Studies on Economics Sciences

Editor

Assoc. Prof. Dr. Yuksel Akay Unvan

ISBN: 978-2-38236-072-9

LIVRE DE LYON

livredelyon.com
livredelyon
livredelyon
livredelyon

Economy

LIVRE DE LYON

Lyon 2020

Studies
on
Economics Sciences

Editor
Assoc. Prof. Dr. Yuksel Akay Unvan

LIVRE DE LYON

Lyon 2020

Editor • Dr. Yuksel Akay Unvan  0000-0002-0983-1455

Cover Design • Aruull Raja
First Published • December 2020, Lyon

ISBN: 978-2-38236-072-9

Publisher • Livre de Lyon

Address • 37 rue marietton, 69009, Lyon France
website • http://www.livredelyon.com
e-mail • livredelyon@gmail.com

LIVRE DE LYON

PREFACE

We are closing the year 2020 by producing. We are in a period when it is important to say different and correct words. The process we are going through requires this. We re-evaluate what we know during the pandemic process and take different approaches. Balances are changing in the economy. This change brings along development. As always, scientists are the pioneers of this. Our wish is that this work serves this purpose.

Best Regards

CONTENTS

REFEREES

Assoc. Prof. Dr. Barış Yıldız, Gümüşhane University

Assoc. Prof. Dr. Eda Bozkurt, Atatürk University

Assoc. Prof. Dr. Egemen İpek, Tarsus University

Assoc. Prof. Dr. Haluk Yergin, Yüzüncü Yıl University

Assoc. Prof. Dr. Yüksel Akay Unvan, Ankara Yıldırım Beyazıt University

CHAPTER I

IS THE EKC HYPOTHESIS VALID FOR THE ECOLOGICAL DEFICIT/SURPLUS? AN EMPIRICAL STUDY FOR TURKEY

Osman Murat Telatar[1] & Aykut Başoğlu[2]

[1](Asst. Prof.), Karadeniz Technical University, e-mail: omtelatar@ktu.edu.tr

0000-0003-3016-0534

[2](Asst. Prof.), Karadeniz Technical University, e-mail: basoglu@ktu.edu.tr

0000-0002-2071-6829

1. INTRODUCTION

The ecosystem has a critical importance in terms of economy and it performs two significant functions within the production and consumption process. One of them is to provide low-entropy matter and energy (natural resource) and the other is to stock high-entropy matter and energy (waste) (Daly, 1991). On the other hand, the capacity of resource supply of the environment and waste storage is limited. When this capacity is exceeded, the environmental quality will reduce. Besides, the quality of the environment varies depending on the level of environmental use, pollution level, and capacity of self-renewal (Brock and Taylor, 2004). Population and economic activities that affect the carrying capacity of the environment are also the other factors that determine the environmental quality. Therefore, environmental degradation will be dependent on these factors. In this context global warming and climate change which are dominant environmental problems take first place among the subjects threatening humanity in the last century. The characteristic feature of today's environmental problems that are discussed intensely by the academic and political community is the prominent human impact depending on the population growth changing, production process, economic growth. At this point, examining the human, economy and environment relationship will be guiding in understanding environmental problems, fighting against these problems and in the resolution of them.

Throughout the history of economic thought, the relationship between the economy and environment has been discussed. Especially, after the second phase of 20th century, social, political, economic and ecological developments have revived this relationship once again. However, as in numerous different subjects, there are also some

counterviews among economists regarding this relation. While some economists claim that economic development is the reason for the environmental problems, others assert that it solves these problems. The neoclassical theory, for example, has evaluated the ecological system as a part of the economic system and has asserted that economic growth will be a remedy for environmental issues. It has examined the details of how technological developments increase capital-natural resource substitution. On the other hand, ecological economists like Kenneth E. Boulding, Dennis L. Meadows, Georgescu Roegen, Herman Daly and others have made both theoretical and empirical debates on considering the view that growth of economic activity leads to environmental problems. According to these economists, economy is an open sub-system of the ecological system. Moreover, the ecological system is closed and limited. As a result of this circumstance, the growing population and expanding economy cause environmental problems to arise by forcing the boundaries of the ecological system. In this respect, especially after the 1950s, the booming economic growth, rapid population growth, urbanization, and meeting the increasing energy demand with fossil fuel have induced environmental problems. Therefore, environmental problems have become an important matter for politicians and academicians and a requirement for analyzing the relationship between economy and environment has emerged. The environmental Kuznets curve (EKC) hypothesis has been recently used to investigate this relationship which was examined by theoretical applications heretofore.

In 1991, Grossman and Krueger identified a relationship which is the inverted U-shaped between sulfur dioxide (SO_2) and per capita income. Similarly, Panayotou (1993) exhibited same relation between deforestation, SO_2, and per capita income. Later on, this relationship is called as the EKC hypothesis by referring to Simon Kuznets. EKC hypothesis argues that there will be deterioration in the environment with the beginning phase of economic growth and then as income rises the process will reverse after a certain threshold. As there is an increase in industrialization and mechanization, the level of pollution (for some pollutants) might rise in the first phase of economic development. This pollution will be diminished with the help of factors like positive income elasticity of environment, variation in production and consumption, technological development, high level of education and democracy. Thus, the process can be reversed (Selden and Song, 1994). In this regard, theoretical explanations for the EKC hypothesis are usually put forward in terms of the process of economic development and it affects the environment via three ways (Grossman and Krueger, 1991): scale, technological, and composition effects.

If the relationship between income and deterioration of the environment is positive and linear, rising income may affect the environment negatively. So, it can be said that the use of environmental assets and the volume of waste will probably increase. In this situation, the scale effect becomes the agent which manages the process. However, environmental pressure may begin to decline as income goes up and after a clear level of income (turning point). Then the process will reverse by leading to an environmental recovery that will be possible with the help of various factors. These are a decline in consumption[1] which is qualified as a decreasing scale effect, transition from agriculture to service and information sectors, an increasing environmental sensitivity, a social pressure about the reconstruction of environmental regulations, technological development, and an increase in environmental expenditures (Panayotou, 1993). That is to say, the composition and technology effect assert the declining part of the EKC. On the other hand, the effects of factors which are mentioned above may differ according to the development levels of countries. For instance, in a developed economy, the environmental sensitivity of the society will be more than underdeveloped and developing economies. This situation will lead to the implementation of both social and public precautions more quickly and efficiently. However, as income increases, there is a risk in the reversibility of the effects above and environmental improvement at high-income levels (Bagliani et al., 2008). Because increasing scale and income effect may extinguish the impacts of technological progress in emission reduction in rapidly growing economies.

The income elasticity hypothesis and international trade also explain the EKC hypothesis. With higher income, people have higher standards of living and this might increase demand for more qualified environment. This request will end up decreasing environmental degradation by causing structural transformation in the economy and pressure for environmental regulations (Dinda, 2004). According to this approach, there is a strong positive relationship between income level and environmental quality after a certain threshold income (Beckerman, 1992). At the low-income levels, the income elasticity of qualified environment demand is negative. On the contrary, as the income level gets higher, the demand for a qualified environment also increases and gets positive values (McConnell, 1997). So, a qualified environment is inferior goods at low-income levels, but superior goods at high-income levels[2]. International

[1] Sim (2006) argues that consumers will revise their decisions and reduce their consumption in response to environmental degradation which leads to a decline in welfare.

[2] There are some opposing viewpoints on this approach. For instance, Ekins (1997) points out that the low-income individuals, especially, in rural areas are directly dependent on the environment and environmental resources and they are too sensitive to the environmental

trade is another phenomenon used in the explanations of the EKC hypothesis. Some arguments support the idea that international trade causes environmental pollution, but others claim that it helps to reduce environmental pollution. According to the first opinion, as a result of the expansion of the economy scale due to international trade, the environmental quality will reduce by being under pressure. As for that the other view, International trade can ameliorate the quality of the environment by means of composition and technological effect. Because stringent environmental regulations can promote pollution-reducing technology, or pollution-generating activities can shift from developed countries to developing countries, as the level of income rises. In this case, owing to international trade, pollution will increase in one country and will decrease in the other. This states a kind of composition effect (Dinda, 2004).

The rest of the paper consists of four sections: ecological footprint, biocapacity and Turkey's profile; literature review; empirical framework and results; and conclusion, respectively.

2. ECOLOGICAL FOOTPRINT, BIOCAPACITY and TURKEY'S PROFILE

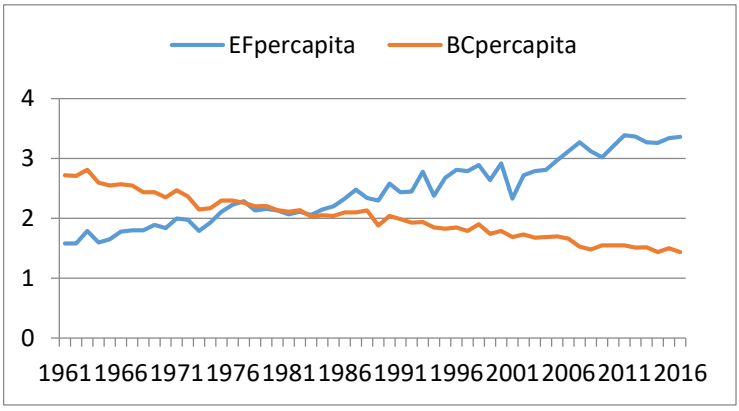
The ecological footprint (EF) was put forward and developed by Mathis Wackernagel and William Rees in the 1990s. The EF reflects the demand of people for environmental resources and the pressure of economic activities on the environment. Hence, a higher EF means a higher use of the environment and higher degradation (Al-Mulali, 2015). The EF is a proper indicator for tracking the deterioration of the ecological system. (Wackernagel et al., 2015). The EF which is measured in global hectares (gha) contains forest area, cropland, carbon demand on land, grazing land, built-up land, and fishing grounds. It is the area used to support the consumption of a defined population (Global Footprint Network [GFN], 2006). The biocapacity (BC), as a part of the natural capital of a country or specific area, represents the ecologically productive area. The BC is the domestic supply of ecosystem services that meet people demand and its capability of regeneration. It is calculated in gha like the EF. When the EF and the BC are evaluated together, it is possible to indicate an ecological budget or ecological balance. In this respect, if the EF is bigger than the BC, there will be an ecological deficit. However, if the BC is bigger than the EF, an ecological surplus will emerge. In case of the ecological deficit, the excessive use of resources within the country or importing BC will meet the requirements (GFN, 2006).

---

degradation. Therefore, it can be said that for those who live in rural areas, there is no need for an increase in their income to consider the environment.

Turkey is a developing country with about 80 million population. The population of Turkey increased approximately 3.2 times between the years 1961-2016. The average economic growth rate in the same period was around 2.72% and per capita income (constant 2010 US$) rose from 3135$ to 14117$. In that period, serious sectoral transformations were experienced in the economy. While the agricultural GDP decreased from 52% to 6%, the industrial GDP increased from 17% to 28% and the services GDP increased from 29% to 54 %. Economic development and population growth in Turkey have also increased energy demand. There is no doubt that all these developments increased the pressure on the environment. According to the data of GFN National Footprint Account 2019, per capita EF of Turkey rose from 1.58 gha to 3.36 gha between the year 1961 and 2016. On the other hand, there was a decrease in per capita BC (from 2.72 to 1.44) in the same period. In 2016, per capita EF of Turkey (3.36) is higher than the world's average (2.75). On the contrary, per capita BC (1.44) is below the world's average (1.63). This situation demonstrates that the ecological deficit of Turkey is much higher than the global deficit. This deficit, which is called environmental overconsumption, shows that the need for BC is provided from abroad or excessive use of resources within the country (Galli et al., 2012).

Fig. 1: Ecological Footprint and Biocapacity (percapita gha, 1961-2016)[3]



The tendencies which are seen in the EF and the BC over time caused Turkey to be a country with an ecological deficit rather than a country that has an ecological surplus. In Fig. 1, Turkey's ecological balance sheet (1961-2016) is analyzed, it can be seen that there was an

[3] According to GFN National Footprint Account 2019 in the 1961-2016 period, the carbon footprint (43.6%) is the biggest part of the ecological footprint of Turkey. The others are cropland (36.8%), fishing grounds (1.86%), forest products (9.87%), grazing land (6.69%), and built-up land (1.12%). On the other hand, the components of biological capacity and their share are cropland (44.42%), forest products (44%), grazing land (6.85%), fishing grounds (3.39%), and built-up land (1.36%).

ecological surplus until 1983 (except 1977). But, after 1983 Turkey has an ecological deficit consistently. In this transformation, some factors have become effective. As emphasized by Acar and Aşıcı (2017), these are; the change in the composition of Turkey's industry based on construction, metals, electricity, gas, water and cement that are energy and pollution-intensive industries, increasing population, economic growth, etc.

3. LITERATURE REVIEW

The pioneering studies about the EKC hypothesis were performed by Grossman and Krueger (1991), Beckerman (1992), Shafik and Bandyopadhyay (1992), Panayotou (1993), Cropper and Griffiths (1994), Grossman and Krueger (1995) and Roberts and Grimes (1997). Even though there is a wide literature based on the EKC hypothesis, there is no consensus on its validity. While some studies (e.g. Apergis and Payne, 2009; Wang et al., 2017; Bello et al., 2018) affirm that the EKC hypothesis is valid, others (e.g. Zhang and Zhao 2014; Hervieux and Darne, 2016; Teixido-Figueras and Duro 2015) could not verify the hypothesis. The use of different samples, periods, methods, environmental indicators, and explanatory variables lead to an inconsistency among results. For instance, in the studies related to the EKC hypothesis used different indicators such as SO_2, suspended particulate matter, deforestation, water pollution, and CO_2. As different from these, the environmental indicator EF was used to research the EKC hypothesis in some studies. In Table 1 the selected literature investigating the EKC hypothesis using the EF is summarized.

Table 1: Literature Summary

Authors	Country/Period	Method	Findings
Rothman (1998)	52 countries/1993	Cross-sectional Analysis	EKC invalid
York et al. (2003)	138 countries/1999	Cross-sectional Analysis	EKC invalid
Jia et al. (2009)	China (Henan region)/1983-2006	PLS (Partial Least Square)	EKC invalid
Tang et al. (2011)	China (Sichuan region)/1995-2008	OLS (Ordinary Least Square)	EKC invalid
Al-mulali et al. (2015)	93 countries/1980-2008	Panel Regression Analysis	EKC valid (for high and upper middle-income countries
Aşıcı and Acar (2016)	116 countries/2004-2008	Panel Regression Analysis	EKC valid (for production footprint)

Hervieux and Darne (2016)	11 countries/1971-2007	ARDL (Autoregressive Distributed Lag) Analysis	EKC invalid
Sebri (2016)	153 countries/1996-2005 (average)	Cross-sectional Analysis	EKC invalid (for water footprint)
Mrabet and Alsamara (2017)	Qatar/1980-2011	-ARDL Analysis -Gregory and Hansen Cointegration	EKC valid
Mrabet et al. (2017)	Qatar/1980-2011	ARDL Analysis	EKC invalid
Aşıcı and Acar (2018)	87 countries/2004-2010	Panel Regression Analysis	EKC invalid (threshold income is upper than the maximum income in the dataset)
Bello et al. (2018)	Malaysia/1971-2016	ARDL Analysis	EKC valid
Destek et al. (2018)	15 European Countries/1980-2013	Panel Cointegration Analysis	-EKC invalid (for panel) -EKC valid (for Portugal/FMOLS and France/DOLS)
Sarkodie (2018)	17 African countries/1971-2013	Panel Cointegration Analysis	EKC invalid
Ulucak and Bilgili (2018)	45 countries (15 high, 15 middle and, 15 low income countries)/1961-2013	-Continuously Updated Bias Corrected (CUP-BC) -Continuously Updated Fully modified (CUP-FM)	-EKC invalid (for most of low income countries) -EKC valid (for high and middle income countries)
Aydin et al. (2019)	26 European Countries/1990-2013	Nonlinear Panel Regression Analysis	-EKC valid (for grazing land, carbon footprints, forest area, cropland, and built-up land) -EKC invalid

			(for fishing grounds footprint)
Yilanci and Ozgur (2019)	G7 Countries/1970-2014	Bootstrap Panel Rolling Window Causality Analysis	-EKC is valid for Japan and USA

In the literature which analyzed the EKC hypothesis for Turkey, CO_2 has been used generally. However, studies that prefer EF as an environmental indicator are rather limited. For instance, in his study Alemdar (2015) used EF for 1970-2010. As a result of co-integration analysis, he did not reach any proof for the validity of the EKC hypothesis. Ozturk et al. (2016) analyzed the effect of tourism on EF from 1988 to 2008 for 144 countries. Their findings indicated an inverted U-shaped relationship. Uddin et al. (2016) analyzed the validity of the EKC hypothesis in 1961-2011 for 26 countries. They founded that the EKC hypothesis is not confirm for Turkey. Acar and Aşıcı (2017) researched the EKC hypothesis for Turkey's economy in 1961-2010 through Johansen Cointegration Test by using 4 different types of EF as production, consumption, import, and export. They determined that the EKC hypothesis was valid only for the EF of production. Ozcan et al. (2018) analyzed the EKC hypothesis via the bootstrap time-varying causality technique in the 1960-2013 period. The evidence shows that EF increases with economic growth. Furthermore, the feedback relationship between them exists. Findings point out that the EKC hypothesis is not acceptable. Destek and Sarkodie (2019) investigated the EKC hypothesis for newly industrialized 11 countries including Turkey in 1977-2013, by using panel data analysis. The results demonstrate the validity of the EKC hypothesis. Doğan et al. (2019) researched the determinants of EF in MINT countries in 1971-2013. They indicated that the EKC hypothesis affirms in MINT countries. The threshold income also detected as 14.705 dollars in Turkey was. In addition, it was emphasized that Turkey does not reach the turning point income in the study period.

4. EMPIRICAL FRAMEWORK AND RESULTS

This study tests the EKC hypothesis for the 1961-2016 period in Turkey. Differently from the common literature, the ecological deficit/surplus is used as the environmental indicator along with EF in the study. To the best of our knowledge, this study is the first attempt to use the ecological deficit/surplus in the EKC hypothesis literature. The ecological deficit/surplus indicates the ecological balance since the ecological deficit/surplus includes both the demand for ecological services, i.e. the EF, and the delivery of ecological services, i.e. the BC. Thus, the ecological balance is an important variable that can reveal the change in

environmental quality better. Because a clear degradation/improvement in the environmental quality depends on whether or not carrying and self-renewal capacity of the environment is exceeded (Munasinghe, 1995). For example, it can be said that there will be a clear degradation in the environmental quality in case of an ecological deficit where the EF exceeds the BC. The explanations of the variables and the databases where they were obtained are shown in the table 2 below.

Table 2: Variables, Definition and Databases

Variable	Definition	Source
LEF	Ecological footprint per capita (logarithmic form)	Global Footprint Network
EB	Ecological balance (EB=BC-EF)	Global Footprint Network
LGDP	Real GDP per capita (constant 2010 US$, logarithmic form)	World Bank (WDI)

The variables used in the co-integration analysis were firstly held subject to the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and, Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests and the results of unit root tests are shown in Table 3.

Table 3: The Results of Unit Root Tests

Variable	ADF		PP		KPSS	
	Constant and Trend	Constant	Constant and Trend	Constant	Constant and Trend	Constant
LEF	-6.197(0)[a]	-1.161(1)	-6.205[a]	-1.210	0.051	0.991[a]
ΔLEF	-11.812(0)[a]	-11.901(0)[a]	-18.948[a]	-18.799[a]	0.047	0.063
EB	-4.942(0)[a]	-0.624(2)	-5.010[a]	-0.573	0.076	0.904[a]
ΔEB	-7.924(1)[a]	-7.990(1)[a]	-12.418[a]	-12.510[a]	0.047	0.049
LGDP	-2.246(0)	-0.008(0)	-2.461	-0.009	0.129[a]	0.911[a]
ΔLGDP	-7.145(0)[a]	-7.199(0)[a]	-7.145[a]	-7.199[a]	0.067	0.079
$LGDP^2$	-1.881(0)	-0.295(0)	-2.094	0.295	0.154[b]	0.910[a]
$\Delta LGDP^2$	-7.128(0)[a]	-7.148(0)[a]	-7.127[a]	-7.149[a]	0.067	0.104

a and b denote the statistical significance level at the 1% and 5%, respectively. The number in the parentheses is the optimal lag order for ADF test. Δ and L refer to the first difference and the logarithm form of the variable, respectively. The null hypothesis of KPSS test indicates that the series does not contain unit root, differently from the ADF and PP tests.

The results vary according to the terms used in unit root equation. All variables in the model which is included constant are stationary in their first differences. However, in the model which is included constant and trend, LEF and EB are stationary in their levels. Since the variables are stationary at different levels, the possible relationships between the variables are examined by the Pesaran et al. (2001) bounds testing approach, regardless of the stationarity levels of the series.

The unrestricted error correction models (1) and (2) were established for the determination of the cointegration relation in the first stage of the bounds testing.

$$\Delta LEF_t = \beta_0 + \sum_{i=1}^{m} \beta_1 \Delta LEF_{t-i} + \sum_{i=0}^{m} \beta_2 \Delta LGDP_{t-i} + \sum_{i=0}^{m} \beta_3 \Delta LGDP^2_{t-i} + \beta_4 LEF_{t-1} + \beta_5 LGDP_{t-1} + \beta_6 LGDP^2_{t-1} + \varepsilon_t \quad (1)$$

$$\Delta EB_t = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \Delta EB_{t-i} + \sum_{i=0}^{n} \alpha_2 \Delta LGDP_{t-i} + \sum_{i=0}^{n} \alpha_3 \Delta LGDP^2_{t-i} + \alpha_4 EB_{t-1} + \alpha_5 LGDP_{t-1} + \alpha_6 LGDP^2_{t-1} + u_t \quad (2)$$

Here, β and α represent the coefficients of the variables; Δ denotes the first difference; m and n are the optimal lag lengths. In equation (1) and (2), the maximum lag length is taken as four and the optimal lag lengths are determined by the Akaike information criterion (AIC). Therefore, the minimum AIC value without the autocorrelation problem is considered as the optimum lag length. The AIC values obtained from the estimation of equations (1) and (2) are presented in Table 4. Accordingly, the optimal lag lengths for equations (1) and (2) are 3 and 1 respectively.

