E-ISSN 2148-3876

# İktisat Politikası Araştırmaları Dergisi

# Journal of Economic Policy Researches

Cilt / Volume: 11 Sayı / Issue: 1 Yıl / Year: 2024

İstanbul Üniversitesi Ekonomi Politikaları Uygulama ve Araştırma Merkezi
Istanbul University Center for Practice and Research in Economic Policy

İSTANBUL UNIVERSITY PRESS

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
OCAK / JANUARY 2024,
CİLT / VOLUME 11 SAYI / NUMBER 1

**Indexing and Abstracting**

TÜBİTAK-ULAKBİM TR Dizin
RePEc IDEAS
RePEc EconPapers
DOAJ
ERIH PLUS
SOBIAD
EBSCO Business Source Ultimate Cabells Journalytics

**Owner / Sahibi**
Prof. Dr. Ahmet İNCEKARA
İstanbul Üniversitesi, İktisat Fakültesi, İstanbul, Türkiye
Istanbul University, Faculty of Economics, Istanbul, Turkiye

**Responsible Manager / Sorumlu Yazı İşleri Müdürü**
Araş. Gör. Yeşim ERÖNAL
İstanbul Üniversitesi, İktisat Fakültesi, İstanbul, Türkiye
Istanbul University, Faculty of Economics, Istanbul, Turkiye

**Correspondence Address / Yazışma Adresi**
Istanbul University Center for Practice and
Research in Economic Policy, 34452, Beyazıt/İSTANBUL
Türkiye
Phone / Telefon: +90 212 440 00 00
Fax: +90 (212) 520 82 86
E-mail: jepr@istanbul.edu.tr
https://iupress.istanbul.edu.tr/tr/journal/jepr/home

**Publisher / Yayıncı**
Istanbul University Press / İstanbul Üniversitesi Yayınevi
Istanbul University Central Campus,
34452 Beyazit, Fatih / Istanbul - Turkiye
Phone / Telefon: +90 (212) 440 00 00



Yayın dili Türkçe ve İngilizce'dir.
The publication languages of the journal are Turkish and English.

Haziran ve Aralık aylarında, yılda iki sayı olarak yayımlanan uluslararası, hakemli, açık erişimli ve bilimsel bir dergidir.
This is a scholarly, international, peer-reviewed, open-access journal published biannually in June, December.

**Publication Type / Yayın Türü**: Periodical / Yaygın Süreli

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
OCAK / JANUARY 2024,
CİLT / VOLUME 11 SAYI / NUMBER 1

## EDITORIAL MANAGEMENT BOARD / DERGİ YAZI KURULU

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
OCAK / JANUARY 2024,
CİLT / VOLUME 11 SAYI / NUMBER 1

## EDITORIAL BOARD / YAYIN KURULU

İSTANBUL UNIVERSITY PRESS

## EDITORIAL BOARD / YAYIN KURULU

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
OCAK / JANUARY 2024,
CİLT / VOLUME 11 SAYI / NUMBER 1

# CONTENTS / İÇİNDEKİLER

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
OCAK / JANUARY 2024,
CİLT / VOLUME 11 SAYI / NUMBER 1

## CONTENTS / İÇİNDEKİLER

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
OCAK / JANUARY 2024,
CİLT / VOLUME 11 SAYI / NUMBER 1

## INTRODUCTION TO THE SPECIAL ISSUE: OPEN ECONOMY MACROECONOMICS

The JEPR has been thriving since its inaugural issue. I am delighted to be a guest editor for the Journal of Economic Policy Researches at its tenth anniversary. This issue brings about a selection of several articles with good insights and policy recommendations. The summary of these articles has been outlined below. I hope these articles inspire more in-depth research for the researchers and contribute to the literature on applied economics.

The JEPR follows strict rules of academic publishing, which I have observed during my guest editorship. The editorial board initially inspect the manuscripts and then forwards them to the reviewers for a double anonymous review process. I am particularly impressed with the editorial assistantship of the JEPR, which made my job very easy. To this end, I would like to thank Dr Betul Mutlugun. I am also grateful to the founding editor of the JEPR, Prof. Dr. Ahmet Incekara, for giving me this special editorship opportunity.

While each of the five articles presents valuable insights independently, we have endeavored to arrange them in a rough thematic order to enhance coherence and highlight methodological parallels and distinctions. The issue begins with İsmail Hakkı İşcan and Tuğba Demirel's study which explores the Kuznets, Financial Kuznets, and Stolper-Samuelson hypotheses' complexities. Through analyzing data from 19 developing and 22 developed economies (2002-2019), they uncover distinct patterns in the relationship between economic factors and income inequality. Consistent with the Kuznets hypothesis, economic growth initially worsens income inequality before declining. Financial development follows an inverted-U relationship with income inequality per the financial Kuznets hypothesis. Stolper-Samuelson's applicability varies between developed and developing nations, with trade openness and financial development exacerbating income inequality in developing countries while reducing it in developed ones. Causality analysis validates these findings, offering nuanced policy implications tailored to a country's development stage.

The second article, written by Mervenur Sozen, Çağlar Sozen, and Onur Şeyranlioğlu employ the copula method to investigate interrelationships among key macroeconomic indicators: Consumer Price Index (CPI), Producer Price Index (PPI), exchange rate (USD/TRY), and interest rate. The study spans 2007 to 2022 and utilizes copula to describe dependencies without distribution assumptions. Analysis reveals intricate interdependencies, with the Joe copula model accurately capturing right-tailed dependencies among CPI, PPI, exchange rates, and interest rates. Notably, the Frank copula model suggests a moderate positive correlation between exchange rates and interest rates, while the Gaussian copula model shows a robust positive association between CPI and interest rates. These findings offer valuable insights for policymakers and researchers, aiding in economic policy formulation, future price level prediction, and understanding macroeconomic indicator interdependencies and economic stability. Next, Ahmet Ekrem Kaya's study explores the exchange rate pass-through effect on producer and consumer prices in Turkey, Brazil, and South Africa—nations sharing common challenges such as weak international reserves and current account deficits. Exchange rate volatility impacts domestic prices via cost, expectations, and indexing behavior. Using the ARDL method on data from 1995Q1 to 2020Q1, Kaya identifies a cointegration relationship between exchange rates and CPI/PPI indices in all three countries, with Brazil showing the highest pass-through, followed by South Africa and Turkey. Bidirectional relationships between exchange rates and CPI/PPI indices are confirmed, aligning with prior literature on the influence of the inflation environment on exchange rate pass-through.

The fourth article by Burak Buyun examines the impact of exchange rate volatility on Turkey's bank lending channel using a Vector Auto Regression model from January 2011 to September 2023. Findings reveal a negative influence of exchange rate volatility on loans, indicating its significant explanatory power for changes in lending. High volatility, signaling instability, prompts banks to avoid risk-taking, hindering lending growth even in low interest rate environments. The study emphasizes the need for stability beyond monetary policy for an effective lending channel. Finally, Hande Aksoz Yılmaz's study investigates the asymmetric impacts of globalization on inflation. The research uses the non-linear autoregressive distributed lags (NARDL) approach to analyze data from Turkey from 1970 to 2021. Results indicate that the effects of social and economic globalization on inflation are uneven, with specialization and economic openness lowering inflation. On the other hand, there is no discernible uneven impact of political globalization on inflation. By focusing on market mechanisms and their effectiveness in lowering inflation, the study adds to our understanding of the complex effects of globalization on inflation dynamics.

I hope that the Journal of Economic Policy Researches community will perceive this special issue as a valuable and practical compilation of articles.

Prof. Dr. Ferda HALICIOGLU
School of Social Sciences,
University of Bradford, UK
f.halicioglu@bradford.ac.uk

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
**JEPR** 2024, 11(1): 1–18
DOI: 10.26650/JEPR1299562

RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

# The Relationship Among Trade Openness, Financial Development and Economic Growth Indicators and Income Distribution Inequality: Testing the Kuznets, Financial Kuznets, and Stolper-Samuelson Hypotheses

## Ticari Açıklık, Finansal Gelişme ve Ekonomik Büyüme ile Gelir Dağılımı Adaletsizliği İlişkisi: Kuznets ve Finansal Kuznets Hipotezi ile Stolper-Samuelson Hipotezinin Testi

İsmail Hakkı İşcan[1] Tuğba Demirel[2]

**ABSTRACT**

This study investigates the complexities of the Kuznets, Financial Kuznets, and Stolper-Samuelson hypotheses, all of which hold fundamental positions in the literature. The primary objective is to scrutinize the intricate interplay among economic growth, financial development, trade openness, and income distribution inequality across nations and characterized by varying developmental stages. This analytical framework seeks to empirically evaluate the aforementioned hypotheses, specifically within the context of diverse clusters of countries. In this vein, a comprehensive investigation of the nexus connecting economic growth, financial development, trade openness, and income distribution inequality unfolds across a dataset encompassing 19 developing economies and 22 developed counterparts over the 2002-2019 period. The empirical assessment has been accomplished through a panel data analysis. The empirical findings shed light on distinctive patterns in the relationship between the specified economic factors and income inequality for the two distinct groups of countries. These empirical insights strengthen the validity of both the Kuznets and financial Kuznets hypotheses. However, the outcomes also exhibit a nuanced complexion in relation to the Stolper-Samuelson hypothesis. While the empirical underpinning within developed countries aligns with the Stolper-Samuelson premise, the observed outcomes in developing nations diverge from the tenets of the Stolper-Samuelson hypothesis, thereby introducing a layer of complexity to the overall findings.

