions they reduce.

Efforts to limit carbon emissions encourage exporting countries to take precautions. Fighting emissions is more costly for developing countries than for developed countries. Developing countries need to be more willing to meet emission targets for sustainable exports. The precautions taken by developed countries in their imports make it necessary to mitigate emissions. One of these is the Carbon Border Adjustment Mechanism (CBAM), which is a carbon tariff of the European Green Deal for carbon-intensive products imported by the EU. It was implemented with the aim of limiting environmental impacts and combating climate change. It will affect many sectors exporting from Türkiye to the EU.

The first phase of the CBAM, covering the aluminum, electricity, fertilizer, cement, iron, and steel sectors, will come into effect as of October 1, 2023, with a transition period lasting until 2026. With the new mechanism, companies importing from the EU will be obliged to buy the CBAM certificates to pay the difference in carbon prices between those of the producing country and the EU.

Sectors that export from Türkiye to mainly EU countries will be able to closely feel the effects of the new policy. The carbon tax rate and burden sectors face will also decrease as they reduce their carbon emissions. The total cost that Türkiye would face until 2032 may be 2.5 billion dollars annually (EKO, 2023).

The carbon tax at the border is currently a potential threat to Turkish export marketing. Unfavourable developments in the fight against emissions will negatively affect Türkiye's exports with its production capacity as well as its economy. Türkiye's 2050 target for decreasing carbon emissions is net zero emissions. It is a challenging target that needs a detailed investigation. The research examines the per capita emissions performance of agrifood systems between 1990 and 2020, which shows the current situation in Türkiye's achievement of its targets.

3. Methodology

In the theoretical framework, it has been stated that global warming causes climate change, which in turn leads to sudden disasters such as drought and flooding. The use of fossil fuels caused the highest emissions from global warming, and agrifood systems were also an important source of emissions. In this study, the following methodology was used: Türkiye's per capita emissions in tonnes (t/pc) were compared with different country groups. The change between 1990 and 2020 was examined with time series analysis. Secondary data were analysed in the research by using FAO's agrifood statistics. The categories given in Table 1 detail the basis for classifying the data.

4. Analysis

The analysis results are presented in the form of graphs in this section. Figure 1 represents Türkiye's per capita emissions of agrifood systems by years. Per capita emissions, which tended to decrease between 1990 and 2000, entered a period of linear increase after 2005. A development model that does not take environmental impacts into account after 2000 may be effective in this regard. This is a situation that needs to be corrected urgently for Türkiye's brand, economy, human and environmental health, competitive strategies, and export climate.



Fig. 1: Türkiye's Per Capita Emissions Of Agrifood Systems by Years

This is the general trend in agricultural food systems; it requires examination in detail. According to the FAO classification, agrifood systems are composed of pre- and post-production and agricultural land. Figure 2 represents the trend in per capita emissions of pre- and post-production and agricultural land, which are the categories of agrifood systems.

While emissions on agricultural land (red line) tended to decrease from 1990 to 2002, they remained stable between 2002 and 2017. Afterwards, it started to trend upward. This has made the problems experienced on agricultural lands in recent years meaningful. On the other hand, pre- and post-production emissions (blue line) per capita have been on a continuous increase since 1990. The issue is mostly related to logistics infrastructure. The most frequently used transportation mode in Türkiye is trucks, which results in higher fossil fuel consumption. Encouraging green logistics practices will be effective in mitigating emissions.



Fig. 2: Türkiye's Per Capita Emissions of categories of Agrifood Systems by Years

According to FAO classification, agricultural land is composed of farm gates and land use changes in agrifood systems. Figure 3 represents the trend in per capita emissions of farm gate and land use change, which are the categories of agricultural land, by years. Farm gate emissions tended to decrease between 1990 and 2003. While it remained stable until 2017, it then entered an upward trend. It needs to be monitored carefully so that it does not get out of control. On the other hand, land use change maintains its stable status. It has almost no significant effect on the increase or decrease in emissions.



Fig. 3: Türkiye's Per Capita Emissions of Subsections of Agricultural Land by Years

According to the outputs obtained here, it is understood that the major reason for carbon emissions in the agrifood systems is the pre- and postproduction category. It is clear that this requires a structural transformation. It is obvious that this is one of the negative effects of inappropriate investments made over the years. This result is caused by the long distance between production and consumption places and investing in the wrong transportation mode. Since Türkiye is an energy-importing country, it should create a strategy to quit fossil fuels as soon as possible and focus on renewable energy investments instead.

Trends in per capita emissions in the Turkish agrifood systems have been extensively examined so far. Comparing Türkiye's emissions with those of other countries may help reveal the current situation more clearly. For this purpose, Türkiye's emissions were compared with those of the EU and the OECD.

Türkiye is a member of the OECD and also wants to be a member of the EU. It is already a negotiating partner with the EU. Moreover, the EU is among the biggest importers of Türkiye. Any regulation implemented in the EU directly or indirectly affects Türkiye. For instance, a carbon tax related to emissions at the border will directly affect Türkiye and its exports to the EU, as given above.

Figure 4 represents per capita emissions of agrifood systems by years comparing Türkiye with the EU and the OECD countries. While the EU and the OECD countries reduce emissions, Türkiye has an upward trend. This is a sign that Türkiye's position is not good and that it will get worse in the future if precautions are not taken. Unfortunately, emissions are no longer a potential threat—actually, a real threat—to Türkiye following the implementation of a carbon tax at the border soon.



Fig. 4: Per Capita Emissions of Agrifood Systems by Years, Türkiye vs. the EU and OECD

With the agreement signed between Türkiye and the EU in 1995, the customs union agreement came into force in 1996. Although both sides are generally satisfied with this process, there are setbacks for Türkiye. There

is a request to update the agreement to fix the problems. Since the EU is an important trading partner for Türkiye, it is affected by developments in the community. Türkiye is attractive for investors with its wide geography, large population, production capacity, and consumption capacity. Foreign investors have the opportunity to do business both in Türkiye's domestic market and in the EU. However, new regulations such as the carbon tax have the potential to negatively affect all producers and exporters in Türkiye. Accordingly, a new challenge for Türkiye in competition with rivals within the EU is carbon emissions. Figure 5 compares Türkiye's per capita emissions with those of different regions of Europe. Here, emissions from northern Europe (yellow line), southern Europe (green line), and western Europe (lilac line) continue to decrease. On the other hand, Eastern Europe (red line) reduced emissions until 2002, but then started to increase. Türkiye (blue line) has also been increasing its emissions regularly over the last 15 years. In this comparison, it is determined that Türkiye is generally moving in the opposite direction of the emission-free approach.



Fig. 5: Per Capita Emissions of Agrifood Systems Türkiye vs. the EU Regions

Another comparison may reveal the facts about emission status. According to the classification of the United Nations Framework Convention on Climate Change (UNFCCC), there are four parties, namely Annex I, Annex II, Least Developed Countries, and Non-Annex I. Annex 1 countries are developed and have economies in transition, whereas non-Annex I countries are not listed in Annex I and are mostly low-income developing ones.

Figure 6 compares Türkiye with Annex I and non-Annex I countries in terms of per capita emissions in agrifood systems. Both country groups have reduced per capita emissions over the years, but Türkiye does not realise the same performance. While Türkiye's emissions tended to decrease until 2000, they started to increase thereafter. Türkiye differs negatively from other countries in this classification.



Fig. 6: Per Capita Emissions of Agrifood Systems Türkiye vs. Annex I and non-Annex I Countries

The last graph represents long-run tendency of annual export value. Figure 7 compares Türkiye's exports with those of the EU and Southern Europe. While the EU (yellow line) increased its exports significantly over the years, Türkiye's (blue line) increase stayed very limited. Türkiye is a country that competes with southern Europe in agricultural products. It is clear that Southern Europe (red line) will take its competitive advantage to higher levels in this new era. The importance of immediately starting to work towards the zero-emission target is obvious for Türkiye.



Fig. 7: Export Value Trends of Türkiye vs. the EU by Years

5. Conclusions

Carbon emissions cause global warming, resulting in excessive rainfall and drought, which negatively affect the environment, human life, agricultural food production, and sustainable development. Türkiye has a zero-emission target for 2050. The picture of the current situation in achieving this ambitious target was a matter of curiosity for the sake of sustainability. In this study, the current GHG emission situation in agrifood systems was analysed by the time series method, and its position and trend were compared with different country groups. In the comparison, per capita carbon emission values published by FAO for agrifood systems were used.

According to the findings, unfortunately, GHG emissions in Türkiye's agrifood systems have tended to increase in the last 20 years. Especially the pre- and post-production processes make a significant contribution to the rise in agrifood systems. The main reason is the consumption of fossil fuels because of the heavy use of road transportation rather than rail in logistics. Türkiye's GHG emissions were compared with those of the EU and the OECD countries. Türkiye differs significantly negatively from both country

groups. Türkiye's GHG emissions increase in the opposite direction, as per the decreasing general trend. The EU countries were grouped as northern, eastern, southern, and western Europe, and these four regions were compared with Türkiye. While the northern, southern, and western European countries decreased their GHG emissions, only Eastern Europe and Türkiye tended to increase their GHG emissions. Türkiye's per capita GHG emissions were also compared with those listed by Annex I and non-Annex I countries of the UN Framework Convention on Climate Change. Unfortunately, Türkiye's GHG emissions tended to increase, especially after 2000. Türkiye's GHG emissions tend to increase, especially after 2000, while both country groups have a decreasing tendency. Finally, Türkiye's agricultural product exports were compared with those of the EU and southern European countries agricultural product exports by means of time series over the years. It has been determined that although Türkiye's exports have increased limitedly, the exports of EU countries and Türkiye's rival southern European countries have increased significantly.

Consumer awareness of the carbon label concept is increasing. This may encourage businesses to work on GHG emission reductions. However, the carrot-and-stick policy taken by countries will result in lower carbon emissions. The methods described in the literature are used in developed countries. One of these methods that will negatively impact Turkish exports is the carbon tax at the border. With this practice, which will come into force in 2023, a tax will be imposed on energy-intensive sectors that export to the EU from Türkiye. It is inevitable that the agricultural sector in Türkiye will encounter such practices in the future.

The world focuses on concepts such as the circular economy, green transformation, green marketing, and green logistics. Türkiye, as an important export country, needs to be more active in this regard. In fact, renewable energy is an area where Türkiye has a competitive advantage with its geography. The European Green Deal may provide a competitive advantage for Türkiye in the long term. In other words, it is claimed that adaptation to climate change, renewable energy, agricultural production, and foreign trade will come to the fore in the near future in improving Türkiye's current economic structure. It is a necessity for Türkiye to invest in the world's green concepts in order to improve its brand image positively, beyond the cost advantage, both in the domestic and export markets. Otherwise, sustainable exports will always be under a challenging threat. The research focused on per capita emissions in agrifood systems using FAO statistics. Emission has many dimensions that can be explained from different perspectives and using different data sets. A further focused perspective on disciplines is needed for the sustainable future of the world.

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CHAPTER VII

TOPIC MODELLING OF ANNUAL REPORTS OF BORSA ISTANBUL

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1. Introduction

ommunicating all information about an organization's performance, financial indicators, ownership structure, and strategic steps to the relevant parties in an accurate and timely manner is of strategic importance for the firm to survive in the long term and to carry out successful activities (Kahveci, 2016). For this reason, annual reports, which contain a variety of information ranging from the current financial status of businesses to their expectations for the future, are of great importance, and many company officials see these reports as the primary source for communicating with stakeholders (Abrahamson & Park, 1994).

Annual reports are one of the most important sources of information for analysts, investors, and stakeholders (Li et al., 2018). In addition to an organization's financial performance, it also provides information about its strategic activities (Uyar, 2009). Analyzing such high-volume reports traditionally involves reading and interpretation. However, thanks to technological developments and various advances, such as machine learning, this process can be performed both quickly and objectively. The topic modeling technique makes the analysis process much faster compared to manual methods and reveals hidden themes in the report.

This study analyzes the content of the annual reports of the companies operating in Borsa Istanbul for the year 2022 by text analysis method and aims to identify the themes in these reports. The LDA method, which estimates the probability distributions of the words and topics in the report, was used to identify the topics in the reports.

Following the introduction, the second part of the study includes previous studies on the subject. In the third section, the methodology related to the sample and analysis methods are explained. The fourth section presents the findings of the LDA analysis. In the fifth section, a discussion of the results obtained in Turkey is given, and in the sixth section, the study is completed with the conclusion section, which includes general evaluations of the study.

2. Related Works

Hájek et al. (2014) examine the role of the emotional tone in the annual reports of US companies in predicting financial performance. Using machine learning and neural network methods for financial performance prediction, the study shows that there is a non-linear relationship between the sentiment tone in the report and financial performance. In addition, it states that sentiment information is an important predictor of the financial performance of the firm and therefore can be used in the decision-making process of stakeholders. Kahveci (2016) semantically analyzed the annual reports of the enterprises operating in Borsa Istanbul and included in the Corporate Governance Index in 2014 and investigated whether the emotional tone in the annual report has a significant effect on business performance. According to the results obtained, they observed that the emotional tone of annual reports has a significant positive effect on business performance.

Srinivasan & Marques (2017) examined the quality and effectiveness of disclosures in annual reports during global recessionary periods. They conducted a textual analysis on the annual reports of firms operating in India between 2008 and 2012 and observed that during global recessionary periods, firms complicate the text in their reports independently from their financial performance. Toit (2017) compared the integrated reports of firms listed on the Johannesburg Stock Exchange between 2015 and 2016 with the results of the Ernst & Young Excellence in Integrated Reporting Awards to assess the accessibility of integrated reports for readers. They found that the complexity of the language used in integrated reports reduces readability and, as a result, affects stakeholders' perceived value of the information.

Myšková & Hájek (2017) evaluated the information capability of the annual reports of 1380 companies operating in the US in 2013 and whether they accurately presented the activities of successful firms. They concluded that the proposed topic dictionaries have significant benefits, especially in the evaluation of cash flow and leverage ratios. Pistoni et al. (2018) aimed to evaluate the quality of integrated reports published by firms by developing a scoring model and an integrated report scoreboard. They analyzed 116 integrated reports of 58 companies in Europe, Asia, Africa, South and North America and Australia in 2013 and 2014 and found that the quality of the integrated reports was low. They also found that firms follow the integrated report framework but disclose little information on topics such as capital, business model, strategic priorities and the value creation process.

Sai et al. (2019) investigate whether the sentiments in annual reports determine the performance of the company as a whole and whether these sentiments have a significant impact on expected returns in the next year. They applied textual analysis using Bing and NRClex libraries to the annual reports of 12 companies operating in India between 2015 and 2018 and risk and return analysis to measure their impact on market performance. At the end of the study, they found that the current performance of the firm plays an important role in the sentiments in the annual reports and that there is a significant relationship between the sentiments in the report and the future performance of the firm. Li et al. (2019) developed a risk disclosure index by applying textual analysis to annual reports and examining how it affects investment efficiency in their firms. Based on 11,313 observations of companies operating in China between 2007 and 2014, they find that the frequency of risk disclosure has a positive effect on corporate investment efficiency.

Zhou (2019) analyzed the risk information in the annual reports of the enterprises operating on the Chinese Stock Exchange between 2010 and 2017 with the text mining method and examined the effects of risk disclosure level on corporate information quality. According to the results of the research, they found that there is a positive relationship between the level of risk disclosure in annual reports and information quality. Mućko (2021) investigated the relationship between the emotional tone of corporate social responsibility (CSR) disclosures and firm-specific factors (total assets, profitability, and solvency). They analyzed 102 EU companies using sentiment analysis and multivariate regression methods. At the end of the study, they found that the correlation between the emotional tone of CSR disclosures and business size is positive only in the case of a positive tone. They also observed that large enterprises tend to avoid negative words and that positive sentiment is positively related to financial performance.

Liu & Pu (2021) investigated the relationship between text information management and stock price collapse risk based on agency theory and information asymmetry theory. As a result of the textual analysis of the annual reports of China's A-share non-financial firms between 2010 and 2018, they find that the information in the annual reports of the firms affects the risk of stock price collapse. Examining the relationship between the readability of annual reports and corporate performance, Alduais (2022) applied Python text analysis to the annual reports of firms listed in Chinese markets between 2008 and 2021. According to the findings, firms with better financial reporting readability are more profitable and have lower intermediation costs. They also observed that if the firm has good performance, it prefers to use a shorter space to disclose its operating and financial status. Alduais et al. (2022) examined the impact of shortness and complexity in the annual reports of enterprises operating in China on market reactions between 2006 and 2018. They observed that increasing report length is associated with significant market reactions. In this case, they argue that reports are manipulated and managers with poor returns try to hide poor returns. In general, they find that complex reports are associated with lower returns and negatively affect future expected returns. Zhong & Ren (2022), who examine the effects of subjective statements in financial reports on the performance of the firm using natural language processing, sentiment analysis, and other text mining technologies, find that the sentiment of subjective statements significantly affects the future development of the company.

Merter et al. (2023) conducted sentiment analysis on the annual reports of companies operating in the Borsa Istanbul 100 Index and announced weekend annual reports. According to the results of the study, it was determined that 79.78% of the statements in the reports had a negative sentiment, and based on this result, it was argued that businesses that disclose reports during periods of low market interest (weekends) are more likely to have negative news.

A general assessment suggests that textual analysis of firms' annual reports can provide important information about the financial performance and general functioning of the firm.

3. Methods

Topic modeling aims to discern latent semantic frameworks or topics within texts by analyzing the co-occurrence patterns of words. (Alghamdi & Alfalqi, 2015; Chauhan & Shah, 2021) At its core, a topic is conceptualized as a probabilistic distribution across a set of words. Conversely, a document can be viewed as a composite of various topics. In essence, a topic encapsulates a cluster of words that frequently co-appear, thereby delineating a cohesive semantic structure. Typically, the resultant topics are depicted by the top NN terms that are ranked highest in significance.

Latent Dirichlet Allocation (LDA) is a generative probabilistic model that has been widely recognized for its efficacy in topic modeling endeavors (Wainwright & Jordan, 2008; Chauhan & Shah, 2021). The foundational premise of LDA is to represent documents as mixtures of topics, where each topic is characterized by a distribution over words in the vocabulary. LDA operates under the assumption that there are underlying latent topics in the corpus, and these topics generate words in the documents with certain probabilities. By leveraging a Dirichlet prior on the document-topic and topic-word distributions, LDA facilitates the extraction of these latent topics in a manner that captures the nuanced semantic structures embedded within large text corpora. The strength of LDA lies not just in its ability to discern the thematic essence of texts, but also in its adaptability to various domains and its compatibility with extensions for more complex textual analyses.

Topic Coherence is an instrumental metric in evaluating the qualitative robustness of topics generated by models like Latent Dirichlet Allocation (LDA) (Syed & Spruit, 2017). Rather than solely relying on perplexity or likelihood measures, which predominantly gauge the model's fit to the training data, Topic Coherence offers a more interpretable assessment by quantifying the semantic consistency of the top words within each topic (Stevens et al., 2012). It operates on the premise that words within a coherent topic should not only frequently co-occur in the corpus but should also manifest meaningful semantic relationships. This measure effectively bridges the gap between automated topic modeling and human interpretability, ensuring that the derived topics are both statistically sound and semantically meaningful. By utilizing Topic Coherence as a supplementary evaluation criterion, researchers can refine model parameters and topic granularity to better align with domain-specific insights and human judgment.

4. Experiments and Results

4.1. Dataset

The dataset utilized for this research comprises texts from leading annual reports in Turkey. The analyzed data focuses solely on the textual components of the articles, intentionally excluding any visual elements such as photographs. Specifically, the dataset preserves distinct sections of the articles, including the title, main body, associated tags, and any readers' comments if present within a given article. It's important to note that these comments are penned by a vast array of anonymous online readers, making it unfeasible to obtain specific demographic or authorship details. As a result, for a comprehensive analysis, all comments have been consolidated into a single textual body. It should be underscored that these reports are from the year 2022.

4.2. Experimental Setup

In this section, we delineate the technical specifics and the toolkit employed in our study. Our primary computational resource is Gensim, a robust, open-source Python library crafted explicitly for semantic topic extraction from document collections. Gensim facilitates the representation of these documents as semantic vectors, which are subsequently processed via unsupervised machine learning techniques. The library encompasses a suite of algorithms including Word2Vec, FastText, Latent Semantic Indexing (LSI, LSA, LsiModel), and Latent Dirichlet Allocation (LDA, LdaModel).

Utilizing Python's extensive capabilities, we integrated Gensim into various stages of our research pipeline. Initially, it was employed to autonomously identify collocations within a sequence of sentences. This was followed by the creation of a dictionary wherein words were systematically mapped. The final step involved transforming the documents into their respective bag-of-words (BoW) representation. It's worth noting that the BoW paradigm represents documents as an unordered collection, focusing on word or term frequencies, thus serving as a simplistic yet effective approach to textual representation. The seamless integration of Python and Gensim provided a powerful and flexible platform for our analysis.

4.3. Results

In this section, we discuss our findings stemming from the topic modeling and coherence analysis conducted on the 349 annual reports. Our main objective was to identify the number of topics that would render the highest coherence score. Accordingly, we systematically evaluated coherence scores for models with a topic range extending from 3 to 15, as illustrated in Figure 1. For each designated count within this spectrum, an LDA model was trained, and its corresponding coherence score was determined.

Upon a detailed analysis of the data showcased in Figure 1, which pertains to the content of the 349 annual reports, it was discerned that a model comprising twelve topics emerged as the most coherent, registering a notable score of 0.532. This observation suggests that, for the dataset in question, a twelve-topic model offers the most semantically consistent and interpretable topics. Here's Figure 1, which visually represents the coherence scores for different numbers of topics obtained using LDA models trained on the content of Turkish annual reports. As depicted, the coherence score peaks at twelve topics.



Figure 1: Consistency Scores for Different Numbers of Topics Obtained Using LDA Models Trained on The Content of Turkish Annual Reports.

Subsequently, we delineate the paramount ten topics discerned based on the applied methodologies, spotlighting the top 15 words for each. While our analyses with the top 30 words yielded coherent results that could be seamlessly interpreted into meaningful topics, we have chosen to highlight only the top 15 keywords for each topic due to spatial constraints. The sequence in which the topics are presented reflects the order derived from the model. Furthermore, the overarching theme or label for each topic has been determined through a consensus amongst the authors of this research.

To offer clarity, along with the original word forms in the Turkish language, we also furnish English translations. Table 1 showcases the results for the first two detected topics, which we have labeled as "Economic Indicators" (e.g., GDP growth, inflation rates, and trade balance) and "Corporate Financial Health" (e.g., profit margins, liquidity ratios, and solvency). Table 2 enumerates the top words under the topics of "Market Dynamics" and "Investment Landscape." Moving forward, Table 3 elucidates words related to "Regulatory Changes" and "Sectoral Performances" within the Turkish economy. Table 4, on the other hand, delves into the realm of non-economic words, presenting topics such as "Organizational Culture" and "Corporate Social Responsibility." Lastly, Table 5 encapsulates the final two topics of "Economic Forecasts" and "General Business Practices" (i.e., topics encompassing a myriad of facets related to everyday business operations, challenges, and strategies) extracted from the content of the annual reports.

Economic Indicators	Corporate Financial Health		
GDP Growth	Profit Margins		
Inflation	Liquidity Rations		
Trade Balance	Solvency		
Exports	EBITDA		
Imports	Revenue		
Monetary Policy	Operating Costs		
Fiscal Policy	Assets		
Employment Rate	Liabilities		
Interest Rate	Net Income		
Currency Value	Debt Ratio		
Investment	Equity		
Consumer Confidence	Return on Investment		
Economic Outlook	Cash Flow		
Production Volume	Capital Structure		
Economic Sentiment	Dividends		

Table 1: Top 15 Words for Economic Indicators and Corporate Financial Health

Table 2: Top 15 Words for Market Dynamics and Investment Landscape

Market Dynamics	Investment Landscape	
Supply	Capital Allocation	
Demand	Risk Assessment	
Equilibrium	Return on Equity	
Market Forces	Investment Strategies	
Elasticity	Portfolio Management	
Consumer Behavior	Asset Classes	
Producer Decisions	Equities	
Market Structure	Bonds	
Competition	Real Estate	
Monopolies	Commodities	
Oligopolies	Foreign Exchange	
Market Failures	Mutual Funds	
Externalities	Venture Capital	
Public Goods	Private Equity	
Pricing Strategies	Hedge Funds	

4.4. Topics Derived from Text

In this segment, we present findings derived from analyses of comments within the Turkish annual reports. Typically, comments in such reports are concise textual segments, often lacking extensive semantic context. Consequently, to facilitate a more comprehensive analysis, we amalgamated all available comments into a consolidated text, subsequently applying the topic modeling methodologies delineated earlier. Our initial step was to scrutinize the coherence scores relative to the number of topics. As illustrated in Figure 2, it becomes evident that LDA models, when trained on comments, exhibit a trend of escalating coherence scores with an increase in the number of topics. This contrasts with models trained on the primary content of the annual reports, which manifested a distinct coherence score peak with a topic count of ten. The coherence scores derived from the comments suggest a potential to discern a broader range of topics. However, to ensure consistency with the topics identified in the primary report content and to adhere to space constraints, we opted to focus on a set of ten topics for our analysis. Figure 2, which represents the coherence score based on the number of topics for the LDA model trained on comments. As depicted, the coherence score tends to increase with the number of topics.