Table 4: The Selection of Optimal Lag Length

Lag Length	Model (1)		Model (2)	
	AIC	LM	AIC	LM
1	-3.553	4.159[b]	**-1.897**	0.661
2	-3.568	5.951[a]	-1.790	0.001
3	**-3.748**	0.953	-1.708	0.072
4	-3.706	0.025	-1.635	4.144[a]

a and b indicate significance level at the 1% and 5%, respectively. LM is the Breusch-Godfrey LM test statistic for first order autocorrelation.

Table 5: The F Statistics for Model (1) and Model (2)

F statistic		Critical Values	
		Lower Bound I(0)	Upper Bound I(1)
10.864 (Model 1)	1%	5.15	6.36
8.357 (Model 2)	5%	3.79	4.85

Critical values of the bounds test are obtained from Pesaran et al. (2001:301) Table CI (III).

As shown in Table 5, there is a cointegration relation between the series for both models, because the F statistic value is greater than the upper bound at the 5% significance level. After the detection of the cointegration relationship in the equation (1) and (2), the ARDL model is established so as to reveal the long and short-run relationships.

$$LEF_t = \gamma_0 + \sum_{i=1}^{p} \gamma_1 LEF_{t-i} + \sum_{i=0}^{q} \gamma_2 LGDP_{t-i} + \sum_{i=0}^{r} \gamma_3 LGDP^2{}_{t-i} + \nu_t \quad (3)$$

$$EB_t = \varphi_0 + \sum_{i=1}^{k} \varphi_1 EB_{t-i} + \sum_{i=0}^{l} \varphi_2 LGDP_{t-i} + \sum_{i=0}^{s} \varphi_3 LGDP^2{}_{t-i} + \nu_t \quad (4)$$

Here, γ and φ represent the coefficients of the variables; Δ denotes the first difference; p, q, r, k, l, and s are the optimal lag lengths selected by using AIC. The optimal lag length is determined for the equation (3) as 1, 4 and, 0 whereas 1, 0 and, 2 for the equation (4).

After estimating the long-run coefficients, the study continues with the error correction model by using Eq. (5) and (6).

$$\Delta LEF_t = \delta_0 + \delta_1 ECT_{t-1} + \sum_{i=1}^{P} \phi_i \Delta LEF_{t-i} + \sum_{i=0}^{q} \lambda_i \Delta LGDP_{t-i} + \sum_{i=0}^{r} \theta_i \Delta LGDP^2{}_{t-i} + \mu_t \quad (5)$$

$$\Delta EB_t = \delta_0 + \delta_1 ECT_{t-1} + \sum_{i=1}^{k} \phi_i \Delta EB_{t-i} + \sum_{i=0}^{l} \lambda_i \Delta LGDP_{t-i} + \sum_{i=0}^{s} \theta_i \Delta LGDP^2{}_{t-i} + \mu_t \quad (6)$$

where ECT is the residual obtained from the ARDL model. The results of the ARDL (1,4,0) model are presented in Table 6.

Table 6: The Results of the ARDL (1,4,0) Model

Long-run coefficients (dependent variable: LEF)			
Variable	**Coefficient**	**t-statistic**	
LGDP	3.9136[a]	4.7720[0.000]	
$LGDP^2$	-0.1908[a]	-4.1202[0.000]	
Short-run coefficients (dependent variable: ΔLEF)			
ΔLGDP	2.6933	1.0571[0.296]	
ΔLGDP(-1)	-0.1345	-0.9899[0.327]	
ΔLGDP(-2)	-0.0432	-0.3726[0.711]	
ΔLGDP(-3)	0.3470[b]	2.8951[0.005]	
Δ$LGDP^2$	-0.0912	-0.6401[0.525]	
Constant	-15.0598[a]	-5.6941[0.000]	
ECT(-1)	-0.8020[a]	-5.6880[0.000]	
R^2	0.809	χ^2_{LM}	0.053[0.8165]
DW-statistic	2.006	χ^2_{WHITE}	4.094[0.8485]
F-statistic			22.276[0.0000]

a and b denote the statistical significance level at the 1% and 5%, respectively. Number in the brackets is the p value of related statistic. Δ and L refer to the first difference and the logarithm form of the variable, respectively.

As it is seen in Table 6 the lag of error correction term [ECT(-1)] is statistically significant and negative as expected. This result supports the findings of the bounds test for model (1). Hence, the ECT(-1) shows that a deviation from current period equilibrium with the amount of 80% has

been eliminated in a following period. The long-run coefficients of LGDP and LGDP2 are found to be positive and negative respectively and statistically significant. Accordingly, there is an inverted U-shaped relationship between GDP and EF in the long-run. On the other hand, the threshold income of Turkey is calculated at approximately 28.000$. This value is rather above the sample range. In this context, Turkey has not reached the turning point income yet, although the findings reveal that the EKC hypothesis is valid empirically. Furthermore, it does not seem possible that Turkey could reach the estimated threshold income in the short-run when considering the macroeconomic outlook of Turkey. Besides, the sum of ΔLGDP coefficients has a positive sign whereas $\Delta LGDP^2$ has a negative sign, but these are insignificant. In summary, the EKC hypothesis is empirically valid but not economically.

Table 7: The Results of ARDL (1,0,2) Model

Long-run coefficients (dependent variable: EB)			
Variable	**Coefficient**	**t-statistic**	
LGDP	-7.4802[a]	-3.3080[0.001]	
$LGDP^2$	0.2979[b]	2.3283[0.024]	
Short-run coefficients (dependent variable: ΔEB)			
ΔLGDP	-0.5197	-0.0869[0.934]	
Δ$LGDP^2$	-0.1112	-0.33313[0.741]	
Δ$LGDP^2$(-1)	0.0488[a]	2.8752[0.006]	
Constant	26.585[a]	4.9729[0.000]	
ECT(-1)	-0.6299[a]	-4.9766[0.000]	
R^2	0.677	χ^2_{LM}	0.078[0.7799]
DW-statistic	1.962	χ^2_{WHITE}	9.736[0.1362]
F-statistic			15.741[0.0000]

a and b denote the statistical significance level at the 1% and 5%, respectively. Number in the brackets is the p value of related statistic. Δ and L refer the first difference and the logarithm form of the variable, respectively.

In Table 7, the results of the ARDL (1,0,2) model, in which EB is accepted as the dependent variable, are represented. The findings of the ARDL (1,0,2) model correspond to the ARDL (1,4,0) model. Firstly, the lag of error correction term [ECT(-1)] is statistically significant and negative as expected. This result supports the findings of the bounds test for the model (2). Besides, the ECT(-1) shows that a deviation from current period equilibrium with the amount of 63% has been eliminated in the following period. In the long-run, while LGDP has a negative coefficient, LGP^2 has a positive coefficient and both are statistically significant. Therefore, between GDP and EB there is a U-shaped relationship. In other words, there will be deterioration in ecological balance along with the income increase and there will be an improvement in the ecological

balance after a certain level as the income increases. This situation reveals that the EKC hypothesis is valid as empirical.

5. CONCLUSION

In the study where the EF and EB variables are used as the environmental indicator, whether the EKC hypothesis is valid for Turkey is analyzed for the 1961-2016 period. Findings indicate that the EKC hypothesis is affirmed for both EF and EB as empirical in the study in which the bounds testing approach is used. Besides, the threshold income calculated for EF is around 28.000$. This value is quite above the maximum income level for the period, which is the subject of the study. According to these, although empirical results are convenient, it can be said that the EKC hypothesis has not been validated yet, considering the current income level. In other saying, as income rises the environmental quality will decrease until the income reaches the turning point level. Thereby, the policies on the income increase will not be enough for the environmental improvement by itself. Furthermore, the environment is an input in the production process, deteriorating environmental quality can restrain the income increase as emphasized by Ozcan et al. (2018). Thus, policymakers need to consider other policies along with the economic growth at this point. As carbon footprint is the largest part of Turkey's EF, encouraging eco-friendly technologies that will decrease the carbon intensity of the economy more and using renewable energy sources more efficiently takes the first place among these precautions. Moreover, environmental regulations can cause environmental improvements in low income levels by decreasing the threshold income level, as Aşıcı and Acar (2018) emphasize. For this reason, economic and legal regulations that decrease environmental pressure will cause environmental quality to improve. For example, charging the use of plastic bags as in many European countries by the law that took into effect on December 10th, 2018 is a simple yet remarkable implementation on behalf of environmental regulations. Other significant contributions to ecological footprint come from cropland, forest products, and grazing lands. Moreover, the share of them in the biocapacity of Turkey is approximately 95%. In this context, bringing the precautions that will increase the efficiency in agriculture and forestry lands and enhance the unit output level can be quite important in terms of environmental improvement as well. The population is a crucial factor in degradation of the environment. Although it is not possible to decrease the population in the short-run, it is possible to develop the knowledge, skill and education level of population. Thus, the policies to improve human capital could lead to rises in environmental quality by easing off the pressure of the population on the environment, as Başoğlu (2018) reveals.

REFERENCES

Acar, S., & Aşıcı, A. A. (2017). Nature and economic growth in Turkey: What does ecological footprint imply? *Middle East Development Journal*, *9*(1), 101–115. https://doi.org/10.1080/17938120.2017.1288475

Al-Mulali, U., Weng-Wai, C., Sheau-Ting, L., & Mohammed, A. H. (2015). Investigating the environmental Kuznets curve (EKC) hypothesis by utilizing the ecological footprint as an indicator of environmental degradation. *Ecological Indicators*, *48*, 315–323. https://doi.org/10.1016/j.ecolind.2014.08.029

Alemdar, A. A. (2015). Analysis of the determinants of ecological footprint in Turkey. *Dissertation*, Kadir Has University

Apergis, N., & Payne, J. E. (2009). CO 2 emissions, energy usage, and output in Central America. *Energy Policy*, *37*(8), 3282–3286. https://doi.org/10.1016/j.enpol.2009.03.048

Aşici, A. A., & Acar, S. (2015). Does income growth relocate ecological footprint? *Ecological Indicators*, *61*, 707–714. https://doi.org/10.1016/j.ecolind.2015.10.022

Aşıcı, A. A., & Acar, S. (2018). How does environmental regulation affect production location of non-carbon ecological footprint? *Journal of Cleaner Production*, *178*, 927–936. https://doi.org/10.1016/j.jclepro.2018.01.030

Aydin, C., Esen, Ö., & Aydin, R. (2019). Is the ecological footprint related to the Kuznets curve a real process or rationalizing the ecological consequences of the affluence? Evidence from PSTR approach. *Ecological Indicators*, *98*, 543–555. https://doi.org/10.1016/j.ecolind.2018.11.034

Bagliani, M., Bravo, G., & Dalmazzone, S. (2008). A consumption-based approach to environmental Kuznets curves using the ecological footprint indicator. *Ecological Economics*, *65*(3), 650–661. https://doi.org/10.1016/j.ecolecon.2008.01.010

Başoğlu, A. (2018). STIRPAT modeli kapsamında Türkiye'de ekolojik ayak izinin belirleyicileri. In H.F. Erdem, & A. Başoğlu (Eds.), *İktisat Seçme Yazılar*, (pp. 207-218). Trabzon: Celepler Matbaacılık.

Beckerman, W. (1992). Economic development and the environment: conflict or complementarity? *World Development Report*, 1–50. http://eprints.ucl.ac.uk/17888/

Bello, M. O., Solarin, S. A., & Yen, Y. Y. (2018). The impact of electricity consumption on CO_2 emission, carbon footprint, water footprint and ecological footprint: The role of hydropower in an emerging economy. *Journal of Environmental Management*, *219*, 218–230. https://doi.org/10.1016/j.jenvman.2018.04.101

Brock, W. A., & Taylor, M. S. (2005). Economic growth and the environment: A review of theory and empirics. *Handbook of Economic Growth*, *1*(SUPPL. PART B), 1749–1821. https://doi.org/10.1016/S1574-0684(05)01028-2

Cropper, B. M., & Griffiths, C. (2016). The interaction of population growth and environmental quality. *The American Economic Review*, *84*(2), 205–254.

Daly, H.E. (1991). *Steady-State Economics*. Washington, DC: Island Press.

Destek, M. A., & Sarkodie, S. A. (2019). Investigation of environmental Kuznets curve for ecological footprint: The role of energy and financial development. *Science of the Total Environment*, *650*, 2483–2489. https://doi.org/10.1016/j.scitotenv.2018.10.017

Destek, M. A., Ulucak, R., & Dogan, E. (2018). Analyzing the environmental Kuznets curve for the EU countries: the role of ecological footprint. *Environmental Science and Pollution Research*, *25*(29), 29387–29396. https://doi.org/10.1007/s11356-018-2911-4

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, *74*(366), 427. https://doi.org/10.2307/2286348

Dinda, S. (2004). Environmental Kuznets curve hypothesis: A survey. *Ecological Economics*, *49*(4), 431–455. https://doi.org/10.1016/j.ecolecon.2004.02.011

Dogan, E., Taspinar, N., & Gokmenoglu, K. K. (2019). Determinants of ecological footprint in MINT countries. *Energy and Environment*, *30*(6), 1065–1086. https://doi.org/10.1177/0958305X19834279

Ekins, P. (1997). The Kuznets curve for the environment and economic growth. *Environment and Planning A*, *29*, 805–803.

Galli, A., Moore, D., Cranston, G., Wackernagel, M., Kalem, S., Devranoğlu, S., & Ayas, C. (2012). *Türkiye ' nin Ekolojik Ayak İzi Raporu*.

Global Footprint Network (2006) Ecological footprint and biocapacity. Technical notes: 2006 Edition.

https://www.footprintnetwork.org/content/documents/EF2006technotes2.pdf. Accessed 24 DEcember 2019

Global Footprint Network (2019) National footprint account 2019 edition. http://data.footprintnetwork.org/#/. Accessed 20 December 2019

Grossman, G. M., & Krueger, A. B. (1991). Environmental impacts of a North American free trade agreement. *National Bureau of Economic Research Working Paper Series, No. 3914*, 1–57. https://doi.org/10.3386/w3914

Grossman, G. M., & Krueger, A. B. (1995). Economic growth and the environment. *The quarterly journal of economics*, *110*(2):353–377. https://doi.org/10.2307/2118443

Hervieux, M. S., & Darné, O. (2016). Production and consumption-based approaches for the environmental Kuznets curve using ecological footprint. *Journal of Environmental Economics and Policy*, *5*(3), 318–334. https://doi.org/10.1080/21606544.2015.1090346

Jia, J., Deng, H., Duan, J., & Zhao, J. (2009). Analysis of the major drivers of the ecological footprint using the STIRPAT model and the PLS method-A case study in Henan Province, China. *Ecological Economics*, *68*(11), 2818–2824. https://doi.org/10.1016/j.ecolecon.2009.05.012

Kwiatkowski, D., Phillips, P. C. B., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root. How sure are we that economic time series have a unit root? *Journal of Econometrics*, *54*(1–3), 159–178. https://doi.org/10.1016/0304-4076(92)90104-Y

McConnell, K. E. (1997). Income and the demand for environmental quality. *Environment and Development Economics*, *2*(4), 383–399. https://doi.org/10.1017/S1355770X9700020X

Mrabet, Z., & Alsamara, M. (2017). Testing the Kuznets curve hypothesis for Qatar: A comparison between carbon dioxide and ecological footprint. *Renewable and Sustainable Energy Reviews*, *70*(November 2016), 1366–1375. https://doi.org/10.1016/j.rser.2016.12.039

Mrabet, Z., AlSamara, M., & Hezam Jarallah, S. (2017). The impact of economic development on environmental degradation in Qatar. *Environmental and Ecological Statistics*, *24*(1), 7–38. https://doi.org/10.1007/s10651-016-0359-6

Munasinghe, M. (1995). Making economic growth more sustainable. *Ecological Economics*, *15*(2), 121–124. https://doi.org/10.1016/0921-8009(95)00066-6

Ozcan, B., Apergis, N., & Shahbaz, M. (2018). A revisit of the environmental Kuznets curve hypothesis for Turkey: new evidence from bootstrap rolling window causality. *Environmental Science and Pollution Research*, *25*(32), 32381–32394. https://doi.org/10.1007/s11356-018-3165-x

Ozturk, I., Al-Mulali, U., & Saboori, B. (2016). Investigating the environmental Kuznets curve hypothesis: the role of tourism and ecological footprint. *Environmental Science and Pollution Research*, *23*(2), 1916–1928. https://doi.org/10.1007/s11356-015-5447-x

Panayotou, T. (1993). Empirical tests and policy analysis of environmental degradation at different stages of economic development. *ILO Working Papers, Working Paper 238*, 1–27, International Labour Organization.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326. https://doi.org/10.1002/jae.616

Phillips, P. and P. P. (1988). Testing for a unit root in time series regression. *Biometrika*, *75*(2), 335–346.

Roberts, J. T., & Grimes, P. E. (1997). Carbon intensity and economic development 1962–1991: A brief exploration of the environmental Kuznets curve. *World development*, *25*(2), 191-198. https://doi.org/10.1016/S0305-750X(96)00104-0

Rothman, D. S. (1998). Environmental Kuznets curves—real progress or passing the buck?: A case for consumption-based approaches. *Ecological economics*, *25*(2), 177-194. https://doi.org/10.1016/S0921-8009(97)00179-1

Sarkodie, S. A. (2018). The invisible hand and EKC hypothesis: What are the drivers of environmental degradation and pollution in Africa? *Environmental Science and Pollution Research*, *25*(22), 21993–22022. https://doi.org/10.1007/s11356-018-2347-x

Sebri, M. (2016). Testing the environmental Kuznets curve hypothesis for water footprint indicator: a cross-sectional study. *Journal of Environmental Planning and Management*, *59*(11), 1933–1956. https://doi.org/10.1080/09640568.2015.1100983

Selden, T. M., & Song, D. (1994). Environmental quality and development: Is there a kuznets curve for air pollution emissions? *Journal of Environmental Economics and Management*. https://doi.org/10.1006/jeem.1994.1031

Shafik, N., & Bandyopadhyay, S. (1992). Economic growth and environmental quality: time-series and cross-country evidence. *World Bank Working Papers Series, 904*, 1–50, Washington, DC: World Bank Publications.

Sim, N. C. S. (2006). Environmental Keynesian macroeconomics: Some further discussion. *Ecological Economics*, *59*(4), 401–405. https://doi.org/10.1016/j.ecolecon.2005.11.006

Tang, W., Zhong, X., & Liu, S. (2011). Analysis of major driving forces of ecological footprint based on the STRIPAT model and RR method: A case of Sichuan Province, Southwest China. *Journal of Mountain Science*, *8*(4), 611–618. https://doi.org/10.1007/s11629-011-1021-2

Teixidó-Figueras, J., & Duro, J. A. (2015). The building blocks of International ecological footprint inequality: A regression-based decomposition. *Ecological Economics*, *118*, 30–39. https://doi.org/10.1016/j.ecolecon.2015.07.014

Uddin, G. A., Alam, K., & Gow, J. (2016). Does ecological footprint impede economic growth? An empirical analysis based on the environmental Kuznets curve hypothesis. *Australian Economic Papers*, *55*(3), 301–316. https://doi.org/10.1111/1467-8454.12061

Ulucak, R., & Bilgili, F. (2018). A reinvestigation of EKC model by ecological footprint measurement for high, middle and low income countries. *Journal of Cleaner Production*, *188*, 144–157. https://doi.org/10.1016/j.jclepro.2018.03.191

Wackernagel, M., Zokai, G., Katsunori, I., Kelly, R., & Ortego, J. (2015). The Footprint and Biocapacity Accounting: Methodology Background for State of the States 2015. https://www.footprintnetwork.org/content/images/article_uploads/USATechnicalReport_Final.pdf. Accessed 24 December 2019

Wang, Yuan, Zhang, C., Lu, A., Li, L., He, Y., ToJo, J., & Zhu, X. (2017). A disaggregated analysis of the environmental Kuznets curve for industrial CO 2 emissions in China. *Applied Energy*, *190*, 172–180. https://doi.org/10.1016/j.apenergy.2016.12.109

Yilanci, V., & Ozgur, O. (2019). Testing the environmental Kuznets curve for G7 countries: evidence from a bootstrap panel causality test in rolling windows. *Environmental Science and Pollution Research*, (1995). https://doi.org/10.1007/s11356-019-05745-3

York, R., Rosa, E. A., & Dietz, T. (2003). STIRPAT, IPAT and ImPACT: Analytic tools for unpacking the driving forces of environmental

impacts. *Ecological Economics*, *46*(3), 351–365. https://doi.org/10.1016/S0921-8009(03)00188-5

Zhang, C., & Zhao, W. (2014). Panel estimation for income inequality and CO_2 emissions: A regional analysis in China. *Applied Energy*, *136*, 382–392. https://doi.org/10.1016/j.apenergy.2014.09.048

CHAPTER II

THE RELATION DEFENSE EXPENDITURES, UNEMPLOYMENT AND INFLATION: THE CASE OF G-8 COUNTRIES

Ekrem Gül[1] & Mustafa Torusdağ[2]

[1](Prof. Dr.), Sakarya University, e-mail: egul@sakarya.edu.tr
0000-0002-2607-9066

[2](Asst. Prof. Dr.), Van Yüzüncü Yıl University, e-mail: mustafatorusdag@yyu.edu.tr
0000-0002-8839-0562

1. INTRODUCTION

Although the many stuedies examining the relationship between defense expenditures and growth are available in the literature, there is no consensus on the relationship between defense expenditures and growth. However, the number of studies examining the relationship between inflation and unemployment variables, which are closely related to growth, is not available. Defense spending affects growth, and growth affects defense spending, they are closely related variables. Because the unemployment variable is also an indicator related to growth, it can be stated that defense spending also affects unemployment. Different opinions, including conservative view, liberal view and radical view on the effects of defense spending on unemployment, are included in the literature. It is claimed that defense spending is not productive and defense spending does not affect supply and leads to an increase in demand. Increase in defense expenditures will cause an increase in labor and capital demand by the companies that supply the supply of defense services. Because qualified labor supply will not increase in the short term, an increase in defense expenditures will increase wages and prices. In this case, as defense expenditures increase costs, it will lead to cost inflation. On the demand side, defense spending causes nominal demand growth, causing inflation if it is not supported by a tax increase or tightening monetary policy (Karakurt et al., 2018: 156, 157).