**Keywords:** Kuznets hypothesis, financial Kuznets hypothesis, income distribution inequality, Stolper-Samuelson hypothesis, panel data analysis

**Jel Code:** C12, C23, E10

[1]Prof. Dr., Bilecik Şeyh Edebali Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, İktisat Bölümü, Bilecik, Türkiye
[2]Doktora Öğrencisi, Bilecik Şeyh Edebali Üniversitesi, Lisansüstü Eğitim Enstitüsü, İktisat Anabilim Dalı, Bilecik, Türkiye

**Corresponding author / Sorumlu yazar:** İsmail Hakkı İşcan
**E-mail / E-posta :** ismailhakkiiscan@bilecik.edu.tr

**Submitted / Başvuru** : 19.05.2023
**Revision Requested / Revizyon Talebi** : 31.07.2023
**Last Revision Received / Son Revizyon** : 04.08.2023
**Accepted / Kabul** : 07.11.2023

**ÖZ**

Bu çalışmada, iktisat literatüründe önemli bir yere sahip olan Kuznets ve Finansal Kuznets ve Stolper-Samuelson hipotezleri kapsamında, ekonomik büyüme, finansal gelişme ve ticari açıklık ile gelir dağılımı eşitsizliği arasındaki ilişkinin farklı gelişmişlik seviyelerine sahip ülke ekonomileri için araştırılması ve ifade edilen hipotezlerin test edilmesi amaçlanmıştır. Buna göre 2002-2019 dönemi için gelişmekte olan 19 ülke ekonomisi ve gelişmiş 22 ülke ekonomisi için ticari açıklık, finansal gelişme ve ekonomik büyüme ile gelir dağılımı adaletsizliği arasındaki ilişki panel veri analiziyle araştırılmıştır. Analiz sonuçlarına göre 19 gelişmekte olan ülkede ticari açıklık %1 arttığında gelir dağılımı adaletsizliğini temsilen modelde kullanılan gini endeksi %0.13; finansal gelişmişlik %1 arttığında gini endeksi %0.27; ekonomik büyüme %1 arttığında ise gini endeksi %0.08 oranında artmaktadır. 22 gelişmiş ülkede ise ticari açıklık %1 arttığında gini endeksi %0.02; finansal gelişme %1 arttığında gini endeksi %0.05 azalmakta ve ekonomik büyüme %1 arttığında gini endeksi %0.001 oranında artmaktadır. Bu sonuçlar belirli bir gelişmişlik seviyesine kadar ekonomik büyüme ve finansal gelişmedeki artışların gelir dağılımı adaletsizliğini arttırdığını fakat belirli bir gelişmişlik seviyesinden sonra bu artışların gelir dağılımı adaletsizliğini azalttığını ifade eden Kuznets ve Finansal Kuznets hipotezlerini doğrular niteliktedir. Fakat çalışmada varılan sonuçlar, gelişmiş ülkeler için Stolper-Samuelson hipotezini doğrulamasına rağmen gelişmekte olan ülkeler için Stolper-Samuelson hipotezi için uyuşmayan bulgular içermektedir.

**Anahtar Kelimeler:** Kuznets Hipotezi, Finansal Kuznets Hipotezi, Gelir Dağılımı Adaletsizliği, Stolper-Samuelson Hipotezi, Panel Veri Analizi

**Jel Sınıflaması:** C12, C23, E10

## Introduction

The elimination of income distribution inequality is an important issue among the goals of national economies. Although many factors affect income distribution inequality, the tendency toward commercial liberalization since the 1980s and financial liberalization since the 1990s have increased countries' interactions and caused any economic problem that broke out in once country to affect all countries of the world. This result emerges as a factor affecting countries' income distribution inequality.

Kuznets (1955) proposed a hypothesis stating that the economic growth achieved before reaching a certain level of development in a country's economy increases the inequality of income distribution and that after that level, the inequality of income distribution decreases with economic growth. According to this hypothesis, savers are high-income in the first stage of a country's economic development. In this case, the high-income segment will benefit from the high income of capital, which is already relatively scarce in underdeveloped and developing countries' economies, and will increase their income even more. In other words, income inequality increases. However, after the development level reaches a certain point, the relative abundance of capital will allow the low-income group to benefit from capital income; therefore, an increase will be observed in the income of this segment. In this case, income inequality is reduced. According to this hypothesis, an inverted U-shaped relationship exists between economic growth and income distribution inequality (Kuznets, 1955, p. 7).

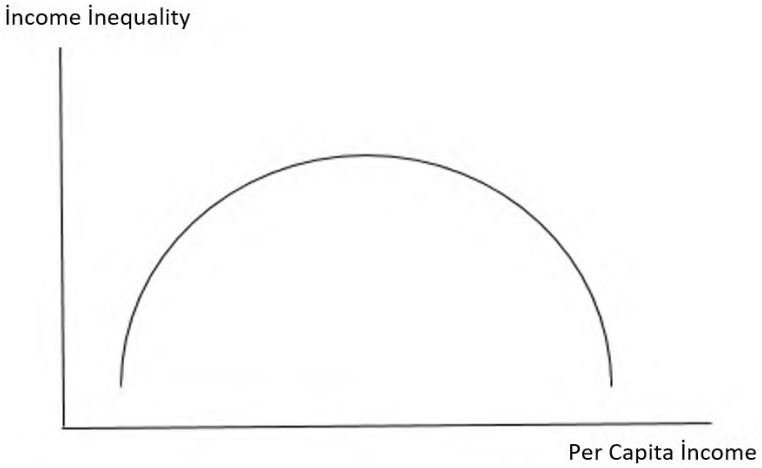



**Figure 1.** Kuznets curve (Source: Weil, 2016, p. 318).

This relationship is illustrated in Figure 1, which shows that as income inequality increases, per capita income increases up to a certain point, after which per capita income decreases as income inequality increases.

When looking at studies that reveal the relationship among financial liberalization, financial development, and income distribution inequality in this context, three pioneering studies are encountered. These studies were conducted by Galor and Zeira (1993), Greenwood and Jovanovic (1990), and Rajan and Zinglasdes (2003). While Galor and Zeira (1993) argued a negative relationship to exist between financial development and income inequality, Rajan and Zinglasdes (2003) argued the relationship to be positive. Meanwhile, Greenwood and Jovanovic (1990) stated that an inverted-U-shaped relationship exists between financial development and income inequality (as cited in Jauch & Watzka, 2012, p. 7).

Galor and Zeira (1993) developed a dynamic model for income distribution in an economy, in which generations are linked by inheritance and investment indivisibility. In this model, an economy exists in which a single good (for consumption and investment) is produced using skilled and unskilled labor-intensive technology. In addition, individuals' lives are divided into two periods, according to which individuals can work unskilled in both periods or individuals can work qualified in the second period as a result of having invested in capital and received education in the first period. In addition, the model considers individuals to be identical in terms of skills and preferences and to differ only in their inherited wealth. Individuals determine whether they will invest in capital or not, the level of inheritance they have, and the loans they receive under the imperfection of capital markets. Thus, wealthy people can work with the highest quality and leave a greater legacy to future generations by investing in human capital, whereas poorer people cannot. This leads to an increase in income inequality in the long run (Galor & Zeira, 1993, pp. 35–36). Having a low level of financial development makes the poor's ability to use credit, and therefore borrow money, very difficult. Providing financing for investments in this sector will result in serious changes regarding income levels. With an increase in the level of financial development (i.e., as financial markets develop) to the extent that capital market defects can be prevented, individuals with lower incomes will be able to borrow for high-yield investments, obtain capital, and expand their existing projects. Thus, income inequalities decrease as a result of the narrowing of income differences between high- and low-income individuals (Argun, 2006, p. 65).

Galor and Zeira (1993) attributed the relationship between financial development and income inequality to the fact that low-income people earn income through borrowing as a result of financial development; in this context, they can participate in the production process by investing. According to Galor and Zeira, low-income people in this case reduce their income gap with high-income people and reduce income inequality.

Rajan and Zingales (2003) argued financial development to be related to institutional quality and to benefit only wealthy individuals when the institutional quality is weak. Financial markets have such things as asymmetric information, adverse selection, and moral hazards, and therefore debtors need collateral to borrow money. While the rich have wealth that can provide collateral, low-income individuals who do not have this wealth cannot borrow money even if the country's economy is financially developed. In this case, as the financial sector develops, rich households can borrow more, whereas low-income households cannot benefit from this opportunity. Therefore, low-income individuals cannot possibly invest their capital or start a new business. As a result, only the rich benefit from financial development, thus increasing the income gap between rich and poor. As a result, financial development plays a role in widening income inequality. This hypothesis explaining income inequality in financial development is called the inequality widening hypothesis" (Clarke et al., 2006, pp. 578–580; Shahbaz et al., 2017, pp. 5–6).

Meanwhile, Greenwood and Jovanovic (1990) stated that when countries have an underdeveloped or developing structure, financial development comes into question; only high-income people can benefit from this development due to the high costs, and in this context, income inequality will increase. The increase in countries' development causes a decrease in costs, and access to financial instruments will become easier for the low-income segment. In this case, income inequality decreases. This view is in line with the Kuznets hypothesis. In this context, this hypothesis is called the financial Kuznets hypothesis (Hepsağ, 2017, p. 137).

A pioneering study examining the relationship between trade openness and income inequality was proposed by Stolper and Samuelson (1941). According to their study, trade openness favors the abundance factor and opposes the scarcity factor. In other words, the price of what is abundant will increase, as will cheap factors in this context, while the cost of what is scarce will decrease, as will expensive factors in this context. As a result, the differences in the percentages the factors have of income decrease, as does income distribution inequality. In line with these statements, the Stolper–Samuelson hypothesis argues that a negative relationship exists between trade openness and income distribution inequality. This hypothesis has been tested several times in various studies. For example, Barro (2000) found results supporting this hypothesis, while Spilimbergo et al. (1999) reached conclusions that did not support the hypothesis.