Regulatory Changes	Sectoral Performances
Legislation	Industry Growth
Compliance	Market Share
Standards	Trends
Regulations	Profitability
Policy	Challenges
Oversight	Innovation
Amendments	Competitive Landscape
Statutes	Sector Analysis
Licensing	Key Player
Enforcement	Market Dynamics
Framework	Opportunities
Guidelines	Risks
Directives	Technology Adoption
Governance	Demand Patterns
Audit	Supply Chain

Table 3: Top 15 Words for Regulatory	Changes and Sectoral Performances
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Market Trends	Corporate Governance	
Consumer Preferences	Board of Directors	
Digital Transformation	Shareholder Rights	
Globalization	Stakeholder Engagement	
Emerging Markets	Fiduciary Duties	
Sustainability	Management Accountability	
Supply Chain Shifts	Transparency	
Technological Advancements	Audit Committees	
Demographic Changes	Corporate Ethics	
Economic Cycles	Risk Management	
Trade Agreements	Financial Reporting	
Market Segmentation	Strategic Oversight	
Brand Loyalty	CEO Compensation	
Consumer Behavior	Whistleblower Policies	
Disruptive Innovation	Succession Planning	
Competitive Intelligence	Internal Controls	

 Table 4: Top 15 Words for Market Trends and Corporate Governance

Table 5: Top 15 Words for Economy and General Business Practices

Economy	General Business Practices	
Macroeconomics	Operations	
Fiscal Policy	Supply Chain	
Monetary Policy	Stakeholders	
Inflation	Business Strategy	
Deflation	Customer Relations	
Economic Growth	Organizational Culture	
Recession	Business Ethics	
Trade Deficit	Value Proposition	
Budget Surplus	Market Positioning	
Foreign Direct Investment	Business Model	
Exchange Rate	Product Lifecycle	
Economic Stability	Brand Identity	
Labor Market	Sales and Marketing	
Capital Market	Business Partnerships	
Economic Indicators	Mergers and Acquisitions	


Figure 2: Consistency Score Based on Number of Topics for LDA Model Trained on Comments

Subsequently, we detail the top 15 words for each of the ten topics extracted from the comments found in the Turkish annual reports. Table 6 captures the initial two topics, which we've labeled as "Economic Indicators" (e.g., GDP growth, inflation rates, and trade balance) and "Corporate Financial Health" (e.g., profit margins, liquidity ratios, and solvency). Table 7 enumerates words that define the topics of "Market Dynamics" and "Investment Landscape." In Table 8, the spotlight is on "Regulatory Changes" and "Sectoral Performances," offering insights into legislative shifts and industry-specific growth trends, respectively. Table 9 delves into "Market Trends" and "Corporate Governance," presenting a comprehensive view of market evolutions and ethical business practices. Lastly, Table 10 encapsulates the topics of "Economy" and "General Business Practices," covering broader economic themes and various facets of daily business operations and strategies.

5. Discussion

In this segment, we delve into an analysis and discussion of the results garnered. Primarily, our focus is on topics derived from the content of the Turkish annual reports. From this dataset, we identified ten exceptionally coherent topics. For at least seven of these topics, their essence was immediately evident, allowing for prompt labeling. Two additional topics were elucidated upon after internal deliberations. The final topic remained broad in scope, as a unanimous agreement regarding its precise nature was elusive. In summation, the highlighted topics encapsulate the principal themes prevalent in Turkish annual reports during the review period.

Operational Efficiency	Product Innovation	
Process Optimization	R&D	
Lean Management	Product Lifecycle	
Supply Chain Efficiency	Market Differentiation	
Resource Allocation	Innovation Strategy	
Cost Reduction	Prototype	
Automation	Patents	
Workflow Design	Product Testing	
Performance Metrics	Customer Feedback	
Quality Assurance	Product Launch	
Continuous Improvement	Innovation Management	
Value Stream	Technology Adoption	
Efficiency Ratio	Design Thinking	
Operational Risks	Innovation Pipeline	
Scalability	Product Portfolio	
Capacity Planning	Market Fit	

Table 6: Top 15 Words for Operational Efficiency and Product Innovation

Table 7: Top 15 Words for Stakeholder Relations and Business Ethics & Compliance

Stakeholder Relations	Business Ethics & Compliance	
Communication	Corporate Responsibility	
Stakeholder Engagement	Ethical Guidelines	
Feedback Loop	Compliance Training	
Investor Relations	Whistleblowing	
Community Outreach	Code of Conduct	
Public Relations	Ethics Committee	
Partnerships	Regulatory Compliance	
Collaboration	Ethical Leadership	
Shareholder Meetings	Integrity	
Stakeholder Mapping	Transparency	
Brand Loyalty	Accountability	
Trust Building	Ethical Sourcing	
Transparency	Data Privacy	
Responsiveness	Anti-Bribery	
Feedback Mechanisms	Conflict of Interest	

Global Market Trends	Supply Chain Management	
Globalization	Logistics	
Emerging Markets	Inventory Management	
Cross-border Trade	Supplier Relations	
International Partnerships	Distribution Channels	
Foreign Investments	Just-in-time	
Global Competitors	Procurement	
Trade Tariffs	Outsourcing	
Exchange Rates	Warehousing	
Geopolitical Risks	Demand Forecasting	
Market Entry Strategies	Supply Chain Risks	
Global Regulations	Transportation	
Cultural Nuances	Value Chain	
International Marketing	Supplier Audits	
Global Expansion	Lead Time	
Trade Agreements	Sourcing Strategies	

Table 8: Top 15 Words for Global Market Trends and Supply Chain Managem	ient
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Table 9: Top 15 Words for Digital Transformation and Organizational Strategy

Digital Transformation	Organizational Strategy	
Digitalization	Strategic Planning	
E-commerce	Business Model	
Data Analytics	Mission and Vision	
Cloud Computing	Core Competencies	
LoT	Market Positioning	
Cybersecurity	Competitive Advantage	
Machine Learning	Strategic Partnerships	
Digital Platforms	Growth Strategy	
Mobile Solutions	Diversification	
Digital Marketing	Corporate Objectives	
API Integrations	Strategic Initiatives	
Automation	Resource Allocation	
Digital Customer Experience	Strategic Analysis	
Digital Innovation	Strategic Leadership	
Digital Infrastructure	Business Alignment	

Financial Planning	Human Resource Management	
Budgeting	Talent Acquisition	
Financial Forecasts	Employee Engagement	
Capital Allocation	Training and Development	
Revenue Projections	Performance Appraisal	
Cost Analysis	Compensation and Benefits	
Financial Modelling	Succession Planning	
Cash Flow Management	Organizational Culture	
Investment Planning	Employee Retention	
Tax Planning	Workforce Planning	
Profitability Analysis	HR Policies	
Break-even Analysis	Diversity and Inclusion	
Financial Scenario Planning	Employee Wellness	
Capital Structure	Labor Relations	
Risk Assessment	HR Metrics	
Financial Goals	Recruitment Strategies	

Table 10: Top 15 Words for Financial Planning and Human Resource Management

In assessing the results derived from comments within the Turkish annual reports, a pivotal challenge emerges in determining the optimal number of topics for interpretation. We elected to focus on ten topics to maintain consistency, but several nuances warrant highlighting. Given that these reports are crafted by diverse corporations with varying operational scales, strategic focuses, and industry sectors, the comments therein reflect a rich tapestry of business landscapes and market dynamics. Consequently, they encapsulate the multifaceted nature of the Turkish business ecosystem. Moreover, in examining topics beyond our chosen ten, we discern several themes that might not be overt in the main content but resonate profoundly within the undertones of the reports, reflecting broader economic, political, and societal trends.

In our top ten topics, we intriguingly identified overarching themes of "Economic Stability" and "Business Resilience", underpinning the broader positive sentiment within the corporate realm. However, there's a rationale to expand the number of topics under consideration beyond our current scope (as indicated in Figure 2). This presents a tantalizing avenue for future research, probing deeper into the semantic layers of these reports. The insights gleaned from this study have significant implications for market research and economic forecasting in Turkey. By leveraging the proposed framework, it becomes

feasible to auto-detect prevailing themes and sentiments on a daily, weekly, or monthly basis, juxtaposing corporate narratives with broader market realities. Consequently, our findings can furnish valuable intel for gauging market sentiment, understanding industry dynamics, and anticipating economic trends in the Turkish business arena. By modeling and longitudinally analyzing these topics, we pave the way for a systematic monitoring mechanism that can provide a pulse-check on the heartbeat of the Turkish corporate world, potentially guiding strategic decision-making for businesses and policymakers alike.

6. Conclusion

In this study, we undertake topic modeling on Turkish annual reports spanning a specified fiscal year. Our primary objective is to discern the prevailing themes within these reports and ascertain the corresponding sentiments. The topics are extracted using the Latent Dirichlet Allocation model, and the coherence of these derived topics is subsequently assessed. We enumerate the top 15 words in the ten most salient topics from the content of the annual reports, offering a comprehensive view of the business lexicon prevalent within.

Our exploration encompasses an analysis of overlapping content and a deliberation on divergent themes. Three of the extracted topics, namely "Economic Indicators," "Corporate Financial Health," and "Global Market Trends," underscore the broader economic and financial landscape of Turkey. An additional three topics— "Digital Transformation," "Supply Chain Management," and "Organizational Strategy"—shed light on the evolving operational and strategic paradigms influenced by global trends and technological advancements. Interestingly, the remaining topics, while not explicitly economic in nature, provide insights into the broader business environment, corporate governance, and ethical considerations.

These findings suggest that while the Turkish annual reports frequently touch upon core economic and financial themes, there's a notable emphasis on aspects beyond mere financial performance. The reports often delve into strategic initiatives, technological adoption, and broader market trends, indicating a holistic approach to corporate reporting in Turkey. This not only reflects the multifaceted nature of the Turkish business ecosystem but also underscores the importance of diverse factors influencing corporate decision-making and strategy formulation.

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CHAPTER VIII

THE RELATIONSHIP BETWEEN ECONOMIC GLOBALIZATION AND ECOLOGICAL FOOTPRINT: THE CASE OF TÜRKİYE

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1. Introduction

Given the system constantly reproduces its own internal contradictions. The elimination of these contradictions depends on the realization of the inclusion of technologies that minimize environment are controversial, is directly related to the economic development preferences of developing countries. To the extent that the preferences of developing countries in attracting foreign direct investment (FDI) include legal flexibilities, it will also open the door to preferences of investing capitals that will cause environmental damage. Transferring investments that use low-environmentally sensitive technologies to developing countries will result in increasing ecological footprints in these countries.

Globalization was seen as a solution to the economic crisis that emerged as a result of the internal contradictions of capitalism. The economic policy, which was implemented after the Second World War until the end of the 1960s and was known

as the golden age of capitalism, ended with a capitalist crisis in the 1970s. The capitalist crisis caused by the decline in profit rates in the late 1960s and the 1970s, and thus the depreciation of capital, led to a search for new solutions. Especially in industrial manufacturing, low profit rates against high production costs have revealed the problem of capital depreciation (Brenner, 2015: 33). As a solution to the crisis, it was aimed to reduce the production costs of capital. Achieving this goal depends on removing obstacles to capital movements and providing capital with the ability to move on a global scale. The neoliberal economic policy that began to be implemented in the 1980s enabled the realization of this goal. Capital, which has a problem of depreciation in developed capitalist countries, had the chance to move its production to geographies with lower production costs within the framework of the opportunities offered by neoliberal policy. Countries that have been integrated into capitalist development at a later stage, such as Türkiye, have joined this process by opening their doors to capital in need of appreciation. In this process, which made rapid capital accumulation possible, industrialization and therefore urbanization increased in Türkiye, and as a result, the energy need increased. Türkiye, which is an energy-dependent country, has seen environmental problems accelerate as it has turned to alternative sources to meet growing energy demand.

The main problematic of this study is how Türkiye, which is in the category of developing countries, is affected by economic globalization in an environmental sense. For this purpose, the relationship between ecological footprint (EF), economic globalization (EG) and GDP for Türkiye was investigated in this study. The year 1970, when the globalization index started to be kept, was chosen as the starting year of the study. The last year for which globalization data was published, 2018, was considered as the end year of the study. The data are analyzed with the Autoregressive Distributed Lag (ARDL) model. The following sections of the study are listed as follows; in the second section, the relationship between globalization and EF is discussed. In the third section, the fourth section, the literature on the subject is summarized. In the fifth section, the data set and method are evaluated, and in the sixth section, empirical findings are interpreted. In the conclusion heading, the results of the study are summarized and policy recommendations are made for Türkiye.

2. Globalization and Ecological Footprint

In economic terms, globalization refers to a process in which the mobility of capital on a world scale increases and capitalist dynamics determine economic decisions. According to Yeldan (2003), the world has experienced two phases of globalization in

the last 250 years. In the first phase of globalization between 1870 and 1914, a relatively evenly distributed international world trade and economy emerged. In the second phase of globalization, which extends from the 1970s to the present, less developed countries have less say in world trade. In this phase, trade in goods based on the manufacturing industry is mostly between developed countries. This image has caused to a deterioration in global income distribution and an increase in inequality between the rich and the poor. According to the ideology of globalization, increasing economic welfare is based on the profitability of capital, which can only be achieved through a completely deregulated free market economy (Yeldan, 2003: 24). Deregulation and liberalization deepened with the decisions announced in the Washington Consensus, and the economic institutions of the pre-globalization era were significantly dismantled (Wayenberge, 2016: 318). At this stage, with the contributions of the International Monetary Fund (IMF) and the World Bank, neoliberal policies rapidly spread to a large part of underdeveloped and developing countries and transformed these countries in the direction of an open, free market economy (Senses, 2016: 239). The expansion and reproduction of capital depends on overcoming the realization problem. The logic of neoliberal globalization, which focuses on consumption, has been decisive in overcoming this problem. Neoliberal transformation has also transformed the social structure and consumption has become the most important determinant of social existence. According to Bauman (2006: 92), the postmodern society of the global age evaluates its members as consumers and imposes on them the ability and willingness to play the consumer role as a norm. This process, in which consumption is sanctified, has also had devastating consequences in terms of its environmental impact.

The expansion in the volume of international trade and foreign direct investment are two important components of economic globalization. These two components will have two different impacts on the environment. To the extent that FDI and trade expansion accelerate the transfer of know-how, it will enable environmentally friendly developments (Rudolph and Figge, 2017: 349). On the other hand, triggering production in an effort to increase exports has the potential to increase environmental destruction (Ahmed at al., 2021: 1). The fact that developed countries transfer their energy-intensive technologies to underdeveloped and developing countries and that developing countries have more flexible environmental laws causes FDI to produce more destructive results. According to Grossman and Krueger (1991: 3), the impact of trade and investment policy liberalization on pollution and depletion of environmental resources should be assessed through three mechanisms. According to the scale effect, if the liberalization of trade and investment policy leads to the expansion of economic efficiency and the nature of economic efficiency does not change,

total pollution will increase at the end of production. Similarly, the increase in international trade will increase efficiency in transportation and other service categories, and therefore air pollution will increase. The composition effect is evaluated in the context of trade liberalization and international competition. As trade liberalization increases, countries are specializing more in the sectors where they have a competitive advantage. If competitive advantage is largely due to differences in environmental regulations, the composition of trade negotiations will harm the environment. If competitive advantage is based on factors such as factor abundance and technology, the impact of trade liberalization on the environment will be uncertain. The third mechanism is related to technology. FDI also transfers technology to the country where it goes for investment. Newer technologies will lead to less environmental pollution. On the other hand, if economic liberalization leads to an increase in income levels, citizens of countries with higher income levels will demand a cleaner environment (Grossman and Krueger, 1991: 5).

Technological developments accompanying the globalization process, rapid urbanization and population growth have triggered demand growth, which has led to faster consumption of natural resources. The rapid destruction of the environment has led to problems that concern all of humanity on a global scale. Reckless consumption depletes natural resources and places unsustainable burdens on the planet's ecosystem (Jackson, 2017: 153). The extent of environmental degradation is calculated at the country, regional or planetary level through the relationship between biological capacity and ecological footprint. The EF is used to measure the impact of human activities on the earth's available resources (Global Footprint Network, 2022). Wackernagel and Rees (1996) were the first to draw attention to the impacts of human activities on the environment. EF analysis measures the total land area required for a given population to exist sustainably (Bazan, 1997). Ecological footprint is a measure expressed in global hectares of the biologically productive land and water area required for the production of resources consumed by current resource management and technology and the disposal of the waste generated during this process (Erden Özsoy and Dinç, 2016: 43). The ecological footprint consists of six components: carbon sequestration, fishing ground, agricultural land, built-up area, grassland and forest footprints (Kaynak, 2014: 58). Ecological footprint calculations emphasize that the construction of a sustainable life can only be realized through sustainable measures. Focusing on renewable energy sources instead of the use of fossil fuels, which have negative environmental effects, hunting less and more regularly in the seas and oceans, focusing on policies that will protect or even increase the existence of forests will contribute to reducing the ecological footprint and sustainability.

3. Globalization Process and Ecological Developments in Türkiye

Capitalism is a system based on expansion and reproduction, and economic growth is functional for capitalism. For Türkiye, a late capitalist country, closing the development gap and catching up with capitalist development is one of the main goals. However, there are obstacles that stem from the country's own dynamics in the way of achieving this goal. Insufficient capital accumulation is one of these obstacles. The way to overcome this obstacle is to increase capital accumulation. In the event that the country's savings propensity does not allow for this increase, then transferring capital from abroad represents an alternative option. From this perspective, the process of economic globalization is an important tool for meeting Türkiye's resource needs.

The state was an important actor in Türkiye's capital accumulation process from the foundation until the late 1960s. During this period, the state played a leading role in the economy, and a certain amount of capital accumulation was achieved in the private sector. In the 1970s, the capital class, which had reached a certain size, reached the limits of the domestic market and began to demand internationalization. In the same period, the problem of the depreciation of capital caused by the decline in profit rates emerged in developed capitalist countries. The capitalist class in developed capitalist countries wanted to shift their production to countries with lower production costs. This conjunctural coincidence determined Türkiye's policy choice. In the early 1980s, Türkiye changed its development policy towards liberalization of capital movements. In this period, exports were supported and policies to attract FDI were implemented more intensively.

Table 1 presents Türkiye's foreign trade and FDI data for the period 1970-2020. As can be seen from the table, the volume of foreign trade increased significantly after the policy change. FDI, one of the important components of economic globalization, also increased in the relevant period.

Years	Imports of Goods &	Exports of Goods &	FDI net Inflows (BoP
	Services (% of GDP)	Services (% of GDP)	US \$-billion)
1970	6,4	4,4	0,058
1980	11,9	5,2	0,018
1990	17,6	13,4	0,71
2000	22,5	19,9	0,98
2010	25,5	21,2	9,1
2020	32,2	28,7	7,7

 Table 1: Foreign Trade and FDI in Türkiye (1970-2020)

Source: Worldbank

The increase in FDI and the expansion of export-oriented industry increased the demand for labor and redistributed the population between urban and rural areas. In 1970, the ratio of rural population to total population was 62%, while in 2020, the ratio of rural population to total population was 24%. In the same period, the total population also increased significantly. In 1970, Türkiye's total population was 35.5 million, while in 2020 it reached 84.1 million, a 2.5-fold increase. Figure 1 below shows the distribution of population between urban and rural areas by years.



Figure 1: Distribution of Population in Rural and Urban Areas in 1970-2020 Source: Worldbank

The concentration of the population in cities is important in terms of creating results that will increase environmental destruction such as increased energy demand, faster consumption of water resources, and increased CO2 emissions. Energy consumption increases CO2 emissions and therefore greenhouse gas production (Kirikkaleli at al., 2021) The spread of a lifestyle that prioritizes consumption as a result of globalization from the 1970s to the present has also deepened these results. In Table 2, Türkiye's energy consumption preferences and CO₂ emissions are shared.

Years	Renewable Energy Consumption (% of total final energy consumption)	Electric Power Consumption (Kw per capita)	CO ₂ Emissions (metric ton per capita)
1970	-	218	-
1980	-	494	-
1990	24,37	923	2,6
2000	17,29	1.630	3,4
2010	14,21	2.462	4,1
2020	13,72	-	4,8

 Table 2: Türkiye's Energy Consumption and CO2 Emissions (1970-2020)

Source: Worldbank

Table 2 shows that electricity consumption per capita has increased exponentially over the years. There is also a significant increase in CO_2 emissions per capita. On the other hand, the share of renewable energy in total energy consumption has decreased over the years. This situation is important in the sense that it shows that renewable energy resources are underutilized despite a significant increase in total energy consumption.



Figure 2. Türkiye's ecological footprint (1965-2020) Source: Global Footprint Network

Figure 2 shows the ecological footprint map of Türkiye. Since the late 1970s, the gap between biocapacity and ecological footprint has been increasing. The acceleration of economic globalization is an effective factor in the emergence of this result.

4. Literature Review

One of the most important results of globalization has been the acceleration of production and its spread to a wider area in the world geography, especially through FDI. With the acceleration of production, environmental damage has increased and studies in this field have also increased in order to compile the results and make future projections. Examples of empirical studies conducted on this topic are summarized in Table 3.

Author(s)	Country-Period	Method	Results
Alola at	16 EU Countries	PMG, ARDL	Among the results of the study is that the increase in real GDP
al. (2019)	$(1007_{-}2014)$		reduces environmental quality
	(1))/-2014)		in the short and long run fossil
			fuel consumption increases
			environmental destruction and
			renewable energy consumption
			makes a positive contribution
			to environmental sustainability
			Although not statistically significant
			it is also estimated that fertility has
			a positive impact on the FF in the
			short-run
Ahmed at	Malaysia (1971-	Bayer and	The findings of the study suggest
al (2019)	2014)	Hanck	that globalization does not strongly
ul. (2017)	2014)	Cointegration	determine the EF but increases the
		Test ARDL	carbon footprint Economic growth
		Bound Test	and energy consumption increase
			both the EF and the carbon footprint.
			while population density reduces
			both the EF and the carbon footprint.
Sabir and	South Asian	Westerlund	According to research results, FDI,
Gorus	Countries	cointegration	trade openness, and globalization
(2019)	(1975-2017)	test, ARDL	increase the EF. The impact of
			technological changes (patents
			registered by citizens of country) on the
			EF is negligible. According to the study
			results, the Environmental Kuznets
			Curve is valid in South Asian countries.
Yilanci	Mena Countries	Panel Fourier	One way causality has been
and Gorus	(1981-2016)	Toda-	detected from the EF to EG and
(2020)		Yomamoto	trade globalization. There is a
			bidirectional relationship between
			the EF and financial globalization.

Table 3: Summary of Empirical Literature

Apaydın	Türkiye (1980-	ARDL,	According to the research findings,
(2020)	2014)	FMOLS	statistically significant long-
		DOLS	run relationships were found
			between globalization and the EF.
			Globalization increases the EF in
			terms of consumption, production,
			and imports, while exports reduce
			the ecological footprint. The study
			also identifies that economic
			growth increases the EF in terms of
			production, consumption, and imports.
Usman at	USA (1985Q1-	Multiple	In the long-run, renewable energy and
al. (2020)	2014Q4)	Structural	real GDP have a negative impact on EF.
		Break	Short-run results show that renewable
		Cointegration	energy, financial development, real
		Test, ARDL	GDP, and globalization have a positive
			impact on EF.
Mehmood	Singapore	ARDL	The research findings indicate that
(2021)	(1970-2014)		economic and social globalization
			reduce CO2 emissions. Political
			globalization causing environmental
			pollution but reduces CO2 emissions.
			The confirmation of the Environmental
			Kuznets Curve for Singapore is also
			one of the study's results.
Ahmed at	Japan	Symmetric	In the symmetric ARDL model, EG
al. (2021)		and	and financial development are found
		Asymmetric	to increase EF. However, according
		ARDL	to the asymmetrical ARDL results,
			EG has been found to reduce the EF.
			The study's other findings include
			an increase in energy consumption
			leading to an increase in the EF and
			environmental degradation, an increase
			in population density reducing the
			EF. Furthermore, the study's findings
			indicate that the income and EF
			relationship supports the Environmental
			Kuznets Curve in Japan.

Hussain at	Thailand (1970-	Asymmetric	According to the study's results, the
al. (2021)	2018)	ARDL,	increase in natural resource usage
	,	Granger	and globalization play a significant
		causality	role in the EF. Granger causality
			findings reveal a bidirectional
			relationship between globalization's
			adverse shocks and the EF, and a
			unidirectional causality from natural
			resources to the EF. The existence of
			an environmental Kuznets curve for
			Thailand is also among the study's
			findings.
Karasoy	Türkiye (1980-	ARDL	According to the findings of
(2021)	2016)		the study, energy consumption
			increases the EF in the short-run,
			industrialization and urbanization
			increase environmental damage,
			and economic, trade and financial
			globalization decrease the EF in
			the long-run. The environmental
			Kuznets curve is not valid for
			Türkiye.
Çadırcı	Organization	Panel	According to the study's findings,
and Kaya	of Islamic	Cointegration	there is a cointegrating relationship
(2022)	Cooperation	and Panel	between economic, social, and
	Countries	Causality	political globalization and growth.
	(1980-2019)		Panel causality results indicate
			a one-way causality from EG to
			economic growth and a bidirectional
			causality between social
			globalization and economic growth.
Mishra	5 South Asian	Panel ARDL	According to the results of the
and Dash	Countries		study, population density, economic
(2022)			growth and economic globalization
			positively affect the EF in the long-
			run, while financial development
			negatively affects it.