The aim of this study is to examine the existence of the relationship between defense spending, unemployment and inflation for G-8 countries in the period of 1990-2018 and its relationship with inflation. After mentioning the studies in the literature, in connection with the literature, defense expenditures in G8 countries, unemployment and inflation

relationship, Pesaran (2008) horizontal section dependency test, Pesaran CADF (2007) panel unit root test, Gengenbach, Urbain and Westerlund (2016) panel cointegration test and Emirmahmutoğlu and Köse (2011) were examined by panel causality test. Policy recommendations were made in accordance with the findings of the analyzes.

G-8 countries are consist of the most developed world economies. As a result of a detailed literature review, there was no study investigating the relationship between three variables (defense spending, inflation and unemployment), as well as analysis findings testing the validity of the Philips curve in G-8 countries, beside the as a result of analysis conclusion whether defense spending has an inflationary effect in the G-8 countries and what direction defence spending affects unemployment. Thus the importance of the study and its contribution to the literature are expressed.

In addition to the lack of consensus on defense spending and unemployment thus there are various opinions. The conservative view argues that defense expenditures increase labor demand and have an unemployment-reducing effect, by directly or indirectly generating expansionary effects on the economy. The liberal view states that the increase in defense spending will cause inefficient use of resources in the economy and so excluding the private sector, resulting in increased taxes and unemployment will increase (Yıldırım and Sezgin, 2003: 130; Üçler, 2017: 161). According to this view, high defense spending defines it as 'extravagance'. According to the radical view, increasing defense spending will increase the total demand by increasing the growth rate and cause decrease unemployment (Topal, 2018: 141, 142).

Defense spending affects employment through various dimensions. Defense spending has different effects on the labor force, namely, "efficiency enhancing effect", "tax-distorting effect" and "redistribution effect". Efficiency of defense expenditures cause, production or import of defensive tools and equipment and expenditures made for R&D an expansion in the defense sector and increase labor demand by increasing the efficiency of the labor factor. The tax-distorting effect of defense expenditures, on the other hand, affects labor supply and demand for both labor force and employer by increasing the tax expenditures (Navarro and Cabello, 2015; 2). As for the redistribution effect, sectoral contractions in the defense industry cause frictional unemployment. It is also possible to comment on the increasing defense expenditure in terms of providing idle labor power employment and a positive relationship between the two variables (Aydemir et al., 2016: 438). Therefore, there is no clear explanation about how unemployment will lead to defense spending (Tang et al., 2009: 253-254).

As stated in the demand-side view, an external increase in defense spending will increase demand and increased demand will lead to a decrease in unemployment and growth (Yıldız, Akbulut and Yıldız: 2017: 54). Defense spending and unemployment relationship is that the majority of countries' defense spending will differ depending on whether they are employed for the production of personnel and weapons employed in the field of defense. While the defense expenditures of arms exporting countries that produce capital intensive production in the field of defense increase unemployment; labor-intensive arms importers countries are is also expected to reduce unemployment (Malizard, 2014: 641; Destek and Okumuş, 2016: 392).

Inflation rate and unemployment are key indicators of an economy (Alisa, 2015: 89). Therefore, each government closely follows these two variables as the main performance indicator. In all economies, they try to keep both variables at a single digit rate because these variables are also important for ensuring the stability of macroeconomic policies and achieving the target of economic policies (Orji, Orji-Anthony and Okafor, 2015; Jelilov et al., 2016: 222).

Monetary policy makers can temporarily reduce unemployment by increasing short-term aggregate demand. They can temporarily increase unemployment by reducing total short-term demand (Mankiw et al., 2013). The fact that the relationship between inflation and unemployment, which is one of the leading economic problems improved and implemented policies by developed, developing and underdeveloped countries, is not possible to overcome both problems simultaneously. The relationship between inflation and unemployment is examined by the 'Philips Curve' theory. While high inflation causes low unemployment, low inflation causes unemployment rates to increase (Gül et al., 2014: 1).

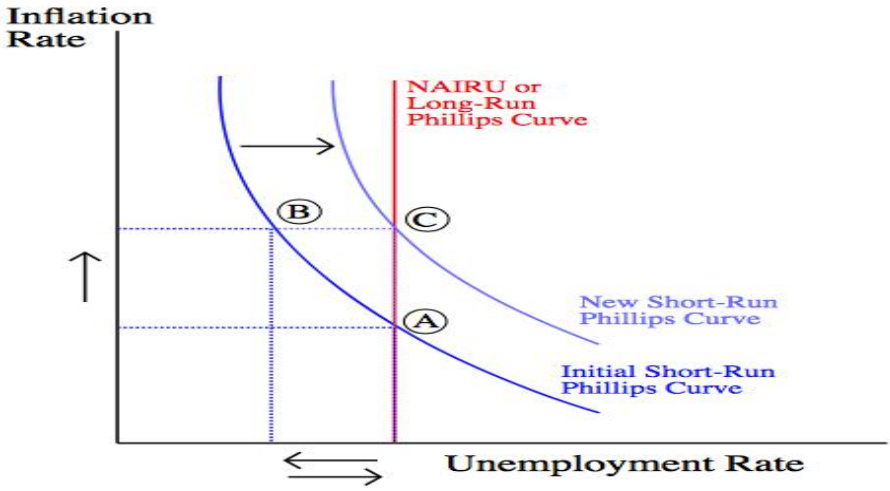


Figure 1. Short and Long Term Philips Curve

Source: (Dritsaki and Dritsaki, 2012:119)

In Figure 1, the model in which the notion of Philips curves and NAIRU concepts are harmonized with the Philips curve in the short and long term are expressed. NAIRU has been defined by Tobin (1997) as a natural unemployment that is compatible with and does not increase inflation. According to the new Keynesian view, they consider the inverse oriented relationship between inflation and unemployment suitable in the short term, but argue that this is not the case in the long term. (Özkök and Polat, 2017: 7). Based on the concept of inflation, which is defined as a continuous increase in prices at the general level, price stability is targeted for all countries. Inflation, which has a determining effect on consumption, investment and savings decisions, is also defined as the financial income reaching a higher level than the real output (Topçu, 2010: 24, 25).

There is a negative relationship between inflation and unemployment. Measures that cause total demand to decrease for unemployment or increase in employment cause inflation to increase and measures to decrease the increasing inflation cause unemployment to increase. The Philips curve is valid for the short term, but not for the long term. As Edmund Phelps stated, even if the inflation rate is zero, the natural (frictional+structural unemployment) unemployment rate will be acceptable in the economy (Güçlüoğlu, 2017: 39, 40).

2. LITERATURE REVIEW

In the literature review section, the relationship between inflation and unemployment has been examined and the validity of the Philips curve has been tested and the relationship between defense expenditure and unemployment and defense expenditure and inflation has also been discussed. In addition to the economy of the country examined in the empirical studies, the period studied, the econometric policies followed by the countries, besides the econometric tests used, are determinant and leads to different conclusions.

The relationship between inflation and unemployment has been examined in the literature by the British economist Philips (1958) with a graph of the Philips curve. Tajra (1999) Brazil, Eller and Gordan (2002) USA, Pallis (2006) new EU countries, Kitov (2008) Austria and Brazil, Chicheke (2009) South Africa, Altay et al. (2011), G-8 countries, in their study a negative correlation was found between inflation and unemployment variables. In the study of Newala (2003) examined to USA, the reverse relationship between inflation and unemployment is invalid in the short term, Kuştepeli (2005)'s study that examined Turkey was concluded to be invalid Philips curve for Turkey.

Not many studies are available in the literature that examine the relationship between defense spending and unemployment. Hooker and Kenetter (1997), Barker et al. (1991), it was concluded that defense expenditures caused unemployment and increased economic outcomes in the studies examined to England. Chester (1978) examined 9 countries, Dunne and Smith (1990) 11 OECD countries, Dunne and Watson (2005) 9 OECD countries, Paul (1996) 18 OECD countries, Payne and Ross (1992) they are concluded that the neutrality hypothesis is valid between the defense expenditure and unemployment variables. Yıldırım and Sezgin (2003)'s study in examine to Turkey and they concluded that military spending negatively affected the employment rate.

There are not many studies in the literature examining the relationship between defense expenditures and inflation. Starr et al. (1984), in his studies involved with USA, England, France and Germany, bilateral causality relationship was found for two variables for France and Germany. In Looney (1989) 's study, it is stated that defense spending will cause demand inflation due to cost inflation and increasing demand increase. Aiyedogbon et al. (2012) Nigeria, Kinsella (1990) USA, Payne and Ross (1992) USA, in their studies there was no causal relationship between defense spending and inflation was examined countires. Hung-Pin (2016) China, Japan and S. Korea and Taiwan, it was concluded that defense spending caused high inflation in Taiwan. The studies Günar (2004), Özsoy and Ipek (2010) is examined for Turkey, has reached the conclusion

that defense spending not having an inflationary effect. Karakurt et al. (2017), in his studies examine for Turkey has concluded that defense spending is inflationary.

3. DATA SET AND METHODOLOGY

In the study, the causality relationship between defense expenditures, inflation and unemployment, using annual data for the period of 1990-2018, was analyzed by using Emirmahmutoğlu-Köse (2011) panel causality analysis methods. In the analysis used variables are taken from the World Bank Database. Econometric analysis applied using Gauss 10 and Stata 12 econometrics programs.

3.1. ECONOMETRIC METHODS AND FINDINGS

In this study, G8 countries are analyzed with panel data analysis in terms of defense spending, inflation and unemployment relationship. In this framework, the econometric analysis of the variables was accomplished by Pesaran (2008) CSD (Cross Section Dependency) test, Pesaran CADF (2007) unit root test, Gengenbach, Urbain and Westerlund (2016) cointegration and Emirmahmutoğlu and Köse (2011) panel causality tests.

Pesaran (2007) CADF test is the horizontal cross-section averages of the first differences and delay levels of the series and the extended form of ADF regression. With the CADF statistics, individual results for each horizontal section can be obtained, as well as the CIPS (Cross sectionally IPS) statistics, which are expanded by taking the section averages, and the results for the overall panel can be obtained from the test.

The CADF test can be used when T (time) > N (horizontal section) and hem N> T (Pesaran, 2007: 266, 267). Assuming that Yit's time at t is an observable value in the horizontal section unit of i at time t, Y_{it} is as in equation (1) in the simple dynamic linear heterogeneous panel data model (Koçbulut and Altıntaş, 2016: 154-156):

$$y_{it} = (1 - \emptyset_i)\mu_i + \emptyset_i\, y_{i,t-1} + \mu_{it}\ (i = 1, \dots, N; t = 1, \dots, T) \qquad (1)$$

Here, the initial value $y_i 0$ has a finite mean and variance with the frequency function. The term error "u_{it}" has a single-factor structure.

$$u_{it} = \gamma_i f_t + \varepsilon_{it} \qquad (2)$$

In equation (2), f_t is the unobservable common effects of each country, and ε_{it} is the individual-specific error term. Equality (3) is obtained in equations (1) and (2) (Pesaran, 2007: 268):

$$\Delta y_{it} = \alpha_i + \beta_i y i_{t-1} + y_i f_t + \varepsilon_{it} \qquad (3)$$

Here, $\alpha_i = (1 - \emptyset_i)\mu_i, \beta_i = -(1 - \emptyset_i)\ ve\ \Delta y_{it} = y_{it} - y_i, t - 1.$ Accordingly, the hypotheses of the CADF test with $\emptyset_i = 1$ are created as follows:

H_0: $\beta_i = 0$ (for all i's) *series is not stationary.*

H_A: $\beta_i < 0$ $(i = 1, 2, \dots, N1, \beta_i = 0$

$= N1 + 1, N1 + 2, \dots, N)$ series is stationary.

When $N \to \infty$ and δ converge to a constant value greater than 0, less than 1, or equal to 1 $0 \leq \delta \leq 1$ and a fixed value is different, some stagnation arises in some of the individual results with the assumption $N1/N$.. Im et al. (2003), as stated in the study, this condition is necessary for the consistency of panel unit root tests. Accordingly, the CADF regression can be written as in equation (4).

$$\Delta y_{it} = \alpha_i + b_i y_{i,t-1} + c_i \bar{y}_{t-1} + d_i \Delta \bar{y}_t + e_{it} \quad (4)$$

The critical values of the individual CADF test (Δy_{it}) were calculated separately for three different situations, namely constant ($yi, t1$) constant ($\bar{y}t - 1$) and constant-trend ($\Delta \bar{y}_t$), by applying 50,000 replications based on the OLS regression. In the analysis, the table critical values are determined by the size of T and N (for any value in the range of 10 to 200) 1%, 5% and 10% significance (Pesaran, 2007: 269).

In the CADF test developed by Pesaran (2007), CIPS, which is the unit root test statistics for the overall panel, can be calculated by taking the average of the unit root test statistics for each country, ie each horizontal section. CIPS statistics are formulated as follows (Koçbulut and Altıntaş, 2016: 155, 156):

$$CIPS\ (N,T) = N^{-1} \sum N_i = 1\ ti(N,T) \quad (5)$$

In the equation (5), $ti\ (N,T)$ becomes CADF statistics for the horizontal section unit i. Therefore, we can write the equation (5) as in the equation (6) (Pesaran, 2007: 276).

$$CIPS\ (N,T) = N - 1 \sum N_i = 1\ \ CADF_i \quad (6)$$

CADF unit root statistics for each panel forming country and CIPS statistics values for the overall panel are shown in Tables 1, 2, 3, with constant and constant trend.

Table:1 Cross Section Dependency (CSD) Test

Variables	unemp		milex		enf	
	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.
LM	111.042**	0.000	-241.294**	0.000	91.142**	0.000
CDLM	11.097**	0.000	-28.503**	0.000	8.438**	0.000
CD	-3.570**	0.000	-1.534**	0.045	2.034**	0.021
LMadj	11.216**	0.000	26.362**	0.000	10.907**	0.000

Note: ***, **, * indicate 10%, 5% and 1% significance levels, respectively. Unemp: unemployment, Milex: Defense spending, Inf: Inflation.

Table 1 indicates the horizontal cross section dependency test results for the inflation and defense expenditure variables. CDLm1 (Breausch, Pagan 1980), CDLm2 (Pesaran, 2004 CDlm) and Bias-adjusted CD tests are important in the interpretation of horizontal cross section dependency when T>N. According to CDLm1 (Breausch, Pagan 1980), CDLm2 (Pesaran, 2004 CDlm) tests, 'no horizontal cross-section dependence', the H_0 hypothesis was rejected, so there is a horizontal cross-section dependence on unemployment, defense expenditures and inflation variables.

Table 2. Cross Section Dependency (CSD) Test for Models

Variables	1- unemp=f(milex,enf)		2- milex=f(unemp,enf)		3- enf=f(unemp,milex)	
	stat.	prob.	stat.	prob.	stat.	prob.
lm	65.417**	0.000	90.588**	0.000	33.293**	0.000
cdlm	5.000**	0.000	8.364**	0.000	0.707**	0.000
cd	3.213**	0.001	0.450**	0.326	1.431**	0.00
Lmadj	10.120**	0.000	6.863**	0.000	0.601**	0.000

Note: Unemp: unemployment, Milex: Defense spending, Inf: Inflation. ***, **, *% respectively 10, 5% and 1% indicate significance levels.

As stated in Table 2, the results of tests expressing cross section dependence are seen in all three models, where unemployment, defense expenditures and inflation are taken as dependent variables, respectively. According to LM (Breausch, Pagan 1980), CDLm (Pesaran, 2004 CDlm) and CD (Pesaran, 2004 CD) horizontal section tests, 'no horizontal cross section dependence' H_0 hypothesis was rejected at the level of 10% significance. Cross section dependence is available in all three models.

Table 3. CADF Panel Unit Root Test

	Unemp		Milex		Enf	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
England	-1.794	-2.234	0.105	-1.186	-2.570	-6.311***
Russia	-3.245**	-2.473	-1.065	-1.198	-2.731	-6.466***
USA	-2.802	-2.728	-1.816	-4.134***	-3.874**	-6.091***
Canada	-2.114	-2.760	-1.429	-3.499**	-2.540	-3.616**
France	-1.111	-2.651	-0.160	-2.224	-1.802	-3.580**
Germany	-1.820	-2.945	-1.379	-2.139	1.802	-1.887
Italy	-1.633	-2.216	-1.947	-3.242*	-1.629	-3.382**
Japan	-1.740	-2.512	-2.192	-1.151	-1.323	-3.184**
CIPS-stat: Panel Statistic	-2.032	-2.564**	-1.235	-2.347**	-1.833	-4.314***

Note 1: CADF statistic critical values, -4.11 (1%), -3.36 (5%) and -2.97 (10%) in fixed model (Pesaran 2007), Panel statistic critical values, -2.57 (1%) in fixed model, - 2.33 (5%) and -2.21 (10%) (Pesaran 2007, table Panel statistic is the average of CADF statistics. Unemp: unemployment, Milex: Defense spending, Inf: Inflation. Note 2: ***, **, *% respectively 10, 5% and 1% indicate significance levels.

The results of the CADF unit root test in Table 3, it is seen that the unemployment variable is stationary in I (1), and Russia (5%) is stationary in I (0). The defense expenditure variable is stationary in panel-wide I(1), and for countries, it is stationary at the level of USA (10%), Canada (5%), Italy (1%). The inflation variable is stable at I (1) level in all countries except Germany. In general, inflation variable is stationary in I (1), while England, Russia, USA are still stationary at 10% significance level; In Canada, France, Italy and Japan, it is stationary at the level of (5) significance. When the results of CIPS, which performs stability analysis in Table 3, are analyzed for panel-wide G-8 countries, the natural unemployment rate hypothesis is that the unemployment rate series is not stationary at the level and the unemployment hysteresis hypothesis is valid in Russia [because it is stationary at I (0)] it is concluded that it is valid (Yalçınkaya and Kaya, 2017: 8, 9).

Series that don't become stationary in level value are also probably to be estimated by panel cointegration tests. These tests are based on residue or error correction model. However, these tests are in two different groups, the first generation tests that neglect the correlation of the units among themselves and the second generation tests that consider the inter-unit correlation. Gengenbach et al., (2016) test one of the second

generation panel cointegration tests. The cointegration relationship between the variables is estimated. An important feature of the test is that in case of heterogeneity, it is possible to apply it to units with unbalanced panel and to unequal delay lengths (Tatoğlu, 2017: 207; Baltacı et al., 2018: 734, 735). After determining the cointegration relationship, the long-term coefficients of the variables should also be determined.

Gengenbach et al. (2006) cointegration test model is established as stated in equations 7, 8, 9 and 10 (Alev and Erdemli, 2019: 75, 76):

$$\Delta y_{i,t} = \delta'_{y,xi} d_t + \alpha_{yi} y_{i,t-1} + \gamma'_{\omega i,t-1} + \beta_{y,yi}(L)\Delta y_{i,t-1} + A_{y,x,xi}(L)\Delta x_{i,t} + \Delta_{y,F,xi}(L)\Delta F_t + \eta'_{y,xi} f_{it} + \varepsilon_{y,xi,t} \quad (7)$$

Firstly, the test statistical values for each unit in the test are calculated with the model in which it is expressed in equation 2.

$$\Delta y_i = d\delta_{y,xi} + \alpha_{yi}\gamma_{i,-1} + \omega_{i,-1}\gamma_i + \nu_i\pi_i + \varepsilon_{y,xi} = \alpha_{yi}\gamma_{i,-1} + g_i^d\lambda_i + \varepsilon_{y,xi} \quad (8)$$

As seen in equation 3 in the first stage of the test, OLS estimation of the model for each unit is made with the hypothesis test $H_0 = \hat{\alpha}_{yi} = 0$:

$$\widehat{\sigma_{yı}} = \frac{y'_{i,-1} Mgi^{d\Delta yi}}{y'_{i,-1} Mgi^{d\Delta yi,-1}} \quad (9)$$

and

$$\hat{\sigma}^2_{\sigma_{yi}} = \frac{\hat{\sigma}^2_{y,xi}}{y'_{i,-1} Mg_i^{d\Delta yi,-1}}$$

hereby,

$$T_{\alpha_{yi}}(F,0) = \frac{\hat{\alpha}_{yi}}{\hat{\sigma}_{\alpha\bar{y}ı}} \quad (10)$$

$H_0 = \propto_{y1}, \ldots, \propto_{YN} = 0$: there is no cointegration relationship,

H_A : en az bir i için $\propto_{yi} < 0$: there is a cointegration relationship.

Zero hypothesis and alternative hypothesis are established for panel statistical values calculated as expressed in equation 10. According to the H_0 hypothesis, it can be interpreted that there is no cointegration relationship, while according to the H_1 hypothesis, it is accepted that there is a cointegration relationship. It can be expressed in the form.

Table 4. Gengenbach, Urbain ve Westerlund (2016) Cointegration Test Results

Models	d.y	Coef	T-bar	P-val*
Model1: Unemp =f(milex,enf)	y(t-1)	-0.280	-1.728	>0.1
Model2: Milex =f(unemp,enf)	y(t-1)	-0.165	-1.004	>0.1
Model3: Enf =f(unemp,milex)	y(t-1)	-0.669	-3.287	<=0.05**

Note: ***, **, * indicate 10%, 5% and 1% significance levels, respectively. Unemp: unemployment, Milex: Defense spending, Inf: Inflation.