Within the scope of this information in the economics literature, the current study aims to investigate the relationship among trade openness, financial development, economic growth, and income distribution inequality for countries with

different levels of development and to test the stated hypotheses. The aim of this study is different from that of other studies. Few studies have investigated the effects of trade openness, financial development, and economic growth on income distribution. Therefore, this study is important for continuing the discussion on this subject in the literature.

In economics, the measure of income distribution inequality, which is the main variable of the study, is the Lorenz curve, as well as the Gini index in this context. The Gini index takes a value between 0 and 1, where 0 means that the income of the country is evenly distributed and 1 means that all of the country's income is collected in one person. Accordingly, as the Gini index approaches zero, income inequality decreases, and as it approaches one, income inequality increases. However, the Gini index as estimated by the World Bank takes a value between zero and 100. Here, as the value approaches 0, income inequality decreases, and as it approaches 100, income inequality increases (World Bank, 2022).

This study carries out panel data analyses to determine the relationship among trade openness, financial development, economic growth, and income distribution inequality in 19 developing and 22 developed economies for the 2002-2019 period. The models created for panel data analysis use the percentage of trade in Gross Domestic Product (GDP) to represent the variable of trade openness, the percentage of loans extended to the private sector in GDP to represent financial development, the real per capita income (in 2015 USD) to represent economic growth, and the Gini index to represent income distribution inequality. The models with these variables are first subjected to multiple linear correlation. Cross-sectional dependence (CSD) is then examined based on the models and variables. In this review, CSD is found to be present in each variable; therefore, a cross-sectionally augmented Dickey Fuller (CADF) second-generation unit root test is performed, which has the advantage of controlling for CSD. In the context of these test results for the models in the study, Westerlund's (2007) cointegration analysis and autoregressive distributed lag (ARDL) cointegration analyses have been applied. This study performs the augmented mean group (AMG) estimation and vector error correction model (VECM) panel causality analyses.

The following section provides the results of the literature review on the subject, with the next sections containing the models of the study and data information, the findings related to the analyses carried out using the method, and the interpretations of these findings. The conclusion section then evaluates the results of these analyses.

## Literature Review

The literature on the relationship among trade openness, financial development, economic growth, and income distribution inequality, being the subject of this study, is presented in the form of studies investigating the effects of each of the mentioned variables on income distribution inequality. The reason for this is the literature has limited studies that have examined the effects of these variables on income inequality (i.e., Shahbaz & Islam, 2011; Satti et al., 2015; Ahmed & Masih, 2017; Cengiz & Demir, 2023). This also reveals the originality of this study. However, many studies have explained the effects of income distribution on trade openness, financial development, and economic growth.

The literature investigating the relationship between trade openness and income inequality involves some studies that have shown a negative relationship to exist between trade openness and income distribution inequality (e.g., Calderon & Chong, 2001; Değer, 2006; Gökalp et al., 2011; Dorn et al. 2021). However, the literature also has studies that have found a positive relationship to exist between trade openness and income inequality (Calderon & Chong, 2001; Mahesh, 2016; Zakaria & Fida, 2016; Khan & Nawaz, 2019; Wang et al., 2020; Dorn et al., 2021; Xu et al., 2021).

The relationship between financial development and income inequality is an intensively researched subject in the literature. Many studies have investigated this issue, with some showing a negative relationship to occur between financial development and income distribution inequality (e.g., Clarke et al. (2003), Batuo et al. (2010), Akbıyık (2012). However, the literature also has studies that have found a positive relationship between financial development and income inequality (Jauch & Watzka, 2012; Sehrawat & Giri, 2016; Younsi & Bechtini, 2018; Kar & Kar, 2019). Meanwhile, other studies in the literature have stated an inverted U-shaped relationship to exist between these variables (Akbıyık, 2012; Nikoloski, 2013; Topuz, 2013; Zhang & Chen, 2015; Park & Shin, 2015; Altunöz, 2015; Pata, 2020).

Most studies investigating the relationship between economic growth and income distribution inequality were developed to test the Kuznets hypothesis with some studies confirming the hypothesis and stating an inverted U-shaped relationship to exist between economic growth and income inequality (Paukert, 1973; Ahluwalia, 1976; Papanek & Kyn, 1986; Ogwang, 1995; Jha, 1996; Barro, 2000; Thornton, 2001; Topuz & Dağdemir, 2016; Şengür, 2020). Other studies also contain findings that have falsified the Kuznets hypothesis (Matyas et al., 1998; List & Gallet, 1999; Dişbudak & Süslü, 2009; Huang et al., 2012; Kiatrungwilaikun & Suriya, 2015; Çakmak & Tosun, 2017; Abdioglu et al., 2019).

**Table 1.** *Literature Review*

| Author | Sample | Period | Variables | Method | Findings |
|---|---|---|---|---|---|
| **Shahbaz and Islam (2011)** | Pakistan | 1971-2005 | Trade openness, Financial Development, Economic Growth and Income Distribution Inequality | ARDL Analysis | There is a negative relationship between financial development and income inequality, and a positive relationship between trade openness and economic growth and income inequality. |
| **Satti et al. (2015)** | Kazakhistan | 1991-2011 | Trade openness, Financial Development, Economic Growth and Income Distribution Inequality | ARDL analysis | Negative direction between financial development and trade openness and income inequality; On the other hand, there is a positive relationship between economic growth and income inequality. |
| **Ahmed and Masih (2017)** | Malaysia | 1970-2007 | Trade openness, Financial Development, Economic Growth and Income Distribution Inequality | ARDL Analysis | There is a long-term and statistically significant relationship. |
| **Cengiz and Demir (2023)** | MIST | 1987-2019 | Trade Openness, Financial Openness, Economic Growth and Income Distribution Inequality | Panel Data Analysis | Economic growth has no effect on income inequality. Financial development affects income inequality more than trade openness. |
| **The Literature Review on the Relationship between Trade Openness and Income Distribution Inequality** | | | | | |
| **Calderon and Chong (2001)** | 102 Developed Countries | 1960-1995 | Trade openness and Income Distribution Inequality | GMM Method | There is a positive relationship between trade openness and income distribution inequality in developed country economies and negative in developing country economies. |

**Table 1.** Continued

| | | | | | |
|---|---|---|---|---|---|
| **Değer (2006)** | 68 Countries | 1975-2002 | Trade openness and Income Distribution Inequality | Panel Data Analysis | Negative Relationship |
| **Gökalp et al. (2011)** | Türkiye | 1980-2001 | Trade openness and Income Distribution Inequality | ARDL Anlaysis | Negative Relationship |
| **Mahesh (2016)** | BRIC | 1991-2013 | Trade openness and Income Distribution Inequality | GMM Method | positive Relationship |
| **Zakaria and Fida (2016)** | SAARC | 1973-2012 | Trade openness and Income Distribution Inequality | Panel Data Analysis | Positive Relationship |
| **Khan and Nawaz (2019)** | CIS | 1990-2016 | Trade openness and Income Distribution Inequality | Panel Data Analysis | Positive Relationship |
| **Khan, Nawaz and Saeed (2020)** | 5 South Asian Countries | 1990-2016 | Trade openness and Income Distribution Inequality | GMM Method | Inverted-U Relationship |
| **Wang et al. (2020)** | 58 Countries | 2005-2014 | Trade openness and Income Distribution Inequality | VECM Analysis | Positive Relationship |
| **Dorn et al. (2021)** | 139 Countries | 1970-2014 | Trade openness and Income Distribution Inequality | OLS Method | Negative in Transition Economies, Positive in Developed Countries |
| **Xu, Han, Dossou, and Bekun (2021)** | Sub-Saharan Africa | 2000-2015 | Trade openness and Income Distribution Inequality | GMM Method | Positive Relationship |
| **The Literature Review on the Relationship between Financial Development and Income Distribution Inequality** | | | | | |
| **Clarke et al. (2003)** | Developing and Developed Country Groups | 1960-1995 | Financial Development and Income Distribution Inequality | Panel Data Analysis | Negative Relationship |
| **Batuo et al. (2010)** | 22 African Countries | 1990-2004 | Financial Development and Income Distribution Inequality | GMM Method | Negative Relationship |
| **Akbıyık (2012)** | Developing and Developed Country Groups | 2000-2010 | Financial Development and Income Distribution Inequality | Panel Data Analysis | Negative Relationship |
| **Jauch and Watzka (2012)** | 138 Countries | 1960-2008 | Financial Development and Income Distribution Inequality | Panel Data Analysis | Positive Relationship |

**Table 1.** Continued

| | | | | | |
|---|---|---|---|---|---|
| **Nikoloski (2013)** | 161 Countries | 1962-2006 | Financial Development and Income Distribution Inequality | Panel Data Analysis | Inverted-U Relationship |
| **Topuz (2013)** | High-income, upper-middle-income, and low- and low-middle-income country groups | 1995-2011 | Financial Development and Income Distribution Inequality | Panel Data Analysis | Inverted-U Relationship |
| **Zhang and Chen (2015)** | China | 1978-2013 | Financial Development and Income Distribution Inequality | SVAR Analysis | Inverted-U Relationship |
| **Park and Shin (2015)** | 162 Asian Contries | 1960-2011 | Financial Development and Income Distribution Inequality | Panel Data Analysis | Inverted-U Relationship |
| **Altunöz (2015)** | Türkiye | 1991-2014 | Financial Development and Income Distribution Inequality | ARDL Anlysis | Inverted-U Relationship |
| **Sehrawat and Giri (2016)** | South Asian Countries | 1990-2013 | Financial Development and Income Distribution Inequality | Panel Data Analysis | Positive Relationship |
| **Younsi and Bechtini (2018)** | BRICS | 1995-2015 | Financial Development and Income Distribution Inequality | Panel Data Analysis | Positive Relationship |
| **Kar and Kar (2019)** | BRICS | 1990-2014 | Financial Development and Income Distribution Inequality | Panel Data Analysis | Positive Relationship |
| **Pata (2020)** | Türkiye | 1987-2016 | Financial Development and Income Distribution Inequality | CCR ve FMOLS Method | Inverted-U Relationship |
| **The Literature Review on the Relationship between Economic Growth and Income Distribution Inequality** | | | | | |
| **Jha (1996)** | 132 Countries | 1960-1992 | Economic Growth and Income Distribution Inequality | Panel Data Analysis | Inverted-U Relationship |
| **Matyas et al. (1998)** | 109 Countries | 1970-1993 | Economic Growth and Income Distribution Inequality | Panel Data Analysis | Kuznets hypothesis is falsified. |
| **List and Gallet (1999)** | 71 Countries | 1961-1992 | Economic Growth and Income Distribution Inequality | Panel Data Analysis | Inverted-U Relationship |
| **Barro (2000)** | 100 Countries | 1960-1995 | Economic Growth and Income Distribution Inequality | Panel Data Analysis | Inverted-U Relationship |