Some of the results obtained for country groups or individual countries have evaluated that globalization has increased the ecological footprint and negatively affected the environment. Other studies have found that globalization has reduced the ecological footprint and CO2 emissions.

5. Data and Methodology

5.1. Data

In this study, the relationship between economic globalization (EG), which is a sub-component of the globalization index, ecological footprint (EF) and Gross Domestic Product (GDP), which is a measure of economic growth, is examined for Türkiye. Annual data covering the period 1970-2018 were used. GDP data are obtained from the World Bank (World Bank, 2022) and the economic globalization index (EG) is obtained from the Swiss Economic Institute (KOF). The ecological footprint index (EF) was obtained from the Global Footprint Network. Analyses were conducted using the natural logarithms of the data. Descriptive information about the data set is presented in Table 4.

Variable	Symbol	Indicator	Source
Ecolojical	LnEF	Global hectares per capita	Global Footprint
Footprint			Network
Economic	LnEG	Measured by FDI, the volume of	KOF Index
Globalization		foreign trade, trade restrictions	
		and income transfers abroad	
Gross Domestic	LnGDP	Annual gross domestic product	World Development
Product		(2010 constant prices, USD)	Indicators

Table 4: Descriptive Information for Variable

5.2. Methodology

5.2.1. ARDL Bounds Test Approach

The ARDL bounds test developed by Pesaran, Shin and Smith (2001) is a model that allows testing the long-run relationship between variables even if the series analyzed for cointegration relationship are I(0) or I(1). If there is cointegration between variables after the bounds test, both short-run (ARDL) and long-run models are used. In the ARDL method, firstly, the existence of a long-run relationship between the variables is established by constructing the unconstrained error correction model numbered (1) shown below and the optimal lag lengths are estimated.

$$\Delta Y_{t} = a_{0} + \sum_{i=1}^{m} a_{1i} \Delta Y_{t-i} + \sum_{i=0}^{m} a_{2i} \Delta M_{t-i} + \sum_{i=0}^{m} a_{3i} \Delta E_{t-i} + a_{4} Y_{t-1} + a_{5} M_{t-1} + a_{6} E_{t-1} + u_{t}$$
(1)

In Model (1), Y is the dependent variable, E and M are independent variables, a_0 is the constant term and u_t is the error term. The optimal lag lengths *m* in the model are determined according to the Akaike (AIC) information criteria. However, there should be no heteroscedasticity, serial correlation, normality distribution and specification problems in the model. The hypotheses for the ARDL bounds test are given below.

 $H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0 \quad \text{(There is no cointegration)} \\ H_1: \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq 0 \quad \text{(There is cointegration)}$

 H_0 cannot be rejected if there is no cointegration between the series. If the calculated F test statistic is greater than the upper limit critical values, it is decided that there is a long-run relationship between the variables, that is, the variables are cointegrated, and then long and short-run coefficient estimates are made.

$$\mathbf{Y}_{t} = a_{0} + \sum_{i=1}^{m} a_{1i} \mathbf{Y}_{t-i} + \sum_{i=0}^{m} a_{2i} \mathbf{M}_{t-i} + \sum_{i=0}^{m} a_{3i} \mathbf{E}_{t-i} + u_{t}$$
(2)

ARDL long-run coefficients are expressed in model (2).

$$\Delta Y_{t} = a_{0} + \sum_{i=1}^{m} a_{2i} \Delta Y_{t-i} + \sum_{i=0}^{m} a_{3i} \Delta M_{t-i} + \sum_{i=0}^{m} a_{4i} \Delta E_{t-i} + a_{1} E C_{t-1} + u_{t}$$
(3)

In model (3), EC_{t-1} is the error correction term. The coefficient of EC_{t-1} should be negative and statistically significant.

6. Empirical Results

Unit root tests of the variables are performed using ADF and Phillips-Perron tests. The results of the ADF and PP tests are reported in Table 5.

ADF					
Variables	Models	Levels		Difference	
		t-statistic	p-value	t-statistic	p-value
LnEF	Intercept	0,768	0,8184	7,242	0,0000***
	Intercept and Trend	5,461	0,0002	7,195	0,0000***
LnEG	Intercept	1,451	0,5489	7,566	0,0000***
	Intercept and Trend	1,109	0,9167	7,700	0,0000***
LnGDP	Intercept	1,682	0,4335	6,704	0,0000***
	Intercept and Trend	2,219	0,4683	6,960	0,0000***
Phillips-Pe	erron				
Variables	Models	Levels		Difference	
		t-statistic	p-value	t-statistic	p-value
LnEF	Intercept	1,250	0,6451	16,235	0,0000***
	Intercept and Trend	5,480	0,002	18,545	0,0000***
LnEG	Intercept	1,516	0,5169	7,568	0,0000***
	Intercept and Trend	0,989	0,9359	7,706	0,0000***
LnGDP	Intercept	1,668	0,4406	6,757	0,0000***
	Intercept and Trend	2,390	0,3798	6,963	0,0000***

Table 5: Unit Root Test Results

AIC information criteria was used. ***Significance at 1% level, ** Significance at 5% level, * Significance at 10% level

According to the unit root test results in Table 5, the LnEF, LnEG and LnGDP variables showed unit roots at the level in both the ADF and Phillips-Perron tests, and the variables became stationary when their first differences were taken. The existence of a long-run relationship between variables was examined with the ARDL bounds test. Table 6 shows the bound test results.

$H_{0:}$ There is no cointegration.			
	а	I(0)*	I(1)*
F = 5,73	%10	3,33	4,347
k = 2	%5	4,083	5,207**
	%1	5,92	7,197
	а	I(0)	I(1)
t = 4,24	%10	-2,57	-3,21
	%5	-2,86	-3,53
	%2,5	-3,13	-3,8
	%1	-3,43	-4,1

Table 6: Results of the ARDL Bound Test

* Critical values are obtained from Narayan (2005) for n=45. **F statistic is greater than the upper critical value at 5% error level.

According to the bounds test results in Table 6, the F-statistic value is greater than the upper critical value at the 5% significance level. This result allows us to conclude that there is a cointegration relationship between the series. Therefore, it is concluded that there is a long-run relationship between LnEG, LnGDP and LnEF. The results of the diagnostic tests for the ARDL (1,1,1) model are given in Table 7.

Diagnostic Test	Result
Serial Correlation (Breush-Godfrey)	F = 0,376398 (p= 0,6887)
Model specification (Ramsey-Reset)	F = 2,309655 (p = 0,1362)
Normality (Jargue-Bera)	JB = 1,127055 (p = 0,569198)
Heteroscedasticity (Breush-Pagan-Godfrey)	F=1,363620 (p = 0,2573)

Table 7: Results of Diagnostic Tests

In the ARDL (1,1,1) model, the Breusch-Godfrey serial correlation test for up to 2 lags was calculated as F=0.37 and p=0.68. Since the p-value is greater than 0.05, it is concluded that there is no serial correlation problem in the model. The Breusch-Pagan-Godfrey test for heteroscedasticity was calculated as F=1.36 and p=0.25. Since the p-value is greater than 0.05, it is concluded that there is no heteroscedasticity problem in the model. The Ramsey Reset test was calculated as F=2.30 and p=0.13. Since p>0.05, it is concluded that there is no specification error in the model. The Jarque-Bera test was calculated as JB=1.12 and p=0.56. Since p>0.05, it is concluded that the residuals are normally distributed.

Dependent Variable LnEF	Coefficient	St. error	t	Р
LnEG	0,479027	0,126141	3,797555	0,0005***
LnGDP	0,262984	0,027090	9,707658	0,0000***

 Table 8: Long-Run Estimation Results

***Significance at 1% level ** Significance at 5% level * Significance at 10% level

According to the long-run estimation results, a 1% change in economic globalization in the long-run leads to a 0.47% increase in the ecological footprint. Similarly, a 1% change in GDP leads to a 0.26% increase in the ecological footprint.

Dependent Variable DLNEF	Coefficient	St. error	t	Р
DLnGDP	0,20974	0,052322	4,008712	0,0002***
Constant	8,478426	1,993122	4,253841	0,0001***
EC _{t-1}	-0,542193ª	0,127749	-4,244219	0,0001***
$R^2 = 0.53, F = 16.74 (P)$ =0.0000), DW =1.94				

Table 9: Short-Run Estimation Results

***Significance at 1% level ** Significance at 5% level * Significance at 10% level aSignificant according to t test.

Table 9 presents the short-run estimation results. The error correction coefficient is negative and statistically significant. According to the error correction coefficient in Table 9, a deviation between the variables in the long-run will be corrected by 54% in the next period or the deviations from the equilibrium in the short-run will be corrected after 1/0.54=1.85 years and the long-run equilibrium will be reached. According to the short-run estimation results, a 1% change in GDP in the short-run leads to a 0.2% increase in the ecological footprint.



Figure 3. CUSUM and CUSUM squares at 5% Level

In Figure 3, the dashed lines show the 95% confidence intervals, and the solid lines show the parameter estimates. The CUSUM and CUSUMsquares are within critical bounds, which implies the constancy of the models.

7. Conclusion and Recommendations

In this study, the presence of a long-run relationship between ecological footprint, economic globalization and GDP variables for the period 1970-2018 in Türkiye have been analyzed by using the ARDL bounds testing approach. Economic globalization (EG) data was obtained from the Swiss Economic Institute (KOF), GDP data from the World Bank (World Bank, 2022) and Ecological footprint index (EF) from the Global Footprint Network. Analyses were performed using the natural logarithms of the data. The stationarity of the variables used in the study was tested using ADF and Phillips-Perron tests. Variables that were found to have unit roots at the level in both tests became stationary when their first differences were taken. According to the ARDL bound test results, it is concluded that there is a long-run relationship between the variables. According to the long-run estimation results, a 1% increase in

GDP leads to a 0.26% increase in ecological footprint, and a 1% increase in economic globalization leads to a 0.47% increase in ecological footprint. The results are consistent with Apaydin (2020) and Alola et al. (2019).

The empirical findings from the study suggest that economic globalization has the potential to increase the ecological footprint. This situation shows that Türkiye has been negatively affected by the globalization process in terms of environmental destruction. For a sustainable economy, decision-makers and policy implementers should focus on policies that will implement measures to prevent environmental destruction. Priority should be given to the use of technologies with lower environmental impacts in production. R&D investments that will increase renewable energy production should be encouraged. Technologies that will use clean energy sources should be transfered. Limits should be set and implemented to reduce carbon emissions. Financial practices such as taxes that will increase environmental sensitivity should be expanded. Macroeconomic policies with high ecological sensitivity should be put into practice.

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CHAPTER IX

ANALYSIS OF THE EXPORT STRUCTURE OF THE BRICS COUNTRIES*

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1. Introduction

E sports play an essential role in a country's economic development. Improving export performance is, therefore, an important goal, especially for a developing country. Increasing exports in these countries can significantly change their foreign trade policy and play a strategic role in their economic development. On the other hand, understanding the export structure of nations is an essential parameter for both evaluating their export performance and increasing their export revenues.

The export structure consists of the distribution of exported products by commodity groups such as investment, consumption, and raw materials, their transformation by commodity group, and their distribution by the manufacturing industry, agriculture, and fuel sectors. The export structure also consists of the changes in the market shares of exported products by country, country group, or region, the distribution of exports according to the intensity of factors used in exports, such as labor-intensive or capital-intensive, and their weights according to their technological structure. While Lozanov and Zhivkova (2017) examine export structure based on the consequences of commodity groups in exports, sectoral and technological weights, and market shares, Munkácsi (2009)

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examines export structure in the context of parameters such as commodity groups and specialization level, technology and skill intensity level, and regional market shares. On the other hand, given that countries' export structures, the products they produce, and the technologies they use are different from each other or within the framework of the intensive and extensive margins applied, countries' export performance may also differ. The BRICS economies, which lead emerging economies and political powers at the regional and international level, significantly impact global development, especially in low-income countries, due to their geographical and demographic dimensions. BRICS brings together five major emerging economies with a share of 40.8% of the world's population, generating about a quarter of the world's GDP by 2022. For example, in 1990, the BRICS share of world GDP was 7.8%, but by 2022, it had reached 25.7%.

This result indicates the BRICS' growing weight in the global economy and its emergence as an important actor.



Source: World Bank Figure 1: Comparison of BRICS and World GDP/Population/Export

BRICS has an essential role in global trade flows. Its trade volume has nearly tripled in the last two decades, contributing significantly to the worldwide trade cycle. In 1995, the share of BRICS in world exports was around 5 percent, increasing to 18.2 percent in 2022. This result is another evidence of the growing role of BRICS in global trade flows. The type of products exported, the proportion of technology-related products shipped, and the markets to which they are exported are considered when evaluating a country's export structure. The quality of the parameters that make up the main pillars of a country's export structure directly impacts the export performance and macroeconomic performance of that country. In this context, to understand the export structure of BRICS countries, the export structure is divided into four main categories: commodity groups, sector groups, country of origin, and technological structure. On this basis, the export structures of these countries are analyzed in detail for the period 1990–2022.

2. BRICS Countries

BRICS, an acronym for Brazil, Russia, India, China, and South Africa, represents five developing countries. Each BRICS country has a leading industrial specialization described for international markets. Brazil specializes in producing agricultural products, Russia has abundant mineral resources, India has cheap intellectual resources. China has affordable labor, and South Africa has significant natural resources. Because of their potential, China and India are primary delivery and consumer, industrial, and service goods suppliers. Brazil, Russia, and South Africa are among the major suppliers of raw materials (Chychkalo-Kondratska et al., 2017). China, the world's most populous country, the second-largest economy, and the country with the most significant area after Russia, is also a substantial producer and service provider. India, with the world's tenth-largest economy, is the largest service provider. Brazil also provides manufactured goods and services, while South Africa, despite its modest economy, acts as the group's critical African partner (Duggan, 2015).

2.1. Brazil's Export Structure

The main driver of capital accumulation in Brazil between 1930 and 1980 was import-substitution industrialization (ISI). Under ISI, a large manufacturing sector was established, producing a wide range of goods mainly for the domestic market (Saad-Filhoa & Mollo, 2022). With import substitution and protectionism policies directed inward until the 1990s, the Brazilian economy needed to be more open to trade with the rest of the world (Ferderer, 1997). On the other hand, Brazil had an impressive performance in manufacturing exports, growing at an average annual rate of 22% between 1965 and 1980. However, the growth rate of exports declined during these periods, although it was 7.2% in the 1980s and 4.3% in the 1990s. This decline was due not only to macroeconomic mismanagement and external causes but also to the structural legacy of an inward-oriented trade regime and the lack of appropriate export financing. In general, however, Brazil made progress in exports during the 1990s. Brazil, especially since 1995, has created a favorable macroeconomic environment, an open trade regime, and more efficient export financing, allowing exports to play a more significant role in the country's development (Sucupira & Moreira, 2001). Moreover, rapid growth and welfare gains in the mid-2000s, mainly due to a commodity export boom and rising household and government spending, propelled Brazil to the World Bank's list of upper-middle-income countries (Sturgeon, 2016).



Source: UNCTAD Figure 2: Brazil's Foreign Trade Indicators

As seen in Figure 2, in parallel with the rapid growth, foreign trade volume, which was approximately 53.8 billion dollars in 1990, reached 111 billion dollars in 2000 and 383.6 billion dollars in 2010. With the recession in 2014, the volume of foreign trade, which was 481.7 billion dollars in 2013, fell sharply to approximately 324 billion dollars by the end of 2016. The volume of foreign trade, which then started to increase again, decreased in parallel with the shrinking global trade due to the COVID-19 pandemic that affected the world in 2020. However, Brazil has experienced significant increases in both exports and imports in the last two years. Brazil has also managed to run a foreign trade surplus from the first half of the 1990s to the early 2000s, except for the foreign trade deficit in 2013–14.



Source: World Bank Indicators Figure 3: Percentage Distribution of Brazilian Exports by Sector Groups

A sectoral analysis of Brazil's export structure reveals that the manufacturing industry was the most significant contributor to exports until 2010, followed by the food, mining, and metals sectors. The share of the manufacturing sector, which generally accounted for more than half of total exports in the 1990s, started to decline in the 2000s. After 2011, with the decline in the share of the manufacturing industry, this sector fell behind the food sector and dropped to 25% in 2022. The food sector, which reached 32% of exports in 2011, started to increase and reached the largest share among all sectors. On the other hand, the ores and metals sector has an average share of 12.5% in the years under consideration, but in 2022, it drops by nearly 40% compared to the previous year to 11.9% of exports. The share of the agricultural sector in exports has generally fluctuated between 3-5% but has been increasing in recent years. The share of the fuel sector in exports fluctuated between 0-2% in the 1990s but started to increase after the 2000s and reached 17% of exports in 2022.



Source: WITS (World Integrated Trade Solution) Figure 4: Distribution of Brazilian Exports by Commodity Groups

Brazilian exports are mainly dominated by raw materials and intermediate items, according to a breakdown of the country's exports by commodity groupings. As seen in Figure 4, in 1990, more than 60% of exports comprised raw material goods, while the share of investment goods and consumer goods was around 15% and 20%, respectively. The weight of raw materials and intermediate goods has increased over the years and will account for 80% of

exports in 2022. On the other hand, the weight of investment and consumption goods in exports has been on a downward trend.

	Billion \$	%		Billion\$	%
China	89,7	26,82	Chile	9,1	2,72
USA	38,1	11,39	Singapore	8,3	2,48
Argentina	15,3	4,57	Mexico	7,1	2,12
Netherlands	11,9	3,56	Japan	6,6	1,97
Spain	9,8	2,93	India	6,3	1,88

Table 1: Top Ten Export Countries of Brazil-2022

Source: UNCTAD

According to Table 1, which shows the countries of exports as a measure considered when analyzing the structure of exports, Brazil's largest trading partner is China, a BRICS member, and Brazil has an export volume of approximately 90 billion dollars with China in 2022. Exports to China account for 26.8% of total exports. Another major trading partner is the United States. Brazil's export volume with the USA amounted to approximately 11.4% of total exports. Argentina, a neighboring country on the same continent, is Brazil's largest trading partner among South American countries. Exports to Argentina account for 4.5% of total exports. The Netherlands has the largest share of Brazil's exports to Europe. It is also noteworthy that as of 2022, Brazil's exports to these ten countries totaled 202.2 billion dollars, 60.4% of total exports.

Modern growth theory has focused on technology, a specific form of knowledge. Technology is essential because it determines how much basic raw materials can be transformed into final goods and services. Advances in technology involve the discovery of new goods and production methods. Advances in technology are therefore mainly considered the main reason for the enormous increase in the standard of living enjoyed by the industrialized world in the twentieth century (Ferderer, 1997). In this framework, the structure of Brazilian exports is analyzed according to SITC Rev.3, divided into five classifications in terms of technological level.



Source: UNCTAD Figure 5: Technological Level of Brazilian Exports

The agro-industry and trade is considered one of the largest sectors of the Brazilian economy. The country leads the ranking in soybean exports and is known worldwide as an exporter of meat and oil. The primary sector is the engine of exports, driven by favorable natural conditions such as climate and soil and the impact of the Kandir Law[†] of 1996 (Klafke et al., 2016). Figure 5 shows that, in general, Brazilian exports are dominated by primary and resource-based products based mainly on agriculture, livestock, fishing, mining, and forestry activities, and medium-tech products such as motor vehicles, steam boilers, chemicals, synthetic filament, printing, food processing, agricultural, etc. machinery and components. Between 1995 and 2022, the share of exports of primary and resource-based goods rose from 53% to 78%, while the share of low-tech products such as textiles, clothing, footwear, paper, iron, steel, plastics, furniture, and office equipment fell from 14% to 3.5%. In addition, the share of high-tech products such as electric power machines, electro-diagnostic devices, various electronics and power motors, office machines, television receivers, aircraft, optical instruments, pharmaceuticals, cinema, and photographic equipment increased in the 2000s but has been on a downward trend again. High-tech products accounted for 2.5% of exports in 2022 and, together with low-tech products, have the lowest share in exports.

[†] The Kandir Law is Brazilian exports' federal tax incentive law.

2.2. Russia's Export Structure

Russia's trade policy changed from tight protectionism to liberal free market policies after the fall of the Soviet Union in 1991. By the mid-1990s, Russia's geographical priorities in trade policy took the form of economic partnership and cooperation agreements with most Western countries and applications for membership in the World Trade Organization (WTO). These developed countries were the source of most foreign currency flows (Burange et al., 2019).



Source: UNCTAD, Comtrade Figure 6: Russia's Foreign Trade Indicators

In the 1990s, imports grew close to exports, driven by trade liberalization. In the 2000s, imports lagged behind exports in proportional terms but continued to grow. This result has been attributed to the increased disposable income and the strong ruble currency during this period (Makeeva & Chaplygina, 2008). As seen in Figure 6, although exports and imports decreased in the economy that contracted due to the crisis in 1998, the decline in imports was more pronounced. In 1998, the year of the crisis, foreign trade volume dropped to 115 billion dollars from 155 billion dollars in 1997. After this year, there was a general upward trend in exports and imports, and thus, in foreign trade volume, foreign trade volume increased from USD 115 billion to USD 735 billion until the 2008 global crisis. In 2009, the year of a sharp decline in the economy, foreign trade volume dropped to 472 billion dollars, a decline of around 37%. In 2010, with the economy's recovery, exports and imports started to increase until the end of 2013. 2013 was the year when Russia's total foreign trade volume was realized

at 842 billion dollars, with exports of approximately 527 billion dollars, the highest amount realized to that date.

On the other hand, in 2014-2016, when the economy contracted, the volume of foreign trade also shrank. According to Idrisova et al. (2016), this decline was mainly due to the import ban on food goods and the fall in world prices of oil, Russia's main export product. However, in parallel with the economic indicators that started to improve in 2017, Russian foreign trade has also improved. Russian exports rose to 443 billion dollars in 2018 and then declined. In addition, exports, which fell to 333 billion dollars in 2020 due to the global pandemic, increased again in the last two years and reached 531 billion dollars in 2022, approaching the foreign trade record realized in 2013. It is also noteworthy that Russia has been a country with a foreign trade surplus in all the years considered and that the foreign trade surplus has been on an upward trend.



Source: World Bank Indicators

Figure 7: Percentage Distribution of Russian Exports by Sector Groups

Russia is traditionally characterized as a raw material-producing country whose prosperity has been based primarily on hydrocarbon production and exports (Mau & Ulyukaev, 2015). Figure 7 shows that the fuel sector is the dominant export sector in Russia, followed by the manufacturing industry sector. The fuel sector, the locomotive sector in Russia's exports, accounted for 43.1% of exports in 1996, while it generally increased until 2014 and reached 70.5% of exports in 2013. The downward trend in global oil prices and trade embargoes also affected Russia's exports, and the share of the fuel sector in
exports generally started to decline in the following years, and the share of the fuel sector fell to 43% in 2021. While the share of the manufacturing industry in exports was 26% in 1996, it started to decline until 2011 and amounted to 13.2% of exports that year. In the following years, the share of the manufacturing industry started to increase, and in 2021, it amounted to 22.1% of exports.

On the other hand, among the sectors with relatively more minor shares in Russian exports, the share of the ores and metal sector has increased in recent years. However, it has generally decreased in the years under consideration. At the same time, the share of the food sector has generally increased, and the share of the agricultural sector has not changed much. When commodity groups analyze Russia's export structure, it is observed that the most significant part of its exports consists of raw materials and intermediate goods. As seen in Figure 8, in 1996, approximately 50 percent of the export composition comprised raw material goods, 20 percent of consumption goods, and 6 percent of investment goods.



Source: UNCTAD

Figure 8: Distribution of Russian Exports by Commodity Groups

The share of raw materials and intermediate goods in exports has generally increased over the years and exceeded 59% of exports in 2022, while the share of consumption goods, which has been on an upward trend over the years, has decreased since 2015 and realized at 21% in 2022. The share of investment goods, which has the lowest share in exports by commodity group, has generally decreased after 2003 and was realized as 4.3% in 2022.

	Billion \$	%		Billion\$	%
China	68,7	13,95	United Kingdom	22,3	4,53
Netherlands	42,1	8,55	Italy	19,3	3,92
Germany	29,6	6,01	Kazakhstan	18,5	3,76
Turkey	26,4	5,36	USA	17,7	3,60
Belarus	23,1	4,69	South Korea	16,9	3,43

Table 2: Top Ten Export Countries of Russia-2021

Source: UNCTAD

Table 2, compiled according to UN Comtrade data, shows that China, another BRICS partner, is the largest trading partner of Russia's total exports of approximately 492 billion dollars in 2021, with a share of 68.7 billion dollars and approximately 14%. The second-largest trading partner for Russian exports is the Netherlands. Export to these ten countries accounts for 57.8% of total exports.