The results obtained from Table 4 indicate that the H_0 hypothesis cannot be rejected at 5% significance level and there is a long-term cointegration relationship from unemployment to inflation and defense spending to inflation in model 3, where inflation is taken as a dependent variable.

Tablo 5. Long Term Coefficient

Models	Variables	Coef.	Std. Err.	z	P>z
Model 1: Unemp = f(milex,enf)	milex	3.821	3.829	1.00	0.318
	enfl	-0.4868	0.294	-1.66	0.098*
Model 2: Milex = f(unemp,enf)	unemp	-0.156	0.172	-0.91	0.365
	Enf	0.048	0.087	0.56	0.578
Model3: Enf = f(unemp,milex)	milex	4.410	2.220	1.99	0.047*
	unemp	0.709	0.215	-3.29	0.001***

Note: ***, **, * indicate 10%, 5% and 1% significance levels, respectively. Unemp: unemployment, Milex: Defense spending, Inf: Inflation.

In Model 3, in which inflation data is taken as dependent variable in Table 5, the third model is statistically significant (p: 0.047≤0.01), and a positive and significant relationship was found between defense spending and inflation in the long run.

One unit increase in defense expenditures increases inflation by 4,410 units. In addition, (p: 0.001≤0.1), there is a positive and significant relationship between unemployment and inflation variables in the long term. While one unit increase in unemployment inflation increased by 0.709 units, one increase in defense expenditures caused 4.410 increase in

inflation. According to this model, there is a positive relationship between inflation and unemployment.

Table 6: Emirmahmutoğlu ve Köse (2011) Panel Causality Direction Result

Causality Direction		Panel Fisher	P-val	Causality
Defense Expenditures	→ Unemployment	29.147	0.023**	Yes
Unemployment	→ Defense Expenditures	26.032	0.054*	Yes
Inflation	→ Defense Expenditures	12.710	0.694	No
Defense Expenditures	→ Inflation	39.537	0.001***	Yes
Inflation	→ Unemployment	39.461	0.001***	Yes
Unemployment	→ Inflation	27.062	0.041**	Yes

Note: ***, **, * indicate 10%, 5% and 1% significance levels, respectively. Unemp: unemployment, Milex: Defense spending, Inf: Inflation.

Table 6 presents the results of Emirmahmutoğlu and Köse (2011) panel causality analysis. A bidirectional relationship was found between defense spending and unemployment, and between inflation and unemployment. In addition, there is a one-way causality relationship defense expenditures to inflation.

Table 7. Emirmahmutoğlu – Köse (2012) Panel Causality Test Results

	Milex to Unemp			Unemp to Milex		
i	Lag	Wald	p-val	Lag	Wald	p-val
England	2.000	2.486	0.288	2.000	4.978	0.083
Russia	2.000	4.941	0.085*	2.000	0.572	0.751
USA	2.000	7.370	0.025**	2.000	2.114	0.347
Canada	2.000	1.549	0.461	2.000	9.664	0.008 ***
France	2.000	0.094	0.954	2.000	5.587	0.061 *
Germany	1.000	0.844	0.358	1.000	0.002	0.965
Italy	2.000	9.725	0.008 ***	2.000	0.192	0.908
Japan	2.000	0.928	0.629	2.000	2.854	0.240
Panel Fisher : 29.147				Panel Fisher : 26.032		
p-value : 0.023**				p-value : 0.054*		

Note: ***, **, * indicate 10%, 5% and 1% significance levels, respectively. Unemp: unemployment, Milex: Defense spending, Inf: Inflation.

In Table 7, when the causality relationship from defense spending to unemployment is analyzed for countries, when the panel is appreciated ($p = 0.023 < 0.05$), it is statistically significant. For Italy (10%), Russia (1%) and the USA (5%), it is seen that there is a causal relationship between defense spending and unemployment. The causality relationship from unemployment to defense spending is meaningful across the panel ($p = 0.054 < 0.01$). For Canada (10%) and France (1%) there is a causal relationship to growth from defense spending.

Table 8. Emirmahmutoğlu-Köse (2012) Panel Causality Test Results

	Enf to Milex			**Milex to Enf**		
i	Lag	Wald	p-val	Lag	Wald	p-val
England	3.000	0.116	0.990	3.000	3.979	0.264
Russia	3.000	2.212	0.530	3.000	5.739	0.125
USA	2.000	0.814	0.666	2.000	1.011	0.603
Canada	2.000	0.045	0.978	2.000	0.035	0.983
France	3.000	3.193	0.363	3.000	1.903	0.593
Germany	3.000	2.608	0.456	3.000	5.799	0.122
Italy	3.000	7.585	0.055*	3.000	23.103	0.000 ***
Japan	3.000	2.083	0.555	3.000	7.908	0.048**
Panel Fisher : 12.710				Panel Fisher : 39.537		
p-value : 0.694				p-value : 0.001***		

Note: ***, **, * indicate 10%, 5% and 1% significance levels, respectively. Unemp: unemployment, Milex: Defense spending, Inf: Inflation.

In Table 8, when the causality relationship from inflation to defense spending is analyzed by countries, when the panel is appreciated in general ($p = 0.694 > 0.1$), statistically insignificant. For Italy (1%), it is seen that there is a causal relationship inflation to defense expenditures. The causality relationship defense expenditures to inflation is meaningful overall the panel ($p = 0.001 < 0.05$). For Italy (10%) and Japan (5%), there is a unidirectional causal relationship defense spending to growth.

Table 9. Emirmahmutoğlu-Köse (2012) Panel Causality Test Results

	Enf to Unemp			Unemp to Enf		
i	Lag	Wald	p-val	Lag	Wald	p-val
England	3.000	2.651	0.449	3.000	2.976	0.395
Russia	3.000	1.790	0.617	3.000	5.959	0.114
USA	2.000	3.905	0.142	2.000	3.711	0.156
Canada	2.000	0.255	0.880	2.000	0.417	0.812
France	2.000	1.412	0.494	2.000	11.117	0.004***
Germany	1.000	2.909	0.088	1.000	0.040	0.841
Italy	2.000	0.468	0.791	2.000	3.727	0.155
Japan	2.000	25.994	0.000 ***	2.000	1.539	0.463
Panel Fisher : 39.461				Panel Fisher : 27.062		
p-value : 0.001***				p-value : 0.041**		

Note: ***, **, * indicate 10%, 5% and 1% significance levels, respectively. Unemp: unemployment, Milex: Defense spending, Inf: Inflation.

In Table 9, when the causality relationship from inflation to unemployment is analyzed by countries, when the panel is appreciated ($p = 0.001 < 0.1$), it is statistically significant. For Japan (10%), there is a one-way causality relationship from inflation to unemployment. The relationship between unemployment and inflation causality ($p = 0.041 < 0.5$) is significant. For Italy (10%) and Japan (5%), there is a one-way causality relationship from unemployment to inflation.

RESULT

In the study, G8 (Canada, France, Germany, Italy, Japan, Russia, England, USA) countries, which are the eight industrialized countries of the world, were examined in the relationship between defense spending, unemployment and inflation for the period of 1990-2018. Inflation and unemployment problems are defined as an important problem in economically developed countries and developing countries.

When countries maintain development goals, also they follow policies aimed for ensuring price stability and increasing employment. Because inflation, by definition, is increasing the general level of prices, it is important in terms of increasing production costs and having a determining role in investment decisions is taken. If unemployment and inflation occur simultaneously, is faced with stagflation problem.

In the study, the series and three different models in which each variable was taken as dependent variable were established to investigate

the cross-sectional dependence and then Gengenbach et al. (2006) panel cointegration relationship and long-term coefficients were examined. In model 3, inflation is taken as dependent variable, it is seen that there is a long-term cointegration relationship from unemployment to inflation and defense expenditures to inflation. According to the long-term coefficients, according to the other model in which the inflation variable is taken as dependent variable, it is seen that an one unit increase in defense expenditures has increased inflation by 4.410 unit and an increase one unit in unemployment has led to an increase of 0.709 unit.

The conclusion that can be inference from the analysis findings is that defense spending in G8 countries has an inflationary effect. Contrary to the Philips curve, where the unemployment and inflation relationship is inversely proportional, there is a positive relationship between the inflation and unemployment variables in the G8 countries.

Emrimahmutoğlu and Köse (2011) panel causality test results, there is a bidirectional causality relationship between defense expenditure-unemployment and inflation-unemployment variables, and there is a one-way causality relationship defense expenditures to inflation. Causality relationship is analyzed by countries, defense spending causes unemployment in Russia, USA and Italy. In Canada and France unemployment causes defense spending. For Italy and Japan, defense spending is inflationary and inflation causes defense spending. In France, unemployment causes inflation.

As a policy proposal, governments seek solutions by applying contractionary policies implemented for increasing inflation and governments should follow expansionary policies to reduce unemployment. Within the framework of this dilemma, the importance of unemployment and inflation is explained for the economies of the country. By increasing the defense expenditures, which is one of the public expenditure items, an increase in production can be achieved by increasing the demand and economic growth can be increased and high inflation can be reduced. Or, in order to reduce high inflation, the ratio of public expenditures to defense expenditures can be reduced to inflation by decreasing aggregate demand.

REFERENCES

Aiyedogbon, J.O., Ohwofasa, B.O. and Ibeh, S.E. (2012). Does Military Expenditure Spur Inflation? Autoregressive Distributed Lag (ARDL) & Causality Analysis for Nigeria. European Journal of Business and Management, 4 (20), 147-151.

Alisa, M., 2015. The Relationship between Inflation and Unemployment: A Theoretical Discussion about the Phillips Curve. Journal of Business and Economics, Vol: 3, No.2, 89-97.

Alev, N. ve M., Erdemli (2019). Elektrik Enerjisi Tüketimi ve Ekonomik Büyüme İlişkisi: Avrupa Birliği Ülkeleri ve Türkiye için Bir Analiz. ASSAM-UHAD (ASSAM Uluslararası Hakemli Dergi), 6, 15: 88-111.

Altay B., Can Tansel Tuğcu and Mert Topcu (2011). Causality Relationship Between Unemployment and Inflation Rates: The Case of G8 Countries. Afyon Kocatepe University Journal of FEAS, 13 (2), pp. 1-27.

Aydemir, A. F., Özdemir, D., Kabadayı, B. & Emsen, Ö. S. (2016). Relationships between Unemployment and Military Expenditures in G-20 Countries. 7th International Conference of Eurasian Economies, 29-31 August, Kaposvar-Hungary, pp. 437-444.

Baltacı N., A. V. Çam and H. Akyol (2018). The Relationship Between Tourism, Economic Globalization and External Borrowing: Heterogeneous Panel Analysis Method. IWACT 2018 International West Asia Congress of Tourism Research, 29 September-1 October 2018.

Barker, T., Dunne, P. and Smith, R. (1991). Measuring the peace dividend in the United Kingdom. Journal of Peace Research, vol. 28, no. 4.

Breusch, T. S. and Pagan, A. R. (1980). The lagrange multiplier test and its applications to model specification in econometrics. The Review of Economic Studies, 47 (1), 239-253.

Chester, E. (1978). Military Spending and Capitalist Stability. Cambridge Journal of Economics, (3): 293– 298.

Chicheke, Aaron (2009). Monetary Policy, Inflation, Unemployment and the Phillips Curve in South Africa. Doctoral dissertation, University of Fort Hare.

Destek, M. A., İ. Okumuş (2016). The Effects of Unemployment on Defense Spending in Turkey: Asymmetric Causality Analysis. 17 International Econometrics, Statistics and Operations Research Symposium (EI 17).

Dritsaki, C., & Dritsaki, M. (2012). Inflation, unemployment and the NAIRU in Greece. International Conference on Applied Economics (ICOAE), pp. 118–127.

Dunne, Paul and Duncan Watson (2000). Military Expenditure and Employment in South Africa. Defense and Peace Economics, 11 (4): 587-596.

Eller, Jon and Robert Gordon (2002). Inflation and Unemployment in the New Economy: Is the Trade – off Dead or Alive?. Trade Union Institute for Economic Research, pp. 1-87.

Emirmahmutoğlu, F. and Köse, N. (2011). Testing for granger causality in heterogeneous mixed panels. Economic Modeling, 28, 870-876.

Güçlüoğlu, Ü. M., "Some of Macroeconomic Analysis and employment Employment Effects of Variables in Turkey", The Ministry of Labor and Social Security, General Directorate of Turkey Business Council ", Thesis, 2017 Ankara.

Gül, Ekrem; A., Kamacı and S., Konya (2014). Testing the Causality Relationship Between Inflation and Unemployment: Panel Cointegration and Causality Analysis. International Conference On Eurasian Economies, 1-3 June 2014, Mekadonya.

Günana, T. (2004). The Relationship between Defense Spending and Inflation: An Emprical Analysis for Turkey, Unpublished Master's Thesis. The Department of Management Bilkent University.

Hooker, Mark and Michael, Knetter (1994). Unemployment Effects of Military Spending: Evidence from a Panel of State. NBER Working Paper, No. 4889.

Hung-Pin, L., Wang, T. and Yang, C. (2016). Further Causality Evidence on Arms Race, Inflation and Economic Growth. Economic Computation and Economic Cybernetics Studies and Research, 50 (2), 123- 137.

Im, K.S., Pesaran, M. H. and Shin, Y. (2003). Testing for unit roots in heterogeneous panels. Journal of Econometrics, 115, 53-74.

Jelilov, G., Obasa, OJ and Işık, A. (2016). Impact of Inflation and Unemployment on Economic Growth in Ten (10) Selected Member's States of Economic Community of West Africa States (ECOWAS) (2001-2014). Advances in Economics and Business, 4 (5), 222-244.

Karakurt, B. et al. (2018). Inflation Impact of Defense Spending in Turkey: Structural Breaks Cointegration Analysis. Journal of Finance in July-December 2018; 175: 154-170.

Kitov, Ivan (2008). Inflation, Unemployment, Labor Force Change in European Countries. Munich Personal Repec Archive, 14557, pp. 1-68.

Kinsella, D. (1990). Defense Spending and Economic Performance in The United States: A Causal Analysis. Defense Economics, 1 (4), 295-309.

Koçbulut, Ö. & Altıntaş, H. (2016). Twin Deficits and Feldstein-Horioka Hypothesis: Structural Break Panel Cointegration Analysis Under Horizontal Section Dependency on OECD Countries. Journal of Erciyes University Faculty of Economics and Administrative Sciences. 48. 145-174.

Kuştepeli, Y. (2005). A Comprehensive Short-run Analysis of a (possible) Turkish Phillips Curve. Applied Economics, 37 (5), pp. 581-591.

Looney, R., E. (1989). Impact of Arms Production on Income Distribution and Growth in the Third World. Economic Development and Cultural Change, 38 (1), 145-153.

Malizard, Julien (2014). Defense Spending and Unemployment in France. Defense and Peace Economics, 25 (6): 635-642.

Mankiw NG, Euston Q, Wilson P (2013), "Principles of economics: an Asian edition (2nd ed) Singapore: Cengage Learning Asia.

Navarro, M.S. and Cabello, M.V. (2015). The Causal Relationship between Military Spending and Unemployment in the EU 15. Social Science Research Network, 1-21.

Nwala, Kingsley; (2003). Is There Still an Unemployment and Inflation Trade-off?". International Advances in Economic Research, 9 (2), pp. 168.

Orji, A., Orji-Anthony, I., and Okafor, J. (2015). Inflation and Unemployment Nexus in Nigeria: Another test of the Phillip's Curve. Asian Economic and Financial Review.

Özkök Sancar, C. and M. Atay Polat (2017). An Empirical Practice on the Relationship Between Inflation and Unemployment (Example of G7 Countries). Global Journal of Economics and Business Studies, 6 (12), 1-14.

Özsoy, O. and İpek, E. (2010). The Relationship between Defense Spending and Macroeconomic Variables. International Journal of Economics and Finance Studies, 2 (1), 103-111.

Payne, J.E. and Ross, K.L. (1992). Defense Spending and the Macroeconomy. Defense Economics, 3 (2), 161-168.

Pallis, Dimitrios; (2006). The Trade-O between Inflation and Unemployment in the New European Union Member- States. International Research Journal of Finance and Economics, 1, pp. 80-88.

Paul, Satya (1996). Defense Spending and Unemployment Rates. Journal of Economic Studies, 23 (2): 44-54.

Pesaran, M. H. (2004). General diagnostic tests for cross section dependence in panels. Cambridge Working Papers in Economics, No: 435, Faculty of Economics, University of Cambridge.

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross - section dependence. Journal of applied econometrics, 22 (2), 265-312.

Pesaran, M. H., Ullah, A., & Yamagata, T. (2008). A bias - adjusted LM test of error cross - section independence. The Econometrics Journal, 11 (1), 105-127

Phillips, William (1958). The Relation Between Unemployment and the Rate of Cliange of Money Wage Rates in the United Kingdom, 1861-1957. Economica, 25 (100), 283-229.

Starr, H., Hoole, F.W., Hart, J.A. and Freeman, J.R. (1984). The Relationship between Defense Spending and Inflation. The Journal of Conflict Resolution, 28 (1), 103-122.

Tajra, Haroldo Feitosa; (1999). The Phillips Curve in Brazilian Economy After Real Plan. The George Washington University The Minerva Program, pp. 8-45.

Tang, Jenn-Hong, Cheng-Chung Lai And Eric S. Lin (2009). Military Expenditure And Unemployment Rates: Granger Causality Tests Using Global Panel Data. Defense and Peace Economics, 20 (4): 253-267.

Tatoğlu, F. Y. (2017). Panel Time Series Analysis. Istanbul: Beta Publishing Distribution.

Tobin, James (1997). Supply Constraints on Employment and Output: NAIRU versus Natural Rate. Cowles Foundation Paper 1150.

Topal, M. H. (2018). An Analysis of the Relationship Between Military Spending and Economic Growth in Turkey (190-2016). Journal of Finance, 174 (January-June), 175-202.

Üçler, G., (2017). Defense Spending and Unemployment Rate in Turkey: An Econometric Analysis for the Period 1980-2014. Journal of Yasar University, Volume 12, Number 46.

Yalçınkaya Ö. and Kaya V. (2017). Natural unemployment rate or not; unemployment hysteria? Evidence from new generation panel unit root tests for OECD countries (1980-2015). Journal of Social Economic Research, 17 (33): 1-18.

Yıldırım J. and S. Sezgin (2003). Military Expenditure and Employment in Turkey. Defense and Peace Economics, 14 (2): 129-139.

Yıldız B. and G. Akbulut Yıldız (2019). The Relationship Between Military Spending and Economic Growth in Middle Eastern Countries: Bootstrap Granger Causality Analysis. TCA Journal, 112 (January-March), 53-74.

CHAPTER III

THE IMPACT OF TURKEY'S REAL EFFECTIVE EXCHANGE RATE AND ITS VOLATILITY ON TURKEY'S AGRICULTURAL EXPORT TO THE EUROPEAN UNION*

Yılmaz Toktaş[1] & Alaattin Kızıltan[2]

[1] (Asst. Prof. Dr.) Amasya University, e-mail: toktasyilmaz@gmail.com

ORCID *0000-0002-6996-7987*

2 (Prof. Dr.), Recep Tayyip Erdoğan University, e-mail: alaattin.kiziltan@erdogan.edu.tr

ORCID *0000-0002-7239-7874*

1. INTRODUCTION

The volatile structure of exchange rates has been a crucial problem in calculating the scope and structure of trading manners and trading volume between the countries that export to and import from one another. Factors that affect exchange rates directly or indirectly affect trade flows as well. Yet, it is uncertain whether exchange rate volatility affects trade flows. Studies investigating the relation between exchange rate volatility and foreign trade volume have reached different results. Some of these studies conclude that exchange rate volatility has a negative impact on international trade flows, while others report findings that exchange rate volatility has a positive impact on international trade flows. In the literature, there are also studies which conclude that the impact of exchange rate volatility on international trade flows is uncertain.

Studies on Turkey are often conducted either by means of aggregate data or within the scope of total agricultural export commodities. The present study is significant in that it investigates the impact of real effective exchange rate and its volatility on the agricultural export to the EU by Turkey, which aims to join the EU and the monetary union.

The primary objective of this study is to determine the long-term volatility in exchange rates and its impacts on Turkey's agricultural exports to the EU.

Another objective of the study is to achieve a general understanding of the impact of exchange rate and its volatility on

* This paper based on a PhD thesis tittled ''Determining the effects of exchange rate and exchange rate volatility on Turkey's agricultural export to the European Union.

agricultural export by means of referring to studies that have investigated this subject. Also, by means of empirical findings to be obtained as a result of this study, the study aims to evaluate Turkey's accession to the EU within the framework of monetary union and to initiate discussions on changes in Turkey's agricultural export to the EU after Turkey's potential accession to the EU.

In the light of these objectives, the following research questions will be answered:

1. Which agricultural export groups are affected by real effective exchange rate and its volatility?

2. What are the possible impacts of real effective exchange rate and its volatility on the policies of Turkish agricultural exporters and farmers?