**Table 1.** Continued

| | | | | | |
|---|---|---|---|---|---|
| **Thornton (2001)** | 96 Countries | 1990-1992 | Economic Growth and Income Distribution Inequality | Panel Data Analysis | Inverted-U Relationship |
| **Dişbudak and Süslü (2009)** | Türkiye | 1963-1998 | Economic Growth and Income Distribution Inequality | Panel Data Analysis | Inverted-U Relationship |
| **Huang et al. (2012)** | USA | 1917-2007 | Economic Growth and Income Distribution Inequality | Panel Data Analysis | Inverted-U Relationship |
| **Kiatrung wilaikun and Suriya (2015)** | 91 ülke | 2000-2012 | Economic Growth and Income Distribution Inequality | Panel Data Analysis | Inverted-U Relationship |
| **Topuz and Dağdemir (2016)** | Group of low-income, middle-income and high-income countries | 1995-2011 | Economic Growth and Income Distribution Inequality | Panel Data Analysis | Positive in Low- and Middle-Income Countries, Negative in High-Income Countries |
| **Çakmak and Tosun (2017)** | Upper-middle and high-income country groups | 2002-2013 | Economic Growth and Income Distribution Inequality | Panel Data Analysis | U Relationship |
| **Abdioğlu, Yamak and Yamak (2019)** | Türkiye | 1978-2016 | Economic Growth and Income Distribution Inequality | ARDL Anlysis | U Relationship |
| **Şengür (2020)** | Transition Economies | 1995-2013 | Economic Growth and Income Distribution Inequality | Robust regression, clustered standard errors and Driscoll-Kraay estimator | Inverted-U relationship |

## Data and Model

This study uses two samples with different levels of development to investigate the relationship among trade openness, financial development, economic growth, and income distribution inequality. These samples include two groups, one with 19 developing countries and another with 22 developed countries in accordance with the World Bank 2021 classification. The 19 developing countries are Ukraine, Türkiye, Russia, Peru, Panama, Moldova, Kyrgyzstan, Kazakhstan, Indonesia, Honduras, Georgia, El Salvador, Ecuador, Dominican Republic, Costa Rica, Brazil, Bolivia, Belarus, and Armenia. The 22 developed countries are Austria, Belgium, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Czech Republic, Finland, Hungary, Israel, Estonia, the United States of America, Saudi Arabia, and Sweden (World Bank, 2021). Panel data analysis was carried out using the Eviews-12 and Stata-17.0 package programs with the annual data of the stated samples covering the 2002-2019 period. Information regarding the data used for the analyses performed in this study is presented in Table 2.

**Table 2.** *Information on Data*

| Information on Data | | |
|---|---|---|
| Lngini | Gini İndex | WDI* |
| Lntic | Trade (%GDP) | WDI* |
| Lnfin | Loans Extended to the Private Sector (%GDP) | WDI* |
| Lngdp | Real Per Capita Income (2015 $) | WDI* |

Source:*World Development Indicators [WDI], 2022; https://databank.worldbank.org/source/world-development-indicators

The functional expressions of the two different models created for the two samples used in the study in line with its purpose are as follows:

$$lngini_{it} = a_{it} + lntic_{it} + lnfin_{it} + lngdp_{it} + u_{it} \quad (1)$$

$$lngini_{jt} = a_{jt} + lntic_{jt} + lnfin_{jt} + lngdp_{jt} + \mu_{jt} \quad (2)$$

In Models (1) and (2), $i = 1, 2, \ldots, 19$, $j = 1, 2, \ldots, 22$, and $t = 1, 2, \ldots, 18$, with *lngini* representing the income distribution inequality, *lntic* representing the trade's percentage of GDP, *lnfin* denoting loans extended to the private sector to represent financial development, and *lngdp* denoting the real per capita income to represent economic growth. The variables were included in the analysis by taking their natural logarithms.

**Econometric Method**

Various methods can be used to investigate the relationships among trade openness, financial development, economic growth, and income inequality. This study performs a panel data analysis because of its advantages (e.g., better interpretation of parameters, more degrees of freedom, fewer multicollinearity problems).

In addition to its advantages, multiple linear connections and CSD are common problems in panel-data analysis. In this context, these should be tested first in panel data analyses.

This study has tested multicollinearity using the Spearman correlation analysis and variance inflation factor (VIF) analysis. Meanwhile, CSD was tested with the Peseran cross-sectional dependence (CD; 2004), Breusch-Pagan CD Lagrange multiplier (CDLM; 1980), and Peseran CDLM (2004) analyses. The hypotheses regarding these tests are given in Equations 3 and 4.

$$H_0 : p_{ij} = p_{ji} = corr(u_{it}, u_{jt}) = 0, i \neq j, There\ is\ no\ dependency\ between\ horizontal\ sections. \quad (3)$$

$$H_a : p_{ij} = p_{ji} \neq 0, i \neq j, There\ is\ dependency\ between\ horizontal\ sections. \quad (4)$$

The next step is to apply the panel unit root test to find the integration order of the variables. Second-generation unit root tests have the advantage of checking CSD while verifying the stationarity of variables, and first-generation unit root tests that do not have this advantage are unreliable in the presence of CSD. For this reason, the study uses the covariate augmented Dickey Fuller (CADF) second-generation unit root test proposed by Peseran (2007) as based on the estimation from Equation 5:

$$\Delta Y_{it} = a_i + b_i y_{i,t-1} + \Sigma_{j=1}^{pi} c_{ij} \Delta Y_{i,t-j} + d_i t + h_i Y_{t-1}^{-} + \Sigma_{j=0}^{pi} \eta_u \Delta Y_{i,t-j}^{-} + \varepsilon_{i,t} \quad (5)$$

The hypotheses regarding the CADF test are given in Equations 6 and 7.

$$H_0 : b_i = 0, the\ series\ is\ stationary. \quad (6)$$

$$H_a : b_i < 0, the\ series\ is\ no\ stationary. \quad (7)$$

Cointegration analysis has been used to investigate the long-term relationships among the variables. First-generation panel cointegration analyses are ineffective at considering CSD. In this context, Westerlund's (2007) second-generation panel cointegration analysis has been performed for this sample, due to CSD being identified in the panel data of the study and the variables of trade openness, financial development, economic growth, and income distribution inequality having no unit roots in the first difference forms for the sample of 19 developing countries. This analysis provides more effective information compared to the first-generation cointegration analyses.

In Westerlund's (2007) analysis, Equations 8 and 9 are first calculated using the dynamic least squares method:

$$\Delta Y_{it} = \delta_i d_t + \lambda_i x_{i,t-1} \Sigma_{j=1}^{pi} a_{ij} \Delta Y_{i,t-1} + \Sigma_{j=0}^{pi} \lambda_i \Delta x_{i,t-j} + u_t \tag{8}$$

$$Y_{i,t-1} = \delta_i d_t + \lambda_i x_{i,t-1} \Sigma_{j=1}^{pi} a_{ij} \Delta Y_{i,t-1} + \Sigma_{j=0}^{pi} \lambda_i \Delta x_{i,t-j} + u_t \tag{9}$$

Then, the error correction coefficient and the standard deviation are estimated for the panel. Finally, panel cointegration statistics are calculated in line with Equations 10 and 11:

$$Y_{it} = \frac{a}{S.E(a)} \tilde{} N(0,1) \tag{10}$$

$$P_a = T_a \tilde{} N(0,1) \tag{11}$$

The selection of the hypotheses is decided in accordance with the obtained test statistics. The null hypothesis of this analysis states that no long-term relationships exist among the variables, while the alternative hypothesis states a long-term relationship does exist among the variables. Westerlund (2007) suggested that the test statistics obtained to consider CSD in the rejection or acceptance of these hypotheses should be compared with the critical bootstrap distribution values expressed in Chang (2004; as cited in Westerlund, 2007, p. 718).