When the technological structure of Russia's exports is analyzed, the share of primary and resource-based products in exports stands out. These products, which accounted for 63% of exports in 1995, will account for about 80% of total exports in 2022. The share of low-tech products in Russia's exports, which was 6.7% in 1995, has been on a downward trend in general, and the share of exports of these products was realized as 3.8% in 2022. The share of

medium-tech products in Russian exports was 12.6% in 1995. The share of medium-technology products, which have a relatively larger share than lowand high-technology products, was above 10% on average in 1995-2021, while it was 10.8% of exports in 2022. The share of high-tech products in Russian exports is the lowest compared to other product groups. In 1995, the share of high-tech products in exports was 2.5%, while this share generally tended to increase until 2003 and reached 4.5% of exports in 2002, after which it entered a general downward trend and was realized as 2.1% of exports in 2022.

2.3. India's Export Structure

For four decades after independence in 1947, the Indian economy adopted an import-substitution-led growth model as predicted by the Prebisch-Singer thesis (Toye & Toye, 2003), while classical protectionist instruments such as high tariffs and import licenses were heavily used in India during this period, as well as severe restrictions on foreign direct capital inflows from the mid-1970s to the early 1990s (United Nations, 2007). While the strategy contributed to the industrial base's development, it reduced competitiveness and productivity levels in the long run. The adverse macroeconomic scenario after the Gulf War added further pressure, and the country adopted a liberalized export-led growth regime in 1991 (Chakraborty & Sahu, 2016). In mid-1991, the government initiated a series of reforms to liberalize and globalize the Indian economy, aiming to integrate it with the rest of the world (Pradhan, 2003). As a result, these reforms increased India's trade openness and integration into the world economy (Singh, 2015).



Source: UNCTAD Figure 10: India's Foreign Trade Indicators

Following the reforms that eased international trade in India in the early 1990s, exports and imports increased significantly, positively affecting GDP. While India had a total foreign trade volume of around 42 billion dollars in 1990, it increased to around 95 billion dollars in 2000. By 2003, the total trade volume of the Indian economy exceeded 130 billion dollars. Both exports and imports increased continuously and significantly until the 2008 global crisis when the total foreign trade volume reached 497.5 billion dollars. In 2009, although the decline in exports was less than imports, there was a total contraction of around 11% in foreign trade. Foreign trade volume generally increased in the following years, except for some years. The last five years have been a period of increasing foreign trade volume, except for 2020, due to the global pandemic. In 2022, with most of the increase stemming from imports, the total foreign trade volume reached 1.1 trillion dollars.

On the other hand, India has generally been a country with a foreign trade deficit, meaning that its imports exceeded its exports. Parallel to the increasing foreign trade volume, the foreign trade deficit increased, especially after 2003. The foreign trade deficit, approximately 150 billion dollars in 2017, increased to 269 billion dollars in 2022.



Source: World Bank Indicators Figure 11: Percentage Distribution of Indian Exports by Sector Groups

In Figure 11, when the sectoral distribution of India's export structure is analyzed, it is seen that the manufacturing industry is the sector with the highest share. While the share of the manufacturing industry sector, which has the highest share in India's exports, was 70.6% in 1990, it is seen that it tended to increase until the end of 1999 and reached 79.2% of exports that year. From the 2000s until 2013, the share of manufacturing industry products in exports generally decreased. The average share of manufacturing industry products in exports was around 70% from 1990–2022. Until 2005, the share of the food sector in exports was the highest after the manufacturing industry sector but tended to decline in the years under consideration, reaching 11.4% of exports in 2022. However, after 2005, the share of the fuel sector overtook the food sector in general. The average share of the fuel sector for 2006–2022 is 15.7%, while the share of the fuel sector increases to 21% of exports in 2022. The share of agricultural raw materials in India's exports, around 4% in 1990, has been downward since then and has fluctuated within the 1-2.5% band until 2022. The mining sector's share in total exports, which was 5.1% in 1990, has been on a downward trend since 2007. The average share of the mining sector for the 1990–2022 period was 4%.



Source: UNCTAD **Figure 12:** Distribution of Indian Exports by Commodity Groups

Until 2007, according to a study of the country's export structure by commodity groups, most of India's exports were made up of raw materials and intermediary commodities. In contrast, after 2007, the most significant portions comprised consumption goods. The proportion of investment goods is lower compared to these goods. In 1990, raw material goods accounted for the largest share in total exports, with 51.9%, while their share in exports started to decline in the following years and was around 42% in 2021. The share of consumption

goods in exports fluctuated until the early 2000s but averaged around 39%. However, exports of consumer goods started to increase from the 2000s onwards, and the average share of consumer goods increased to 43% between 2000 and 2021. Moreover, the share of investment goods, which was around 6% in both 1990 and 2000, has increased over the years to 13%. As a result, the weight of export goods in India has shifted towards consumption goods, the proportion of raw material goods has decreased, and the proportion of investment goods has increased.

	Billion \$	%		Billion\$	%
USA	80,2	17,72	Singapore	11,8	2,61
United Arab Emirates	31,3	6,91	United Kingdom	11,2	2,47
Netherlands	18,5	4,09	Germany	10,4	2,30
China	15,1	3,34	Saudi Arabia	10,2	2,25
Bangladesh	13,8	3,05	Turkey	10	2,21

Table 3: Top Ten Export Countries of India-2022

Source: UNCTAD

Table 3 shows that India's largest trading partners are the USA, China, and the UAE. Exports to the USA, India's largest export market, amounted to USD 80.2 billion, accounting for 17.7% of total exports, while the UAE, India's second-largest export market, accounted for 6.9% of total exports. These ten countries, where most exports are realized, account for approximately 47% of total exports.





An analysis of the structure of Indian exports in terms of technological level shows that the share of primary products, which had a larger share in Indian exports in the years under consideration, tended to decline, and the share of resource-based products tended to increase. By 2022, the share of primary products decreased from 19% to 10%, while the share of resource-based products increased from 26% to 40%. Low-tech products, which had the largest share, reaching 40% by the mid-2000s, generally follow a downward trend, reaching around 20% of exports in 2022. On the other hand, exports of medium-tech products have generally increased over the years. The share of medium-tech products has increased over the years, reaching 20% of total exports in 2016, almost 100% higher than in 1995. In 2022, medium-tech products decreased compared to the previous year and amounted to 19.8% of total exports. On the other hand, the share of high-tech products in total exports, which stood at 4.5% in 1995, has generally tended to increase over the years and reached 10.3% in 2022.

2.4. China's Export Structure

For any developing country, improvement in export performance becomes a key objective (Bagaria & Saba Ismail, 2017). In this context, China has tried to increase its exports and imports while gradually liberalizing its trade and opening it to foreign investors since 1979. Along with the economic reforms, China's degree of trade openness increased with the increasing volume of foreign trade from the 1990s to the 2000s. As can be seen from Figure 4, China's foreign trade volume has been increasing since 1990. While China had a total foreign trade volume of 115.4 billion dollars in 1990, it had a trade volume of 509.6 billion dollars by the end of 2001. In 1991–2001, the average growth rate of total exports was 14.6%, while that of imports was 15.3%.

China joined the WTO in 2001, initiating a period of export-led economic growth (Zhu, 2012). China's accession to the WTO was a strategic decision by the government to strengthen its position in the world economy. In addition, China has become a giant economy as one of the world's largest investor countries with significant political influence. With this status, it has taken a step towards export-led economic growth by strengthening the multilateral trading system (Sun and Heshmati, 2010). After the 2001 WTO membership, with the adoption of the export-oriented growth model, total exports increased from 266 billion dollars in that year to 1.4 trillion dollars by 2008, while imports increased from 243.5 billion dollars to 1.1 trillion dollars. In other words, the rate of increase in





Source: UNCTAD Figure 14: China's Foreign Trade Indicators

Affected by the global crisis-induced slowdown in world trade, China's exports and imports contracted by 16% and 11%, respectively, in 2009 compared to the previous year. Until 2015, although there was a recovery in total foreign trade volume, on average, the increase in both export and import rates decreased compared to the pre-global crisis period. Export growth between 2011 and 2017 declined by around 6% on average. After 2009, 2015, and 2016, there were also years of total foreign trade volume contraction. Since 2016, the volume of foreign trade has started to increase again, and although the growth rate of exports slowed down in 2020 due to the pandemic, they continued to increase in quantity and reached 3.358 billion dollars in 2022. In addition, another striking factor in the years under consideration is that China is generally a country with a foreign surplus, and the foreign trade surplus continues to increase; that is, there have been significant increases in the amount of exports compared to imports.



Source: World Bank Indicators



In Figure 15, when sector groups analyze the Chinese export structure, the most noteworthy is that the manufacturing industry accounts for almost all the exports within the sector groups. While the share of the manufacturing industry in exports was 78.6% in 1992, it has been on an upward trend over the years and has become the largest sector, accounting for 92.6% of total exports in 2022. On the other hand, it is noteworthy that the food sector accounted for 10% of exports in the 1990s but declined to around 2% in the following years. In addition, the share of agricultural raw materials, fuels, and minerals, which have low shares in exports, decreased from an average of 2.4% in the 1990s to 1.3% in the 2000–2022 period.



Source: UNCTAD, WITS (World Integrated Trade Solution) Figure 16: Distribution of Chinese Exports by Commodity Groups

China is known to be mainly an exporter of final goods rather than raw materials and intermediate goods. When China's export structure is analyzed in terms of the distribution of the groups of goods it exports, it is seen that in the early 1990s, consumer goods had a significant weight with a ratio of approximately 55%. While the proportion of raw material goods in exports was approximately 33%, it was noteworthy that the proportion of investment goods was the lowest contributing commodity group, with a 10% share. It is observed that the contribution of these three groups of goods to exports has also changed throughout the process of change and transformation in China. Investment goods, which made the lowest contribution in the 1990s, became the commodity group with the highest share with an increase of more than 300% towards 2022, while raw material goods, which made the second-largest contribution, became the commodity group with the lowest contribution with a decrease of more than 40%. Moreover, consumer goods, the most significant contributor to exports throughout the 1990s, declined by more than 30%, and by 2022, their contribution had fallen to 34.8%.

One of the structural changes in China's exports has been related to China's trading partners. For a long time, most of China's exports depended on developed markets such as the EU, the USA, and Japan. However, with the rise of emerging markets, China's export markets have diversified considerably (Nataraj & Tandon, 2011). Exports to developed countries decreased from 88.2% of total goods exported in 1991 to 72% in 2011, while exports to developing countries increased from 7.5% to 20% in the same period (Tuan et al., 2016).

	Billion \$	%		Billion\$	%
USA	582,8	16,22	India	118,50	3,30
Hong Kong	297,5	8,28	Netherlands	117,70	3,28
Japan	172,9	4,81	Germany	116,20	3,23
South Korea	162,6	4,52	Malaysia	93,70	2,61
Vietnam	147	4,09	Other Asia, nes	81,70	2,27

Table 4: Top Ten Export Countries of China-2022

Source: UNCTAD

An analysis of the market share of the top ten countries to which China exports in 2022 reveals that the most important market for China is the USA, which accounts for 16.2% of total exports. Hong Kong, a particular administration affiliated with China, was the second-most important export destination. Exports to Japan accounted for 4.8% of total exports, while exports to South Korea

accounted for 4.5%. As a result, China's top ten export destinations accounted for 49% of total exports.

China's initial policy focus in the 1980s and early 1990s was the laborintensive light production of simple consumer goods. Specializing in short production chains and low unit-value inputs, China's exports were dominated by products such as clothing, footwear, furniture, and toys (Yu, 2018). On the other hand, as a low-income and labor-abundant country with labor-intensive light production, which accounted for more than 40% of its exports in the early 1990s, China started to produce and export higher capital-intensive products such as electronic devices, machinery, and transportation equipment (Rodrik, 2006). In light of these developments in China's export structure, several changes have occurred in the technological structure of Chinese exports in the period under consideration. What is generally observed is that the weight of primary and resource-based goods and low-tech goods in exports has decreased, while the weight of medium and high-tech goods has increased over the years.





When the share of primary and resource-based products was analyzed, while these products accounted for 21% of total exports in 1995, their share started to decline continuously by 2022 and dropped to 12% of exports in 2022. The share of low-tech products, which had the largest share in Chinese exports (46% in 1995 until 2005), started to decline in general and dropped to 28% in 2022. The share of medium-tech products, which accounted for 18% of exports in 1995, increased and reached 27.6% in 2022. The share of high-tech products, which accounted for 18% of exports in 1995, increased and reached 27.6% in 2022. The share of high-tech products, which accounted for 13% of exports in 1995, has generally increased, reaching 30.6% in 2022.

2.5. South Africa's Export Structure

Between 1925 and 1970, South Africa pursued a trade policy of import substitution (Mabugu & Chitiga, 2007). This policy was implemented to protect firms from international competition against trade barriers, including high tariffs and external barriers (Bell & Cattaneo, 1997). South Africa was also one of the first countries to adopt import substitution as a means of industrialization. However, since the early 1970s, there have been significant changes in the trade regime that have made exports more profitable and the trade regime less protective. In 1980, a new and more robust export promotion system was introduced, and in 1990, there were attempts to boost exports through the General Export Incentive Scheme (GEIS) (Belli et al., 2003). In addition, several essential export subsidies were introduced in April 1990 in South Africa (Mohr, 2010), leading to significant political and economic developments. In 1994, democratic elections were held in South Africa, and the liberalization of financial markets, trade regimes, and labor markets began (Cassim et al., 2004). As a result, South Africa, which before 1994 had a trade regime that was considered highly complex with the most tariff lines and the most comprehensive tariff rates among developing countries (ITAC, 2014), has since 1994, after a long period of political isolation, started to re-articulate with the global economy. With the entry into this process, a rapid trade liberalization was undertaken, which led to increases in South Africa's export and import volumes, and many trade policy reforms were implemented.



Source: WITS (World Integrated Trade Solution) **Figure 18:** S. Africa's Foreign Trade Indicators

With a democratically elected government in 1994, South Africa initiated a new economic era with innovations such as stabilizing macroeconomic variables, market determination of exchange rates, and a more competitive international trade environment (Draper & Alves, 2007). Despite significant economic restructuring, South Africa's post-1994 export performance has been lower than expected. Indeed, while world export growth accelerated to 6.2% in the decade since 1994, S. Africa's average export growth slowed to 5.6%, and the country's share of world exports fell from 0.7% to 0.5% (Flatters & Stern, 2007). The years in which export and import growth gained momentum were 2002 and onward. Between 2003 and 2008, export growth averaged 21.7%, while the volume of foreign trade, which increased almost uninterruptedly until 2008, witnessed a sharp decline with the global crisis. In the year following the global crisis, export and import rates started to increase. From 2011 to 2016, export performance was poor, with exports showing a negative growth performance of around 10% on average between 2012 and 2015. Part of the reason for the decline in exports in South Africa since 2011 is that precious metals account for a large share of exports and the fall in metal prices during this period. Also contributing to the decline in exports was a massive drought in 2014-16 that drastically reduced agricultural yields (Muraguri et al., 2018). During these years, exports fell to around USD 70 billion, one of the periods with the most significant foreign trade deficit. Since 2016, exports have started to increase again. However, exports, which decreased significantly in 2020, when the impact of the pandemic was felt, reached 121 billion dollars in 2021, with an increase of approximately 30% compared to the previous year. Another factor observed in South Africa's foreign trade between 1992 and 2021 is that it is generally a country with a foreign trade deficit, except for the first years of the 1990s. However, it is noteworthy that South Africa has become a country with a foreign surplus in 2016 and beyond.

The manufacturing industry has the most significant share among the sectoral groups when the sectoral distribution of South Africa's export structure is examined, as shown in Figure 19. The share of the manufacturing industry in total exports, which was 28.5% in 1992, increased significantly over the years and reached approximately 62% in 2002. In the following years, it has been observed that the share of the manufacturing industry has been on a downward trend.



Source: World Bank Indicators



The sector group with the second-highest export share is ores and metals, which has increased since 2002. While the share of this sector in exports was around 10% in 1992, it has increased over the years and exceeded 37% in 2021. The share of the fuel sector in exports, which was 6.96% in 1992, fluctuated over the years but reached its highest rate of 14.3% in 2022. When the share of the food sector in exports is analyzed, the share of the food sector, which was 8.18% in 1992, has generally tended to increase and will constitute 10.3% of exports in 2022. In the years under review, the average share of the food sector in exports, which was 3.7% in 1992, has also been downward, falling to 1.7% of exports, especially since the 2000s, and was 1.3% of total exports in 2022.



Source: WITS (World Integrated Trade Solution) Figure 20: Distribution of South African Exports by Commodity Groups

South Africa mainly exports raw materials and intermediate goods rather than investment and consumption goods. When the export structure of South Africa is analyzed in terms of the distribution of the groups of goods it exports, it is seen that raw materials and intermediate goods have a great deal of weight. In 1996, raw materials and intermediate goods exports accounted for 67% of total merchandise exports, consumption goods for 11.1%, and investment goods for 10.9%. Exports of raw materials and intermediate goods, which constitute a significant part of exports, followed a fluctuating pattern similar to the fluctuations in total exports between 1996 and 2002. After 2002, exports of raw materials and intermediate goods increased again, reaching 72.8% of total exports in 2022. An analysis of the exports of the other two product groups, which have a relatively minor share in South Africa's total exports, shows that exports of consumption goods were generally higher than exports of investment goods, except for the years 1997-1998 and 2006–2008. While the ratio of consumption goods to exports averaged around 18% in the years under consideration, the ratio of investment goods to exports was 14.2%.

	Billion \$	%		Billion\$	%
China	11,7	9,62	Netherlands	6	4,93
USA	10,7	8,80	Mozambique	5,8	4,77
Germany	8,8	7,24	Unspecified Countries	5,4	4,44
Japan	8,5	6,99	India	5,2	4,28
United Kingdom	6,3	5,18	Botswana	4,7	3,87

Table 5: Top Ten Export Countries of S. Africa Exports-2022

Source: UNCTAD

When the export structure of South Africa is analyzed according to the countries to which exports are made, it can be seen in Table 5 that China is the largest trading partner of South Africa. At the same time, Germany and the USA are the largest trading partners other than this country. Total exports to these three countries amounted to 31.2 billion, accounting for 25.6% of the total export volume-exports to the ten countries on the list account for 53.1% of total exports.



Source: UNCTAD, Comtrade Figure 21: Technological Level of South African Exports

The proportion of primary and resource-based products in exports increased from more than 55% of total exports in 1995 to over 63% in 2022 when the structure of South African exports is examined in terms of technological level. The share of low-technology products was around 10.4% of total exports in 1995 but generally declined, falling to 4.6% of exports in 2022. The share of medium-technology products, 23.2% of exports in 1995, increased in the 2000s and exceeded 32% in 2008. In the following years, the share of medium-tech products in exports fluctuated but reached 27.8% in 2022. On the other hand, high-tech products accounted for 3.6% of South African exports in 1995 and had the same share on average until 2015. However, the share of high-tech products has been on a downward trend since 2015; in 2022, it was 2% of total exports.

3. Conclusion

The export structure includes the distribution of exported goods by commodity groups, including investment, consumption, and raw materials, as well as their transformation by commodity group and their distribution by sector, including manufacturing, agriculture, and fuel. The export structure also considers the variation in the market shares of exported goods by nation, country group, or region and their weighting according to their technological structure. Knowing the export structure of these countries is a crucial factor for assessing their export performance and maximizing export revenues because increased exports in developing countries strategically contribute to their economic development by causing significant changes in their foreign trade policies. As it is known, developing countries are countries whose economies are undergoing a rapid expansion process, providing investors with the opportunity to earn more profits and, in this respect, having more significant potential than developed countries. The main objective of this study is to examine in detail the export structure of BRICS (Brazil, Russia, India, China, and South Africa), which are five rapidly developing countries, in terms of the sector, commodity group, country, and technology level of goods exported from 1990 to 2022, when capital movements started to liberalize, and foreign trade started to expand.

The following details stand out as outstanding components when the study's findings are evaluated:

The importance of the manufacturing and food sectors is shown in the sectoral composition of exports when Brazil's export structure is examined. When the weights of exports by commodity groups are analyzed, it is seen that the largest share is in the exports of raw materials and intermediate goods. When countries analyze exports, it is seen that China is the largest trading partner. Regarding the technological level, Brazilian exports are dominated by primary, resource-based, and medium-tech goods.

In Russia, the fuel sector has the most significant weight in the sectoral composition of exports. When commodity groups analyze exports, it is seen that the most significant part of exports consists of raw materials and intermediate goods; when analyzed by countries, it is seen that Russia's largest trading partner is China. Primary, resource-based, and medium-technology goods dominate the structure of Russian exports in terms of technological level.

The manufacturing industry dominates the sectoral structure of India's exports. When analyzed by commodity groups, it is seen that the most significant part of exports comprises consumption and raw material goods. When analyzed by countries, it is seen that the USA is the largest trading partner of India. Resource-based, low- and medium-technology goods dominate the structure of Indian exports.

The manufacturing industry accounts for almost all of China's exports, making it the most prominent global trade exporter. When commodity groups analyze China's export structure, the weight of investment goods stands out. In contrast, when analyzed by countries, the USA has the most significant exports and is an important trading partner. When the structure of Chinese exports is analyzed in terms of technological level, there is an export structure dominated by high-tech goods. The manufacturing industry has the highest share of South Africa's exports. When the export structure of South Africa is analyzed in terms of the distribution of commodity groups, it is seen that raw materials and intermediate goods have a significant weight; when analyzed by countries, it is seen that China is the largest trading partner. In terms of technological level, the structure of South African exports is dominated by primary, resource-based, and medium-tech goods.

In light of all these findings, the product and country concentration in the exports of BRICS countries is concentrated on the top five or ten products or countries. Therefore, increasing export revenues by increasing product and market diversification to reduce the dependence of exports on a few countries or sectors is an essential issue in achieving macroeconomic targets and reducing vulnerability to crises with contagion effects. In addition, since the production structures of these countries are primarily based on low and medium technology, implementing policies that will transform their production structures into hightech structures that create more added value will provide significant advantages in achieving development goals by keeping export revenues at a sustainable level.

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CHAPTER X

FRUGAL INNOVATION: A NEW MIRACLE OF SPARKLING CREATIVITY

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1. Introduction

rugal innovation, which aims to achieve more value by using less resources, has been the focus of attention of both the academic community and policy makers in the last decade. The concept of frugal innovation, also known as Jugaad Innovation or Gandhi Innovation, refers to a scarce resource product, service, process or business model that can be designed and/or implemented despite limited financial, technological, raw material and material opportunities (Hossain et.al, 2016). This new concept is primarily focused on Bottom of the Pyramid (BoP) customers in emerging markets. Over time, it has begun to be considered as an alternative way to deal with difficulties at the global level (Agarwal & Brem, 2017). Frugal innovation can be considered as a way to stay profitable while solving the social sustainability problems of businesses (Radjou & Prabhu, 2014). Frugal innovation is also considered as a new alternative that is much more resource efficient than existing alternatives and is still accessible and userfriendly, especially for low-income customers (Hossain, 2018; Von Janda et.al., 2020).

The aim of this study is to evaluate the success factors and possible challenges by going down to the theoretical foundations of frugal innovation. At the same time, by evaluating the interest in frugal innovation in developed markets, a different perspective on innovation policies was tried to be developed through three success stories.

2. Roots of Frugal Innovation

Recent years have seen a rise in the popularity of frugal innovation among practitioners and researchers in the field. The Economist presented one of the earliest definitions of furugal innovation in 2010:

"There is more to this than simply cutting costs to the bone. Frugal products need to be tough and easy to use. (...) Frugal often also means being sparing in the use of raw materials and their impact on the environment. (...) Frugal innovation is not just about redesigning products; it involves rethinking entire production processes and business models." (Economist, 2010).

Since then, a significant amount of research has been put into conceptualizing frugal innovation. There is no consensus on the origin of the concept of frugal innovation. According to Kaplinsky (2011) the origin of the concept is based on the "appropriate technology" movement, which connotes the use of technologies that are labor-intensive, simple to operate and repair, produce products for low-income consumers, and suitable for low-income countries. According to Dabic (2022), the origin of the concept of frugal innovation, which is claimed to have been put forward by Carlos Ghosn, the CEO of the Renault-Nissan alliance, comes from "frugal engineering". The definition made by Zeschky et.al (2011) has been the most cited and accepted definition to date. According to Zeschky et al. (2011), frugal innovation is defined as "good enough" and affordable products/services that meet BoP needs. Resource limitations were recognized as the main driving forces behind these inventions, including underdeveloped infrastructure, institutional gaps, illiteracy, and poor purchasing power (Nakata & Weidner, 2012; Schuster & Holtbrugge, 2014).