2. LITERATURE REVIEW

In his pioneering study in the literature, Schuh (1974) states that exchange rate is an important variable which has been overlooked in the earlier interpretations of the US' agricultural development and trading issues. It is argued that exchange rate, when adapted to new production technology, is a significant variable affecting trade volume. The degree to which the benefits of technical change have had an impact on the distribution among the US producers and consumers, and in general between the US economy and the world is also investigated. In later periods, several studies were conducted on the US investigating different agricultural products in different aspects. In their study which investigates the impacts of exchange rate variable on the US agriculture during the period between 1969Q1 and 1977Q2, Chambers and Just (1981) conclude that the US agricultural export was responsive to exchange rate variable. In the study on the exchange rate risk on the US agricultural trade in the period between 1978 and 1987, Pick (1990)states that exchange rate's impact was not tangible in agricultural trade flows in seven developed markets, while its impact on the US agricultural export was negative in three developing markets. In their study on the spring onion sector, Fuller, Capps Jr, Bello, and Shafer (1991)have found that the devaluation of the Peso and its volatility against the US dollar encouraged the US import from Mexico and thus the exchange rate had a role. de Jesus Espinoza-Arellano, Fuller, and Malaga (1998)have found that the devaluation of the Peso in 1994 and 1995 had a substantial short-term impact on Mexican exportation of melons to the US. Kapombe and Colyer (1999), in their study investigating the US broiler export in the period between 1970 and 1995, have found that the US broiler market was quite responsive to exchange rate changes and trade diversion policies. Baek and Koo (2009)have investigated the impact of exchange rate changes during the period

between 1975Q4 and 2015Q4 on bilateral agriculture trade flows between the US and its ten major trade partners. Their findings show that the US agricultural export was highly responsive both to exchange rate and foreign income, and that the US agricultural import was affected mostly by domestic income. It has been concluded that both dual exchange rates and income in the US and its trade partners had tangible impacts on the US agricultural export and import in the short term. In their study investigating the impact of exchange rate uncertainty on the US' bilateral fresh vegetables and fruits trade, Sheldon, Mishra, Pick, and Thompson (2013)have found that exchange rate uncertainty had a negative impact on the US' bilateral fresh fruit trade, while no negative impact was observed on the US' bilateral vegetable trade. Huchet-Bourdon and Bahmani-Oskooee (2013)have investigated the impact of exchange rate uncertainty on agricultural and non-agricultural trade flows between the US and China. In their study drawing on the data from the period between 1999M1 and 2009M6, they conclude that exchange rate volatility had a positive impact only on non-agricultural export in the long term, and that the devaluation of the US dollar had a long term impact on the export income of the agriculture sector. The study conducted on Turkey by Buguk, Isik, Dellal, and Allen (2003) is considered among the pioneering studies. They have investigated the impact of exchange rate volatility on developing countries' agricultural export, yet they could not find any significant impact of exchange rate and its volatility on Turkey's export of dried figs, grapes, and tobacco. Fidan (2006), in a study investigating the impacts of real effective exchange rate on Turkey's agriculture trade, emphasise that the short term impacts of real effective exchange rate on Turkey's agricultural export and import were insubstantial compared to the long term impacts. In their study focusing on the impact of exchange rate volatility on Turkey's bilateral agricultural trade with major countries, Erdem, Nazlıoğlu, and Erdem (2010)conclude that exchange rate and its volatility are one of the important factors that determine the dynamics of agriculture-based Turkish trade flows. Erdem et al. (2010)have investigated the impact of exchange rate uncertainty on Turkey's agricultural trade during the period between 1980 and 2005. They have found that exchange rate level has a weaker relation with trade volume compared to exchange rate uncertainty. Gündüz (2010), in a study investigating the impact of exchange rate on Turkey's dried apricot export, has found that the exchange rate had a distinctive impact on Turkey's dried apricot export in the period between 2003:01 and 2008:12. Nazlıoğlu and Erdem (2011), in their study focusing on the period between 1995Q1 and 2007Q2, have investigated the impact of exchange rate on Turkey's bilateral fresh vegetable and fruit trade with EU countries during this period. A J-Curve effect was observed in both cases in the short term, while in the long term it was found that in two out of fourteen cases exchange rate had a positive

impact on trade balance. Erdal, Erdal, and Esengün (2012) have investigated the impact of exchange rate volatility on Turkey's agricultural trade in the light of data from the period between 1995M1 and 2007M10. They have found that there was a positive relation between agricultural export and real effective exchange rate, and a negative relation between real effective exchange rate and agricultural import. Sever (2012) has found that real exchange rate volatility had a negative impact on Turkey's agricultural export and import. Yazıcı and Qamarul Islam (2012), in their study investigating the agricultural foreign trade balance between Turkey and the EU15by referring to the data from the period between 1998Q1 and 2008Q4, have concluded that real exchange rate had an inconsistent impact on agricultural trade balance and the devaluation of the Turkish Lira had a balancing effect in the short term; however, they have found that the devaluation of the local currency had a negative impact in the long term. Yanıkkaya, Kaya, and Koçturk (2013), in their study investigating the impacts of real exchange rate and its volatility on Turkey's selected agricultural export products by referring to the data from the period between 1971 and 2010, have observed that exchange rate volatility did not have a tangible impact on Turkey's agricultural export, while real exchange rate had a statistically tangible impact on agricultural export flows. Toktaş and Bozkurt (2016), in their study investigating the relation between real effective exchange rate and Turkey's hazelnut export to Germany by referring to the data from the period between 1996Q1 and 2016Q2, have observed that there was a negative relation in the long term between real effective exchange rate and Turkey's hazelnut export to Germany.

The literature on the subject includes studies conducted over different groups of countries and different groups of products. Lamb (2000), in a study investigating agriculture in fourteen African countries in the period between 1975 and 1999, has analysed the dependence of a country's export on its own currency's exchange rate and has come to the conclusion that there was a strong negative relation between exchange rate and cumulative agricultural output in the market. Kargbo (2006), in a study conducted over South Africa, has reached the conclusion that exchange rate is a significant variable for agricultural trade, and that exchange rate volatility had a negative impact on agricultural trade. Kandilov (2008), in a study investigating the impacts of exchange rate volatility on agricultural trade, has found that exchange rate volatility had a negative impact on agricultural trade between G-10 countries in the period between 1975 and 1997. Fogarasi (2011) has found that nominal exchange rate volatility had a negative impact on Hungary's agricultural trade in the period between 1999 and 2008.

3. MODEL AND DATA

The main model used in this study to investigate the impact of exchange rate and its volatility on agricultural export was developed drawing on the trade model developed by Bahmani-Oskooee and Wang (2008). The main equation used in this study is given below:

$$LNEXP_{Xt} = \alpha_0 + \alpha_1 LNREER_t + \alpha_2 VOL_t + \alpha_3 LNGDP_t + e_t \quad (1)$$

In the equation $LNEXP_{Xt}$ stands for agricultural export, x for agricultural export group, *LNREER* for real effective exchange rate, VOL_t for volatility of real effective exchange rate, $LNGDP_t$ for national income of EU countries, and e_t for error term.

Turkey's agricultural export and foreign income are expected to be positive, as the growth in the EU as Turkey's trading partner is expected to increase the demand for agricultural products imported from Turkey. The devaluation of the local currency, in the case of this study the Turkish Lira, is expected to increase agricultural export (Bahmani-Oskooee & Goswami, 2004, p. 3). An increase in the value of the Turkish Lira relatively decreases the prices of Turkish agricultural products. In trade models, there are no tangible views on the tendency of exchange rate volatility. In the absence of a method to reduce the exchange rate volatility risk, trade will decrease. In such a scenario, the volatility will be negative. If exchange rate volatility allows for easy access to financial institutions and loaning opportunities, trade flows will not be affected, and it will not matter whether the exchange rate volatility is negative or positive. Under such circumstances, the volatility's tendency may also be positive. Such a scenario can be realised if exporters increase their trade volume against the risk of losing their future income (Erdem et al., 2010, p. 300)

Volatility can be described as unpredictable and above average movements in the value of a variable (Akel, 2011, p. 7) Volatility in financial asset income is influential in the making of many financial decisions. Exchange rate volatility, for instance, has a decisive role in risk management in financial markets (Klaassen, 2002, p. 1). Uncertainty due to exchange rate volatility is an important data to be taken into consideration for almost all sectors including foreign trade.

Studies on risk measurement in financial theory have increased in number and in significance in the recent years (Hafner, 2013, p. 7). Volatility is measured by standard deviation approach, implied volatility models, exponentially weighted moving average model (EWMA), and autoregressive conditional heteroscedasticity models (ARCH). In this study, autoregressive conditional heteroscedasticity models such as ARCH, GARCH and EGARCH, which are commonly used in the

literature, were used to measure and estimate exchange rate volatility. EGARCH (3.2) was determined as the most suitable model for estimating volatility series according to Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC).

Twelve of Standard International Trade Classification (SITC) Revision 3 Level 2 commodities, which cover 87% of Turkey's agricultural export to the EU countries, were selected. The selected agricultural food export commodities stand for 82% of the total agricultural export and 89% of the total food export. The only item with code number 26 selected in the category of agricultural raw material export stands for 67% of the total raw material export, and 5% of the total agricultural export. Detailed information on these variables is given below (TUIK, 2016).

The abbreviations and explanations related to the data used in the study are given in Table 1.

Table 1: Variables Used in Analyses

Abbreviation	Period	Explanation	Source
LNREER	1997Q1-2015Q3	Real Effective Exchange Rate	Bank for International Settlements (BIS)
LNGDP	1997Q1-2015Q3	EU Real GDP	OECD Database
VOL	1997Q1-2015Q3	Measured from LNREER series by EGARCH (3,2) model	EGARCH(3.2)
LNTP	1997Q1-2015Q3	Total Value of Turkey's Agricultural Exports	Turkey Statistical Institute (TUIK)
LNRM	1997Q1-2015Q3	Total Value of Turkey's Agricultural Raw Materials Exports	Turkey Statistical Institute (TUIK)
LNFP	1997Q1-2015Q3	Total Value of Turkey's Food Products Exports	Turkey Statistical Institute (TUIK)

4. METHODOLOGY AND EMPIRICAL RESULTS

Stationarity analyses of the variables used in this study were carried out by means of Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests.

The results of the unit root tests for the variables are given in Table 2.

Table 2: Results of Stationarity Tests

Variable			ADF		PP	
			Constant	Constant & Trend	Constant	Constant &Trend
LNREER	Level	T-Statistic	-2.702	-2.728	-2.545	-2.487
		1%	-3.522	-4.087	-3.522	-4.087
		5%	-2.901	-3.472	-2.901	-3.472
		10%	-2.588	-3.163	-2.588	-3.163
	First Difference	T-Statistic	-7.626	-7.682	-8.339	-10.291
		1%	-3.523	-4.089	-3.523	-4.089
		5%	-2.902	-3.473	-2.902	-3.473
		10%	-2.588	-3.163	-2.588	-3.163
LNTP	Level	T-Statistic	-1.606	-3.586	-1.334	-3.581
		1%	-3.522	-4.087	-3,522	-4.087
		5%	-2.901	-3.472	-2,901	-3.472
		10%	-2.588	-3.163	-2,588	-3.163
	First Difference	T-Statistic	-13.027		-12,987	
		1%	-3.523		-3,523	
		5%	-2.902		-2,902	
		10%	-2.588		-2,588	
LNFP	Level	T-Statistic	-2.127	-3.669	-1,359	-3.679
		1%	-3.522	-4.087	-3,522	-4.087
		5%	-2.901	-3.472	-2,901	-3.472
		10%	-2.588	-3.163	-2,588	-3.163

	First Difference	T-Statistic	-12.969		-12,928	
		1%	-3.523		-3,523	
		5%	-2.902		-2,902	
		10%	-2.588		-2,588	
LNRM	Level	T-Statistic	-2.127	-2.451	-2,185	-2.601
		1%	-3.522	-4.087	-3,522	-4.087
		5%	-2.901	-3.472	-2,901	-3.472
		10%	-2.588	-3.163	-2,588	-3.163
	First Difference	T-Statistic	-8.680	-8.642	-8,681	-8.643
		1%	-3.523	-4.089	-3,523	-4.089
		5%	-2.902	-3.473	-2,902	-3.473
		10%	-2.588	-3.163	-2,588	-3.163
VOL	Level	T-Statistic	-8.216	-8.295	-8,218	-8.312
		1%	-3.532	-4.101	-3,532	-4.101
		5%	-2.906	-3.478	-2,906	-3.478
		10%	-2.590	-3.167	-2,590	-3.167
LNGDP	Level	T-Statistic	-1.722	-2.151	-2,576	-1.908
		1%	-3.523	-4.089	-3,522	-4.087
		5%	-2.902	-3.473	-2,901	-3.472
		10%	-2.588	-3.163	-2,588	-3.163
	First Difference	T-Statistic	-3.523	-3.631	-3,523	-3.631
		1%	-3.523	-4.089	-3,523	-4.089
		5%	-2.902	-3.473	-2,902	-3.473
		10%	-2.588	-3.163	-2,588	-3.163

As different degrees of stationarity were determined for variables as a result of the ADF and PP unit root tests, there is no ground for achieving reliable results from Engle Granger and Johansen cointegration tests. Having analysed studies on exchange rate volatility and trade flows, Bahmani-Oskooee and Hegerty (2007) have found that trade flows generally include unit root, and that volatility series, on the contrary, is stationary. Therefore, they have suggested bounds testing approach for further studies on exchange rate volatility and trade flows. Bounds testing

approach developed by Pesaran, Shin, and Smith (2001) so as to investigate cointegration relation regardless of variables' stationarity degrees was selected as the most suitable method for the present study.

5. ARDL BOUNDS TEST

The first stage for bounds testing approach is to form an unrestricted error correction model (UECM). The UECM adapted and used for each agricultural export item investigated in this study is given below in Equation 2:

$$\Delta LNEXP_{xt} = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i}\, \Delta LNEXP_{xt-i} + \sum_{i=1}^{p} \alpha_{2i} \Delta LNREER_{t-i} + \sum_{i=1}^{p} \alpha_{3i} \Delta VOL_{t-i} + \sum_{i=1}^{p} \alpha_{4i} \Delta LNGDP_{t-i} + \alpha_{5i} LNEXP_{xt-i} + \alpha_{6i} LNREER_{t-1} + \alpha_{7i} VOL_{t-1} + \alpha_{8i} LNGDP_{t-1} + \alpha_9 t + \epsilon_t \quad (2)$$

In the model, t stands for trend variable, and p for lag value. Trend variables are omitted in the models when insignificant. Schwarz information criteria are used in the study to determine the optimal lag value for bounds test. The lag length with the smallest Schwarz information criteria is determined as the optimal lag length.

Variables $\alpha_5, \alpha_6, \alpha_7$ and α_8 in Equation 2 are tested on the hypothesis that there are no relations between them. The main hypothesis formed for the existence of a cointegration relation can be expressed as: $H_0: \alpha_5 = \alpha_6 = \alpha_7 = \alpha_8 = 0$. The calculated F statistic values are compared to the values at the table in Pesaran et al. (2001) in order to refute the hypothesis or not. If the calculated F-statistic is lower than the critical bottom limit in the table, it is found that a cointegration relation is not present. If the calculated value is between the bottom and upper critical limits, a cointegration relation cannot be interpreted. When the calculated value exceeds the upper critical limit in the table, a cointegration relation is present; in this case, the hypothesis that no long-term relation exists between variables is refuted.

After the optimal lag value is determined, cointegration relations between series are investigated by bounds testing approach. Table 3 shows the results of the bounds test.

Table 3: ARDL Bounds Test Results

Dependent Variable	F - statistic	Bottom Limit	Upper Limit	Cointegration	A: Serial Correlation	B: Functional Form	C: Normality	D: Heteroscedasticity	Cusum	CusumSq
LNTP	4.647	3.382	4.552	Yes	4.034[0.401]	1.094[0.295]	0.123[0.940]	1.321[0.250]	Stable	Stable
LNRM	1.065	3.382	4.552	No	4.303[0.366]	2.250[0.134]	0.014[0.993]	0.118[0.731]	Stable	Stable
LNFP	7.053	3.382	4.552	Yes	4.773[0.311]	1.586[0.208]	0.455[0.796]	1.069[0.301]	Stable	Stable

In 2 of the agricultural export groups, a cointegration relation was found between the variables of real effective exchange rate and volatility. These two groups are: total agricultural exports and food products exports.

6. ARDL MODEL (Autoregressive Distributed Lag)

After a cointegration relation was found between the variables, short term and long term relations between exchange rate, volatility, and agricultural export were investigated. The ARDL model used in this study is given below in Equation 3.

$$LNEXP_{xt}=\alpha_0+\sum_{i=1}^{k}\alpha_{1t}LNEXP_{xt-i}+\sum_{i=1}^{l}\alpha_{2t}LNREER_{t-i}+\sum_{i=1}^{m}\alpha_{3t}VOL_{t-i}+\sum_{i=1}^{n}\alpha_{4t}LNGDP_{t-i}+\alpha_{5t+}\varepsilon_t \quad (3)$$

In Equation 3; k, l, m, and n stand for lag values. The optimal lag lengths for the ARDL model were determined according to Schwarz information criteria. The lag length with the minimum Schwarz information criteria was selected.

Table 4: Long Term Estimation Results of the ARDL Model

Dependent Variable		LNREER	VOL	LNGDP
LNTP	Coefficient	-0.611	-6.108	3.562
	T-Statistic [Prob]	-2.104[0.043]**	-2.881[0.007]*	9,373[0.000]*
LNFP	Coefficient	-0.675	-6.298	3.819
	T-Statistic [Prob]	-2.485[0.017]**	-3.175[0.003]*	10.970[0.000]*

Note: * indicates significance at 1% level, ** at 5% level, and *** at 10% level and [] indicates probability value.

According to the data in Table 4, a 1% increase in LNREER at 5% significance level causes a 0.611% decrease in total agricultural exports and 0.675% in food products exports. A 1% increase in LNGDP, on the other hand, increases Turkey's total agricultural exports by 3.562%, and food products exports by 3.819%. Real effective exchange rate volatility is statistically significant in all models. A 1% increase in VOL at 1% significance level 2.881 decrease in Turkey's total agricultural products and 3.175% in Turkey's food products exports.

The adapted version of the error correction model based on the ARDL approach, which was used to investigate the short-term relation between the variables, is given below in Equation 4.

$$\Delta LNEXP_t=\alpha_0+\alpha_1 EC_{t-1} + \sum_{i=1}^{k} \alpha_{2i}\Delta LNEXP_{t-i} + \sum_{i=1}^{l} \alpha_{3i}\Delta LNREER_{t-i} + \sum_{i=1}^{m} \alpha_{4i}\Delta VOL_{t-i} + \sum_{i=1}^{n} \alpha_{5i}\Delta LNGDP_{t-i} + \varepsilon_t \quad (4)$$

The results of the error correction model based on the ARDL are given in Table 5. ECt-1 variable is the lagged value of the error term series obtained from the long-term relation. The coefficient of this variable indicates the degree to which the short-term imbalance is corrected in the long term. The error correction coefficient was found in the models which dependent variables are total agricultural exports and food products exports. The error correction term was found in the first model was found as -0.591, which indicates that in case of a short-term deviation from the long-term balance, the system will be balanced in approximately 1.69 terms. The error correction term was found in the second model was found as -0.630, which indicates that in case of a short-term deviation from the long-term balance, the system will be balanced in approximately 1.58 terms.

Table 5: Estimation Results of the Error Correction Model Based on the ARDL

Dependent Variable	ΔLNTP		ΔLNFP	
	Coeff.	Prob.	Coeff.	Prob.
ΔLNREER	-0.03	0.83	0.03	0.82
ΔLNREER1	0.49	0.01*	0.58	0.00*
ΔLNREER2	0.47	0.01**	0.51	0.00*
ΔLNREER3	-0.56	0.00*	-0.58	0.00*
ΔLNREER4	-0.09	0.59	-	-
ΔVOL	1.2	0.00*	1.36	0.00*
ΔVOL1	5.18	0.00*	5.87	0.00*
ΔVOL2	4.48	0.00*	5.06	0.00*
ΔVOL3	2.65	0.00*	3.09	0.00*
ΔVOL4	1.54	0.05***	1.87	0.01**
ΔVOL5	0.62	0.25	1.02	0.08***
ΔVOL6	1.71	0.02*	1.98	0.00*
ΔVOL7	1.67	0.00*	1.8	0.00*
ΔLNGDP	6.36	0.00*	6.9	0.00*
ΔLNGDP1	-7.38	0.03*	-8.25	0.00*
ΔLNGDP2	-0.45	0.83	-	-
ΔLNGDP3	0.9	0.59	-	-
Ecm (-1)	-0.59	0.00*	-0.63	0.00*

Note: * indicates significance at 1% level, ** at 5% level, and *** at 10% level

In our study conducted on Turkey, it was concluded that real effective exchange rate had a negative impact on total agricultural exports and food products exports. The impact on food products exports was found to be higher than the impact on total agricultural exports. Exchange rate volatility has a similar case as well; it was found that exchange rate volatility had a greater impact on food products exports than on total agricultural exports. As anticipated, GDP of importing countries had a positive impact on agricultural exports. The impact of real effective exchange rate volatility was determined to be much higher than the impact of real effective exchange rate.

7. CONCLUSION

Fluctuations in exchange rate are more responsive to external factors in developing countries than they are in developed countries. This situation results in the reinforcement of the unpredictable structure of exchange rate fluctuations in developing countries. Exporters in developed economies not only have easy access to loans and protection from financial risks, but also receive a high level of export aid for agricultural and commercial export commodities from their governments.

With the adoption of the flexible exchange rate system, an era in which exchange rate volatility has increased even more has begun in Turkey. High inflation and interest rates, balance of payments deficit, incompatibility between financial and fiscal policies, speculative attacks, and expectations as well as social, economic and political factors have all caused fluctuations in exchange rate to increase. The exchange rate risk occurs in foreign trade when there is a time difference between the signing of the agreement by the two parties -the importing and the exporting company- and the due date for the payment. Under such circumstances, unexpected rises in exchange rate will reduce the benefit of the trade by increasing uncertainty.

The present study has emphasized that it is important to take exchange rate volatility into consideration in addition to the exchange rate variable which is used often in the literature concerned with determining the relationship between foreign trade and exchange rate, and it has also shown that exchange rate volatility can be utilised as a policy tool. Considering that an increase in exchange rate volatility can be considered by investors and traders as an increase in fragility, instability, and a risk factor, methods developed by policy makers to reduce exchange rate volatility and stabilise the exchange rate are estimated to make a contribution to increase foreign trade volume.