Following the Westerlund (2007) cointegration analysis, elasticities were calculated for the 19 developing country samples using the AMG long-term estimator developed by Eberhardt and Bond (2009). This estimator takes CSD into account in the panel data set and makes an estimation using Equations (12) and (13), where $i = 1, 2, \ldots, N$ and $t = 1, 2, \ldots, T$:

$$y_{it} = \beta' x_{it} + u_{it}, u_{it} = a_i + \lambda_i' f_t + \mu_{it} \tag{12}$$

$$x_{mit} = \pi_{mi} + \delta_{mi}' g_{mt} + p_{1mi} f_{1mt} + \cdots + p_{nmi} f_{nmt} + v_{mit}, m = 1, \cdots, k \; ve \; f_{.mt} \subset f_t, f_t = \phi' f_{t-1} + \mu_t \; ve \; g_t = K' g_{t-1} + \mu_t \tag{13}$$

In the equations, $x_{it}$ is the vector of the observable variables; $f_t$ is the factors affecting the sections in common, while $\lambda_i$ expresses the other factors affecting the sections. Meanwhile, $m$ represents $k$ observable variables, and $\lambda_i$represents the factor loadings specific to the sections. Based on these equations, an estimation is made in two stages in line with Equations 14 and 15. In the first step, the standard first difference OLS model is estimated by adding $t$–1 time dummy variables, and the coefficients of the time dummy variables are calculated. In the second step, the coefficients of the calculated time dummy variables are included in the model as independent variables, and the elasticities are obtained by averaging the equations calculated for each section:

$$y_{it} = a_i + b_i', x_{it} + c_{it} + d_i \hat{u}_t + \mu_{it} \tag{14}$$

$$\hat{} b_{AMG} = N^{-1} \Sigma_i \hat{} b_i \tag{15}$$

In the CADF unit root tests performed for the sample of 22 developed country samples as the second group, the integration orders of the variables were determined to differ. Therefore, the long-term relationships among the variables for this sample group were investigated using ARDL cointegration analysis. This analysis is performed by calculating Equations 16 and 17:

$$\Delta lngini_{it} = \alpha_0 + \alpha_1 lngini_{i,t-1} + \alpha_2 lntic_{i,t-1} + \alpha_3 lnfin_{i,t-1} + \alpha_4 lngdp_{i,t-1} + \Sigma_{j=1}^{p} \alpha_{5j} \Delta lngini_{i,t-j} + \Sigma_{j=0}^{p} \alpha_{6j} \Delta lntic_{i,t-j} + \Sigma_{j=0}^{p} \alpha_{7j} \Delta lnfin_{i,t-j} + \Sigma_{j=0}^{p} \alpha_{8j} \Delta lngdp_{i,t-j} + u_{it} \quad (16)$$

$$\Delta lngini_{it} = c_0 + \Sigma_{j=1}^{p} c_{1j} \Delta lngini_{i,t-j} + \Sigma_{j=0}^{p} c_{2j} \Delta lntic_{i,t-j} + \Sigma_{j=0}^{p} c_{3j} \Delta lnfin_{i,t-j} + \Sigma_{j=0}^{p} c_{3j} \Delta lnogdp_{i,t-j} + \lambda ECT_{i,t-1} + \mu_{it} \quad (17)$$

In Equation 16, $a_0$ is the constant term, $u_t$ is the error term, $a_1$ - $a_4$ are the long-term parameters, and $a_5$ - $a_8$ refer to the short-term parameters. In Equation 17, $\lambda$ is the correction rate parameter, which shows how much of the effect of a shock that occurs in the short term will disappear in the long term. $ECT_{i,t-1}$ is a lagged value of the residuals of the cointegration model from which the long-term relationship is obtained.

The hypotheses for this analysis are as follows:

$$H_0: a_1=a_2=a_3=a_4=0$$
$$H_a: a_1=a_2=a_3=a_4\neq 0$$

In the last stage of the panel data analysis, the study carries out a panel causality analysis within the scope of VECM to determine the existence and direction of the causality relationships among the variables. Panel causality analysis within the scope of VECM was carried out according to Equations 18-21:

$$\Delta lngini_{it} = a_0 + \Sigma_{j=1}^{n} a_{1i} \Delta lngini_{i,t-j} + \Sigma_{j=0}^{n} a_{2i} \Delta lntic_{i,t-j} + \Sigma_{j=0}^{n} a_{3i} \Delta lnfin_{i,t-j} + \Sigma_{j=0}^{n} a_{4i} \Delta lngdp_{i,t-j} + a_5 ECT_{i,t-j} + u_{1t} \quad (18)$$

$$\Delta lntic_{it} = \beta_0 + \Sigma_{j=1}^{n} \beta_{1i} \Delta lntic_{i,t-j} + \Sigma_{j=0}^{n} \beta_{2i} \Delta lngini_{i,t-j} + \Sigma_{j=0}^{n} \beta_{3i} \Delta lnfin_{i,t-j} + \Sigma_{j=0}^{n} \beta_{4i} \Delta lngdp_{i,t-j} + \beta_5 ECT_{i,t-j} + u_{2t} \quad (19)$$

$$\Delta lnfin_{it} = \delta_0 + \Sigma_{j=1}^{n} \delta_{1i} \Delta lnfin_{i,t-j} + \Sigma_{j=0}^{n} \delta_{2i} \Delta lngini_{i,t-j} + \Sigma_{j=0}^{n} \delta_{3i} \Delta lntic_{i,t-j} + \Sigma_{j=0}^{n} \delta_{4i} \Delta lngdp_{i,t-j} + \delta_5 ECT_{i,t-j} + u_{3t} \quad (20)$$

$$\Delta lngdp_{it} = \gamma_0 + \Sigma_{j=1}^{n} \gamma_{1i} \Delta lngdp_{i,t-j} + \Sigma_{j=0}^{n} \gamma_{2i} \Delta lngini_{i,t-j} + \Sigma_{j=0}^{n} \gamma_{3i} \Delta lntic_{i,t-j} + \Sigma_{j=0}^{n} \gamma_{4i} \Delta lnfin_{i,t-j} + \gamma_5 ECT_{i,t-j} + u_{4t} \quad (21)$$

## Research Findings and Comments

The study first investigated the existence of any multicollinearity problem prior to the panel data analysis. This is because in the case of a multicollinearity problem, which expresses a correlation between independent variables in the model, the results obtained in terms of panel data analysis will not be reliable. Accordingly, the study used the Spearman correlation analysis and variance inflation factor (VIF) to examine whether any correlations are present among the independent variables in the model. The analysis results are given in Table 3. Accordingly, the correlation coefficients being determined to have values less than 0.50 in the Spearman correlation analysis and less than 5 for the VIF in the VIF analysis results informs that there is reveals no multicollinearity problem to be present in the model.

**Table 3.** *Multiple Linear Connection Test*

| **Spearman Correlation Analysis** | | | |
|---|---|---|---|
| | **Lntic** | **Lnfin** | **lngdp** |
| Lntic | 1.000 | 0.0179 | -0.2822 |
| Lnfin | 0.0179 | 1.000 | 0.4713 |
| Lngdp | -0.2822 | 0.4713 | 1.000 |
| **VIF Analysis** | | | |
| | **Coefficient of Variance** | | **Central VIF Value** |
| LnCAP | 1.44 | | 0.693 |
| LnLAB | 1.33 | | 0.753 |
| LnREN | 1.12 | | 0.891 |

Another issue to be investigated before the panel data analysis is CSD. The presence or absence of CSD is important for determining which tests to run in panel data analysis and for obtaining reliable results in this context. Accordingly, the Breusch-Pagan (1980) LM test, Peseran (2004) CD test, and Peseran (2004) CDLM test were performed to investigate the presence of CSD. The results of these tests for the panels in the study are given in Table 4.

**Table 4.** *Panel-Based CSD Test*

| | **First Model** | | **Second Model** | |
|---|---|---|---|---|
| | **Statistics** | **Probability** | **Statistics** | **Probability** |
| CDLM (Breusch,Pagan 1980) | 1302.590 | 0.000 | 702.315 | 0.000 |
| CDLM (Pesaran 2004) | 61.189 | 0.000 | 21.927 | 0.000 |
| CD (Pesaran 2004) | 2.373 | 0.000 | 2.767 | 0.005 |

Each of the probability values of the CSD tests given in Table 3 was determined to be less than 0.05. This means that CSD is present in the panel and that a shock in any one country affects every other country. Due to CSD being detected in the panel, CSD then had to be investigated on the basis of the variables. Again, the Breusch-Pagan (1980) LM test, Peseran (2004) CD test, and Peseran (2004) CDLM test were performed to investigate CSD in terms of the variables, with the results being given in Table 5.

**Table 5.** *Variable-Based CSD Test*

| | **First Model** | | **Second Model** | |
|---|---|---|---|---|
| | **CDLM (Breusch,Pagan 1980)** | | | |
| | **Statistics** | **Probability** | **Statistics** | **Probability** |
| Lngini | 1040.153 | 0.000 | 802.638 | 0.000 |
| Lntic | 668.532 | 0.000 | 1904.449 | 0.000 |
| Lnfin | 1034.969 | 0.000 | 1312.746 | 0.000 |
| Lngdp | 538.921 | 0.000 | 2350.793 | 0.000 |
| | **CDLM (Pesaran 2004)** | | | |
| | **Statistics** | **Probability** | **Statistics** | **Probability** |
| Lngini | 46.998 | 0.000 | 26.595 | 0.000 |
| Lntic | 26.903 | 0.000 | 77.855 | 0.000 |
| Lnfin | 46.718 | 0.000 | 50.327 | 0.000 |
| Lngdp | 19.894 | 0.000 | 98.621 | 0.000 |
| | **CD (Pesaran 2004)** | | | |
| | **Statistics** | **Probability** | **Statistics** | **Probability** |
| Lngini | 15.322 | 0.000 | 39.907 | 0.000 |
| Lntic | 2.625 | 0.008 | 34.986 | 0.000 |
| Lnfin | 15.816 | 0.000 | 8.874 | 0.000 |
| Lngdp | 14.831 | 0.000 | 38.656 | 0.000 |

Each of the probability values of the CSD tests given in Table 4 was determined to be less than 0.05. This determination means that each of the variables includes CSD. Accordingly, in order to test the degree to which the variables are integrated, the CADF second-generation unit root test was conducted, which has the advantage of controlling for CSD. The results from this test are given in Table 6.