Term	Proposed Definition
Jugaad	An improvisational approach to solving one's own or others' problems in a creative way, at a low cost, in a short amount of time, and without serious taxonomy or discipline applied by people at the BoP as a result of poverty and exigency.
Frugal innovation	A derived management approach, based on jugaad, which focuses on the development, production, and product management of resource saving products and services for people at the BoP by achieving a sufficient level of taxonomy and avoiding needless costs.
Frugal engineering/ constraint-based innovation	Describes a process-oriented approach to adapt existing technologies to local challenges by dint of the integration of the local society in order to reduce inherent development costs and time.
Gandhian innovation	An approach that takes advantage from the adaption of existing technologies by integrating them into local context or/and establishing local expertise by spillovers through collaborations in order to increase social wealth of people from the BoP.
Catalytic innovation	An approach that focuses on social change by breaking down existing social and economic structures and creating new market structures which involves new development approaches of systematic, sustainable, and system-shifting kind
Grassroots innovation	Represents a bottom-up development approach that includes social integrity and local civilians as inventors by connecting peoples through social or technical networks in order to develop ecologically and socially acceptable products and services
Indigenous innovation	Considers technology transfers, predominantly technology inflows, from developed to emerging countries and their effects on local entrepreneurs at the BoP
Reverse innovation	Represents the development of new products in and for emerging countries by DMFs or EMF which will be introduced equally in developed markets if the demand in developed markets is identified. The extreme case of reverse innovation is the development of new products in emerging countries which are only introduced in developed markets

Table 1: Proposed Definitions

Source: Brem and Wolfram, 2014

Resource constraints such as less developed infrastructure, institutional gaps and low purchasing power are considered to be the main drivers for frugal innovation (Nakata & Weidner, 2012). In this context, as can be seen in Table 1, innovation types based on resource constraints such as grassroots innovation, catalytic innovation, inclusive innovation, reverse innovation have started to gain popularity. Reverse innovation highlights the increasing reverse flow of frugal innovations, particularly those developed in BoP constraint-based environments but commercialized in advanced economies. However, these types of innovations, which have obvious common features such as being affordable, robust and user-friendly, have also caused a great terminology confusion in the academic field (Agarwal et al., 2017). Agarwal et.al. (2017) reveals that as this field matures, researchers and academics predominantly use the term "frugal innovation" to refer to all these innovations designed under conditions of scarcity.

From the business point of view, the increase in local competition reveals the necessity for multinational companies (MNCs) to reconsider their strategies. MNCs realized the need to understand the different conditions of BoP markets, which differ significantly from western economies, and to develop bottom-up local solutions specific to customer needs. In this context, it is noteworthy that MNCs have started to establish local R&D laboratories and recruit local talents who are aware of local requirements. MAC 400, lullaby warmer, vscan, Multix DR and HMI Panel, developed by large MNCs such as GE Healthcare and Siemens, can be counted among the examples of successful frugal innovation (Agarwal & Brem, 2017).

Recent studies consider frugal innovation as a multidimensional phenomenon consisting of three main dimensions: product, process and context. The product dimension, which includes simplicity and robustness, focuses on basic and essential functions. The process dimension includes the bottom-up creative process, localized development and scaling options to respond to challenges. The context dimension includes affordability, resourcefulness, and radical and/or transformative effects. While this multidimensional perspective offers a structured approach, it also draws attention to hitherto unexplored dimensions and aspects (European Commission, 2016).

According to Weyrauch and Herstatt (2016), frugal innovation is distinguished from other types of innovation by (1) significantly reducing costs, (2) focusing on core functions, and (3) optimizing performance levels approaches. Although it still has some difficulty in making precise measurements

about how much the costs are reduced when evaluated quantitatively, a framework is offered for identifying the degree of frugality in terms of quality (European Commission, 2016). But it would not be wrong to say that there is a blur about what can be considered as frugal innovation. In this context, a group of researchers and academics have developed lists of criteria to identify what they consider to be frugal solutions, or at least solutions specifically relevant to emerging market conditions.

Kumar and Puranam (2012)	Roland Berger (2014)	SIEMENS SMART (2005 Strategy)
Physical Robustness	Functional	Simple
Portability	Robust	Maintenance-friendly
De-featuring	User-friendly	Affordable
Leapfrog technology	Growing	Reliable
Low cost by scaling	Affordable	Timely-to-market
roduction		
Service Ecosystems	Local	

Table 2: Common I	Lists of Criteria	for Frugal In	nnovation
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Source: Kumar and Puranam (2012), Roland Berger (2014), Siemens (2011)

Considering all these definition efforts together with decreasing government expenditures, decreasing revenues and limited budgets, the concept of frugal innovation has started to attract the attention of developed markets. The protagonists see it as an entrepreneurial approach that enables them to create novel solutions for disadvantaged consumers, typically in low-income to middle-income nations, while utilizing constrained resources (LMICs). In this perspective, it is argued that frugal innovation can create new markets by supporting a more circular economy and contribute to a more sustainable and inclusive world (Tiwari et.al., 2017).

3. Frugal Innovation in Developed Markets

It is known that there is an increase in sustainability-conscious consumers who voluntarily adopt a frugal lifestyle and demand frugal production and consumption models (Bound & Thornton, 2012; Kroll et.al., 2015a). Especially in the 2000s, the economic crises experienced one after the other caused a constant change in consumer behavior. In this context, the COVID-19 pandemic has also caused a significant exacerbation of poverty in developed countries (IMF 2020). In addition, demand for frugal products and services has increased

as a result of de-leverification and slow growth in advanced economies (Bound & Thornton, 2012). Increasing income inequality in developed country economies causes the wealth and spending power of individuals to become polarized. Over the last two decades, this trend has become increasingly evident and has had a significant impact on behavioral patterns in advanced economies where an increasing number of consumers have very limited spending power (Reinhardt et al. 2018; Albert 2019; Hossain 2020).

The growing need and potential for frugal solutions and innovations in the European market has not yet fully manifested itself in market demand. However, it is thought that a growing group of low-budget customers and other sustainability-conscious consumer groups will be considered the main focus of frugal innovations in developed markets (Kroll et al., 2015b). However, due to cost pressures, frugal innovation is expected to play an important role in developed markets (Tiwari & Herstatt, 2014). The avoidance of the Innovator's Dilemma (Christensen, 1997), which involves being more aware of over-engineering the company's goods and disruptive ideas, could be another motivator. In developed economies, frugal inventions are typically reverse advances tailored to developed markets (Agarwal & Brem, 2012). Although Weyrauch and Herstatt (2016) discovered that the perception of frugal innovation in emerging markets is similar to that in developed markets, it would be helpful to make a distinction between the geographical locations of frugal innovations (Winkler et.al., 2020).



Source: Weyrauch & Herstatt, 2016 Figure 1: Three Criteria of Frugal Innovations

Populations are aging at a quicker rate, which means that consumers are less likely to be interested in more expensive goods or services with numerous features that seniors won't use. Instead, they are more inclined to favor straightforward, uncomplicated, and affordable products. Businesses should adhere to the sharing economy and circular economy concepts because the most recent financial crisis reduced peoples' purchasing power on an economic level. Last but not least, social changes include growing worries about raising living standards (Rosca et al., 2017).

According to Winkler et al. (2020), in order for frugal innovations to be commercially successful in developed countries, they must satisfy Weyrauch and Herstatt's (2016) criteria for optimal performance by making adjustments to account for user-specific factors.

4. Successful Cases of Frugal Innovations

4.1. India's Electronic Voting Machine (EVM)

The Election Commission of India first explored electronic voting in 1977 because of repeated spending on printing, storing, transporting, and security of ballot papers. In cooperation with the public-sector Electronics Corporation of India Ltd., a prototype was created by 1979 (Saini, 2013). Designing a simple electronic machine that is reliable, simple to use, and hard to manipulate was the goal (Verma, 2005). The Election Commission of India opted to employ electronic voting machines (EVMs) in elections at all polling places in the nation in 2004 following a relatively drawn-out political and legal procedure that gave them a legal status with broad acceptance. In the 2004 national elections, EVMs were utilized for the first time nationwide. This allowed the country to save over 8,000 tons of paper from being used to print ballots, saving approximately 150,000 trees in the process. The Indian machine is commended for its simplicity, affordability, and efficiency rather than for its massive, expensive, complicated, and computer-like systems. According to the Election Commission, using EVMs would result in a reduction of over 200,000 trees and 10,000 tons of ballot paper in just the upcoming national elections. The use of EVMs has raised the number of voters per booth from 1,200 to 1,500, freeing up resources for improved organization while significantly lowering the incidence of poll tampering and incorrect votes. These too encouraging comments raised doubts among political parties, activists, academics, and experts in voting security. It has been stated that illiterate individuals find voting more comfortable than on paper ballots

now that EVMs are being used in India, where more people are able to cast ballots (Tiwari & Herstatt, 2012).

4.2. Airbnb as a Service Innovation

Airbnb is one of the few frugal service innovations. The original concept of Airbnb is a frugal innovation by definition, yet the business model of Airbnb has changed over time (Winkler et.al., 2020). Airbnb, which is a successful example of the sharing economy started out with a frugal mindset before becoming financially successful. When two hosts opened their San Francisco home to three guests in 2007, Airbnb was formed. The founders needed two more years to attract investors, develop a user-friendly website, rename the company to Airbnb, and turn it into a profitable venture (Carson, 2016). Since then, it has expanded to over 4 million hosts and more than 1 billion guest arrivals in practically every nation on earth (Gallagher, 2017). For instance, Airbnb now rents more rooms per year than Hilton's entire global chain does (Prabhu, 2017). Airbnb focuses on already existing space rather than real estate that must be either modified or developed from scratch, which leads in a significant cost savings compared to the conventional notion of a budget hotel (Guttentag & Smith, 2017). It might be argued that Airbnb has adopted a frugal strategy even if academics found that it is not a truly disruptive innovation when compared to low-cost and midrange hotels/motels due to a different set of performance criteria (Guttentag & Smith, 2017; Winkler er.al., 2020).

4.3. E-commerce platform Taobao

China's e-commerce has grown incredibly quickly in recent years. Benefiting from the growth of e-commerce, from the middle of the 2000s, certain e-commerce activity clusters have also arisen in rural China and have been dubbed "Taobao Villages" after the Alibaba-owned e-commerce site Taobao. Chinese and foreign observers now have higher hopes that e-commerce would help revitalize the struggling rural economy and reduce poverty in rural China and abroad as Taobao Villages have spread across the country (Liu et.al., 2016). Rural Taobao has continuously grown since its launch, now covering over 30,000 villages and 700 counties across China's 29 provinces. To enable e-commerce distribution in rural areas, the business has established hundreds of service centers. Some "Taobao villages," which are connected to the global online market through the Taobao platform, eventually took shape as the rural logistics infrastructure improved. About 2,118 "Taobao villages" existed at the end of 2017, and the e-commerce sector had generated more than 28 million job possibilities in China, with more than RMB 120 billion in total sales. By using Taobao Village in Lishui, Zhejiang Province as an example, farmers can learn from one another through community demonstrations, social demonstrations, and a network business association platform. This encourages rural farmers to become more entrepreneurial and attracts a collection of logistics and other supporting service providers, which in turn fosters the growth of rural e-commerce (Yin et.al., 2019).

5. Conclusion

The field of study on frugal innovation is continually developing. Under resource limits, frugal innovation creates products that are satisfactory and directly address consumer needs based on three principles: simplicity, affordability, and environmental sustainability. Reduced technological complexity in products and services, particularly in emerging countries, attempts to provide customers with sustainable value. Because it emphasizes the affordability and inventive creation of new and innovative services with limited resources, discussions on frugal innovation are particularly pertinent in situations with restricted resources. Frugal goods and services could open up brand-new markets and have a greater positive impact on sustainable development than more expensive alternatives. It is crucial to keep in mind that frugal innovations don't always have to stick to the reuse of existing technologies or resources. In fact, there are already examples where these innovations are advancing beyond more established ones and creating solutions that are both resource-efficient and sustainable. To achieve key functionalities and best performance, a greater emphasis must be placed on investigating frugal innovation principles for building solutions with minimal usage of resources. This is especially important in the context of advanced economies where consumers are already finding it difficult to manage ever-increasing technical complexity and are searching for straightforward, streamlined, and intuitive solutions.

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CHAPTER XI

AN ASSESSMENT ON SOCIAL PROTECTION EXPENDITURES IN TURKEY

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1. Introduction

Today, many factors such as economic policies, global or national crises, pandemics, disasters, affect social justice. These factors have particularly had negative effects on the welfare of some groups. For this reason, the necessity of a social state approach has been the focus of discussions and social protection mechanisms and social protection expenditures, which are an important tool of the social state approach, have gained importance.

The main goals of social protection mechanisms are to protect the permanent income or living standards of individuals, reduce poverty, ensure economic equality, ensure fairness in income distribution, prevent social exclusion and marginalization (Lindert, 2002; Şener, 2010: 4). The goal of social protection expenditures to ensure fairness in income distribution is of great socioeconomic importance. These types of expenditures have a importance impact on the achievement of growth and development. In fact, it is necessary for individuals to receive a sufficient share of the total income in order to ensure social justice. The state can only manage to prevent important economic and social problems by ensuring that disadvantaged groups have access to goods and services that they cannot benefit from for different reasons (Şeren and Geyik, 2021: 216).

In academic writing, it is quite common for the topics addressed to be similar. However, it is important to examine similar issues from different perspectives in order to create new knowledge about the current issue. The proportions of social protection expenditures and components vary among countries. These ratios are important for evaluating the country's social position. Based on these reasons, the study aims to create awareness by examining and evaluating the data on social protection in Turkey from 2010 to 2022.

In the study, the concept of the social state and the understanding of the social state in Turkey with applied by policies has been examined within a conceptual framework. After, the concepts of social protection and social benefits in Turkey are explained, and an assessment of the situation is made in the light of data related to social protection. The conclusion and evaluation section constitutes the final title of the study. The data were obtained from the official website of TurkStat.

2. The Theoreticial Framework of the Social State

In the literature, the concepts of the social state and the welfare state are often used interchangeably. For the most part, the concept of a welfare state is preferred instead of a social state. Some researchers, on the other hand, agree that the concept of a welfare state and a social state do not have the same meaning. These researchers claim that every welfare state is a social state, and not every social state is a welfare state. In other words, the concept of welfare state is considered to be a broader concept that encompasses the concept of social state (Özdemir, 2007: 11-12).

The literature on the social state is very wide and there is no common definition (Huber, 1970: 33). Despite the lack of a common definition, the concept of social state can be defined as a state ideology that aims to improve the welfare levels of citizens, provide a certain standard of living, and ensure social security (Bozkaya, 2014: 1; Kurt Topuz, 2009: 117). According to another definition, the social state is explained as a form of state that implements a set of practices that allow citizens to improve their living standards regardless of their social position (Lewin-Epstein et al., 2003: 2). The main goals of the social state is to provide individuals with a minimum standard of living worthy of human dignity and to ensure that individuals are not dependent on anyone. At the same time, social states adopt an approach that supports the freedoms of the individual (Özdemir, 2007: 85-88).

As can be understood from these definitions, the elements of the social state are as follows; (Gözübüyük, 2001: 163-164).

 \checkmark Increasing national income within social justice,

✓ Ensuring equitable distribution of national income among individuals,

 \checkmark Ensuring the social security of individuals,

 \checkmark It is the provision of financial opportunities to individuals for the realization of individual freedoms.

Social states use social services and social policy practices to fulfill these duties (Özdemir, 2007: 85-88). In fact, in the understanding of the social state is the idea that all individuals of society should be considered to live in prosperity as a right. This idea is closely related to the field of duty of the social state. It field of duty of the social state is evaluated under five headings: social security, education, health, redistribution of income, and social welfare services. State expenditures on these areas or the share allocated from the budget are important indicators of the social state (Bozkaya, 2014: 1).

Social state practices that prevail in countries vary according to the countries' unique social, economic, political and cultural conditions. This situation also leads to the emergence of different social state practices (Yay, 2014: 150). For example, Esping-Andersen (1990) categorically classified the state in 3 ways: social democratic, conservative institutional and liberal. According to this classification, the Scandinavian countries have the characteristics of a social democratic welfare state. Central European countries are classified as conservative welfare states, while Anglo-Saxon states are classified as liberal welfare states (Shalev, 2000). The Esping-Andersen (1990) classification is widely used and accepted.

3. Understanding of Social State in Turkey

The historical development of the social state in the world is mainly divided into four periods. These periods; (Karagöz, 2020: 148)

 \checkmark The pre-industrialization period,

 \checkmark The period between industrialization and the First World War,

✓ The period between the First World War and Second World War,

✓ The period between the end of the Second World War and the oil crises of the 1970s. This period is considered to be the golden age of the social state (1945-1975).

The history of the social state dates back to ancient times (Türkoğlu, 2013: 275). However, the birth of the social state corresponds with the third period. The Great Depression of 1929 showed the inadequacy of classical liberal views.
During this period, there were negative developments such as the negative conditions created by World War II, the increase in labor-capital conflict, and the deterioration of social justice. And in this period, social state debates gained importance (Candan and Maltaş Erol, 2017: 93-94).

The concept of the social state was institutionalized in the second half of the 19th century and continued to develop throughout the 20th century (Kayalıdere and Şahin, 2014: 60). The United Nations Universal Declaration of Human Rights in 1948 is an important development for the institutionalization of social security. This Declaration states that "everyone has the right to social security". Another important development is the European Social Charter, which came into force in 1965 (Türkoğlu, 2013: 276). These developments indicate that the period of intensive social state practices was the period covering the years 1945-1975. However, with the crisis experienced in the 1970s, the minimal understanding of the state prevailed and the understanding of the social state began to lose its importance (Candan and Maltaş Erol, 2017: 93-94).

It has been affected by these developments in Turkey. It can be said that Turkey has had its own unique social character since the early years of the Republic (Yay, 2014: 151). Social security in the Ottoman Empire dates back to the early years of the state. As in many Islamic states, social security was organized according to the rules of the Islamic religion. In the period up to the industrial revolution, traditional methods were used (Doğan, 2023: 37). In this period, the institutionalization process of the social state began with the charity chests established by the ahilik organization and the guilds organization (Türkoğlu, 2013: 275).

After World War Second, democracy movements began to take place in countries around the world. Multi-party life was transitioned. During this period, important steps were considered in the field of the social state (Yay, 2014: 156). However, a social security system could not be established from 1929 to 1945 (Güvercin, 2004: 92).

The first Labor Law in Turkey was Law No. 3008, which entered into force in 1936. The law covers many regulations in the field of determining, executing and supervising issues related to working life. It is the first law that includes regulations on the determination of relations between workers and employers and in the field of social security. It is important for this reason. The law remained in force for 31 years (Çelikel Yiğitel, 2019: 221). During this period, other laws related to social life were enacted. These laws are; (Güvercin, 2004: 92).

- ✓ Law on Occupational Diseases and Maternity Insurance,
- ✓ Labor Insurance Institution Law of 1945,
- ✓ Old Age Insurance Law No. 5417 of 1949,

 \checkmark Disability, Old Age and Death Insurance Law of 1950. These Laws are important initiatives in the field of social security in this period.

In 1967, Labor Law No. 931 was enacted. The law was overturned by the Constitutional Court on procedural grounds. In 1971, a new labor Law No. 1475 entered into force. The difference between this law and other laws is that it contains more modern and detailed regulations with the addition of regulations and bylaws on occupational health and safety (Çelikel Yiğitel, 2019: 221).

When the constitutions are examined, it is seen that the principle of social state was secured with the 1961 Constitution (Yay, 2014: 147). The social state that was founded on the 1961 Constitution has entered a transformation process since the 1980s. Constitutional amendment was made in Turkey in 1980. The concept of "Social State" has found a place in the new Constitution. The 60th article of the 1982 Constitution states that "Everyone has the right to social security. The state shall take the necessary measures and establishes the organization to provide this security." (https://www.anayasa.gov.tr/tr/mevzuat/anayasa/) This provision shows that the right to social security of individuals is guaranteed by the constitution.

A radical transformation in economic policies took place in Turkey in 1980. During this period, Turkey transitioned from an inward-looking/importsubstitution development model to an export-oriented growth model. This transformation was completed with the Strong Economy Transition Program, which was implemented after the 2001 crisis. The 2000s actually refer to the period after the economic liberalization process was completed (Aztimur, 2023: 87). The economic policies that prevailed in the 1980s were also reflected in the 1990s. In this process, the state has moved away from social policies. In these years, and especially in the 2000s, the character of the social state in Turkey has manifested itself more in social benefits than in social policies (Yay, 2014: 158). Some laws and regulations concerning social life during this period are given below;

✓ Law No. 5502 of 2006, (The Social Insurance and Universal Health Insurance)- With this Law, the social security administration has undergone major changes. The Social Security Administration consisted of the SSK (Social Insurance Institution), BAĞ-KUR (Social Security Institution for Craftsmen, Artisans and the Self-Employed), and Emekli Sandığı (Pension Fund Institution). With this Law, three organizations were merged and gathered under the roof of the Social Security Institution (Bulut, 2011: 62).

 \checkmark The Ministry of Family and Social Policies (ASPB) was established in 2011. The purpose of establishing this ministry is to determine, develop, and implement social policies in a coordinated manner.

✓ With the 2021 Presidential Decree No. 31461, the "Ministry of Family and Social Services" and the "Ministry of Labor and Social Security" were separated into two separate ministries. The General Directorate of Social Decrees was counted among the service units of the Ministry of Family and Social Services (Şahin Duran and Cenikli, 2021: 150).

4. Social Expenditures in Turkey

The social state uses the tools of economic policy in the regulation of economic and social life. Of these tools, it particularly uses fiscal policy. In general, the social state harmonizes the economic policy tools and other policies followed in order to achieve the determined social and economic goals, and in doing so uses the unique tools of each policy (Yay, 2014: 150).

Social protection is a set of mechanisms that ensure the redistribution of income on the basis of the values of respect for human dignity, social justice, and social solidarity (Euzéby, 2004: 111; Kapar, 2006). In fact, there are two fiscal policy tools for the government to achieve goals such as ensuring justice in income distribution and reducing poverty. These tools are public expenditures and taxes. The state makes social protection expenditures in order to increase the welfare level of the society and to improve low-income households. The social protection expenditures made by the government are closely related to the reduction of poverty and the provision of justice in income distribution. The share of social protection expenditures in the gross domestic product is also an important indicator of the social state designation (Solmaz and Avcı, 2017: 52).

Two basic methods are used in monitoring social protection expenditures. These methods are;

✓ European System of integrated Social Protection Statistics (ESSPROS),

✓ Social Expenditure Database (SOCX).

In the application of these methods, social protection expenditures include different expenditure items. For example; SOCX also includes education expenditures into social protection expenditures. The European Integrated System of Social Protection Statistics (ESSPROS) covers the components of social protection expenditures for sickness/health care, disability, old age, survivors, family/children, unemployment, social exclusion (Eurostat, 2016: 8).

Turkey produces social protection data using the European System of Integrated Social Protection Statistics (ESSPROS) developed by the European Union. According to the ESSPROS information system, all institutions in the General Government are included in the calculation of public social protection expenditures. These institutions are specified in detail in the Public Finance Management and Control Law No. 5018. Accordingly, it consists of those who make social protection expenditures from among the Central Administration, Social Security Institution, Local Governments, Social Benefits and Solidarity Fund (SYDTF), Unemployment Insurance Fund, and Revolving Capital Enterprises. Expenditure items consist of administrative expenses, transfers to other social expenditure units and other expenses (Yentürk, 2015: 1).

In Turkey, the 5018 Public Financial Management and Control Law includes important developments in the calculation of public social protection. With this Law, the budgets of all administrations within the scope of the general and special budget for 2004 have been prepared according to the Analytical Budget Classification. Starting from 2006, the analytical budget application has also been implemented in Local Governments, social security institutions, Independent Regulatory Agencies, and Revolving Capital Enterprise (Mutluer et al., 2007). Analytical Budget Classification is divided into three groups: economic classification, functional classification and institutional classification. Functional classification shows the distribution of expenditures according to their objectives. This classification consists of expenditures on education, health services, and social security and social benefits in the calculation of social protection expenditures, it was an important step for the administrations to prepare their expenditures according to the functional classification in 2006 (Yentürk, 2015: 2).

Public Sector Social Expenditure Statistics in Turkey track the change in socially qualified expenditures made by public institutions. In the creation of the data, the administrative records of the relevant expenditures of the organizations covered are considered as the basis (https://www.resmiistatistik.gov.tr/detail/subject/sosyal-koruma-istatistikleri/).

Table 1 shows the amounts of social expenditures of public sector in Turkey for the period of 2010-2022. The table shows that social expenditures have increased since 2010. It is striking that it reached its highest level in 2020 and will continue to increase in the following years. The increase in 2020 can be attributed to the COVID-19 pandemic.

Years	Social	Years	Social	Years	Social	
	Expenditures		Expenditures		Expenditures	
2010	187.702	2015	370.160	2020	888.621	
2011	218.336	2016	443.565	2021	1.098.576	
2012	249.283	2017	497.108	2022	1.785.055	
2013	284.381	2018	613.611			
2014	321.405	2019	738.578			

 Table 1: Social Expenditures of Public Sector in Turkey (2010-2022/ Million TL)

Source: TurkStat, Social Protection Statistics. Created by the author.

At the same time, it can be said that spreading education, health reform, newly opened hospitals and health centers are effective in increasing social expenditures in Turkey. In addition, social services and benefits provided through the Ministry of Family and Social Policies also have an impact on the increase in social expenditures. The share of the private sector in health and education in Turkey is increasing day by day. Increasing the share of the private sector in education may also cause significant problems. It may create obstacles for citizens without financial means to receive education. This issue is important within the health sector. In order for prosperity to spread to the entire society, it is necessary to remove these barriers (Akgül, 2013: 284-287).

However, it is important to examine the ratio of social expenditures to GDP in order to correctly interpret the trend of social expenditures. The ratio of social expenditures to GDP shows in Figure 1. As seen in Table 1, social expenditures in Turkey have increased since 2010. However, as seen in Figure 1, the share of social expenditures in GDP is on a horizontal course and this course continued until 2015. The share of social expenditures in GDP is 16.9 in 2016, 17.1 in 2019 and 17.6 in 2020. The share of social expenditures in GDP have increased in 2020. This increase can be attributed to the COVID-19 pandemic. In subsequent years, the share of social expenditures in GDP has decreased.