According to the findings of this study, real effective exchange rate and its volatility can be considered as primary decisive factors for agricultural policies. It was found that the exchange rate and volatility variables directly affected Turkey's agricultural exports. This situation indicates that policymakers should consider the impact of real effective exchange rate and volatility in relation to agricultural export commodities. Some methods by which to tackle the risks caused by exchange rate fluctuations are: subvention of agricultural export, price stability-oriented policies by central bank, easy access for exporters to opportunities such as loans and protection from financial risks. Erdem et al. (2010) suggest in their study that volatility is insignificant as trade flows will not be affected in case access to financial institutions and loan opportunities are facilitated by exchange rate volatility. However, in case of insufficient methods to

reduce the exchange rate volatility risk, in such a scenario, the volatility will be negative, and the trade will decrease. From this point of view, Turkey has insufficient policies and institutions to protecting agricultural producers against exchange rate volatility. Development of a cooperative system in agriculture will bring about more modern agricultural methods and the power of unity.

Following the Customs Union, Turkey's agricultural export to the EU countries increased. The fact that the impact of exchange rate on Turkey's exports during the period investigated in this study was significant can be accounted by the use of imported seeds and pesticides to produce the crops to be exported. This situation can be considered as a cost-increasing factor that prevents falls in prices.

REFERENCES

Akel, V. (2011). Kriz Dönemlerinde Finansal Piyasalar Arasındaki Volatilite Yayılma Etkisi, 1. *Basım, Detay Yayıncılık, Ankara*, 7.

Baek, J., & Koo, W. W. (2009). Assessing the exchange rate sensitivity of US bilateral agricultural trade. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie, 57*(2), 187-203.

Bahmani-Oskooee, M., & Goswami, G. G. (2004). Exchange rate sensitivity of Japan's bilateral trade flows. *Japan and the world economy, 16*(1), 1-15.

Bahmani-Oskooee, M., & Hegerty, S. W. (2007). Exchange rate volatility and trade flows: a review article. *Journal of Economic studies*.

Bahmani-Oskooee, M., & Wang, Y. (2008). Impact of exchange rate uncertainty on commodity trade between the US and Australia. *Australian Economic Papers, 47*(3), 235-258.

BIS. Effective Exchange Rates Statistics. Retrieved from https://www.bis.org/statistics/about_fx_stats.htm?m=6%7C381%7C674

Buguk, C., Isik, M., Dellal, İ., & Allen, A. (2003). The Impact of exchange rate variability on agricultural exports of developing countries: The case of Turkey. *Journal of International Food & Agribusiness Marketing, 13*(1), 83-105.

Chambers, R. G., & Just, R. E. (1981). Effects of exchange rate changes on US agriculture: a dynamic analysis. *American Journal of Agricultural Economics, 63*(1), 32-46.

de Jesus Espinoza-Arellano, J., Fuller, S., & Malaga, J. (1998). Analysis of forces affecting competitive position of Mexico in supplying US winter melon market. *The International Food and Agribusiness Management Review, 1*(4), 495-507.

Erdal, G., Erdal, H., & Esengün, K. (2012). The effects of exchange rate volatility on trade: evidence from Turkish agricultural trade. *Applied Economics Letters, 19*(3), 297-303.

Erdem, E., Nazlıoğlu, S., & Erdem, C. (2010). Exchange rate uncertainty and agricultural trade: Panel cointegration analysis for Turkey. *Agricultural Economics, 41*(6), 537-543.

Fidan, H. (2006). Impact of the real effective exchange rate (Reer) on Turkish agricultural trade. *International Journal of Social Sciences, 1*(2), 70.

Fogarasi, J. (2011). The effect of exchange rate volatility upon foreign trade of Hungarian agricultural products. *Studies in Agricultural Economics, 113*(1316-2016-102741), 85-96.

Fuller, S. W., Capps Jr, O., Bello, H., & Shafer, C. (1991). Structure of the fresh onion market in the spring season: a focus on Texas and its competition. *Western Journal of Agricultural Economics*, 404-416.

Gündüz, O. (2010). Effect of exchange rate on dried apricot export in Turkey: A vector autoregression (VAR) analysis. *African Journal of Agricultural Research, 5*(18), 2485-2490.

Hafner, C. (2013). *Nonlinear time series analysis with applications to foreign exchange rate volatility*: Springer Science & Business Media.

Huchet-Bourdon, M., & Bahmani-Oskooee, M. (2013). Exchange rate uncertainty and trade flows between the United States and China: The agricultural versus the nonagricultural sector. *Chinese Economy, 46*(2), 29-53.

Kandilov, I. T. (2008). The effects of exchange rate volatility on agricultural trade. *American Journal of Agricultural Economics, 90*(4), 1028-1043.

Kapombe, C. M., & Colyer, D. (1999). A structural time series analysis of US broiler exports. *Agricultural Economics, 21*(3), 295-307.

Kargbo, J. M. (2006). Exchange rate volatility and agricultural trade under policy reforms in South Africa. *Development Southern Africa, 23*(01), 147-170.

Klaassen, F. (2002). Improving GARCH volatility forecasts with regime-switching GARCH. In *Advances in Markov-switching models* (pp. 223-254): Springer.

Lamb, R. L. (2000). Food crops, exports, and the short-run policy response of agriculture in Africa. *Agricultural Economics, 22*(3), 271-298.

Nazlıoğlu, Ş., & Erdem, E. (2011). Exchange Rates and Turkish Fresh Fruits and Vegetables Trade with the EU Countries: Bilateral Trade Data Analysis. *Journal of International Food & Agribusiness Marketing, 23*(2), 93-109.

OECD. Quarterly National Accounts Retrieved from https://stats.oecd.org/index.aspx?queryid=60702

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics, 16*(3), 289-326.

Pick, D. H. (1990). Exchange rate risk and US agricultural trade flows. *American Journal of Agricultural Economics, 72*(3), 694-700.

Schuh, G. E. (1974). The exchange rate and US agriculture. *American Journal of Agricultural Economics, 56*(1), 1-13.

Sever, E. (2012). Döviz Kuru Dalgalanmalarının Tarımsal Dış Ticarete Etkisi: Türkiye Örneği. *Akademik Araştırmalar ve Çalışmalar Dergisi (AKAD), 4*(7).

Sheldon, I., Mishra, S. K., Pick, D., & Thompson, S. R. (2013). Exchange rate uncertainty and US bilateral fresh fruit and fresh vegetable trade: an application of the gravity model. *Applied Economics, 45*(15), 2067-2082.

Toktaş, Y., & Bozkurt, E. (2016). *The Analysis of the Relationship Between Turkey's Real Effective Exchange Rate and Hazelnut Export to Germany via Bounds Test.* Paper presented at the 2 nd International Conference on Applied Economics and Finance (ICOAEF), At North Cyprus.

TUIK. (2016). Foreign Trade Statistics. Retrieved from http://www.tuik.gov.tr/PreTablo.do?alt_id=1046

Yanıkkaya, H., Kaya, H., & Koçturk, O. M. (2013). The effect of real exchange rates and their volatilities on the selected agricultural commodity exports: A case study on Turkey, 1971-2010. *Agricultural Economics, 59*(5), 235-246.

Yazıcı, M., & Qamarul Islam, M. (2012). Exchange Rate and Turkish Agricultural Trade Balance with EU. *Agricultural Economics Review, 13*(389-2016-23474), 35-47.

CHAPTER IV

EXPORT, IMPORT AND ECONOMIC GROWTH: EVIDENCE FROM BRICS-T COUNTRIES

Gizem Akbulut Yıldız[1]

[1](*Asst. Prof.), Gümüşhane University, e-mail: gizem-akbulut@hotmail.com*

0000-0001-7492-2428

1.INTRODUCTION

According to Adam Smith (1776) and David Ricardo (1817), who are the leading economists of the theories of international trade, trade is the driving force of economic growth. However, the view that trade is an outcome of economic growth has started to stand out in accordance with the criticisms made on this view over time. In particular, endogenous growth theories developed as an opposing view neoclassical growth theories emphasize the dynamic relationship between trade and economic growth. The fact that countries started to adopt open industrialization policies instead of import substitution since the 1980s further increased the importance of the issue. Countries that play an active role in international markets contribute more to productivity and growth, rather than the countries engaged in production for the domestic market. On the one hand, export benefits the country from various aspects by increasing the employment, providing foreign currency income, increasing the standard of life, and consequently supporting the economic growth. However, if the right market is not selected and the right products are not produced, it is likely to negatively affect the economic growth.

Import, which is another item of international trade, negatively can affects the economic growth by causing the outflow of foreign currency from the country. However, it can positively affects the economic growth, especially in cases such as importing intermediate goods to be used in the production of export goods or transferring information from developed or developing countries. Therefore, it is not possible to say that there is a clear consensus on the relationship between export, import and economic growth.

4 hypotheses have been developed to explain the relationship between export, import and economic growth. One of the hypotheses developed is the Export-Led Growth (ELG) hypothesis, which refers to the

causality relationship from export to economic growth. The alternative hypothesis is the hypothesis called Growth-Led Export (GLE), which refers to the causality relationship from economic growth to export. The Import-Led Growth (ILG) hypothesis, which explains the relationship between import and economic growth, suggests that economic growth can be basically driven by the growth in import. Therefore, the direction of causality is from import to economic growth. According to the Growth-Led Import (GLI) hypothesis, which is an alternative to this hypothesis, the direction of causality is from growth to import (Awokuse, 2008: 161; Bakari, Fakraoui & Tiba, 2019: 2, Fannoun & Hassouneh, 2019: 258).

One of the groups of countries that direct world trade in the global markets consists of Brazil, Russia, India, China, South Africa and Turkey (BRICS-T). Chart 1, Chart 2 and Chart 3 were created by using the logarithmic values of export, import and economic growth data of BRICS-T countries.

When the charts are examined, it is observed that China is the leading country in all indicators. While China's export was $ 49 billion and its import was $ 38 billion in 1990, its export and import reached $ 2.6 trillion and $ 2.5 trillion, respectively, in 2018. Therefore, the country with the highest trade share among these countries is China. According to the figures of Gross Domestic Product (GDP), which is an indicator of economic growth, China's GDP was $ 360 billion in 1990 and $ 13.61 trillion in 2018. The country with the lowest performance was South Africa. While South Africa's export was $ 27 billion and its import was $ 21 billion in 1990, its export and import reached $ 110 billion and $ 108 billion, respectively, in 2018.

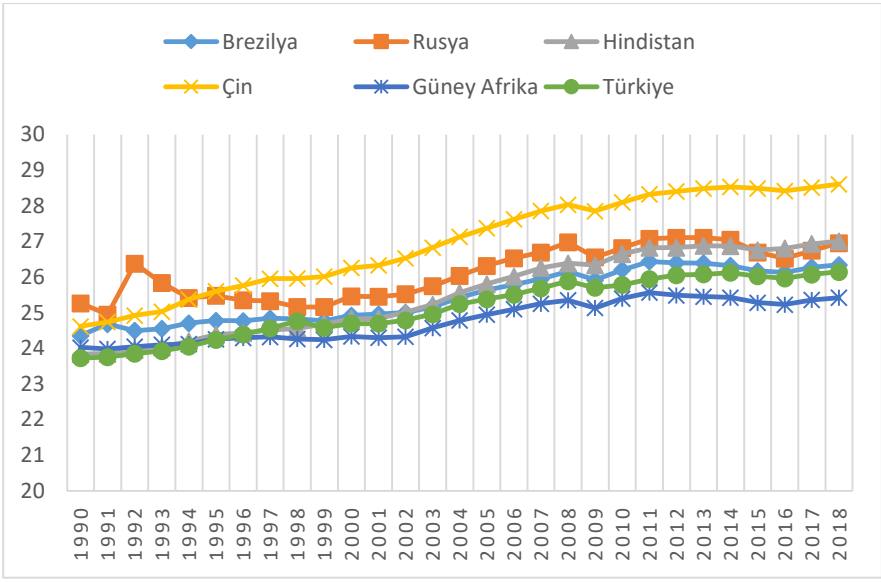


Chart 1. Logarithmic Total Export Values, (1990-2018)
Source: Created by the author with the data obtained from the World Bank database.

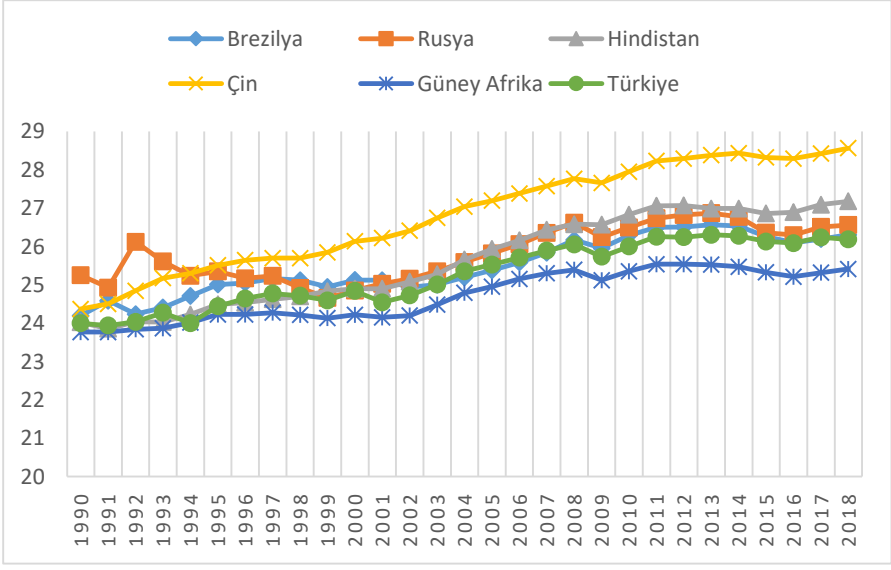


Chart 2. Logarithmic Total Import Values, (1990-2018)
Source: Created by the author with the data obtained from the World Bank database.

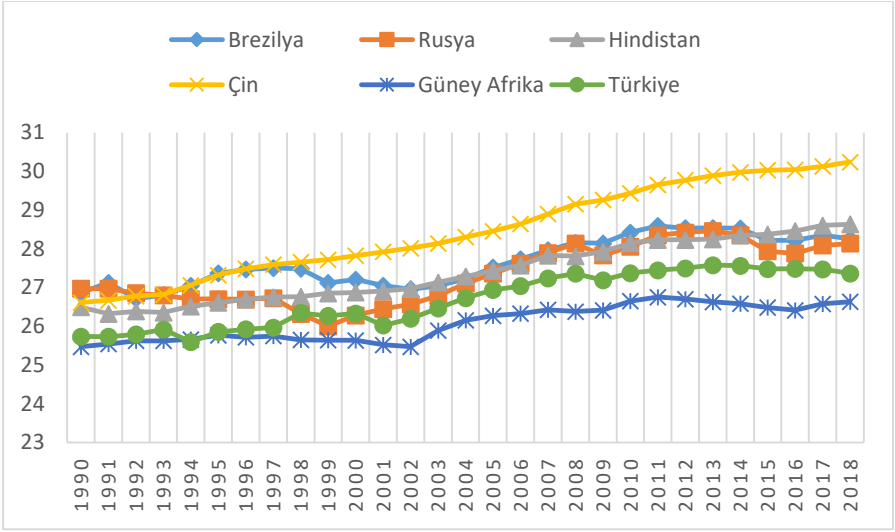


Chart 3. Logarithmic GDP Values, (1990-2018)
Source: Created by the author with the data obtained from the World Bank database.

In conclusion, when all charts are evaluated together, the question arises whether these economic indicators interact with each other. This question constituted the starting point of the study. The aim of this study on BRICS-T countries was to investigate the relationship between export, import and economic growth. In the empirical analysis of the study including the period of 1990-2018, the coefficients were estimated using the Augmented Mean Group (AMG) estimator. The direction of the relationship between the variables was determined by using Emirmahmutoğlu and Köse (2012) panel causality test. In the next section of the study, the relevant studies in the literature will be summarized. In the third section, information on the data set and the model is provided. After the results obtained by empirical analysis are provided in the fourth section, it will be attempted to interpret the results obtained in the conclusion section.

2.LITERATURE REVIEW

The ELG hypothesis, which refers to the relationship between export and economic growth, was tested in many of the pioneering studies in the literature. In most of these studies, the view that export is an important determinant of economic growth is accepted. Some of the relevant studies are Michaely (1977), Balassa (1978), Ram (1985), Fosu (1990), Bahmani-Oskooee & Alse (1993), Islam (1998), Elbeydi, Hamuda & Gazda (2010), Dar et al. (2013), Temiz Dinç & Gökmen (2019).

Import, which is regarded as the second important determinant of international trade, began to be taken into account in the studies over time.

Therefore, the literature investigating the relationship between export, import and economic growth is gradually increasing. Methodologically, these studies can be gathered in two groups. In the studies in the first group, the issue was investigated using time series data methods. Some of these studies are Ramos (2001), Hye (2012), Thirunavukkarasu & Achchuthan (2014), Turan & Karamanj (2015), Bakari (2017), Bakari & Mabrouki (2017), Bahramian & Saliminezhad (2020).

In the studies in the second group, the issue was discussed by using panel data methods. One of these studies was conducted by Çetintaş & Barişik (2009) on 13 transition economies. In the study, the relationship between export, import and economic growth was investigated. The panel Granger causality method was applied by using panel data for the period 1995:2 2006:4. According to the results, a unidirectional causality relationship from economic growth to export was found. Thus, it was determined that the ELG hypothesis was valid for these countries.

In the study of Sharma & Smyth (2009), export and import-led growth hypotheses in Pacific Island countries were tested. The panel Granger causality method was applied using panel data for the period 1982-2004. According to the analysis result, there was a bidirectional causality relationship between the variables.

The same study was conducted by Mishra, Sharma & Smyth (2010) on 5 Pacific Island countries for the period 1982-2004. According to the results of the panel Granger causality analysis, there was a bidirectional causality relationship between export, import and economic growth.

In the study of Ahmed, Cheng & Messinis (2011), 5 Sub-Saharan African countries were analyzed. The FMOLS estimator was used in the analysis of the study covering the period 1991-2001. According to the results, export and import had a statistically significant and positive effect on economic growth.

In the study of Gül & Kamacı (2012), the effect of foreign trade on economic growth was examined. The study on developed and developing countries included the panel data for the periods 1980-2010 and 1993-2010, respectively. According to the results of the Granger causality analysis, there was a unidirectional causality relationship from import and export to economic growth. Accordingly, the ILG and ELG hypotheses were valid.

In the study of Kılavuz & Altay Topçu (2012), the effects of sectoral export and import on economic growth were investigated. The study included 22 developing countries and the period 1998-2006. According to the estimation results obtained by the Least Squares (LS), Random Effects, Fixed Effects and Panel Corrected Standard Errors (PCSE) methods, high-

technology product export and low-technology product import had a statistically significant and positive effect on economic growth.

In the study on BRICS-T countries conducted by Koçyiğit et al. (2015), the causality relationship between international trade and economic growth for the period 1997Q:1-2013Q:3 was investigated. According to the results of the frequency domain causality test, the ELG hypothesis was accepted in Turkey, China, Russia and Brazil. The ILG hypothesis was valid only for India and South African countries.

Hamdan (2016) investigated the effect of export and import on economic growth. The study included 17 Arab countries and the period 1995-2013. According to the fixed effects model estimation results, export and import had a statistically significant and positive effect on economic growth.

In the study of Rani & Kumar (2018) on BRICS countries, the ELG and ILG hypotheses were tested. Panel data covering the period 1967-2014 were used in the analysis. According to the results of the analysis performed by using the FMOLS and DOLS estimators, while export had a statistically significant and positive effect on economic growth, import had a statistically significant and negative effect on it. The causality relationship between the variables was investigated with the panel Vector ECM (VECM). According to the results, a bidirectional causality relationship was found between export and economic growth. Therefore, it was concluded that the ELG and GLE hypotheses were valid. In the study of Manzoor & Safdar (2020), the same group of countries was examined, and analysis was performed by using the panel data for the period 1992-2014. According to the results obtained by the Random Effects Estimator, both ELG and ILG hypotheses were found to be valid.

Based on the literature review, it can be stated that the number of studies investigating the relationship between export, import and economic growth in a single country, namely time series, is quite high. On the other hand, the number of studies investigating the issue on a panel basis, considering only three relevant variables and using up-to-date techniques, has started to increase in recent years. The lack of consensus on the results obtained from these studies also indicates that this issue is still open to study.

3.DATA SET AND MODEL

The aim of the study was to examine the relationship between export, import and economic growth. The panel data on BRICS-T countries and the period 1990-2018 were used in the empirical analysis. Information on the variables in the econometric model is presented in Table 1.

Table 1. Definition of the Variables

Name of the Variable	Definition of the variable	Source Obtained	Period
lngdp	Real Gross Domestic Product (GDP) ($)	World Bank-World Development Indicators	1990-2018
lnexp	Total Exports of Goods and Services ($)	World Bank-World Development Indicators	1990-2018
lnimp	Total Imports of Goods and Services ($)	World Bank-World Development Indicators	1990-2018

The basic econometric model used in the study is as follows:

$$lngdp_{it} = \beta_1 lnexp_{it} + \beta_2 lnimp_{it} + u_{it} \quad (1)$$

In Equation 1, i; represents the countries, t; represents the period and u represents the error term. In the model, lngdp represents the Real GDP as dependent variable, lnexp represents the total exports of goods and services as independent variable, and lnimp represents the total imports of goods and services. The logarithms of all variables were taken.

4.EMPIRICAL RESULTS

In the study, cross sectional dependence tests were first applied for both variables and the model. The results obtained are presented in Table 2. According to the results of the cross sectional dependence test, the null hypothesis that there was no "cross sectional dependence" in the variables and the model was rejected at a significance level of 1%. In other words, this result indicated that the shock that occurred in any country involved in the analysis would also affect other countries.