**Table 6.** *Unit Root Test*

| CADF Unit Root Test | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | First Model | | | | Second Model | | | |
| | Level | | First Difference | | Level | | First Difference | |
| | Constant | Constant and Trend | Constant | Constant and Trend | Constant | Constant and Trend | Constant | Constant and Trend |
| | Z[t-bar] | Z[t-bar] | Z[t-bar] | Z[t-bar] | Z[t-bar] | Z[t-bar] | Z[t-bar] | Z[t-bar] |
| Lngini | -0.050 | 0.770 | -4.452* | -3.012* | 2.062 | 2.009 | -4.455* | -3.928* |
| Lntic | -0.009 | 1.488 | -4.266* | -3.259* | -1.152 | 0.291 | -6.089* | -3.181* |
| Lnfin | 0.166 | -2.003 | -2.075* | -1.585** | -2.704* | -2.183* | -4.865* | -4.247* |
| Lngdp | 1.388 | -3.992 | -3.613* | -2.664* | 1.689 | 1.496 | -1.783* | -1.518** |

Note: The constant term and trend are included in the model. * indicates the absence of a unit root at the 1% significance level. ** indicates the absence of a unit root at the 5% significance level.

According to the test results expressed in Table 5, all of the variables used in the first model of the study contain no unit roots in the first difference forms. The results from the second model of the study reveal that not all variables are integrated to the same degree, and some variables contain no unit root in their first difference forms, with *lnfin* giving the finding that the variable does not contain a unit root at the level.

Due to all the variables in the first model created for the sample of 19 developing countries containing no unit roots in the first difference forms, the long-term relationships among the variables in this model were investigated using the Wersterlund (2007) analysis, with the results being given in Table 7.

**Table 7.** *Westerlund (2007) Cointegration Analysis*

| | Statistics | Asymptotic Probability Value | Bootstrap Probability Value |
|---|---|---|---|
| g_tau | -0.816 | 0.000 | 0.000 |
| g_alpha | -1.050 | 0.000 | 0.000 |
| p_tau | -3.072 | 0.000 | 0.000 |
| p_alpha | -0.824 | 0.000 | 0.000 |

Note: The constant term and trend are included in the model. Asymptotic values, standard normal distribution; The bootstrap probability values were obtained from a 10,000 replicate distribution.

The analysis in Table 6 mainly took bootstrap probability values into account, due to the model containing CSD. However, both asymptotic and bootstrap probability values of all four tests performed in terms of the analysis indicate the presence of a cointegration relationship among the variables. In other words, a long-term relationship is present among the variables mentioned for at least one of the 19 countries that make up the panel.

Due to the determination of the cointegration relationship, long-term elasticities were calculated using the AMG analysis. According to these calculations given in Table 8, when trade openness increases by 1%, the Gini index used in the model to represent income distribution inequality increases by 0.13%. Also, when financial development increases

by 1%, the Gini index increases by 0.27%, and when economic growth increases by 1%, the Gini index increases by 0.08%.

**Table 8.** *AMG Analysis*

| Variables | Coefficient | t-statistics | Probability |
|---|---|---|---|
| Lntic | 0.130 | 0.37 | 0.058 |
| Lnfin | 0.272 | 0.98 | 0.027 |
| Lngdp | 0.084 | 1.07 | 0.028 |
| SABİT | -3.593 | 20.51 | 0.000 |

In order to investigate the long-term relationships among the variables in the second model of the study, ARDL cointegration analysis was used as a result of knowing the variables contain no unit roots in different forms. For the ARDL analysis, the Hausman test was first performed to find whether the mean group (MG) estimator or pooled mean group (PMG) estimator is better. As a result of this test, a chi-square value of 1.31 was calculated, as well as a probability value of 0.245. This result shows the variables to be homogeneous in the long run. Accordingly, the PMG estimator is more efficient and consistent for the ARDL model. The results from the panel ARDL/PMG analysis performed in line with this information are given in Table 9.

**Table 9.** *Panel ARDL Long Term and Error Correction Model*

| **Long Term Model** | | | |
|---|---|---|---|
| **Variables** | **Coefficient** | **Standard Deviation** | **t-statistics** |
| **Lntic** | -0.023* | 0.000 | 5.49 |
| **Lnfin** | -0.056* | 0.007 | -3.01 |
| **Lngpdp** | 0.001* | 0.003 | 6.23 |
| **Short-run Error Correction Model** | | | |
| **Lntic** | -0.002* | 0.016 | 0.17 |
| **Lnfin** | -0.335* | 0.028 | 0.653 |
| **Lngpdp** | 0.002* | 0.000 | 1.24 |
| **ECT** | -0.581* | 0.082 | -7.03 |
| **Constant Term** | 16.773* | 0.004 | 3.409 |

Note: * indicates the presence of cointegration at the 1% significance level.

According to the results in Table 9, when trade openness increases by 1%, the Gini index used in the model to represent income distribution inequality decreases by 0.02%. When financial development increases by 1%, the Gini index decreases by 0.05%, and when economic growth increases by 1%, the Gini index increases by 0.001%. The error correction coefficient obtained in the short-term error correction model is -0.581. Accordingly, when the Gini index (income distribution inequality) is exposed to a shock, the effect of this shock will disappear within an average of two years.

Finally, the panel VECM causality analysis was carried out to determine the direction of the relationship between the mentioned variables. The results of this analysis are given in Table 10. Accordingly, the test results for the first

model of the study are unidirectional, going from economic growth to income distribution inequality. This points to bidirectional causality relationships between economic growth and trade openness and between economic growth and financial development. Meanwhile, the test results for the second model of the study provide information about the existence of unidirectional causality relations going from economic growth to income distribution inequality and from financial development to income distribution inequality, as well as bidirectional causality between economic growth and financial development and between economic growth and trade openness.

**Table 10.** *Panel VECM Causality Analysis*

| | First Model | | Second Model | |
|---|---|---|---|---|
| **Null Hypothesis** | **F-Statistics** | **Probability** | **F-Statistics** | **Probability** |
| **≠>gini** | | | | |
| Lnfin | 0.297 | 0.585 | 34.675 | 0.000 |
| Lntic | 1.309 | 0.252 | 6.711 | 0.243 |
| Lngdp | 3.619 | 0.057 | 27.548 | 0.000 |
| **≠>lnfin** | | | | |
| lngini | 1.598 | 0.206 | 4.131 | 0.530 |
| Lntic | 1.245 | 0.264 | 9.213 | 0.100 |
| Lngdp | 57.685 | 0.000 | 38.009 | 0.000 |
| **≠>lntic** | | | | |
| Lngini | 0.017 | 0.864 | 5.220 | 0.389 |
| Lnfin | 0.140 | 0.707 | 9.062 | 0.106 |
| Lngdp | 3.421 | 0.064 | 41.892 | 0.000 |
| **≠>lngdp** | | | | |
| Lngini | 1.000 | 0.317 | 7.392 | 0.193 |
| Lnfin | 15.831 | 0.000 | 84.854 | 0.000 |
| Lntic | 4.379 | 0.036 | 14.649 | 0.000 |

## Conclusion

In line with the Kuznets hypothesis, economic growth and the increasing level of development in the period before developing countries reach a certain level of development are expected to increase income distribution inequality. This hypothesis also states that the economic growth gained after reaching a certain level of development will then reduce the income distribution inequality. Accordingly, an inverted-U-shaped relationship exists between economic growth and income distribution inequality. In addition, an inverted-U-shaped relationship also exists between financial development, which is one of the conditions of economic growth, and income distribution inequality within the framework of the financial Kuznets hypothesis. In the context of the Stolper-Samuelson hypothesis, a negative relationship is said to exist between trade openness and income distribution inequality. Within the scope of this information in the economics literature, this study has aimed to investigate the relationships among trade openness, financial development, economic growth, and income distribution inequality for countries with different levels of development and to test the stated hypotheses. The aim of this study has differed from that of other studies. Few studies have investigated the effects of trade openness, financial development, and economic growth on income distribution inequality. Therefore, this study is important for continuing the debate on this subject in the literature.

In line with the study's unique purpose, the paper has used panel data analysis to investigate the relationships among

trade openness, financial development, economic growth, and income distribution inequality for 19 developing and 22 developed economies for the 2002-2019 period. Within the scope of the panel data analysis, the study has used the Westerlund (2007) cointegration analysis, AMG analysis, and panel ARDL cointegration analysis. According to the results of the analyses for the group of 19 developing countries, when trade openness increases by 1% the Gini index used in the model to represent income distribution inequality increases by 0.13%, when financial development increases by 1%, the Gini index increases by 0.27%, and when economic growth increases by 1%, the Gini index increases by 0.08%. In the group of 22 developed countries, when trade openness increases by 1%, the Gini index decreases by 0.02%, when financial development increases by 1%, the Gini index decreases by 0.05%, and when economic growth increases by 1%, the Gini index increases by 0.001%.

In line with the Panel VECM causality analysis carried out to determine the direction of the relations in the study, a one-way causality relationship was also found going from economic growth to income inequality in the group of 19 developing countries, as well as bi-directional causality relationships between economic growth and trade openness and between economic growth and financial development. In the group of 22 developed countries, unidirectional causality relationships were determined going from economic growth to income inequality and from financial development to income inequality, as well as bidirectional causality between economic growth and financial development and between economic growth and trade openness.

These results confirm the Kuznets and financial Kuznets hypotheses, which state that increases in economic growth and financial development up to a certain level of development increase the income distribution inequality, after which these increases then reduce the income distribution inequality. However, although the results obtained in the study confirm the Stolper-Samuelson hypothesis for developed countries, these results contain inconsistent findings for the Stolper-Samuelson hypothesis with regard to developing countries.

These results contain compatible findings with the studies by Gökalp et al. (2011), Akbıyık (2012), Nikoloski (2013), Topuz (2013), Zhang and Chen (2015), Park and Shin (2015), Altunöz (2015), Pata (2020), Paukert (1973), Ahluwalia (1976), Papanek and Kyn (1986), Ogwang (1995), Jha (1996), Barro (2000), Thornton (2001), Topuz and Dağdemir (2016), and Şengür (2020).