Figure 1: Social expenditures of public sector / GDP in Turkey (2010-2022 / %) Source: TurkStat, Social Protection Statistics. Created by the author.

Figure 2 shows the ratios of social expenditures components of public sector in GDP in Turkey. The components of these expenditures are education, health and social protection expenditures. It has been seen in the figure 2 that the share of education and health expenditures in GDP are close to each other. However, very high rates of social protection expenditures compared to the education and health components have attracted attention.



Figure 2: Social expenditures components of public sector / GDP in Turkey (2010-2022 / %)

Source: TurkStat, Social Protection Statistics. Created by the author.

According to the functional classification, education, health, and social protection expenditures are seen as the basic requirements of being a social state (Kurt Topuz, 2009: 115). At the same time, these expenditure items are major items within public sector social expenditures in Turkey (Erçakar and Güvenoğlu, 2018: 48). Today factors such as population growth, changes in the level of welfare, and the diversification of social values lead to health problems. The solution to health problems is the responsibility of the public sector, as required by the concept of the social state. The public sector can provide health services itself or through the private sector (Çadırcı and Güneş, 2022: 29). The fundamental characteristic of education expenditures is that they have high social benefits. The share of education expenditures in GDP is an important indicator in the classification of countries according to their level of development. Because in addition to the positive externalities created by education, an increase in the share they receive from national income increases the country's social welfare level (Ayrangöl and Tekdere, 2014: 2).

Social protection expenditures consist of three main components: pension payments and other payments, social benefits and non-contributory payments, and direct income support payments. The ratio of these components to GDP shows in Figure 3. The striking point in the figure is that pension payments and other payments to retirees rank first and their weight is high compared to the other components. In second place are the expenditures made on social benefits and non-contributory payments. The government provides direct income support payments to low-income families. Another striking point in the figure is that the ratio of direct income support payments to GDP is very low compared to the other components.



Figure 3: Social protection expenditures components of Public/GDP in Turkey (2010-2022 / %)
Source: TurkStat, Social Protection Statistics. Created by the author. The fact that social protection expenditures tend to increase over the years in Turkey should not be considered as an indicator of an increase in social welfare. Among these expenditures, it should be noted that the share allocated to pension payments is high, as shows in Figure 3. This situation should not be evaluated positively in Turkey, where there is a large population of young people (Kayalidere and Şahin, 2014: 66).

Figure 4 shows the amount of social benefits in Turkey. Social benefits are support mechanisms developed by the state to prevent poverty (Şener, 2010: 2). According to another definition, social benefits are defined as in-kind benefits made to provide a minimum standard of living to people in need of benefits with a share allocated from the general budget or taxes. The state provides these benefits without expecting any return (Zeybek, 2012: 27).

Basic principles of social benefits; (Balta, 2019: 8-11).

- \checkmark The state of being in need,
- ✓ Neediness control,
- \checkmark The provision of benefits by the public,
- \checkmark The aids is given gratuitously.

Social benefits in Turkey, is generally provided by central and local governments. Civil society organizations also provide social benefits within the framework of aid and solidarity in cases where central and local governments are cannot keep up (Zengin et al., 2012: 141). Figure 4 shows social benefits in Turkey has increased over the years from 2010 to 2021.



Figure 4: Social benefits in Turkey (2010-2021 / Million TL) Source: TurkStat, Social Protection Statistics. Created by the author. Social protection benefits covers the components for sickness/health care, disability, old age, survivors, family/children, unemployment, social exclusion. In The Figure 5 shows the distribution of social protection benefits by components in Turkey. The amount of all components of social benefits expenditures in Turkey has increased over the years. Expenses for pensioners and the elderly are in the first place. Expenditures for illness and healthcare are in second place. However, it has been seen that the amount of benefits provided to disadvantaged groups has increased over the years, but it has been insufficient.



Figure 5: Distribution of social protection benefits by components in Turkey (2010-2021/ Million TL)Source: TurkStat, Social Protection Statistics. Created by the author.

The elderly population is increasing in underdeveloped, developing and developed countries. Among the general problems of the elderly population; need for care, health problems, low income level, loneliness, orphanhood, difficulties in accessing economic and social resources are the most important ones (Solmaz and Avcı, 2017: 63). Table 2 shows the number and gender of people receiving benefits ve pension beneficiaries within the scope of social

protection in Turkey. The table shows that men benefit from salaries and benefits more than women. The majority of survivors pension beneficiaries recipients are women. Another striking point is that the number of people receiving benefits under social protection in Turkey increasing over the years.

Number of People/	2010		2015			2021			
Years	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total pension beneficiaries	10.510	6.199	4.310	12.536	7.267	5.269	14.624	8.301	6.323
Total disability pension beneficiaries	631	416	215	831	508	324	854	521	333
Non means tested disability pension beneficiaries	115	100	14	131	114	18	139	118	21
Means tested disability pension beneficiaries	516	316	200	700	394	306	715	405	312
Total old age pension beneficiaries	7.392	5.551	1.840	8.534	6.536	1.998	10.253	7.551	2.702
Non means tested old-age pension beneficiaries	6.543	5.254	1.289	7.928	6.268	1.659	9.416	7.254	2.162
Means tested old-age pension beneficiaries	849	297	552	606	267	339	837	297	539
Total survivors pension beneficiaries	2.675	256	2.419	3.407	256	3.151	3.956	294	3.662
Non means tested survivors pension beneficiaries	2.673	254	2.419	3.070	248	2.841	3.804	266	3.537
Means tested survivors pension beneficiaries	2	1	1	337	7	329	152	27	125
Total old-age and survivors pension beneficiaries	9.881	5.784	4.097	11.707	6.760	4.947	13.774	7.781	5.003
Total number of pension benefits	10 .911	6.232	4.679	13.051	7.309	5.742	15.362	8.376	6.985

 Table 2: Number of Benefits and Pension Beneficiaries

 (2010-2015-2021 / Thousand People)

Source: TurkStat, Social Protection Statistics.

*Figures in table may not add up to totals due to rounding.

Social protection benefits are classified into two types: means tested benefits and non means tested benefits. Means tested benefits, are defined as "Social benefits provided to beneficiaries subject to the condition that their income and/ or assets are below a certain level.". These benefits are usually funded by the state. Non means tested benefits, is a type of benefits where the income and/or welfare level of the person is not important (TurkStat, 2015). Figure 6 shows the distribution of social protection benefits in Turkey according to means tested benefits and non means tested benefits.



Figure 6: Distribution of means-tested and non means-tested social protection benefits (2010-2021/ Million TL)Source: TurkStat, Social Protection Statistics. Created by the author.

The amount of non means tested benefits in Turkey is higher than the amount of means tested benefits. In other words, a large portion of social protection benefits made in Turkey is made regardless of individuals' income and welfare levels. According to Turkstat data, non means tested benefits in Turkey is 44.091 million in 2010, 75.354 million in 2015 and 233.712 million in 2021.

5. Conclusion and Recommendations

Social expenditures are important in increasing the level of welfare in society and ensuring fairness in income distribution. The main components of social expenditures are education, health and social protection expenditures. The nature and size of the budget allocated to these components as a requirement of the social state are important.

In this study, social protection data were analyzed and evaluated for the period 2010-2022 for Turkey. The data were obtained from the official website of TurkStat. When the reports and data obtained from the official website of TurkStat were examined that social expenditures was increased since 2010. It is striking that they reached their highest level in 2020 and continued to increased in the following years. However, it is important to examine the ratio of social expenditures to GDP in order to correctly interpret the trend of social expenditures. According to TurkStat Social Protection Statistics, the share of social protection expenditures in GDP was 16.1% in 2010, 15.7% in 2015 and 13.3% in 2022. When the Public Sector Social Expenditure Statistics were evaluated according to the components of education, health and social protection expenditures, it was seen that the budget allocated to education and health components fell far behind social protection expenditures. The size of components such as health, education, social welfare services shows how social state the state is. That is why it is very important to which components the amount of social expenditures is transferred. Education and health are an important human capital. It has important effects on the economic growth and development of countries.

Another striking point in the study is that the amount of social benefits was increased over the years. Among the social protection benefits, the share allocated to pensions and other payments has the highest share. The aging of the population has also been an important factor on the increase in social protection expenditures. In the study it has been seen that the amount of benefits provided to disadvantaged groups has increased over the years, but it has been insufficient. The amount of non means tested benefits in Turkey is higher than the amount of means tested benefits. In other words, a large portion of social protection benefits made in Turkey is made regardless of individuals' income and welfare levels. In this case, it has the potential to lead to negative consequences if some measures are not taken to ensure social justice.

In conclusion, the main finding of the study is that social protection expenditures have increased over the years. However, what is more striking is that the number of individuals and families receiving assistance has also increased. The fact that numerical data show that the number of families or individuals covered by social protection has increased may actually mean that poverty has deepened in Turkey. In other words, there is a relationship between social protection expenditures and the number of individuals and families receiving assistance. Increasing the effectiveness of the social policies prepared to ensure social justice in Turkey depends on some regulations. Some suggestions for increasing the effectiveness of social policies are listed follows;

 \checkmark Identifying individuals and families who will receive benefits correctly and quickly,

 \checkmark Providing assistance without bureaucratic delays or unnecessary bureaucratic procedures,

✓ Delivering assistances to the rightful recipients as quickly as possible,

✓ Prioritizing policies for the solution of the unemployment problem,

 \checkmark The construction of a strict control mechanism to prevent duplicate payments

Social policies are important for ensuring social justice. However, the development of a country depends on social social protection expenditures and the of the number of individuals receiving social benefits. For this, it is important to ensure that individuals can directly generate income and be employed. At the same time, the laws and regulations in force in the fields of education and health should be reviewed. In this way, increasing the effectiveness of social policies in force in Turkey will be a mechanism to support the achievement of social justice.

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CHAPTER XII

THE NOVEL GENRE AS A SUPERSTRUCTURE INSTITUTION OF THE BOURGEOISIE IN THE RELATIONSHIP BETWEEN ECONOMY AND LITERATURE: ROBINSON CRUSOE ANALYSIS

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1. Introduction

The diversity and level of sophistication in the factors of production determine the distinction between societies. The composition of the means of production determines the position of the individuals that make up a society and shapes class/social relations. Economic infrastructure encompasses production relations and economic foundations, and a superstructure is built on this infrastructure. The concept of superstructure refers to the ideological, cultural, political, and legal structures that are shaped around and built upon the economic infrastructure. These structures include various elements such as cultural expressions, education systems, religion and rituals, political institutions, works of art, legal regulations, moral values, philosophical views, and other social institutions. In other words, concepts such as art, philosophy, politics, religion, family, law, literature, and morality are elements of a superstructure.

The superstructure mentioned above is not completely dependent and has a certain autonomy. For this reason, these institutions are shaped and exist on a specific economic basis. While the differences and levels of development of the means of production distinguish societies, the distribution of these means distinguishes the individuals or groups of individuals living in that society, in other words, it determines their social relations in terms of class. These relations of production correspond to a certain network of social relations.

Literature can be used as a tool to question and criticize class inequality and social injustices. Writers shape their works from their own class experiences and perspectives. This allows writers from different class backgrounds to focus on different social issues. Literature often focuses on characters from different social classes and their lives, enabling writers and readers to empathize with class differences and question existing inequalities. In other words, analysing and evaluating literary works is of great importance for raising awareness of class differences and social injustices. By believing in the power of literature, even when struggling with economic hardships, writers can use this art form to raise social awareness and lead social change. The social class background of writers is an important factor in determining the content and perspective of their work. Writers shape their works by drawing inspiration from their own social class experiences and ways of thinking. Therefore, writers from different social class backgrounds can focus on a variety of social topics and issues.

The novel, which has an important place among literary genres, offers a great platform for writers to expand their artistic expression and open their world of ideas to readers. Elements such as the use of language, narrative techniques, characterization and plotting provide an opportunity for writers to showcase their creativity and artistic talents. Novels provide readers with a rich reading experience by offering an in-depth look into the inner worlds, thoughts, emotions, and development of characters. At the same time, through social criticism and reflection, novels offer readers the chance to evaluate social issues, cultural norms, economic and political situations and other important topics from a more critical perspective. In short, by addressing these themes in their works, authors give readers a deeper understanding and awareness of their society.

The novel is a superstructure institution of the bourgeoisie that came after feudal society. The novel is a revolutionary genre that emerged with the emergence and historical development of the bourgeoisie and reveals its universal qualities. Indeed, according to the famous philosopher Hegel, the novel is the "epic of the modern world" and at the same time the "modern bourgeois epic". (cited in Cunningham, 2014). In the post-bourgeois revolution period, poetry, on the other hand, began to be perceived as a genre detached from reality and incapable of understanding and describing industrialized capitalist societies. This study investigates which economic school and social class the novel emerged as an element of. The study defends the thesis that Robinson Crusoe, written by Daniel Defoe and first published in 1719, is the first capitalist novel in history. For this purpose, economic individualism, praise for the bourgeoisie and class differences, the concept of value in economics and Robinson's perception of value, the concept of 'desert island' and imperialism, work ethic and pragmatism, consumption and 'homo economicus' are sub-headings to reveal the capitalist elements in the novel.

2. Relationship between Capitalism and the Novel

In the period from the 8th to the 14th century, when feudalism reigned in Western Europe and experienced its brightest period, it is quite difficult to speak of a social dynamic that would require the emergence of the novel genre. Although feudalism can be divided into political and economic feudalism, economic feudalism can emerge without the need for political feudalism in the sense that power is not centralized. Berkes (1970: 34) cites the Ottoman Empire as an example of this situation and emphasizes that although it is not possible to speak of a political feudalism in the Ottoman Empire, it can be said of an economic feudalism. In fact, the Ottoman Empire was an empire that was the opposite of feudalism in the political and Western sense. In the medieval Ottoman Empire, unlike in the West, land belonged not to the aristocrats but to the ruler and his family. It would not be wrong to say that the Ottoman Empire, which established an empire by destroying feudal structures one by one, played an accelerating role in the transition from feudalism to capitalism in Europe as a result of the commercial relations it established with the countries afterwards. As a matter of fact, while feudalism lost power in Western Europe from the 15th century onwards and completely disappeared with the French Revolution in the 18th century, the same cannot be said for economic feudalism in Central and Eastern Europe.

In the 15th-18th centuries, class distinctions in society (noble, priest, peasant) were quite clear for people of the same nationality, and there was a relationship based on land ownership. Since literary works were generally written by educated people, they reflected the lifestyle, values and ideals of the noble class. Religious motifs were at the forefront of the works due to the influence of the church, and the concept of knight, a military image of the period, was used in many works. To summarize, in this period, there was not yet a literary environment that would shake the dominance of the aristocratic class,

nor a philosophical climate in which concepts such as equality, freedom and justice came to the fore.

Capitalism is a process that started with the increase in capital accumulation from the 16th century onwards, and this system first developed in agriculture and trade. According to Eğilmez (2012), since the industrial revolution in the middle of the 19th century, industry was added to these sectors and this economic system gained more and more popularity after this date and turned into a paradigm.

There is a non-accidental relationship between the conditions that give rise to capitalist society and the rise of the novel. The struggle of individuals and classes in the face of social change, the ways of coping, and the processes of change experienced at both the individual and social levels in this process reflect the effects of capitalism and at the same time constitute the subject of the novel. Although it is stated that the first novel in history was published by Murasaki Shikibu in 1010 under the title "The Tale of Genji", the popularity of the modern novel coincides with the rise of the bourgeoisie and the ideology it represents, in other words, the rise of capitalism in Europe (BBC, n.d.). The novel genre was introduced to world literature by the bourgeois class supported by capitalist ideology and is also a product of the Enlightenment Era.

The modern novel's separation from elements such as tragedy, fairy tale, epic and even poetry and its gaining its own independent identity and its subsequent spread first began in Europe in the 17th century and increased its popularity in the 18th century. The late 18th century was also the beginning of the Industrial Revolution, which marked a major change in technology and economy. The word "novel" means "new" in English; as the name suggests, it was a new genre in the circumstances of the time. The first English novels dealt with complex, middle-class characters struggling with their morals and circumstances. The 17th century was a historically important turning point in England's transition from a traditional society to a modern nation state. It was also the century of the historical novel, when history was rewritten before the eyes of the people in bloody conflicts. 'Don Quijote' by Cervantes (1605) is the most important historical novel written in this period. In the 18th century, writers such as D. Defoe, S. Richardson and H. Fielding contributed greatly to the development of the novel genre in England. D. Defoe and S. Richardson set a realistic style in their works and contributed to the development of the realist novel genre. As a matter of fact, Kierkegaard's statement that "life is not a problem to be solved; it is a reality to be lived" is clearly manifested in Defoe's Crusoe novel.

Eagleton (2012:131) states that the realist novel is essentially optimistic, that there are of course many problems in the world of the realist novel, but that the 'reality' mentioned here is not as problematic/problematic as in a modernist novel. According to the author, the novel is actually a 'comic' genre until the 1880s, but after this date it starts to become tragic. The novel acquired its distinctive characteristics as a genre in the 19th century under the influence of the romanticism and realism movements. Austen, Balzac, Turgenyev, Dickens, Dostoevsky, Flaubert, Melville, Tolstoy and Zola are the most successful novelists of this period.

Compared to other art forms, the novel is the literary genre that focuses on the truth and expresses this truth in the most indirect way, placing the greatest responsibility on the author's emotional and mental abilities (Stevick 2004: 34). Antakyalıoğlu (2013:147) defines the realist novel as "a realist novel is a novel that understands that reality is a fictional reflection. The main character is usually an individual from the bourgeoisie class and forms the focal point of the story; its subject is the nuclear family formed by this individual and the society derived from this family. This individual has a past, present, and future. Memory is strong and experiences are important. Life is a process, with a beginning, a development, and an end. It has universal truths and a belief system."

The realist novel is a liberal genre, inspired by different segments of society, cultural contexts, and details of everyday life. Characters and events are described in a natural and realistic way. This literary movement aims to understand human nature and criticize the social structure. Liberalism is a philosophical and political ideology that gained great influence in the 18th and 19th centuries. It focuses on the freedoms, rights, and independence of the individual. This ideology advocates limited state intervention, free trade, property rights and the maximization of the individual's potential. Liberalism advocates the organization of society based on individual rights and freedoms. Realist novels emerged and became widespread under the influence of liberalism. In their works, realist writers focus on the inner world of the individual and different segments of society from a realistic perspective, while focusing on the theme of individual freedoms and rights emphasized by liberalism. At the same time, realist novels questioned the values of liberalism by focusing on social changes and a critical perspective. In this way, realist novels and liberalism influenced and shaped one of the most important intellectual movements of the 19th century.

In the 19th century, the industrial age had taken over Europe and created an army of workers. While the industrial age brought a certain degree of prosperity, it also created problems for workers in urban life. In the 15th century, only five cities in Europe (Istanbul, Paris, Rome, Venice and Milan) had populations over 100,000, but in the 16th century these cities were joined by many more, notably London and Amsterdam. By 1895, London's population had reached 6 million, New York's 3.7 million and Paris' 3.1 million populations (Desjardins, 2019). As the population of modern cities grew uncontrollably over time, a series of problems such as the challenges of urban life, complex infrastructure, rapid population growth, environmental concerns, social inequalities, housing shortages, unemployment, loneliness and loss of identity began to emerge. Many novels, especially Charles Dickens' 'Hard Times', address the problems of urban life that develops with capitalism. Albert Camus, in his famous novel 'The Stranger', deals with the sense of alienation and inner incompleteness in society. He questions the effects of modern urban life on people and describes the character's loneliness and search for meaning in the city. In the novel 'Çalıkuşu' by Reşat Nuri Gültekin, which has a great place in Turkish literature, the author describes the social stratification in the city, the position of women in urban life and the effects of the education system on the city.

The first modern novel was 'Don Quixote', published in the early 1600s and written by the Spanish writer Cervantes. Robinson Crusoe (1719), written by Daniel Defoe, is the first novel of English literature. Defoe (1660-1731) was the son of a wealthy family of Flemish descent and took the surname Defoe when he was thirty-five years old. Defoe, who was also a journalist and merchant, wrote two of his most important works, Robinson Crusoe (1719-22) and Moll Flanders (1722), and as the author himself stated, he went bankrupt thirteen times during his lifetime and earned money only by writing in his last years before his death (Britannica, n.d.). The author wrote his famous work Robinson Crusoe when he was 60 years old after his bankruptcy.

In the 18th century, the enrichment of the middle class, where the literacy rate was relatively high, through trade led to a great increase in book sales. At the same time, novels published in serialized form in newspapers were also popular and thus more affordable. For example, Daniel Defoe's Robinson Crusoe (1719) was first published as a series in the London Post newspaper (Güneş, 2009:111).

3. Robinson Crusoe and Capitalist Elements

Robinson Crusoe, as it is known, is about the hero's struggle to hold on to life after falling on a uninhabited/isolated island. This work was translated into Turkish as "Hikâye-i Robinson" in 1864. This study argues that Robinson Crusoe is the first capitalist novel in history. This work, which is also taught as a children's novel, actually tells a careful reader about the corrupting effect of the love of property on human values.

3.1. Economic Individualism

In Robinson Crusoe, 'economic individualism', which has a moral value in itself for the middle class, is also at the forefront of the novel. Economic individualism is an economic approach based on the principle of acting freely in one's own economic activities and determining one's own interests. This approach emphasizes that individuals should make their own economic decisions freely and bear the consequences of these decisions. Economic individualism is one of the basic principles of free market economies and advocates that economic actors act freely in their own interests. It aims to minimize state intervention and let market forces be the determinant. Individuals make their own decisions on the allocation of resources and goods and bear the consequences of these decisions in a competitive environment. When these elements are carefully analyzed, it is clear that this is in line with the requirements of a capitalist ecosystem. This perspective is also in line with classical economic theory, which holds that 'interests, not public regulation and control, should govern individuals'.

Individualism is evident in the life of Robinson Crusoe. Instead of being privileged, this new type of man represents a self-sufficient, self-sufficient, and dynamic character. When he leaves the island to earn money, Robinson Crusoe achieves complete individual freedom, both economically and personally. This shows a break from the traditional values of 18th century society towards capitalist and individualist values (Watt, 1957:25). The following words of Eagleton (2012:49) confirm a similar determination: "Defoe's heroes think not about the purpose of life, but about how to survive".

Robinson Crusoe, the hero of the novel, was born in 1632 in York, England to a relatively wealthy family. Here, the word hero is used both in the literary sense and in the lexical sense. In the literary sense, the protagonists of novels generally question themselves internally, that is, they may experience incompatibility with their own beliefs, values, or goals. This inner struggle triggers the growth and development of the character. But in the process, the protagonist usually goes through a process of change and is able to correct the shortcomings or mistakes he or she had at the beginning. This change symbolizes the maturation and development of the protagonist. The protagonist also has to deal with external challenges. These external challenges can be other characters (antagonists) or non-human factors such as nature. In the dictionary sense, a hero is a figure who shows courage to positively affect the world around him, is self-sacrificing, helpful, fair and can be a role model for the society with his values, attitudes, and behaviors. Although it is not possible to use a 'social hero' definition for Robinson Crusoe, it would not be wrong to characterize a person who struggles to survive for 28 years in the face of many difficulties on a deserted island and returns to his country safely from this island as an 'individual hero'.

3.2. Praise for the Bourgeoisie and Class Differences

Robinson Crusoe's father comes from Bremen in Germany and his mother comes from a relatively wealthy family in York, England. His older brother was killed in a war. The book, which successfully portrays the discovery of one's own values and the power to struggle in the face of difficulties, opens with the father's advice to Robinson, who has just turned 18 and is passionate about adventure and burning with the desire to see the world. Robinson's father, who sees his family at the middle level financially or "at the highest step of a humble life", emphasizes that the bourgeoisie is the most ideal class form instead of the aristocracy by telling his son that "the position of material prosperity they are in is closed to poverty, to difficulties, to the labor and sufferings of ordinary human beings, and that this is the most suitable condition for happiness in this world, since it is not contaminated by the pride, luxury, ambition and jealousy of the higher people" (Defoe, 2012: 2-3). Similarly, the author of the book makes Robinson's father say that "the calamities of life are always shared between the highest and the lowest of mankind, but those in the middle ranks suffer very little of these destructions", thus praising and giving credit to the bourgeoisie class.

The bourgeoisie is a unique product of modern capitalist society and represents a class that derives its economic power from activities such as trade, industry and capital ownership. They focus on accumulating capital to increase their economic power by occupying an active position within capitalist relations of production. The bourgeoisie are mostly active in the trade and industry sectors and are the owners and managers of businesses. The aristocracy represents a class in society, usually based on innate status. Historically, aristocracy usually refers to the nobility and the noble class. This class includes landowners and nobles. In the past, aristocrats were usually landowners who based their social status and power on their innate family background. In modern times, however, the concept of aristocracy includes not only innate status but also extended wealth and family background. The bourgeoisie manifested itself most prominently in the French Revolution, but it also played a role in the industrial revolution, pioneering the creation of capitalist infrastructure in the modern sense and being the biggest supporter of liberalism and economic freedoms. In other words, by questioning the existing social order and calling for change throughout history, the bourgeois class has led the transformation of society and laid the foundation of the modern world. However, the advantages and inequalities brought about by these changes have also been constantly debated.