Table 2. Cross-Sectional Dependence Test Results

Tests	lngdp	lnexp	lnimp	Model
LM (Breusch, Pagan 1980)	372.7449*** (0.000)	397.0798*** (0.000)	379.8996*** (0.000)	29.181*** (0.015)
CD_{LM} (Pesaran 2004)	65.31499*** (0.000)	69.75791*** (0.000)	66.62124*** (0.000)	2.589*** (0.005)
CD (Pesaran 2004)	65.20784*** (0.000)	69.65077*** (0.000)	66.51410*** (0.000)	-2.393*** (0.008)
LM_{adj} (PUY, 2008)	19.29102*** (0.000)	19.90234*** (0.000)	19.44587*** (0.000)	17.542*** (0.000)

Whether the slope coefficients were homogeneous or heterogeneous for each unit was revealed by the delta test developed by Pesaran and Yamagata (2008). The results of the homogeneity tests are presented in Table 3.

Table 3. Homogeneity Test Results

Tests	Test Statistics
$\tilde{\Delta}$	2.228^{***} (0.013)
$\tilde{\Delta}_{adj}$	2.354^{***} (0.009)
Note: *** indicates the significance level of 1%.	

According to the results of the homogeneity tests, the null hypothesis that "Slope Coefficients are Homogeneous" was rejected at a significance level of 1%. Therefore, it was concluded that the slope coefficients were heterogeneous.

Since there was a cross sectional dependence in the variables, the CADF and CIPS unit root tests developed by Pesaran (2007) were applied to test the stationarity of the series. The results obtained are presented in Table 4.

Table 4. Panel Unit Root Test Results

Countries	lngdp	Δlngdp	lnexp	Δlnexp	lnimp	Δlnimp
Brazil	-0.166	-3.317	0.764	-11.199	-1.793	-4.704
Russia	-2.759	-3.911	-2.396	-7.376	-1.398	-5.332
India	-0.021	-3.776	-0.299	-5.039	-0.582	-2.839
China	-2.374	-2.661	-2.630	-3.482	-0.966	-3.113
South Africa	-3.559	-4.110	-1.627	-7.336	-3.207	-5.201
Turkey	-2.236	-4.117	-2.960	-3.043	-2.302	-3.820
CIPS	-1.821	-3.649^{**}	-1.779	-6.246^{***}	-1.708	-4.168^{***}

Note: The CIPS statistic is the average of the CADF values. The values in Table 2b in the study of Pesaran (2007) were taken as the reference critical values of CIPS statistics. The critical values were taken as -2.57, -2.33 and -2.21, respectively, for a significance level of 1%, 5% and 10% in model. ***,***, * indicate the significance levels of 1%, 5% and 10%, respectively.

According to the panel unit root test result, all variables were stationary at the I(1) level at their first differences. Therefore, since the series are I(1), it is possible to analyze the cointegration relationship in

these series. The results of the Westerlund and Edgerton (2007) panel cointegration test are presented in Table 5.

Table 5. Results of the Westerlund and Edgerton (2007) Panel Cointegration Test

LM-Statistics	Asymptotic P-Value	Bootstrap P-Value
0.832	0.203	0.995
Note: Bootstrap probability values were obtained from 10.000 repetitive distributions. Asymptotic probability values were obtained from the standard normal distribution. The delay and premise were taken as one. The fixed model was used.		

Since there was a cross sectional dependence in the model, the Bootstrap probability value from the cointegration test results was taken into account. According to the results of the LM Bootstrap cointegration test developed by Westerlund and Edgerton (2007), "there is cointegration" null hypothesis that "there is a cointegration" could not be rejected at a significance level of 1%. Therefore, there was a cointegration relationship between the variables.

After it was determined that the series were cointegrated in the long term by the Westerlund and Edgerton (2007) panel cointegration test, the parameter coefficients of the cointegrated relationship were estimated using the AMG estimator. The AMG estimator developed by Eberhardt & Teal (2010, 2011) takes into account the cross sectional dependence and is an estimator that allows heterogeneity. The results obtained with the AMG estimator are presented in Table 6. According to the results obtained across the panel, export and import had a statistically significant and positive effect on economic growth. According to country-based results, while export had a statistically significant and negative effect on economic growth in Brazil, it had a statistically significant and positive effect on economic growth in India. In Brazil, Russia, China and Turkey, import had a statistically significant and positive effect on economic growth.

Table 6. AMG Estimator Results

Countries	Cons.	P-Value	lnexp	P-Value	lnimp	P-Value
Brazil	14.013***	0.000	-0.199***	0.012	0.745***	0.000
Russia	5.519***	0.001	0.145	0.340	0.705***	0.000

India	13.268***	0.000	1.016***	0.001	-0.452	0.118
China	8.897***	0.000	0.335	0.140	0.407*	0.083
South Africa	12.791***	0.000	0.156	0.599	0.386	0.121
Turkey	6.209***	0.000	0.232	0.190	0.581***	0.002
Panel	10.116***	0.000	0.281*	0.087	0.395**	0.028
Note: ***, **, * indicate the significance levels of 1%, 5% and 10%, respectively.						

The causality relationship between the variables was investigated with the panel causality test developed by Emirmahmutoğlu and Köse (2011). Table 7 shows the results on the causality test between export and economic growth. According to the results obtained, across the panel, the null hypothesis that "lnexp is not the cause of lngdp" was rejected at a significance level of 5%, and the null hypothesis that "lngdp is not the cause of lnexp" was rejected at a significance level of 1%. Accordingly, a bidirectional causality relationship was found between export and economic growth. On a country basis, the null hypothesis that "lnexp is not the cause of lngdp" for Russia was rejected at a significance level of 10%. For India, the null hypothesis that "lngdp is not the cause of lnexp" was rejected at a significance level of 5%. A unidirectional causality relationship from export to economic growth and a unidirectional causality relationship from economic growth to export were found in Russia and India, respectively. No causality relationship was found between the variables for Brazil, China, South Africa and Turkey.

Table 7. Causality Relationship Between Export and Economic Growth

Countries	Lag	lnexp → lngdp		lngdp → lnexp	
		Wald	P-Value	Wald	P-Value
Brazil	3	2.500	0.475	5.053	0.168
Russia	3	6.447*	0.092	0.564	0.905
India	2	0.223	0.894	6.751**	0.034
China	2	0.192	0.909	3.160	0.206
South Africa	2	1.703	0.427	4.097	0.129
Turkey	1	1.735	0.188	0.361	0.548
Panel Fisher		11.727**	0.050	18.979***	0.011

Note: ***, **, * indicate the significance levels of 1%, 5% and 10%, respectively.

Table 8 includes the test results on the causality relationship between import and economic growth. According to the results, the null hypothesis that “lngdp is not the cause of lnimp” was rejected at a significance level of 1% across the panel. However, the null hypothesis that "lnimp is not the cause of lngdp" could not be rejected. Therefore, there was a unidirectional causality relationship from economic growth to import. According to country-based results, the null hypothesis that "lngdp is not the cause of lnexp" was rejected at a significance level of 10% for Brazil and 5% for South Africa. A unidirectional causality relationship from economic growth to import was found in the relevant countries.

Table 8. Causality Relationship Between Import and Economic Growth

Countries	Lag	lnimp → lngdp		lngdp → lnimp	
		Wald	P-Value	Wald	P-Value
Brazil	1	0.724	0.395	2.778*	0.096
Russia	3	1.833	0.608	5.576	0.134
India	3	1.939	0.585	5.522	0.137
China	1	1.929	0.165	1.076	0.300
South Africa	2	0.730	0.694	6.987**	0.030
Turkey	1	0.390	0.532	0.032	0.859
Panel Fisher		9.523	0.269	22.385***	0.009

Note: ***, **, * indicate the significance levels of 1%, 5% and 10%, respectively.

The test results of the causality relationship between export and import are presented in Table 9. According to the results, there was a bidirectional causality relationship between export and import across the panel. According to country-based results, the null hypothesis that "lnexp is not the cause of lnimp" and the null hypothesis that "lnimp is not the cause of lnexp" were rejected at significance levels of 10% and 1%, respectively, for Brazil. Accordingly, there was a bidirectional causality relationship between export and import in Brazil. However, only the null hypothesis that "lnexp is not the cause of lnimp" was rejected at a significance level of 5% for Russia. Therefore, there was a unidirectional causality relationship from export to import in Russia.

Table 9. Causality Relationship Between Export and Import

Countries	Lag	lnexp → lnimp		lnimp → lnexp	
		Wald	P-Value	Wald	P-Value
Brazil	3	6.446*	0.092	11.823***	0.008
Russia	3	8.116**	0.044	2.886	0.410
India	2	1.714	0.424	0.039	0.981
China	1	0.026	0.871	2.316	0.128
South Africa	1	1.109	0.292	0.166	0.683
Turkey	1	0.542	0.462	0.919	0.338
Panel Fisher		17.032**	0.020	18.521***	0.009

Note: ***, **, * indicate the significance levels of 1%, 5% and 10%, respectively.

5.CONCLUSION

In the study, the relationship between export, import and economic growth in BRICS-T countries was investigated using the annual data for the period 1990-2018. The coefficients in the econometric model were estimated using the AMG estimator. According to the results obtained across the panel, export and import had a statistically significant and positive effect on economic growth. According to country-based results, while export had a statistically significant and negative effect on economic growth in Brazil, it had a statistically significant and positive effect on economic growth in India. In Brazil, Russia, China and Turkey, import had a statistically significant and positive effect on economic growth. No statistically significant result could be obtained for South Africa.

Emirmahmutoğlu and Köse (2012) panel causality test was applied to determine the direction of the relationship between the variables. According to the causality relationship between export and economic growth, both GLE and ELG hypothesis were valid on a panel basis. Therefore, according to this result, countries earn high incomes through exports, and on the other hand, they invest in producing re-export goods with the income they earn. According to country-based results, it was determined that the ELG hypotheses in Russia and the GLE hypotheses in India were valid. No statistically significant relationship was found for other countries.

According to the causality relationship between import and economic growth, the GLI hypothesis was valid both in the panel and in Brazil and South Africa. Accordingly, the demands of countries that increased their GDP performance, which is an important indicator of purchasing power,

for imported goods also increased. Therefore, it may be possible to explain this result with the inadequacy of countries' domestic production performance. No statistically significant relationship was found for other countries.

According to the causality relationship between export and import, there was a bidirectional causality relationship between the variables on a panel basis. Accordingly, it can be stated that BRICS-T countries used imported inputs in exports, and consequently, the goods produced were re-exported. According to country-based results, a bidirectional causality relationship was found between export and import for Brazil. However, only unidirectional causality relationship from export to import was found for Russia. No statistically significant relationship was found for other countries.

REFERENCES

Ahmed, A. D., Cheng, E., & Messinis, G. (2011). The Role of Exports, FDI and Imports In Development: Evidence From Sub-Saharan African Countries. *Applied Economics*, 43(26), 3719-3731.

Awokuse, T. O. (2008). Trade Openness and Economic Growth: Is Growth Export-Led or Import-Led?. *Applied Economics*, 40(2), 161-173.

Bahmani-Oskooee, M. & Alse, J. (1993). Export Growth and Economic Growth: An Application of Cointegration and Error-Correction Modeling. *The Journal of Developing Areas*, 27(4), 535-542.

Bahramian, P., & Saliminezhad, A. (2020). On The Relationship Between Export and Economic Growth: A Nonparametric Causality-In-Quantiles Approach For Turkey. *The Journal of International Trade & Economic Development*, 29(1), 131-145.

Bakari, S. (2017). The Three-Way Linkages Between Export, Import and Economic Growth: New Evidence from Tunisia.

Bakari, S., Fakraoui, N., & Tiba, S. (2019). Domestic Investment, Export, Import and Economic Growth in Brazil: An Application of Vector Error Correction Model, *MPRA Paper No. 95528.*

Bakari, S., & Mabrouki, M. (2017). Impact of Exports and Imports On Economic Growth: New Evidence from Panama. *Journal of Smart Economic Growth*, 2(1), 67-79.

Balassa, B. (1978). Exports and Economic Growth: Further Evidence. *Journal of Development Economics*, 5(2), 181-189.

Çetintaş, H., & Barişik, S. (2009). Export, Import and Economic Growth: The Case Of Transition Economies. *Transition Studies Review*, 15(4), 636-649.

Dar, A. B., Bhanja, N., Samantaraya, A., & Tiwari, A. K. (2013). Export Led Growth or Growth Led Export Hypothesis in India: Evidence Based on Time-Frequency Approach. *Asian Economic and Financial Review*, 3(7), 869.

Eberhardt, M., & Teal, F. (2010). Productivity Analysis in Global Manufacturing Production. Economics Series Working Papers. *University of Oxford.*

Elbeydi, K. R., Hamuda, A. M., & Gazda, V. (2010). The Relationship Between Export and Economic Growth in Libya Arab Jamahiriya. *Theoretical and Applied Economics*, 1(1), 69.

Emirmahmutoğlu, F. & Köse, N., (2011). Testing for Granger Causality in Heterogeneous Mixed Panels. *Economic Modelling*, 28: 870-876

Fannoun, Z. & Hassouneh, I. (2019). The Causal Relationship Between Exports, Imports and Economic Growth in Palestine. *Journal of Reviews on Global Economics*, 8, 258-268.

Fosu, A. K. (1990). Exports and Economic Growth: The African Case. *World Development*, 18(6), 831-835.

Gül, E., & Kamacı, A. (2012). Dış Ticaretin Büyüme Üzerine Etkileri: Bir Panel Veri Analizi. *Journal of Alanya Faculty of Business/Alanya İşletme Fakültesi Dergisi*, 4(3).

Hamdan, B. S. (2016). The Effect of Exports and Imports on Economic Growth in The Arab Countries: A Panel Data Approach. *Journal of Economics Bibliography*, 3(1), 100-107.

Hye, Q. M. A. (2012). Exports, Imports and Economic Growth in China: An ARDL Analysis. *Journal of Chinese Economic and Foreign Trade Studies.*

Islam, M. N. (1998). Export Expansion and Economic Growth: Testing for Cointegration and Causality. *Applied Economics*, 30(3), 415-425.

Kılavuz, E., & Altay Topçu, B. (2012). Export and Economic Growth in The Case Of The Manufacturing Industry: Panel Data Analysis Of Developing Countries. *International Journal of Economics and Financial Issues*, 2(2), 201-215.

Koçyiğit, A., Bayat, T., Kayhan, S., & Şentürk, M. (2015). Short and Long Term Validity of Export-Led Growth Hypothesis in BRICS-T Countries: A Frequency Domain Causality Approach. *Stud*, 4(3).

Manzoor, W., & Safdar, N. (2020), Export Led Growth Hypothesıs And Import Led Growth Hypothesıs, Whıch Is True For BRIC Countries?, *EPRA International Journal of Research and Development (IJRD)*, 5(3), ISSN: 2455-7838(Online).

Michaely, M. (1977). Exports and Growth, *Journal of Development Economics 4*, no.1 (March) 49-53

Mishra, V., Sharma, S. S., & Smyth, R. (2010). Is Economic Development In the Pacific Island Countries Export Led or Import Led?. *Pacific Economic Bulletin*, 25(1), 46-63.

Pesaran, M. H. (2007). A Simple Panel Unit Root Test in The Presence of Cross-Section Dependence. *Journal of Applied Econometrics*, 22(2), 265-312.

Pesaran, M. H., & Yamagata, T. (2008). Testing Slope Homogeneity in Large Panels. *Journal of Econometrics*, 142(1), 50-93.

Ram, R. (1985). Exports and Economic Growth: Some Additional Evidence. *Economic Development and Cultural Change*, 33(2), 415-425.

Ramos, F. F. R. (2001). Exports, Imports, and Economic Growth in Portugal: Evidence from Causality and Cointegration Analysis. *Economic Modelling*, 18(4), 613-623.

Rani, R., & Kumar, N. (2018). Is There an Export-Or Import-Led Growth in BRICS Countries? An Empirical Investigation. *Jindal Journal of Business Research*, 7(1), 13-23.

Sharma, S. S., & Smyth, R. (2009). "Is Economıc Growth Export-Led or Import-Led In The Pacıfic Island Countrıes? Evıdence from Panel Data Models.", *Development Research Unit Discussion Paper DEVDP 09-15*.

Temiz Dinç, D., & Gökmen, A. (2019). Export-Led Economic Growth and The Case of Brazil: An Empirical Research. *Journal of Transnational Management*, 24(2), 122-141.

Thirunavukkarasu, V., & Achchuthan, S. (2014). Export, Import and Economic Growth: Evidence from Sri Lanka. *Journal of Economics and Sustainable Development*, 4(9), 147-155.

Turan, G., & Karamanaj, B. (2014). An Empirical Study on Import, Export and Economic Growth in Albania. *Academic Journal of Interdisciplinary Studies*, 3(3), 428.

Westerlund, J., & Edgerton, D. L. (2007). A Panel Bootstrap Cointegration Test. *Economics Letters*, 97(3), 185-190.

World Bank (2020), World Bank Development Indicators, https://databank.worldbank.org/source/world-development-indicators.

CHAPTER V

INTERACTION OF FORMAL AND INFORMAL INSTITUTIONS AND THE ECONOMIC RESULTS: A GAME THEORETICAL ANALYSIS

Yıldırım Beyazıt Çiçen[1]

[1]*(Asst. Prof.), Gümüşhane University, ,e-mail: ybcicen@gumushane.edu.tr*

000-0002-3425-280X

1. INTRODUCTION

Institutions are the rules of the game. Rules define how the game is to be played (North, 1990:3). Through these rules and restrictions, political, economic and social interaction between people is regulated. According to Rodrik (2000), institutions are a set of humanely determined behavioral rules. The most important function of institutions is to reduce uncertainty by providing a stable structure between individuals. It does this by determining the preference sets of individuals through institutional constraints. To take advantage of the opportunities that emerge at this point, organizations are also formed. Institutions may be formal as well as informal. Institutions may be formal as well as informal. In the development of differences between countries, recent literature points to the importance of institutions, institutional structure, and institutional change. In this area, important work has been done by scholars such as Ronald H. Coase, Douglass C. North, Olivier E. Williamson, Elinior Ostrom, Oliver Hart, Bengt Holmström, Dani Rodrik, Daron Acemoglu, James A. Robinson, Geoffrey M. Hodgson and Claude Menard. Detailed and complex issues such as transaction costs, property rights, contracts, limited rationality, and organization theory are included and resolved in this area. It should be noted that, in every culture, institutions are not of the same quality. Since playing a game well relies not on players but on well-formed rules (Brennan and Buchanan, 1985:150).

First, the definition, features and impacts of formal and informal institutions will be stated in this report. In the next subject, institutional change is clarified, including formal and informal institutions. Then, under a different title, the interaction and economic consequences of formal and informal institutions are discussed in depth. The game is explained here with a theoretical understanding of the structures of the state (Shackled, Despotic, Absent and Paper Leviathan) that occur when there are strong formal institutions (state) and informal institutions (society). The economic

consequences of these systems are then clarified and presented as a table. In the conclusion portion, general assessments and recommendations are discussed.

2. FORMAL INSTITUTIONS

Formal (external) institutions, such as constitutions, laws, and legislation, consist of written rules. Political, economic rules and contracts are included in these institutions (North, 1990:47). Depending on the versatility of institutions, formal rules may be altered easily. The basic decision-making structure and supervisory characteristics of the state are narrowly defined by political rules, while economic rules describe property rights (North, 2005:1). These rules play a crucial role in the economic success of the country concerned, because the rules laid down by the state regulate and broaden the economic behavioral interests of society and firms.

Formal institutions are created by society consciously. The main aim of this is to eliminate contract ambiguity and lower the cost of transactions. Security of property rights and contract enforcement are essential aspects of the effectiveness of the market. In this way, with the transparency and openness to be generated in the real world markets, the opportunity is prepared for the establishment of organizations (North, 1993:12). Companies will not be able to generate ample incentives to produce if a market has high transaction costs and incomplete contracts, and the level of trade will thus decrease (Williamson, 2002:172).

The state lies behind formal institutions' sanctioning power. Economic entities that breach the laws are disciplined by bureaucratic institutions such as the police and the courts. At this point, a central role is played by the judicial body which, on behalf of society, performs the judicial function of the state. If breaches are not punished quickly and equally, there will be a drop in market trust in formal institutions. In this scenario, societies, based on norms, will establish their own courts. There is no predictability in societies where laws do not rule. The arbitrary actions of the rulers in such societies can not be avoided. In this case, it is not possible to identify and enforce property rights well. The audit and control systems in the administration should be operational and political power should be distributed to diverse social segments in order to prevent such problems. Thus, countries' long-term growth rates can be boosted (Acemoglu, 2005:950-951). However, in order to set up the audit and control mechanisms listed, administrative expenses (political transaction costs) are required. In addition to these positive transaction costs, these institutions can not be structured perfectly and their efficiency is not complete, because formal rules contain a lack of knowledge (Aktan and Aktan, 2019:74). It is necessary to balance state power with the power of society for this reason.

3. INFORMAL INSTITUTIONS

Religion, social sanctions, taboos, rituals, customs and codes of conduct consist of informal (internal) institutions. Informal institutions are value judgments that represent society's culture in general and are defined laws that have spontaneously evolved over time within society (North, 1991:97). Informal institutions, norms by their own description, are, according to Posner (1997:1), a set of rules that have not been proclaimed by an official source, such as a legislator, and are not threatened by legal penalties, but are still routinely followed. It is not possible to specifically describe informal institutions as formal institutions. Unwritten guidelines are included in the material of this definition. The dominant perceptions, historical accumulations and current collection of values in society represent these institutions. Informal structures are more resistant to change and are sticky because they are determined through tradition, history, and codes of conduct and evolve over time (North, 1990:36).

There is a broader sphere of power in informal institutions than formal institutions, and they are passed on from generation to generation. These cultural institutions also provide us with knowledge on the progress of the path of historical transition. As informal constraints remain indefinitely in society, institutions are continuous (North, 1994:360).

From society to society, the sanctioning power of informal institutions can vary. The conduct patterns of society, faith, tradition and custom are the basis of sanctioning power. Although individuals, as a consequence of their preferences, are not subject to sanctions by formal institutions, sanctions can be imposed by informal institutions. For instance, if a individual acts improperly for society, they may be condemned, excluded from society, or lose their reputation (Aktan and Aktan, 2018:78).