Accordingly, the effects of trade openness, financial development, and economic growth on income distribution injustice depend on countries' development levels. In this context, the results that trade openness, financial development, and economic growth will yield should be taken into consideration according to the development levels of the country when policy makers plan policy implementations to reduce income distribution injustice.

---

**Peer Review:** Externally peer-reviewed.

**Author Contributions:** Conception/Design of Study- İ.H.İ; Data Acquisition- T.D.; Data Analysis/Interpretation- İ.H.İ., T.D.; Drafting Manuscript- İ.H.İ., T.D.; Critical Revision of Manuscript- İ.H.İ.; Final Approval and Accountability- İ.H.İ., T.D.

**Conflict of Interest:** Authors declared no conflict of interest.

**Financial Disclosure:** Authors declared no financial support.

**Hakem Değerlendirmesi:** Dış bağımsız.

**Yazar Katkıları:** Çalışma Konsepti/Tasarım- İ.H.İ.; Veri Toplama- T.D.; Veri Analizi/Yorumlama- İ.H.İ., T.D.; Yazı Taslağı- İ.H.İ., T.D.; İçeriğin Eleştirel İncelemesi- İ.H.İ; Son Onay ve Sorumluluk- İ.H.İ., T.D.

**Çıkar Çatışması:** Yazarlar çıkar çatışması beyan etmemişlerdir.

**Finansal Destek:** Yazarlar finansal destek beyan etmemişlerdir.

---

**ORCID:**

İsmail Hakkı İşcan 0000-0003-2786-4928
Tuğba Demirel 0000-0003-2168-6497

**REFERENCES / KAYNAKLAR**

Abdioğlu, Z., Yamak, N. & Yamak, R. (2019). Türkiye'de gelir eşitsizligi ve ekonomik gelişme arasındaki uzun dönem ilişkisi. *Mehmet Akif Ersoy Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 6*(3), 721–735.

Ahluwalia, M.S. (1976). Inequality, poverty and development. *Journal of Development Economics, 3*, 307–342.

Ahmed, A. & Masih M. (2017). What is the Link Between Financial Development and Income Inequality? Evidence from Malaysia. MPRA, No: 79416, 1–27

Akbıyık, C. (2012). Cross-Country Evidence On Financial Development-Income Inequality Link. Yayınlanmamıs Yuksek Lisans Tezi, ODTU.

Altunöz, U. (2015). Kuznet Eğrisi Bağlamında Türkiye'de Finansal Gelişme ve Gelir Eşitsizliği İliskisinin Analizi. International Conference On Eurasian Economies Bildiriler Kitabı, 871–875.

Argun, A. I. (2006). Gelişmekte Olan Ülkelerde Finansal Gelişme ve Gelir Eşitsizliği, *İstanbul Üniversitesi Sosyal Bilimler Dergisi, (2016/1)*, 61–74.

Barro, R. J. (2000). Inequality and Growth in a Panel of Countries. *Journal of economic growth, 5*(1): 5–32.

Batuo, M., Guidi, F. & Mlambo, K. (2010). Financial Development and Income Inequality: Evidence from African Countries. MPRA, 1–27.

Breush, T. S. & 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.

Calderon, C. & Chong, A. (2001). External sector and income inequality in interdependent economies using a dynamic panel data approach. *Economics Letters, 71*(2), 225–231. https://doi.org/10.1016/S0165- 1765(01)00374-3 (Er. Tar: 25.09.2022).

Cengiz, V. & D. Sedanur (2023). Trade Openness, Financial Openness and Income Inequalty: Empirical Evidence for MIST Countries. *International Journal of Economics, Business and Politics, 7*(1), 16–27.

Clarke, G., Xu, L. C. & Zou H. (2003). Finance and Income Inequality Test of Alternative Theories. The World Bank Development Research Group Investment Climate, 1, 1–24. Finance and Income Inequality: Test of Alternative Theories (findevgateway.org) (Er. Tar: 02.09.2022).

Cakmak, A. I. & Tosun, B. (2017). Ekonomik buyume-gelir dagılımı iliskisi: Kuznets hipotezinin secilmis ulkeler uzerine arastırılması. *Kosbed, 33*, 33–44.

Deger, M. K. (2006). Ticari Liberalizasyon ve Gelir Dağılımı: Gelişmekte Olan Ülkeler Uzerine Bir Analiz. *Ankara Üniversitesi SBF Dergisi, 61*(2), 63–87.

Disbudak, C. Suslu B. (2009). Kalkinma Ve Bireysel Gelir Dagilimi: Kuznets Hipotezi Turkiye Icin Gecerli Mi?. Akdeniz University Faculty of Economics & Administrative Sciences Faculty Journal/Akdeniz Universitesi

Dorn, F., Fuest, C. & Potrafke, N. (2022). Trade openness and income inequality: New empirical evidence. *Economic Inquiry, 60*(1), 202–223. https://doi.org/10.1111/ecin.13018 (Er. Tar: 04.08.2022).

Dunya Bankası, 2021, https://datatopics.worldbank.org/world-development-indicators/the-world-by-income-and- region.html (Er. Tar: 26.08.2023).

Eberhart, M. & Bond, S. R. (2009). Cross-sectional Dependence in Non-stationary Panel Models: A Novel Estimator. MPRA Paper, University Library of Munich, Germany.

Galor, O., & Zeira, J. (1993). Income Distribution and Macroeconomics. *The Review of Economic Studies, 60*(1), 35–52.

Gökalp, M. F., Baldemir, E. & Akgun, G. (2011). Tükiye Ekonomisinde Dışa Açılma ve Gelir Eşitsizlikleri İlişkisi. *Yönetim ve Ekonomi, 18*(1), 87–104.

Hepsag, A. (2017). Finansal Kuznets Egrisi Hipotezi: G-7 Ulkeleri Ornegi. *Sosyal Guvenlik Dergisi, 7*(2), 135–156.

Huang, H. C., Yi-Chen L. & Chih-Chuan Y. (2012). An appropriate test of the Kuznets hypothesis. *Applied Economics Letters, 19*(1), 47–51.

Jauch, S. & Watzka S. (2012). Finance and Income Inequality: A Panel Data Approach. 3687, Cesifo Working Papers, 1–47. Microsoft Word - JauchWatzka_Financial Development and Income Inequality_Aug2012_v10 (free.fr) (Er. Tar: 02.08.2022).

Jha, S. K. (1996). The Kuznets curve: A reassessment. *World Development, 24*(4), 773–780.

Kar, B. B. & Kar, M. (2019). Finansal Gelisme ve Gelir Esitsizligi: BRICS Ekonomileri Icin Dinamik Heterojen Bir Yaklasım. *Anadolu Universitesi Sosyal Bilimler Dergisi, 19*(1), 27–46.

Khan, I. & Nawaz, Z. (2019). Trade, FDI and Income Inequality: Empirical Evidence from CIS. *International Journal of Development Issues, 18*(1), 88–108.

Khan, I., Nawaz, Z. & Saeed, B. B. (2020). Does trade openness and FDI reduce inequality? Evidence from South Asia. *International Journal of Finance & Economics*, 1–12.

Kiatrungwilaikun, N. & Suriya, K. (2015). Rethinking inequality and growth: The Kuznets curve after the Millennium. *International Journal of Intelligent Technologies and Applied Statistics, 8*(2), 159–169.

Kuznets, S. (1955). Economic Growth and Income Inequality. *The American Economic Review, 45*, 1–28.

List, J. A. & Gallet, C. A. (1999). The Kuznets Curve: What Happens After the Inverted-U?. *Review of development economics, 3*(2), 200–206.

Mahesh, M. (2016). The effects of trade openness on income inequality–evidence from BRIC countries. *Economics Bulletin, 36*(3), 1751–1761. http://www.accessecon.com (Er. Tar: 04.08.2022).

Matyas, L., Konya L. & Macquarie L. (1998). The Kuznets U-curve hypothesis: some panel data evidence. *Applied Economics Letters, 5*(11), 693–697.

Nikoloski, Z. (2013). Financial Sector Development and Inequality: Is There A Financial Kuznets Curve?. *Journal of International Development, 25*, 897– 911

Ogwang, T. (1995). The Economic Development-Income Inequality Nexus. *American Journal of Economics and Sociology, 54*(2), 217–229.

Papanek, G. F. & Kyn O. (1986). The effect on income distribution of development, the growth rate and economic strategy. *Journal of Development Economics, 23*(1), 55–65.

Park, D. & Shin, K. (2015). Economic Growth, Financial Development, and Income Inequality. Asian Development Bank Economics Working

Paper Series, (441). Economic Growth, Financial Development, and Income Inequality (adb.org) (Er. Tar: 02.08.2022).

Pata, U. K. (2020). Finansal Gelismenin Gelir Esitsizligi Uzerindeki Etkileri: Finansal Kuznets Egrisi Hipotezi Turkiye Icin Gecerli mi?. *Ataturk Universitesi Iktisadi ve Idari Bilimler Dergisi, 34*(3), 809–828.

Paukert, F. (1973). Income Distribution at Different Levels of Development: A Survey of Evidence. *International Labour Review 108*, 97–125.

Pesaran, M. H. (2004). General Diagnostic Tests for Cross Section Dependence in Panels. CESifo Working Paper, No. 1229.

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.

Thornton, J. (2001). The Kuznets inverted-U hypothesis: panel data evidence from 96 countries. *Applied Economics Letters, 8*(1), 15–16.

Satti, S., Mahalik, M., Bhattacharya, M. & Shahbaz, M. (2015). Dynamics of Income Inequality, Finance and Trade in Kazakhstan: Empirical Evidence from a New Transition Economy with Policy Prescriptions. *Monash Business School, 36*(15), 1–40.

Sehrawat, M., & Giri, A. K. (2016). Financial development, povertyandrural–urban incomeinequality: evidencefrom South Asian countries. *Quality&Quantity*, 50(2), 577–590.