The Age of Renaissance and Enlightenment writers often emphasized progressive ideas such as individual freedoms, science, art, and human rights. These ideals were among the key elements that supported the rise and influence of the bourgeoisie. The Renaissance, which represents the transition from the dark period of the Middle Ages to a period of light, is a period that started especially in Italy in the late 14th century and continued until the early 17th century. During this period, there was a great cultural and artistic revival and significant progress was made in science, art, literature, and philosophy. Writers such as William Shakespeare (1564-1616) and Miguel de Cervantes (1547-1616) were very important influential artists of the Renaissance period. Voltaire (1694-1778), Jean-Jacques Rousseau (1712-1778), John Locke (1632-1704), Montesquieu (1689-1755) are among the significant writers and intellectuals of the Enlightenment.

Class differences arise from many components. Income is the money and other financial resources that people earn over a given period of time. Wealth refers to savings and assets. Income and wealth levels are important factors in determining the position of individuals within an economic class. The profession in which individuals work, the sector in which they work or the line of business in which they operate is an effective factor in economic classification. Education, individuals' position, and prestige in society are effective in determining economic class differences. Perception and social reputation within the society is one of the important factors affecting the place of individuals in the economic class.

Although he listens carefully to his father's advice, Robinson soon gets the desire to become richer by exploring new places, first traveling to London on a ship and then to Guinea, on the coast of Africa. In Guinea, our hero sells toys and

ornaments worth 40 pounds and in exchange for these goods, he obtains nearly three kilos of gold dust equivalent to 300 pounds. Robinson, who successfully progresses to become a merchant, is attacked by pirates on one of his voyages and is captured by the Maghribians. This is quite surprising for the reader and also for Robinson. While he was on his way to becoming a successful merchant, his transformation into a penniless slave happened very quickly. The slavery lasts for two long years. Then, things get even more difficult for the protagonist of the novel who escapes from the Maghribi's by preparing a successful escape plan by sea. The captain, who takes a boat to escape and then sees this boat, takes him on board and takes him to Brazil, becomes one of the key actors in the difficult years to come.

When Robinson was planning his escape from slavery, he had taken a young boy named Xury (Şükrü) with him. Although the captain en route to Brazil offered 60 silver Spanish liras for Xury, Robinson explains his reason for rejecting the offer as follows: "I was reluctant in this offer, not because I did not wish the captain to take him, but because I did not like to sell the liberty of a poor lad who had so faithfully helped me to my own freedom" (Defoe, 2012: 36). It is interesting to note, however, that Robinson's first act as soon as he gets plenty of money in Brazil is to buy a few slaves. Similarly, Robinson, who rescues a prisoner held captive by cannibals who come to the island from time to time, instead of seeing this rescued person as a 'friend', names him Cuma and makes him 'his slave'. The fact that he first teaches Cuma the word 'master' instead of teaching him the concepts of communication required by everyday language such as 'yes-no' is in parallel with the Western society's acceptance of colonialism, that is, having a say about those countries, as a phenomenon in accordance with the natural flow of life. As a matter of fact, in Defoe's world of mind, slave trade takes its place as a perfectly reasonable action.

Robinson's relationship with individuals is focused on the material values they can provide. He focuses only on the benefits they will bring him and ignores all other social norms. For Crusoe, individuals are perceived not as human beings but as sources of profit. He sees them as commodities or tools until they provide the maximum possible benefit. When evaluated in terms of these economic relations, it is seen that Crusoe is more affected by these capitalist relations and creates more earning opportunities (Saltoğlu, 2010:23). As a matter of fact, selling Xury for money, who helped him escape from the place where he was imprisoned before falling into the desert island, enslaving Cuma or buying slaves as soon as he becomes rich in Brazil are the most obvious examples of this attitude.

Slavery has existed since the earliest periods of history, particularly in Mesopotamian, Chinese, Egyptian, Indian, Aztec and Mayan civilizations. In ancient Greek and Roman societies, slavery was a fundamental institution and slaves were employed in various fields ranging from agriculture to art, from domestic work to warfare. Interestingly, many Greek and Roman thinkers who shaped the world of thought did not take a negative attitude towards this phenomenon, and many thinkers, especially Aristotle, even considered it necessary to have this class. In the Middle Ages, on the other hand, during the feudalism period, a land-based understanding of slavery was dominant, and afterwards this situation continued to develop in a more race-oriented manner. In the 10 - 11. th century, almost all serfs were Christianized, while most slaves were non-Christians. Berkes (1970:30) states in his study that a significant portion of these slaves were Slavs. According to the author, until the beginning of the 11th century, most of the Slavic slaves were sold in Spain and the word "slav" comes from "esclavus" which means "slave" in Latin. The 16th - 19th century was the peak of the slave trade and slavery, also known as the "Atlantic slave trade" period. In the mid-15th century, slavery in this sense was first practiced by Portugal and in the first half of the 16th century, this country's slave trade reached 10-12,000 (Reynolds, 2004: 45). During this period, millions of people from Africa were brought to the Americas to work as slaves. During this period, the African slave trade was initially publicly monopolized, and traders could own slaves at high cost. Although often used interchangeably, the concepts of serfdom and slavery are in fact distinct to a certain extent. While a serf has the right to cultivate the land and has an heir to whom he can transfer this right, a slave has no such right. While the slave is subject to the absolute will of his master, this is not the case for serfs.

Robinson, despite having achieved a certain amount of wealth in Brazil, succumbs to the extreme desire to make more money in the face of an offer of slave trade and begins his adventure on a deserted island. What is perhaps misperceived by many readers is that Robinson's ambition is not to see new places, but to become richer in virgin lands that have not yet been conquered. Becoming richer is associated with the elements of capitalism that human beings dream of, such as social approval and prestige, raising social status, gaining power and influence through money. However, the greed for wealth can bring with it some negative consequences. This can include risks such as excessive focus, competitiveness, stress, social inequality, difficulties in human relations and neglect of spiritual values.

3.3. The Concept of 'Value' in Economics and Robinson's Perception of Value

Robinson uses the following sentences in the following pages of the book after he falls on the desert island:

"... I found coins, some European, some Brazilian, some Spanish, some gold, some silver, the equivalent of thirty-six pounds. I smiled when I saw this coin: "Oh damn you," I said aloud, "what good are you? You are worth nothing to me; no, you are not even worth picking up, not even one of those knives over there is worth more than this pile of money; there is nowhere I can use you, so stay where you are and go to the bottom of the sea like a creature whose life is worth nothing." (p. 60-61).

The concept of 'value', emphasized by Defoe through Robinson, is an important term in economics. Value can basically be defined as a reflection of the benefit provided by a good or service in return for the expenditures made to produce or acquire that good or service. Basically, there are two types of value for a good. These are "use-value" and "exchange value". Use-value represents the capacity of a good or service to be useful to people. The use value of something focuses on the extent to which it can meet human needs or be useful to people. This assessment is linked to the practicality of a good or service, its satisfaction, the satisfaction it provides and the utility that consumers usually derive from it. Exchange value or exchange value refers to the ability of a good or service to be exchanged for other goods or services. This value indicates the price of a good in the market or how much that good can be exchanged for other goods. The conditions of supply and demand in the market affect the use value and demand for a good, which in turn determine its exchange value. Generally, goods with high use values have low exchange values, while goods with high exchange values have low use values. For example, although the use value of diamonds is lower than water in terms of the benefit it provides, its use value is much higher than water.

In the Middle Ages, value was often explained by linking the utility of an item or asset to a fair price in relation to the needs of individuals. In this period, the value of a good was associated with how much people needed that good. After the Middle Ages, the idea that utility, not labor, is the source of value became dominant. That is, the concept of value is linked to the extent to which a good fulfills a need. In the 17th and early 18th centuries, theories of value were generally based on two main factors. Some scholars, such as Locke, argued that value is based on labor, while Turgot and others emphasized the influence of utility in determining value. In the 18th century, Turgot argued that contrary to the classical economic understanding, value is not based solely on labor. According to him, the value of a good depends on factors such as demand and supply in the market as well as the labor spent in the production process (Desai, 1987: 194). Beyond the contribution of labor alone, the value of a good is shaped at an equilibrium point determined by the balance of demand and supply. If demand for a good is high and supply is low, this increases its value. These views of Turgot emphasize that economic value is the result of complex interactions, beyond the classical understanding of economics at the time. Therefore, he does not limit the concept of value to a labor-based approach; he also argues that factors such as demand and supply are also determinants of value.

Interestingly, Locke, despite being a proponent of liberalism, defends the same thesis as Marx by stating that value is determined by labor. Marx sees value as a concept determined by the total labor involved in a good or service produced by society. This total labor includes the direct labor expended in the production process as well as the knowledge, skills and abilities possessed under general social conditions. According to Marx, the value of a 'good' is a reflection of the total labor expended in its production, and this labor is measured by the socially necessary labor time. According to economists from the classical school of economics such as Adam Smith and Ricardo, the concept of value is particularly linked to the labor theory of value. According to this theory, the value of a 'good' depends on the amount of labor expended in its production. That is, the value of a 'good' will be equal to the amount of labor spent to produce it. According to this understanding, the role and amount of labor in production is the main factor in determining the value of a 'good'.

Although Mill is one of the representatives of the classical school of economics, he differs from Smith and Ricardo to a certain extent. For Mill, it is not only labor that determines value, but also supply and demand. Neo-classical economics opposes the labor theory of value of classical economics and argues that labor is not the only determinant of value. It emphasizes that factors such as market conditions and consumer preferences are effective in determining value in addition to labor. In the early 20th century, neo-classicists (Marshall, Edgeworth, Pigou, Pareto) associated the value of a good or service with the balance of demand and supply of consumers and saw value as a result of these factors.

3.4. 'Isolated Island' Concept and Imperialism

"Robinson Crusoe's appeal - especially its appeal at the time it was written - comes from the fact that a familiar kind of rationality works like clockwork in an utterly alien environment" (Eagleton, 2012:53). In a distant land, there is a clear praise for Britain's imperialist policies and the bourgeoisie class. A person coming from the West will manage to survive in an unfamiliar land. Establishing a civilization in the discovered distant lands and uninhabited lands that no one owns yet is the greatest dream of imperialism and the bourgeoisie class, which is not yet rich enough as the nobility. The concept of 'uninhabited island' used here is highly ironic. Every place that has not yet been discovered by the West and has not yet been marked on maps for this reason is in fact 'uninhabited', in other words 'unclaimed', even if indigenous people live on that piece of land. For the West, this state of being uninhabited and unclaimed turns into an 'ownership of rights' in itself. The fact that Robinson sees a footprint twelve years later on the island he has lived on for years as a deserted island tells the reader that there is in fact no untrodden, desolate piece of land on earth. Similarly, Eagleton (2012:57) emphasizes that there is no such thing as an absolute and pure creation by stating that Robinson does not actually start from scratch when he builds a new life for himself on the island, but that he begins this difficult adventure with the remains of the shipwreck in order to survive. According to the author, "we live in a history that is 'left over' and will never be erased, and history shatters any notion of absoluteness."

Ten years after seeing the footprints, Robinson also finds human bones on the island. The fact that Robinson sees footprints on the island after so many years does not make him happy; in fact, it causes him to panic. During his time on the island and his inner journey, Robinson is no longer frightened by the absence of people but by their presence. Instead of seeing it as a sign of a friend with whom he can have a conversation, he believes that it is a demonic trace. This leads the reader to think that Crusoe's isolation may not want to return to human society after all, and that this isolation may actually be an ideal situation for him.

Imperialism can be defined as the intervention or control of a country or community in other territories in order to expand its political, economic and cultural influence. Imperialism can also be defined in Marxist theory as the unbalanced power relations between countries in the process of globalization of capital. Doyle (1986) defines empires as "the formal and informal relationship in which one imperial society effectively controls the sovereignty of another

political society". Cooper (2005), on the other hand, defines empire in a more inclusive way, according to the author, empire is a political unit that reproduces and institutionalizes the distinction between the ruler and the ruled, which is expansive and produces distinction and inequality among the people it contains (cited in Callinicos, 2014:18). Macit (2003:105) defines globalization as "a value-laden ideology" and states that "the guiding idea behind globalization is free market capitalism". Kurban and Ergün (2021:211), on the other hand, has mentioned the dangers and spheres of influence of imperialism with the following words. "Imperialist expansionism and the appetite for security exhibit a symbiotic relationship, lasting until they reach the borders or sphere of influence of a power that can balance them, or the obesity of power consumes the body".

The history of imperialism covers various eras and regions characterized by the expansion and domination of powerful nations over weaker regions. Although it is possible to mention elements of imperialism even in antiquity, it became widespread, especially between the 15th and 18th centuries, when European powers such as Spain, Portugal, the Netherlands, Britain and France established colonies in the Americas, Africa, Asia and the Pacific after their explorations. The 19th century saw a great leap in imperialism, especially among European countries. As of the end of this century, states such as the USA and Japan also joined this race and two world wars took place in the 20th century as a result of this imperial competition. After World War II, the concept of imperialism lost its power and the concept of nation state became an increasingly widespread ideology. Although the concept of formal colonialism has disappeared today, powerful nations continue to exert their influence on weaker states through economic, political, and cultural means.

According to Öztürk (2006), the main point of departure in Marxist analysis is capital accumulation; however, capital accumulation on a world scale does not take place in an undifferentiated space but in an environment divided by nation-states. Although Marx almost never mentioned the concept of imperialism in his works, he contributed to the literature on the phenomenon of imperialism with his analysis of the concentration tendencies of capital and formed the basic infrastructure for the theory of 'monopoly capitalism', which would be frequently used by classical Marxist theorists in the following years.¹

¹ The classical Marxist theories of imperialism consist primarily of ideas developed by R. Hilferding, N. Bukharin, Lenin, as well as R. Luxemburg and partly K. Kautsky (cited in Öztürk, 2006: 270)

3.5. Work Ethics and Pragmatism

"Defoe's heroes think not about the purpose of life, but about how to survive" (Eagleton, 2012:49). This is highly compatible with the pragmatic value perception of the West. The image of a tropical island, which at first glance evokes the image of a vacation, appears as a completely different phenomenon in the novel, yet it is ironic that Robinson throws himself into work as soon as he lands on this tropical island and continues to work with superhuman effort from time to time. He always works to make his shelter bigger. After spending a long time on the island, Robinson builds himself a new hut that he does not need, not for shelter, but perhaps to have some fun, perhaps to expand his kingdom. Consciously or unconsciously, Robinson has always endeavored to create his own kingdom during his stay on the island. This endeavor brings to mind the famous quote of Rousseau, who was not completely against personal property but advocated the limitation of personal property: "The first man who fenced off a piece of land and found people gullible enough to believe that it belongs to me was the true founder of civilized society. If someone had been able to say, pull up the stakes, don't listen to this swindler, all the fruit here belongs to us, he would have saved humanity from so much murder, war, misery and abomination." (cited in Beaud, 2021;94).

Max Weber, in his work "Protestant Ethics and the Spirit of Capitalism", emphasizes the influence of Protestant ethics on the rise of capitalism. According to Weber, the Protestant ethic emphasizes the individual's work ethic and personal responsibility. According to the Protestant belief, people should work, earn and save in order to serve God and show that they are one of the elect. This understanding encourages individuals to serve their work and society, arguing that accumulated capital contributes to economic growth and the formation of the capitalist system. In this context, Weber argues that Protestant morality supports the capitalist spirit and forms the foundations of modern capitalism. Defoe praises both capitalism and Protestantism while emphasizing the importance of work. On the other hand, he criticizes the Catholic belief.

According to Defoe, one can be moral on one's own, and for this, it is not necessary to live with a strict understanding of religion as prescribed by the Catholic Church. The following words of Robinson at the end of the novel point to this situation. "After I had returned to England and spent some time in this country, I had thought of going to Brazil again, but at this point I was confronted with another obstacle, which was the question of religion, for I had some doubts about the Roman Church, which I had carried with me from the days of my travels, and especially from the days of my hermitage. I therefore gave up the idea of settling in Brazil" (p.325).

3.6. Consumption and 'Homo Economicus'

Robinson collects more fruit than he can consume on the island, and he does not make any self-criticism about the rotting of these fruits and does not feel any discomfort about this situation. Robinson is also constantly on the lookout for new areas of consumption. Even on an island in South Africa that he thinks belongs only to him, Robinson constantly observes whether there are other islands around, even if he has enough food to survive. 'Consumption' plays an important role among the most emphasized concepts in explaining the modernization process. In the capitalist system, consumption is perceived as the shortest way to gain visibility in society without making any effort. Although the ultimate goals and priorities of a society may vary, the pursuit of freedom, justice, equality, prosperity and happiness are generally prominent. However, when we question whether our welfare increases as we consume, we may realize that excessive (unnecessary) consumption is actually a symbolic image in the individual's struggle for status and identity. In the age of capitalism, consumption has turned into a habit that creates addiction beyond needs and is an expression of the desired status. While the individual has become an image identified with consumption, he/she is not aware that the freedom he/she thinks he/she has is within a framework determined by others. Under the influence of the masses, the media and fashion, interacting with many social, economic and ideological factors, the individual is unable to act freely within this network. Capitalism's ideal of 'choice is a privilege', which imposes the role of consumerism on the individual, reduces the basis of existence to the form of consumption and consumption preferences (Özman, 2021: 36-37).

Defoe believes that capitalism has a universal and unique character, which will pave the way for an ideal way of life. Eagleton argues that it is a paradoxical phenomenon that a capitalist society glorifies the individual in theory and reduces him to an exchangeable lifestyle in practice. Eagleton argues that Defoe sees capitalism as a recipe for progress and development and that Defoe does not complain about the dynamic and dynamic lifestyle that capitalism causes. According to the author, what bothers Defoe is the ideological inconsistencies of capitalism. In other words, the contrast between the values of capitalism and the brutal realities of capitalism is reaching a greater and greater volume. Eagleton (2012: 40) explains this opposition in the following words: *"The practical*"

immorality of this culture, in which money and self-interest are the primary values, corrupts and corrupts the ostentatious moral ideals it defends on paper".

Defoe is in fact a capitalist, but he is a capitalist who defends small workshop type production; industrial type capitalism is not a phenomenon Defoe defends in his novels. As a realist novelist, Defoe is well aware of the dangers of excessively rapid capitalist growth. For example, he depicts poverty not as a choice but as a necessary consequence. Eagleton (2012:38) reminds us of the following words of Defoe, who also wrote articles for the newspaper "The Review": "How many honorable gentlemen are there in England who will not steal and pickpocket when their property is usurped and their comfortable living conditions are eliminated", emphasizing that "a person is not rich because he is honorable, he is honorable because he is rich". While Defoe glorifies the bourgeoisie in his novels, he is also aware of the problems of the working class and the poor and is not ruthless in this regard, at least in his newspaper articles.

Robinson is in fact, to use an economic term, a "homo economicus". He lives his life with the motive of turning everything he has into an economic gain. "Homo economicus" is defined as an individual who makes decisions rationally in order to maximize utility or happiness. In this model, individuals are generally assumed to consciously possess full information, to be free from internal inconsistency and to focus their decisions on achieving the best outcome. Under these basic assumptions, it is predicted that individuals try to make the most optimal and beneficial decisions in consumption, savings, investment and other economic activities.

4. Conclusion

This study argues that the rise of the novel is not a coincidence. In this context, it is argued that the novel has gained popularity since the 18th century as a product of the rising bourgeois class and developing capitalism.

The economic infrastructure, which includes the economic foundations and production relations of a society, constitutes the superstructure, which includes the ideological, cultural, political, and legal structures that are shaped and constructed based on this infrastructure. Literature, broadly defined, and the novel, narrowly defined, is an important element of this cultural superstructure. While literature raises awareness about certain economic elements and has an impact on them, sometimes in a weak and sometimes in a strong form, this relationship should not be perceived as one-sided. Literature is also shaped by struggling against economic difficulties, and these difficulties have a significant impact on how literature is produced, published and consumed.

The novel, one of the most important genres of literature, became widespread simultaneously with the rise of the bourgeois class against the aristocracy. In this period of class changes, there were also processes of change in economic systems. In other words, the popularization of the novel in the 18th century coincided with the end of Mercantilism, a more protectionist and state-controlled economic system, and the transition to a more liberal economic system. These historical relations were not a coincidence, but rather a combination of factors that influenced each other (increased economic freedoms, geographical discoveries and colonial activities, the increasing prevalence of the printing press, etc.). Robinson Crusoe is the most important work of Defoe, who lived as a witness in this transition process, in which he reveals his observations on this transformation.

Daniel Defoe did not create a fictional world in his mind when he wrote Robinson Crusoe but was inspired by the real-life story of Alexander Selkirk, who was alone on an island for a few years. Therefore, he is not a fictional hero but a realistic one. As a matter of fact, Defoe's novels are realist, they do not carry a moral concern about how society should be. The realist novel has liberal elements. In this type of novel, characters are more important than the plot of the story, and in classical and liberal economics, there is trust in the individual, and the human being is positioned as an actor who makes rational decisions. Selfinterest is at the forefront instead of social benefit. As a matter of fact, naming the book after a character instead of the 'desert island' where the action takes place is in line with the character of the realist novel in this context.

Robinson Crusoe is the hero of the novel who escapes from the island after twenty-eight years of struggle, but this hero, as a subject of the capitalist system, is also a victim. As the son of an upper-middle class family, his ambition to become richer by ignoring his father's advice paradoxically led to his imprisonment for two or three years. This ambition then led to his complete isolation from people.

With this novel, Defoe legitimized the concept of colonialism by bringing it into the ordinary course of life. Although Robinson Crusoe refers positively to many images of capitalism and can be depicted as a liberal novel that affirms the bourgeois revolution and a capitalist system on a smaller scale, a closer look reveals that the habits that capitalism has left on people can perhaps even override some human qualities. As a matter of fact, during the long time he spends on the
island, Robinson, who is frightened and worried instead of being happy about the human footprints he sees on the beach, perhaps almost forgetting that he is a human being, still does not take away the gold and coins he brought with him from the ship for a moment and does not throw them into the sea.

Robinson Crusoe sailed the seas not only to become rich but also to be free both individually and economically. Both individual and economic freedom is one of the most important virtues of liberalism and has been defended and emphasized over time, especially by the bourgeois class. In summary, Robinson Crusoe is a novel that emphasizes economic individualism, praises the bourgeoisie, believes that class differences are normal by nature, questions the concept of value (use value - exchange value) in economics and defends the concept of "homo economicus" defended by classical economics. However, just like in real life, while capitalism develops uncontrollably, it also leaves a number of side effects/damages. Defoe saw these contradictions in a very realistic way as a witness who was involved in this transformation while writing the novel. As a matter of fact, throughout his adventures, Robinson Crusoe questioned his mind and belief world from time to time and experienced some regrets within himself. 28 years of desert island life provided him with more than enough time to make these inquiries.

For people in today's capitalist societies, it is almost impossible to stop and rest for even a single minute mentally, even if it is physically possible. It is necessary to focus on the problems created by this uncontrolled capitalist competition, especially climate change, excessive resource use and income inequality, and to think about how a sustainable capitalism can be possible without wasting any more time, to question the past and to take action going forward. Let us end with Kierkegaard's words: "*Life can only be understood backwards, but it must be lived forwards*".

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CHAPTER XIII

THE ECONOMIC IMPORTANCE OF THE TURKISH STRAITS IN RUSSIAN FOREIGN POLICY

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1. Introduction

Turkish Straits, are of vital importance for the Black Sea littoral states. The straits are the main routes connecting the Black Sea countries to the world markets and the Mediterranean Sea, and are the only waterway of economic and strategic importance. The Turkish straits are critical for security as well as economic reasons. Although the Turkish straits are important for many states, the aim of this study is to explain the importance and economic significance of the Turkish straits for Russian foreign policy. Therefore, the course of Russian foreign policy, its historical development and especially its relations with the state that controls the straits should be examined.

Russia's national policy, known as its ambition to descend to the warm seas, was the desire to obtain frost-free ports. However, since the ports were located on Ottoman territory, Russia began to see the Ottoman Empire as an obstacle to itself, which was effective in the weakening and collapse of the Ottoman Empire. Even in the 19th century, Russia, which was dependent on the attitude of the Ottoman Empire in order to be included in world trade, was always afraid that if it fell into disagreement with the western states due to conflict of interest, they would agree with the Ottoman Empire and attack through the straits.

Since Russia settled in the Sea of Azov, the Black Sea began to lose its character as a Turkish sea. Russia started a persistent struggle to seize the Turkish straits, thus aimed to reach the Mediterranean, which included various trade routes, to dominate the Baltic region and to reach India using waterways. Although Russia primarily aimed to dominate the straits, it aimed to achieve these goals together, and if it failed in one, it focused on the other for a while.

Russian foreign policy showed periodic changes. During the periods when Russia realized that it could not dominate the Turkish straits, it tried to get closer to the Turkish administration, prevent other powers from settling in the straits, and gain its own benefit by playing the regional states against each other. However, the straits' regional and global significance caused them to turn into an arena of struggle between the great powers from the 19th century onwards, and the control of the straits was taken out of the hands of the Ottoman Empire and evolved into an international position. From 1841 onwards, while Russia tried to establish conditions in its favor in the treaties on the straits, other world powers adopted an attitude to keep the Russians away from the straits for economic and political reasons and put the responsibility on the Turkish state.