4. INSTITUTONAL CHANGE

The process of institutional change, which requires the functioning of formal and informal institutions, consists of four stages. The stages are shown in Figure 1 and the descriptions of the stages are as follows (Williamson, 2000:596-600):

- The first stage is informal institutions. These institutions are formed spontaneously over a long period of time, such as 100-1000 years, and the transition is very gradual. Due to the very long-term phase of transition, this period reflects social settlement in institutional change. This step is known as Social Theory.
- Formal institutions are the second stage and are defined as the institutional setting. Written legislation such as constitution, laws and regulations are at this point defining the meanings and

punishments relating to property rights and contract laws. At this point, essential prerequisites for the effective distribution of resources and economic efficiency will be fulfilled if the definition and enforcement of property rights is successfully realized. The period of transition is between 10-100 years for these institutions. This step is called Economics of Property Rights and Positive Political Theory.

- The third stage is the stage in which the institutional environment created in the second stage is transformed into institutions of governance. The emphasis at this point is on contractual relationships that were ignored in the previous stage. These structures of contract-based governance typically last from 1-10 years. At this point, in addition to production costs during the game, contractual arrangements trigger transaction costs. For this reason, this step is defined as Transaction Costs Economics.
- The fourth stage is the phase where neoclassical economics functions. Resource allocation and employment are determined at this stage. The price and output levels in the market are constantly changed with the aid of the rules that emerged in the previous stages. At this stage, rather than contractual ties, the firm is defined as a production function. The principal-proxy question occurs in accordance with this.

As can be seen from Figure 1, formal and informal institutions interact with each other continuously. The relationship between these institutions and their economic consequences are discussed in the next issue.

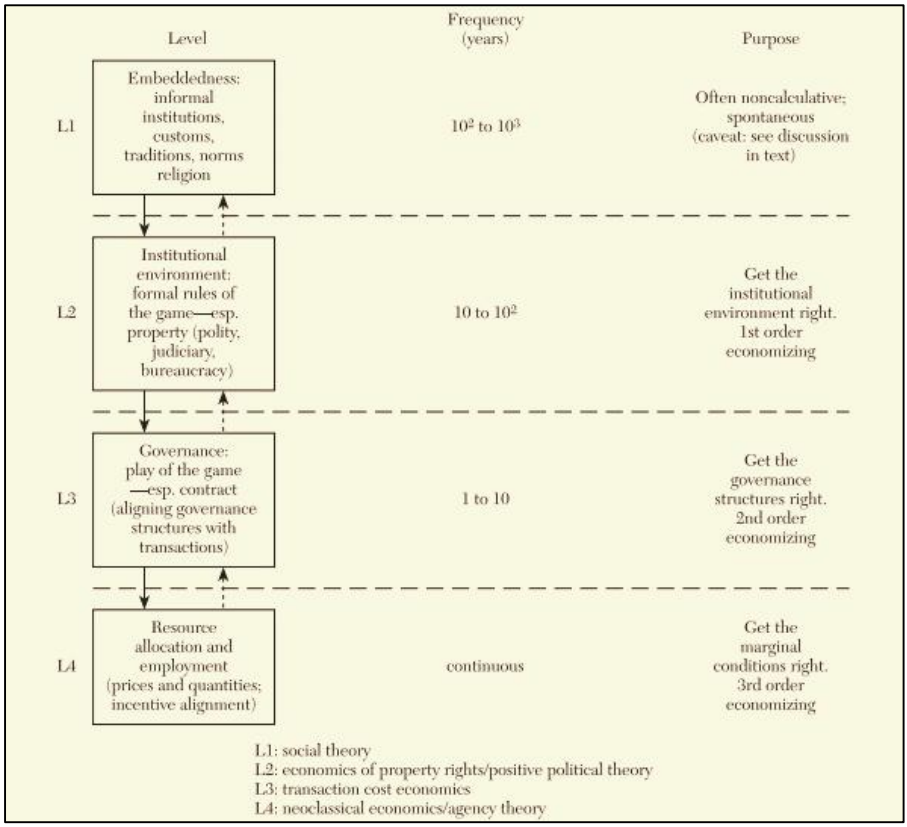


Figure 1: Formal and Informal Institutions in the Institutional Change Process

Source: Williamson, 2000:597.

5. INTERACTION OF FORMAL AND INFORMAL INSTITUTIONS AND ITS ECONOMIC CONSEQUENCES

Formal and informal institutions interact with each other actively. This mutual interaction is a fundamental factor which influences economic stability and growth rates. Since the alignment between institutions avoids limiting the effect on growth rates by reducing positive transaction costs (Pejovich, 1999:166; North, 1994:360). Informal institutions are as important as formal institutions for long-term economic performance. Because informal institutions can influence the economic interests of individuals in society as well. The structure of property rights and the rule of law are important, however, according to the North, more efficient economies can be established by societies that make up economic policy by taking account of informal institutions (North, 1998:553). Again, according to Acemoglu and Robinson, individuals can avoid much of the

negative effects of bad legal laws by developing informal rules (2005:984). Informal institutions are, however, difficult to quantify and, for this reason, informal institutions can not always be used for research purposes. In some cases, informal institutions carry out tasks that are obstructing freedoms and economic growth. Acemoglu and Robinson call these informal institutions 'the cage of norms' (2020:39). As a consequence, it depends on the inclusion of informal institutions in the model to make economic performance more understandable (Voigt, 2016:12).

On the other hand, economic output would be adversely affected if the institutional structure consisting of formal and informal structures does not work effectively. We encounter disagreements in social-state relations if disputes are encountered in the implementation areas of formal and informal institutions. These two institutions, for example, as shown in Figure 1, are established at various stages and at different rates of change. When formal institutions evolve rapidly over some periods of time, the trust of society in these rules decreases and informal institutions in these societies can gain weight. Therefore, legal rules are expected to be in harmony with changing social rules (Kama, 2016:22).

One of the implications of this dispute is that from time to time, formal and informal institutions are incompatible on an issue and they implement contradictory decisions. For instance, a behavior prohibited by law can be encouraged by tradition. Examples of this include feuds, individual armament, a ban on headscarves and violence against women banned by the state in Turkey. In addition, as an example that is not prohibited by the law, abortion is not traditionally welcomed and is not allowed.

Considering the example of feuding in Turkey, this tradition goes back to ancient times and is mainly observed in rural areas. Vendetta is described as “a state of mortal conflict caused by a sense of revenge in societies where family relations are close, lasting with retribution with mutual killings" (Cengiz, 2003:62). In addition to the lack of effective political power, there is a tribal system that provides a favorable atmosphere for blood feuds among the continuing causes of blood feuds. These tribes are in themselves a form of organization and it is decided by the tribal administrators who will take responsibility during the processes of blood feud. The tribes here, as a result, prefer the informal method of punishment to the formal method of punishment. Thus, the family's reputation and integrity are assumed to be preserved (Okten, 2010:176). It is clear that the continuation of such a ceremony would have economically adverse effects in the region concerned. As a solution, by increasing the state's control, the cage of norms should be broken. This will re-establish the balance between the state and the power of society (Acemoglu and Robinson, 2020:37-39). At this point, however, the cost of adjusting,

sustaining and changing the political organization of the formal and informal institutions of the state would increase the political transaction costs (Cicen, 2018:187).

The ban on headscarves introduced in the late 1990s is another significant example of contradictions between formal and informal institutions in Turkey. Under its regulations, the state did not allow staff of official institutions and university students to wear headscarves. The headscarf was seen and banned in public as a sign of political Islam. The 1982 Constitution and the 28 February procedure are based on these prohibitions (Toruk, 2011:486-487). But when you look at the position of the headscarf in the Islamic religion, Surah Nur 31. in the verse, "let women tie their headscarves over their collars" is an obligation to wear their headscarves[1]. Again, Surah Ahzab 59. a similar suggestion is seen in his verse. The issue of the headscarf has remained on the agenda for several years as an important issue that cannot be solved, and urgent issues such as the Kurdish dilemma, the economic crisis and structural reforms should be tackled by the state have not been solved. Discussions on the solution of the problem have created areas of tension and discord in society (Baskan, 2009:109). This issue spread to the wife of Abdullah Gul, who was elected President in 2007. In April 2007, after a memorandum was published on the website, a military coup was attempted, an investigation was launched in the Constitutional Court concerning the closure of the AK Party and the ban on politics of 71 deputies, including Gul. Between the party and the military-bureaucratic system, mutual polarization has grown. With the approval of the constitutional amendment made in 2010 in the referendum, the headscarf issue was resolved in the public sector and universities over the years (Akyuz, 2016:80).

At this point, in the Narrow Corridor Book of Acemoglu and Robinson, important concepts and solutions concerning the harmony and incompatibility of formal and informal institutions have been created. There is a need for the state and rules, that is, formal institutions, in order to establish freedoms, according to the authors. This alone, however, is not sufficient. Since, by regulating the economy, society must grow at the same time. In this context, society needs to engage in politics, to protest when necessary and, through elections, to overthrow the government. The narrow corridor where freedoms are created by balancing the state and society's power and providing the Shackled Leviathan is shown in Figure 2 (Acemoglu and Robinson:15-16).

[1] https://kuran.diyanet.gov.tr/tefsir/N%C3%BBr-suresi/2822/31-ayet-tefsiri - Date of access: 16.10.2020

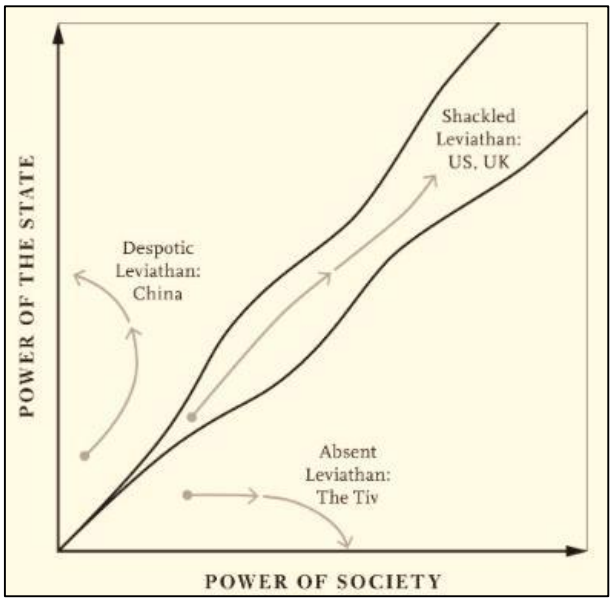


Figure 2: The Evolution of Despotic, Shackled and Absent Leviathan
Source: Acemoglu and Robinson, 2020:89

The disparity of society or state power leads us to the Leviathan of Despotic or Absent. The power of the state depends on the strength of the political and economic elite and the power and capacity of the institutions of the state. As the state's power rises in comparison to society's power, the state assumes the form of the Despotic Leviathan and prevents the environment of freedom. Leaders are not supposed to give liberty to the people in a setting where the state and elites are powerful and societies are docile. In this situation, while the state's capacity increases, in time, society becomes unable to cope with the state and society's power dissolves. As a result, the strength of the state against society is immense (Acemoglu and Robinson, 2020:37-43).

The cage of norms (informal institutions) in societies generates unequal social relations by strict rules and harsh forms of domination in Absent Leviathan. A state that enforces laws, controls violence, settles conflicts and provides public services is required at this stage, but is also governed by society. "Shackled Leviathan" is the name for this state structure. When a balance is struck between the power of the state and the capacity of civil society to control it, The Shackled Leviathan emerges. As they think they can oversee, trust, and cooperate, people allow this Leviathan to increase its capacity. Thus, by cracking the cage of various forms of standards in society, freedoms are extended (Acemoglu and Robinson, 2020:45-48). The balanced growth of the state and society over time and the execution of this fine balance would mean the extension of

freedoms, as well as the increase of economic prosperity and ensuring political progress (Acemoglu and Robinson, 2020:97-98).

As stated, the fact that formal and informal institutions are strong or dominant at different levels creates harmony or disharmony between these institutions. The structures of the Leviathan established in this case are summarized with a game-theoretical understanding in Table 1:

Table 1: Leviathans Emerging in the Interaction of Formal and Informal Institutions[2]

		Society: Informal Institutions	
State: Formal Institutions		*Strong*	*Weak*
	Strong	Shackled Leviathan	Despotic Leviathan
	Weak	Absent Leviathan	Paper Leviathan

Source: It was prepared by the author, using the book of Acemoglu and Robinson (2020).

In Table 1, four different situations appear. The Shackled Leviathan emerges if both formal and informal institutions are strong. The power of informal institutions is not, here, the cage of norms that limit the freedoms referred to in Acemoglu and Robinson (2020). It is the power of informal institutions to be strong, to function collectively in a way that complements formal institutions and to influence the state. For sustained economic development, the Shackled Leviathan is the ideal state structure. In the Shackled Leviathan, investment levels will be high, as property rights are protected and very large-scale economic opportunities are developed. To sum up, in this system, inclusive economic institutions are created, assisted by inclusive political institutions.

The second case is Despotic Leviathan. At this stage, formal institutions dominate informal institutions and state capacity is high. However, freedoms are constrained and society is suppressed. There may also be growth in the Despotic Leviathan structure, but the economic prosperity growth here is both limited and rife with inequalities. Despotic Leviathan can also protect property rights and people's investments, but it is much more concerned with enforcing high taxes and monopolizing resources. In this structure, the property rights of the managers and their close circle are guaranteed, but this assurance is not valid for ordinary indiviuals.

[2] Formation, details and country examples of Leviathan species mentioned in the table can be found in Acemoglu and Robinson (2020).

The third stage is the Absent Leviathan, where there are weak formal institutions, but strong informal ones. There is a state, but its capacity is extremely poor. The cage of norms emerges in this situation. The role of laws is taken over by norms. In society, divisions happen. The willingness to behave collectively hinders this situation and causes disparity within society. The resulting cage of norms leads to economic opportunities that are often restricted for all. People are forced to work for low wages in such countries. In South Africa 's early and recent times, both of these characteristic ideals are seen and these countries are in poverty. In these countries, economic growth does not occur.

The stage we can express, eventually, is the Paper Leviathan. In this structure, which is typical in Latin America , Africa and other parts of the world, both formal and informal institutions are powerless. States are also abused by such state systems. The state is not interested in citizens' welfare and freedoms, since it lacks the resources to do so. Neither does the cage of norms aim for liberation. Economic prosperity turns into a tragedy in such a situation. As the consequences of this stage, the economy grows so little, is steeped in corruption and is inefficient, It is appropriate to expect economic growth and liberty for a long time (Acemoglu and Robinson, 2020).

Finally, the stage we can express is the Paper Leviathan. Both formal and informal institutions are powerless in this structure, which is common in Latin America, Africa and other parts of the world. Such state structures are often exploited states. The state is not interested in the welfare and freedoms of citizens because it lacks the capacity to do so. The cage of norms also does not strive for emancipation. In such a situation, economic prosperity turns into a disaster. The results of this stage come across as an economy that grows very little, is steeped in corruption and is inefficient. Economic prosperity and freedom must be expected for a long time (Acemoglu and Robinson, 2020).

As a consequence, economic growth and prosperity are determined by the interaction of formal and informal institutions. These economic findings are summarized in Table 2:

Table 2: Economic Results in the Interaction of Formal and Informal Institutions

		Society: Informal Institutions	
		Strong	*Weak*
State: Formal Institutions	*Strong*	Continuous growth and economic prosperity (a,b)	Limited growth and economic inequalities within society (c,d)
	Weak	Lack of economic growth and intra-social economic inequalities (e,f)	Total lack ofeconomic prosperity (g,h)

Source: It was prepared by the author, using the book of Acemoglu and Robinson (2020).

A generalization in terms of economic returns can be made in Table 2, as a > c > e > g and b > d > f > h. The Nash equilibrium would therefore display the Shackled Leviathan in such a scenario, which ensures continued growth and economic prosperity. In the real world, however, this order is not common (Acemoglu and Robinson, 2020:16). As is understood from Game Theory, the levels of gain corresponding to these strategies will vary as a result of the strategies (whether they are strong or weak) that the set of players (state and society) will select. The equilibrium can therefore take place at various point or points. In the Prisoners Dilemma, for example, while the related criminals can receive less jail terms, due to the tactics they select, their punishments are greater in the Nash equilibrium. Since the forces of each country in the state and social structures are different, the strategies to be selected will change according to the benefits to be obtained and the equilibrium of the Nash may vary by country.

6. CONCLUSION

In the economic performance of countries, institutions play a deciding role. Institutions are categorized as institutions that are formal and informal. Economic decisions and outcomes are influenced by both institutions. These institutions are, meanwhile, in continuous contact with each other. Such institutions may be complimentary to each other or they can be in conflict. This situation shows various structures of the state (Leviathan) and each structure's economic output varies from each other. It is the balance between the strengths of the desired formal and informal institutions and the creation of the Shackled Leviathan. Therefore, the narrow corridor will be entered, the field of liberty will extend, economic development will achieve continuity and economic well-being will

improve for the whole of society in an equitable way. These positive results in terms of democracy and economic growth can not be accomplished by other Leviathan forms.

In the early 2000s, Turkey had the opportunity to enter the narrow corridor. With the support of the accession process of the European Union, the AK Party carried out significant reforms. Compared to previous years, the average rate of growth after 2002 up to the global crisis phase is high and constant. This rise in economic growth has benefited all segments of society. But there was no access to this narrow corridor that would extend Turkey's freedoms and keep its economy growing.

Studies in the literature on the influence of institutions on economic performance are primarily carried out by formal institutions. Informal institutions, however, have positive or negative impacts on economic growth as well. But the number of studies on this topic is limited. Informal institutions are complicated since several subheadings are included like religion, tradition, customs, and behavioral rules. Each country's informal institutional institutions is also distinct. For this purpose, studies examining countries or subheadings relating to informal institutions would make considerable contributions to the literature and will be able to clarify more precisely how countries are determining their economic output.

REFERENCES

Acemoglu, D., & Johnson, S. (2005). Unbundling Institutions. *Journal of Political Economy*, 113(5), 949-995.

Acemoglu, D., & J. A. Robinson. (2020). *Dar Koridor: Devletler, Toplumlar ve Ozgurlugun Gelecegi*. Istanbul: Dogan Kitap.

Aktan, C. C., & Aktan, S. C. Organizasyonlar ve Kurumlar: Kurallar ve Kurumlarin Rolu, Fonksiyonlari ve Onemi. *Organizasyon ve Yonetim Bilimleri Dergisi*, 11(1), 65-82.

Akyuz, I. (2016). Turkiye'de Dislayici Laiklikten Pasif Laiklige Gecis Surecinde Basortusu Yasaginin Kaldirilmasi. *Electronic Turkish Studies*, 11(7).

Baskan, B. (2009). Basortusu Sorunu ve Mesrulastirilamayan Yasakcilik. *Liberal Dusunce Dergisi*, (55), 109-134.

Cengiz, R. (2003). Kan Davasinin Toplumsal Deger ve Normlar Acisindan Sosyolojik Gorunumu: Tokat/Erbaa Ornegi. *Sosyolojik ve Hukuksal Boyutlariyla Tore ve Namus Cinayetleri Uluslararasi Sempozyumu* (Ed. Atalay Ulug). Diyarbakir: Akader.

Cicen, Y. B. (2018). Islem Maliyetinin Tanimlari: Bir Literatur Taramasi. In *Muhasebe, Finans ve Iktisadi Arastirma Ornekleri* (Ed. Ali Acaravci). Nobel Yayınevi, Ankara, 183-190.

Brennan, G. & Buchanan, J. M. (1985). *The Reason of Rules: Constitutional Political Economy*. Cambridge: Cambridge University Press.

Kama, O. (2016). Kurumlar, Kurallar ve Buyume Iliskisi Uzerine. *Iktisat ve Toplum*, 64, 20-27.

North, D. C. (1990). *Institutions, Institutional Change, And Economic Performance***.** Cambridge: Cambridge University Press.

North, D. C. (1991). Institutions. *Journal of Economic Perspectives*, 5(1), 97-112.

North, D. C. (1993). Institutions and Credible Commitment. *Journal of Institutional and Theoretical Economics*, 149(1), 11-23.

North, D. C. (1994). Economic Performance Through Time. *The American Economic Review*, 84(3), 359-368.

North, D. C. (1998). The Institutional Foundations of East Asian Development: A Summary Evaluation. In *The Institutional*

Foundations of East Asian Economic Development (pp. 552-560). Palgrave Macmillan, London.

North, D. C. (2005). The Contribution of the New Institutional Economics to an Understanding of the Transition Problem. In *Wider Perspectives on Global Development* (pp. 1-15). Palgrave Macmillan, London.

Okten, S. (2010). Kan Davasi: Kanin Ocu ya da Seref Ugruna Verilen Kolektif Savas. *Ankara Universitesi Dil ve Tarih Fakultesi Antropoloji Dergisi*, Sayi 24.

Pejovich, S. (1999). The Effects of the Interaction of Formal and Informal Institutions on Social Stability and Economic Development. *Journal of Markets & Morality*, 2(2).

Rodrik, D. (2000). Institutions for High-Quality Growth: What They Are and How to Acquire Them?. *Studies in Comparative International Development*, 35(3), 3-31.

Toruk, I. (2011). Turkiye'de Basortusu Sorunu ve Yazili Medyada Sunumu. *Turkiyat Arastirmalari Dergisi*, Volume 30, 483-513.

Voigt, S. (2016). How to Measure Informal Institutions. *Available at SSRN 2748214*.

Williamson, O. E. (2000). The New Institutional Economics: Taking Stock, Looking Ahead. *Journal of Economic Literature*, 38(3), 595–613.

Williamson, O. E. (2002). The Theory of the Firm as Governance Structure: From Choice to Contract. *Journal of Economic Perspectives*, 16(3), 171-195.