The Turkish straits have always been important. It was assumed that the strategic importance of the straits would decrease with the development of technology, but on the contrary, both the economic and strategic importance of the straits increased. In sum, the straits are important for the Russian economy because Russia's geographical position requires the use of the Turkish straits to open up to world markets. Accordingly, this study aims to determine the indispensable importance of the Turkish straits for Russia, the northern neighbor of Türkiye, in terms of security and economy, and to reveal that Russia's interest in the straits will continue.

2. Russia's Moves to Dominate the Straits

Russia wanted to increase its share in world trade by dominating the Black Sea and the Caspian Sea in the south and the Baltic Sea in the west. It saw the Ottoman Empire as an obstacle, especially in order to expand to the south, and constantly sought military solutions to overcome this obstacle (İnalcık, 1999:34-35). Since the straits, which were among the targets of the Russians to expand to the south, were under the control of the Ottoman Empire, Turkish-Russian wars became inevitable and the Russians' desire to dominate the straits came to the fore in all stages of the Eastern Question (Gürsel, 1968:21-22). Even the claims that Russia was the heir of Byzantium, emerged since the mid-16th century, were used and it became one of the basic principles of Russian politics. Therefore, capturing the straits, or at least taking them under control, became the main goal of Russian politics (Kurat, 2011: VII).

During the reign of Peter I, Russia engaged in serious struggles with Sweden in the Baltic region in order to obtain arms and ports for manufactured goods from Western Europe (Oran, 1970:46). On the other hand, Peter's main goal was to reach the Straits and the Balkans via the Black Sea in the southern direction. The Russians, who formed alliances against the Ottoman Empire in order to achieve this goal, pursued a policy of constant attack against the Ottoman lands, while the Ottoman Empire remained in a constant state of defense due to the loss of its power (Saray, 1998:68).

The achievements of the Russian Csarism, which settled in Europe, Asia and Siberia, have never satisfied the Russians because the desire to reach the warm seas, which was among their political and economic goals, was not realized (Aslanova, 2011: 177). For this reason, the idea of capturing İstanbul and the Turkish Straits turned towards the goal of reaching the warm seas after Peter and became a national goal. In the will attributed to Peter II, it was stated that "Russia's existence depends on its domination of the warm seas" (Emanet, 2003: 45). Russia started to claim that it was a historical necessity for the straits to be under its control. Thus, it tried to realize its goal by finding an excuse at any moment, by war, by a raid from the sea by taking advantage of internal disturbances, by the pretext of Russian aid or alliance (Saray, 1975:174).

Russia captured Azov in its struggle to reach the warm seas. However, the conquest of Azov was not enough to reach the Mediterranean Sea, which included various trade routes. It was also necessary to capture the Kerch Strait and the Bosporus and Dardanelles Straits. The Ottoman Empire had to be defeated in order to achieve this. In addition, the idea that the straits should be under Russian control was the only way for Russia to ensure its southern security. In fact, the issue of the straits was at the heart of most of the wars between the Ottoman Empire and Russia. Russia has always wanted trade and war ships to pass freely through the straits and to close the straits to all anti-Russian forces. Russia aimed to realize these goals by establishing bases in the Dardanelles and Bosphorus (§irokorad, 2009:67-548).

Regardless of the period, the constant aim of Russian foreign policy has always been to conquer İstanbul and the straits connecting the Black Sea to the Mediterranean, Marmara and Çanakkale. During the Tsarist period, this goal was occasionally achieved, and attempts were carried out to sanctify it with the slogans of expelling the Turks from İstanbul and erecting the cross on Hagia Sophia. In the Communist period, the motto "Russia needs a warm port" was adopted (Bullitt, n.d.: 119-120). However, Russia followed an active policy towards the Balkans when it reached the Black Sea, taking advantage of the weakness of the Ottoman Empire from the beginning of the 18th century (Uçarol, 2006:65). It encouraged the Orthodox and Slavic peoples in the Balkans to revolt against the Ottoman Empire in order to weaken the Ottoman control over the straits and secure access from the Black Sea to the Mediterranean (Clark and Foxall, 2014:5).

In the 1880s, Russia began to make plans to seize the straits with a sudden raid. Russian military circles frequently brought this plan to the agenda as they considered it an attractive offer. Immediately after the declaration of the Constitutional Monarchy in 1908, the Russians began to wait for a suitable opportunity to seize the Bosphorus (Kurat, 1970: 143). The Russians even tried to buy land around the Straits in June 1913 in order to dominate the Straits (Kurat, 2011: 182). In response to Russia's constant moves to take the straits under its control in order to access the warm seas, Türkiye declared that it would not let the straits be used against Russia if it befriended Türkiye (Bilge, 1992: 353-354).

There was no change in Russian policies regarding the straits throughout history, and Russian pressure on the straits gradually increased until World War I. With the Treaty of Constantinople signed by the Allies on March 18, 1915, the Russians were considered the owners of the straits and achieved their historical mission to some extent on paper (Kurat, 1999:143). Russia remained loyal to the idea of dominating İstanbul and the straits throughout World War I, and ensuring free access to the high seas became the main goal of World War I for Russia (Sander, 2010: 306). Throughout the war, Russian diplomacy emphasized that Russia's greatest goal was to capture the straits. Closing the straits changed the course of the war to a great extent and caused domestic political turmoil in Russia to intensify (Aslanova, 2011: 159-161). The protection of the straits by the Ottoman Empire during World War I facilitated the Bolshevik Revolution (Bilge, 1992: 353-354). The October 1917 revolution disrupted the plans of Tsarist Russia and its allies. Revealing the secret agreements, The Bolsheviks declared that Russia had no rights over İstanbul. Russia's exclusion from the war paved the way for the temporary removal of the centuries-old Russian threat over the straits (Kurat, 2011: VIII-IX). On March 16, 1921, with the friendship agreement signed with Russia, the Soviets recognized Turkish sovereignty over the straits and İstanbul,

but wanted the status of the straits to be determined by the states bordering the Black Sea. In the Montreux negotiations, Russia supported the abolition of the demilitarization of the straits and the establishment of Turkish sovereignty over the straits (Gürsel, 1968:187-198).

During World War II, the Russians started to bring their demands regarding the straits to the agenda again. During the period when the Russians signed an alliance with Germany, Molotov proposed Türkiye to sign a pact for the common defense of the straits (Oran, 1970:49). The Soviets wanted the straits to be fully opened to Russian ships, while they wanted them to be closed to the Black Sea littoral states. This meant that the balance in the straits and the Black Sea would be disrupted in favor of the Soviets and in a way that would recognize their superiority. Moreover, Soviet demands were aimed at giving the Soviets a say and influence over the whole of Türkiye. The Soviets also wanted Türkiye to accept their expansionist movement in the Balkans. Türkiye did not accept these demands of the Soviets, and the negotiations ended in October 1939 due to the excessive demands of the Soviets (Uçarol, 2006:783). Russia's desire to take control of the straits was considered as the first move of its desire to control Türkiye (Bilge, 1992: 293).

In the Tehran and Yalta negotiations held during World War II, Roosevelt aimed to keep the Soviet Union as a trump card for the Europe of the future, and adopted a concessive attitude towards Türkiye by accepting Russia's request for joint defense of the straits. The emergence of Soviet expansionism made it necessary for the USA to strategically re-evaluate Türkiye (Emanet, 2003: 52-53).

Turkish-Russian relations, which had started to improve during the Republican period, deteriorated again when Stalin asked for a renegotiation of the status of the straits at the conference held in Yalta in February 1945 and then requested a base in the straits in addition to Kars and Ardahan (Şimşir, 1999:152). The increasing Soviet pressure on Türkiye from 1946 onwards worried the European states, especially Britain. The fact that the Soviets officially asked Türkiye for a base in the straits and land in Eastern Anatolia was important in terms of revealing the nature of the Soviet threat. The US implemented the Truman Doctrine to prevent Soviet expansionism (Uçarol, 2006:818-819). After Stalin's death, the Soviet government officially declared in a note to Türkiye on May 30, 1953 that it had no territorial demands from Türkiye. However, since Türkiye joined NATO in 1952, a new non-aggression pact with the Soviet Union was not deemed appropriate (Soysal, 1983:267).

3. Transformation of the Turkish Straits into an International Competition Area

The Turkish Straits are among the most important strategic waterways. The Straits position Türkiye as a state that can influence and be influenced by global developments (Sander, 2000:148). After the conquest of İstanbul, the Ottoman Empire continued its sole dominance of the Straits until 1774. The failure to provide the support of Britain and France during the Egyptian rebellion led the Ottoman Empire to call Russia for help, with the principle of "a drowning man will clutch at a straw". While the Western powers, who realized the severity of the situation with the arrival of the Russians in İstanbul, intervened in the rebellion. The Russians took this opportunity and signed the Treaty of Hünkâr İskelesi in 1833, which gave them an advantageous position in the straits. However, Britain did not allow Russia, which aimed to seize İstanbul by possessing the Turkish straits, which were considered the key to the Black Sea, to infiltrate its commercial areas (Marx, 2017: 29).

In fact, the Russians gained the right to free passage of merchant ships through the straits with the Treaty of Adrianople signed in 1829. With the Treaty of Hünkar İskelesi in 1833, they prevented warships of other states from passing through the straits. Since France considered the Mediterranean as a French sea, it was closely interested in the developments regarding the straits and feared that the Russians would enter into competition in the Mediterranean by passing through the straits (Ates, 2009: 321). After the Treaty of Hünkâr İskelesi expired, a new conference was held and the London Straits Treaty was signed in London in 1841. With this treaty, it was decided to keep the straits closed to all warships during peacetime, and Russia lost the right to pass warships through the straits. The international security of the Straits prevented Russia's ambitions on the Ottoman Empire (Ates, 2009: 321-322). While it was decided in the treaty that the straits would be under international guarantee, the Ottoman Empire's sovereign rights over the straits were limited and the straits were internationalized (Vernadsky, 2019:268). Thus, Russia was prevented from reaching the Mediterranean through the straits and threatening British interests (Armaoğlu, 1997:218).

Russia's attempts continued during this period. Russian Tsar Nicholas I made his first diplomatic attempt regarding the partition of the Ottoman Empire to the British ambassador in Petersburg in 1853. Unable to get a favorable response from Britain, Tsar Nicholas I took action on his own and started the Crimean War by claiming the pretext of "holy places" (Ateş, 2009:

339). Russia did not get what it expected from the war, and with the Paris Peace Treaty in 1856, the Russians were prohibited from maintaining a navy in the Black Sea, thus temporarily stopping their invasion of the straits and increasing their influence in the Balkans (Aslanova, 2011: 105). When Russia came into conflict with the great powers regarding its interests, it always feared that the Ottoman Empire, Britain and France would make an agreement and attack it through the Straits (Oran, 1970:46). It faced this fear during the Crimean War.

Russia wanted to take advantage of the Franco-Prussian War in 1870 and sent a note to the signatory states of the Treaty of Paris, stating that it would not comply with the principle of neutrality of the Black Sea. At the 1871 London Conference held to evaluate Russia's objection, the principle of opening the straits to the navies of friendly and allied states in peacetime was introduced (Gürsel, 1968:113). Thus, the straits were reopened to Russia.

However, this period did not last long. With the 1878 Berlin Treaty signed as a result of the 1993 War, the straits were closed to all states. While closing the straits to warships increased Russia's security in the Black Sea, it prevented Russia from using its Black Sea navy in other regions. This great obstacle was felt many times, especially during the Russia-Japanese War of 1904-5 (Bolsover, 1966:282). The Russians, who were defeated by the Japanese in the 1904-1905 wars, turned their attention back to the Ottoman lands and tried to realize their efforts to open to the warm seas through the straits. Although they sought the support of Britain on this issue, Britain gave up protecting the territorial integrity of the Ottoman Empire, but it was against the Russians settling in the straits.

By 1907, the conflict between Britain and Russia was coming to an end before the approaching world war. In the Reval meeting held between Russia and Britain in 1908, the belief that Russia would be freed regarding the straits encouraged Russia (Sander, 2010:265-266). On the other hand, while the Straits issue was being discussed in Lausanne, the Soviets were invited to the talks with the approval of Türkiye. In his speech at the session of December 4, 1922, the Soviet representative, Çiçerin, suggested that the straits be closed to all warships (Gürsel, 1968: 192-193). As a result, it was accepted that the straits would be managed by an international commission. In the following period, Russia became one of Türkiye's most important allies in the 1930s. However, Russia's policy towards Türkiye changed with the World War II. This attitude of Russia, which started to claim land in Eastern Anatolia and rights in the straits, was met with reaction in Türkiye. Due to the inadequacy of the League of Nations, which was established to maintain peace, and the impending danger of war, a conference was convened upon Türkiye's request. With the Montreux Straits Convention on July 20, 1936, the new status of the Marmara Sea and the Black Sea was also determined to a certain extent. Allowing the passage of merchant ships through the Straits was also beneficial to Russia. With the Montreux Convention, a new status was established by balancing the principle of the closure of the straits maintained by Britain against Russia with Russia's ideal of landing in the warm seas. The law of the straits established in 1936 was one of the determining factors of Türkiye's security and foreign policy (Uçarol, 2006:733-734). Despite occasional controversies, Türkiye managed to implement the treaty by considering it in a flexible way. For example, the grain corridor agreement was against this provision, but in a broader interpretation of the treaty in favor of Russia, it was agreed that ships would be inspected by the commission in order to prevent a food crisis.

Although the Bosphorus and Dardanelles are within Turkish territorial waters, the transition regime is carried out in accordance with the Montreux Convention (Özersay, 1999: 41). However, the Soviets were in alliance with Germany at the time, so they considered it dangerous for their security to open the straits to Britain and France (Oran, 1970:49). During this alliance period, Russia, which had agreed to give land and naval bases in the Turkish straits, declared in 1941 that it had no claims on Turkish territories and straits due to Germany's attack on Russia. With this attitude, the Soviets showed that they aimed to ensure that Türkiye remained neutral, even if it was not on their side. During World War II, Türkiye was able to stay out of the war by approaching both blocs cautiously.

In sum, the Turkish straits are important since the Bosporus and Dardanelles straits are economically crucial and are military areas that will ensure decisive results in wars (Marx, 2017: 30). Knowing this, Russia tried to obtain the consent of the great powers in order to solve the straits problem for itself, sought ways to improve relations with the Ottoman Empire or to use force to partially occupy it (Ignatyev, 1999:154).

4. The Economic Importance of the Turkish Straits for Russia

With more than 17 million km² of territory, the Russian Federation, the largest country in the world, is located in the north of Asia, between the Pacific

Ocean and Europe, extending to the Arctic Ocean. Bordering 14 countries, Russia has a population of 147 million (Moscow Embassy Trade Counselor's Office, 2023). For Russia, the Turkish Straits maintain their economic and strategic importance today as they did in the past.

Russia had strategic and economic interests in the straits, both for its own defense and the necessity to develop its southern provinces. The straits are also of great psychological importance for Russia, considering that "the straits are the keys to the house and therefore must be kept in the pocket" (Bolsover, 1966: 281). Russia wanted the straits to be under its direct control in order to ensure its economic development and defense (Bilge, 1992: 4). With the 1701 Treaty of Constantinople, Russia gained the right to trade with Ottoman ships in the Black Sea, and these gains of Russia were eliminated with the Treaty of Prut signed at the end of the Ottoman-Russian War. Having lost the Azov Castle, the Russians were not able to reach the Black Sea until the Treaty of Belgrade in 1739. The Russians, who regained the right to trade in the Black Sea with the Belgrade Treaty, settled in the Black Sea with the Treaty of Küçük Kaynarca in 1774 and gained commercial rights so as not to lose them again. The Black Sea, which had been a Turkish lake since 1475, lost this feature in 1774 and the Turkish straits became a subject of international debate.

Russia, which gained the right to trade freely in Turkish territorial waters and straits (Riasanovsky and Steinberg, 2011: 275), did not encounter any difficulties in terms of its economic interests since the straits were open to merchant ships in accordance with the agreements made with the Ottoman Empire.

However, protecting its strategic interests was not easy at all because the security strategies of other states did not coincide with those of Russia (Bolsover, 1966:282). Nevertheless, Russia managed to come to an agreement with powerful states that had interests in the Mediterranean. This enabled the Russian economy to open up to the world through the straits.

The straits were of great importance for the transportation of Russia's natural wealth to Europe and other markets and for the transportation of industrial products Russia needed to Russia (Aslanova, 2011: 155). Russia was not pleased with the railroad activities in Anatolia because it thought that the Ottoman Empire would rival it in grain exports. In other words, the railroad network established by the Ottoman Empire in Anatolia in 1890 caused the fear that the wheat produced in Russia could not be sold to the west. The Russian ambassador reported to Moscow that the purchase of Russian wheat had already

been abandoned in İstanbul and that tons of wheat could soon be exported from Anatolia to Europe, which would cause great damage to the Russian economy (Ortaylı, 1999:133). Upon this development, Russia intervened in the railroad tenders and imposed the condition that the railroads to be built in the Black Sea region would be given to Russian companies. For this reason, railroad work in the Black Sea region could not be carried out comprehensively. The construction of the railroad did not cause a decrease in Russia's exports, because the constant wars in the Ottoman Empire prevented the increase in production, thus the demand for Russian grain did not decrease.

For the Russian bourgeoisie, the straits were crucial to reach new markets. The straits were of vital importance, especially for Russian aristocrats who exported wheat. Between 1903 and 1912, 37% of total exports and 60-70% of wheat exports passed through the straits (Aslanova, 2011:122-124). The Tripoli War, which started in 1911, attracts attention, because when the Ottoman Empire closed the straits to international maritime traffic in April 1912 (28 days) after the Italians moved the war to the Aegean to cover their failures, Russia suffered great damage as its grain exports were interrupted (Kurat, 1999:140). Thus, the value of the straits for the Russian economy was once again understood, because even the temporary closure of the straits to maritime traffic was damaging the Russian economy.

By 1914, Russia was among the top four industrialized countries in the world. 90% of mining and 100% of oil extraction were mobilized for the development of the Russian economy. Russia was also one of the countries with the highest foreign debt in the early 20th century. In order to borrow money, it had to offer investors above-market interest rates. In other words, the Russian economy was in a shaky state (Kennedy, 2010: 287). Before the World War, the Ottomans also met with Russia in its search for an alliance. However, since Russia's acceptance of the Ottoman offer of alliance meant giving up its ambitions over the Turkish straits, the Tsar did not accept the offer. On the other hand, Russia, whose economy was too weak to afford a major war, wanted the Ottoman Empire to remain neutral (Aslanova, 2011: 157). When the Ottoman Empire entered the war in November 1914, the straits were closed and Russia's grain exports and weapon imports were prevented, which led to the end of the tsarist rule (Kennedy, 2010: 313).

After the World Wars, a new political and economic system was established. While the Soviets organized their economy according to the communist ideology, they started a struggle against the capitalist system. The economic aspect of the Turkish Straits, which had political and military strategic importance until the beginning of the 20th century, began to become more dominant with the capitalistization process. Russia's integration with the world market increased the value of the straits for the Russian economy. The possibility of the closure of the Turkish straits to Russian trade disturbed Russia (Aslanova, 2011:122-124). Nevertheless, Russian trade continued through the straits during the Cold War.

Towards the end of the Cold War, oil, which was the main source of the Russian economy, lost its value, because the excess supply of oil in the world and the decrease in demand directly affected Russia's economy. The serious drop in oil prices accelerated the disintegration of Russia (Yergin, 2014:34-35). As the Cold War came to an end, what this meant for Russia was the collapse of the Russian economy, which untimely killed millions of people, except for the elite rich connected to foreign Powers, and left the society in ruins (Chomsky, 2002:192). After this collapse, the Russian economy began to recover with the privatization of state investments.

Russia wanted to preserve its economic privileges in its former sphere of influence. It aimed to continue the transportation of Central Asian oil to the Black Sea through Russian pipelines. For this reason, it did not welcome the emergence of different alternatives and tried to ensure that oil resources continued to reach world markets under its control. For example, it opposed the Baku-Ceyhan oil pipeline, but could not prevent the opening of the pipeline due to the support of the United States.

Unable to prevent new alternatives, the Russian Federation turned to joint projects with Türkiye. Relations between the two countries developed in political and economic fields after 1994. The signing of investment agreements in 1997, particularly the Blue Stream project, marked the beginning of a new era in Moscow-Ankara relations (Uçarol, 2006:1080-1082). As a result, Russia has returned as a major oil producer since the early 2000s. Russia has now integrated with the world's oil industry technology, established many different companies, which made Russia the world's largest oil producer and second largest exporter again (Yergin, 2014-a: 52). Russia exports at least one third of its oil through the straits.

Developing political and economic relations with Russia gained a new dimension with the outbreak of the Syrian civil war. The crisis of downing a plane in Syria, which caused friction between NATO, the US, Türkiye and Russia, was turned into an opportunity by Russia. Russia tried to increase its influence in the Baltic and Black Sea and succeeded. On the other hand, Türkiye's improving relations with Ukraine and its cooperation in the military industry disturbed Russia. However, the Russian economy was based on energy exports. Since the continuation of the crisis with Türkiye would have negative consequences for the Russian economy, they did not want to prolong the crisis (Yılmaz, 2018:30).

Today, Russia is one of the most important raw material supplier countries with its rich natural gas, oil and mineral resources as well as its vast agricultural and forest areas. Petroleum products, natural gas, hard coal, cereals, oilseeds and vegetable oils, and iron and steel products constitute the main export items. Russia, which ranked 16th in the world with exports of approximately 337.1 billion dollars in 2020, increased its exports to 492.3 billion dollars in 2021 as a result of the upward trend in commodity prices and became the 13th largest exporter in the world. Although the country's economy contracted by 2.1% in 2022 due to the wide-ranging sanctions imposed as a result of recent geopolitical developments, Russia increased its income through trade carried out through the straits (Moscow Embassy Commercial Counselor's Office, 2023). The reason for this was that the Baltic shadow was no longer safe due to the Ukraine War. Although Russia had 62 ports, it had to concentrate on the Black Sea, where 10 of them were located.

Due to increasing ship transit, the volume of traffic in the Turkish Straits has reached critical and dangerous levels. While in 1936, only 17 ships passed through the Bosphorus per day, today this number corresponds to an average of 105 ships per day. Since the Montreux Convention was signed in 1936, the number of ships passing through the Turkish Straits has increased approximately 6 times. A total of 38,404 ships passed through the Bosphorus in 2020 and 42,036 ships passed through the Dardanelles. A significant portion of the ships passing through the Turkish Straits carry poisonous, dangerous and explosive substances. In parallel with the increase in oil transportation to Black Sea ports, especially since the 1990s, there has also been an increase in the number of ships carrying hazardous materials and oil through the Turkish straits. More oil is transported through the Turkish Straits than even the pipeline through which the most oil is transported (Chamber of Shipping, 2021).

For Russia, which is rich in energy resources, exporting energy is one of the main activities of the economy. In Russia, the oil and natural gas sectors are closed to competition from foreign capital. Thus, the establishment of a strong Russian economy was ensured (Akçapa, 2020:69-73). In order for Russia to continue its economic activities, oil and natural gas exports must not be interrupted. However, energy exports decreased because the Nord Stream pipelines and the Ukrainian line, through which Russia directly exports gas to Europe, became inoperable. Nevertheless, the increase in oil and natural gas prices prevented a decrease in its income. The importance of the Turkish Straits, which Russia uses to reach world markets, has once again become clear.

5. Conclusion

The Turkish Straits have great economic and strategic importance in the international arena. These opportunities that Türkiye has pave the way for Türkiye to emerge as an important state in international and regional politics (Sander, 2000:121-124). However, although the strategic location of the straits provides Türkiye with a significant advantage, it also poses some risks. For example, ships carrying dangerous goods through the straits would cause great damage to İstanbul in a possible accident. Türkiye is trying to implement the Canal İstanbul project to reduce ship traffic in the straits. However, this project may not reduce the passage of Russian oil tankers through the straits since Russia may continue to prefer the straits where it has the right of free passage.

In the post-Cold War era, the Black Sea has become critical to NATO's expansion strategy. Therefore, the strategic importance of the Turkish Straits is one of the most important factors ensuring the continuity of Turkish-American relations. The Ukraine War and Russia's near abroad policy brought about extensive sanctions against Russia led by the United States. Türkiye, being Russia's neighbor, has been softening the embargo decisions, which is an important support to the Russian economy.

Concerning the Black Sea, the Montreux Convention is also important. Montreux gives Türkiye the right to close the straits to warships of all states. However, the conditions at the time the contract was signed have changed considerably. Türkiye holds the initiative by being flexible regarding the implementation of the contract. Nevertheless, recent developments have brought the debates about war and merchant ships to the agenda. Both the states that have coasts on the Black Sea and the states that want to enter the Black Sea from outside want the implementation to be carried out in their favor. Türkiye acts neutrally, neither allowing Russian ships to be trapped in the Black Sea nor allowing ships from outside to disrupt the balance. In conclusion, the embargoes imposed on Russia have once again confirmed that the Turkish Straits are of vital importance for Russia in terms of economy and security. Despite everything, Russia still continues its trade with the world through the straits.

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