Shahbaz, M. & Islam, F. (2011). Financial Development and Income Inequality in Pakistan: An Application of ARDL Approach. MPRA, No: 28222, 1–20.

Spilimbergo, A., Londono, J. L. & Szekely, M. (1999). Income Distribution, Factor Endowments, and Trade Openness. *Journal of Development Economics, 59*, 77–101.

Stolper, W. & P. Samuelson (1941). Protection and Real Wages. *The Review of Economic Studies, 9*(1), 58–73 | 10.2307/2967638 (Er. Tar: 11.10.2022).

Sengur, M. (2020). Gelir esitsizligi ve ekonomik buyume iliskisi: Gecis ekonomileri uzerine panel veri analizi. *Eskisehir Osmangazi Universitesi IIBF Dergisi, 15*(1), 331–346.

Topuz, S. G. (2013). Finansal gelisme surecinde gelir esitsizligi: Bir panel veri analizi (Yayımlanmamıs Yuksek Lisans Tezi). Eskisehir Osmangazi Univeristesi, Sosyal Bilimler Enstitusu.

Topuz, S. G. & Dagdemir, O. (2016). Ekonomik buyume ve gelir esitsizligi iliskisi: Kuznets ters-u hipotezi'nin gecerliligi. *Eskisehir Osmangazi Universitesi IIBF Dergisi, 11*(13), 115–130.

Wang, M., Park, N. & Choi, C. H. (2020). The nexus between international trade, FDI and income inequality. *Journal of Korea Trade, 24*(4), 18–33. https://doi.org/10.35611/jkt.2020.24.4.18 (Er. Tar: 01.08.2022).

WB, (2022). World Bank Indicator, https://data.worldbank.org/, (Er. Tar: 12.08.2022).

Weil, D. (2016). Economic Growth. International Edition: Routledge

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

Xu, C., Han, M., Dossou, T.A.M. & Bekun, F.V. (2021). Trade openness, FDI, and income inequality: Evidence from Sub-Saharan Africa. *African Development, 33*(1), 193–203. https://doi.org/10.1111/1467-8268.12511 (Er. Tar: 02.08.2022).

The World Bank, (2022). World Development Indicators. https://databank.worldbank.org/source/world-development-indicators#. Erisim Tarihi: 12.10.2022)

Younsi, M. & Bechtini, M. (2018). Economic Growth, Financial Development and Income Inequality in BRICS Countries: Evidence from Panel Granger Causality Tests. MPRA, 1–15.

Zakaria, M. & Fida, B.A. (2016). Trade openness and income inequality in China and the SAARC Region. *Asian- Pacific Economic Literature, 30*(2), 33–44. https://doi.org/10.1111/apel.12152 (Er. Tar: 04.08.2022).

Zhang, Q. & Chen, R. (2015). Financial Development and Income Inequality in China: An Application of SVAR Approach. Procedia Computer Science.

**How cite this article / Atıf biçinmi**

İşcan, İ.H., Demirel, T. (2024). The relationship among trade openness, financial development and economic growth indicators and income distribution inequality: Testing the Kuznets, Financial Kuznets, and Stolper-Samuelson hypotheses. *İktisat Politikası Araştırmaları Dergisi - Journal of Economic Policy Researches, 11*(1), 1-18. https://doi.org/10.26650/JEPR1299562

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
**JEPR** 2024, 11(1): 20–29
DOI: 10.26650/JEPR1317819

RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

# Determining the Dependency Structure Between Selected Macroeconomic Variables Using the Copula Method

## *Seçilmiş makroekonomik değişkenler arasındaki bağımlılık yapısının kapula yöntemi ile belirlenmesi*

Mervenur Sözen[1], Çağlar Sözen[2], Onur Şeyranlioğlu[3]

**ABSTRACT**

Macroeconomic variables reflect the overall economic situation of a country over a specific period. These variables reflect a country's expectations and economic activities for the future and have great importance, particularly for a country's development, strategic planning for the future, and international competitiveness. Because macroeconomic variables are assumed to be interrelated, examining the dependency structure among these variables plays a significant role in shaping countries' economic roadmaps. The main objective of this research is to model the dependency structure between selected macroeconomic variables using the copula method. The copula method is widely used in the fields of economics and finance due to its strength in characterizing dependency among variables without requiring any assumptions. This study uses data from the Consumer Price Index (CPI), Producer Price Index (PPI), exchange rate (USD/TRY), and interest rate (real interest) between 2007-2022. The pairwise dependency structures among the CPI, PPI, exchange rate, and interest rate variables have been determined using the most appropriate copula model, and the results are then interpreted. According to the analysis results, the Joe copula model was found to best model the dependency between the paired variables of CPI and PPI, of CPI and exchange rates, of PPI and exchange rates, and of PPI and interest rates. The Gaussian copula was identified as the most suitable model for capturing the dependency between CPI and interest rates, while the Frank copula was determined to best model the dependency between exchange rates and interest rates.

**Keywords:** copula, PPI, CPI, exchange rate, interest rate

**Jel Code:** E30, E31, E44

[1]Dr., Ondokuz Mayıs University, Department of Statistics,Samsun, Turkiye
[2]Assist. Prof. Giresun University, Department of Finance and Banking,Giresun. Turkiye
[3]Assist. Prof. Giresun University, Department of Business Administration, Giresun, Turkiye

**Sorumlu yazar /**
**Corresponding author:** Çağlar SÖZEN
**E-mail / E-posta :** caglar.sozen@giresun.edu.tr

**Submitted / Başvuru** : 21.06.2023
**Revision Requested / Revizyon Talebi** : 07.11.2023
**Last Revision Received / Son Revizyon** : 16.11.2023
**Accepted / Kabul** : 07.12.2023

**ÖZ**

Makroekonomik değişkenler, belirli bir süre boyunca bir ülkenin genel ekonomik durumunu yansıtmaktadır. Ülkelerin geleceğine ilişkin beklentileri ve ekonomik faaliyetlerini yansıtan bu değişkenler, özellikle bir ülkenin kalkınması, geleceğe dair stratejik planlar yapması ve dolayısıyla uluslararası düzeyde rekabet etmesi için büyük önem taşır. Makroekonomik değişkenler, birbirleri ile ilişkili oldukları varsayıldığından bu değişkenler arasındaki bağımlılık yapısının incelenmesi ülkelerin ekonomik yol haritalarını çizmede önemli rol oynar. Bu araştırmanın temel amacı, makroekonomik değişkenler arasındaki bağımlılık yapısının kapula ile modellenmesidir. Kapula yöntemi, herhangi bir varsayım gerektirmediği ve değişkenler arasındaki bağımlılığı karakterize etmede güçlü bir araç olması sebebiyle ekonomi ve finans alanında kullanımı çok yaygındır. Araştırmada, 2007-2022 yılları arasındaki Tüketici Fiyat Endeksi (TÜFE), Üretici Fiyat Endeksi (ÜFE), döviz Kuru (Dolar/TL) ve faiz oranı (reel faiz) verileri kullanılmıştır. TÜFE, ÜFE, döviz kuru ve faiz oranı değişkenleri arasındaki ikili bağımlılık yapıları, en uygun kopula modeli kullanılarak belirlendi ve elde edilen sonuçlar yorumlandı. Analiz sonuçlarına göre, TÜFE-ÜFE, TÜFE-döviz kurları, ÜFE-döviz kurları ve ÜFE-faiz oranları arasındaki bağımlılığı en iyi modelleyen Joe kapula, TÜFE ile faiz oranları arasındaki bağımlılığı en iyi modelleyen Gaussian kapula ve döviz kurları ile faiz oranları arasındaki bağımlılığı en iyi modelleyen ise Frank kapula olmuştur.

**Anahtar Kelimeler:** Kapula, ÜFE, TÜFE, Kur, Faiz

**Jel Sınıflaması:** E30, E31, E44

## 1. Introduction

Macroeconomic variables play a pivotal role in gauging the overall health, growth, and stability of national economies. These key indicators include the Consumer Price Index (CPI), Producer Price Index (PPI), exchange rate, and interest rate and serve as critical benchmarks closely linked to economic performance (Mishkin & Eakins, 2019). PPI serves as a measure of price changes by assessing the prices of domestically produced and sold goods over a specific timeframe. Its impact extends to company profits and production costs, where elevated PPI values can potentially dampen consumer demand by driving up product and service prices (Woodford & Walsh, 2005). The exchange rate reflects the value of one country's currency relative to another (e.g., US dollar) and plays a crucial role in international trade, investments, and operational costs for exporters and importers. Fluctuations in exchange rates can significantly influence economic relations and contribute to financial stability or volatility between nations (West & Cho, 1994). Interest rates represent the cost of borrowing or the return on lending and hold immense importance in investment decisions and the maintenance of economic equilibrium. Central banks wield interest rates as a tool to regulate economic activity, exerting substantial influence on borrowings, savings, investments, and stock markets (Seyrek & Mızrak, 2009).

Researchers use the copula method to understand the relationships among these variables (i.e., CPI, PPI, exchange rates, interest rates). This statistical approach examines how these variables are dependent on each other by modeling the partner variable's behavior independently of their distribution, thus leading to more accurate predictions. The copula method is particularly useful in finance for risk management and for optimizing investment portfolios. Using this method, one can increase the precision in modeling and estimating the interrelationships among such macroeconomic variables as CPI, PPI, exchange rates, and interest rates. For example, CPI and PPI as indicators of inflation may have a certain degree of correlation that the copula method can capture and measure more accurately (Nelsen, 2007).

Exchange rate and interest rate may also be related, because changes in interest rates often cause changes in exchange rates. These relationships may not be linear, and thus the copula method allows for modeling complex relationships among variables. Furthermore, the copula method can serves as a guide for understanding how these variables behave when they occur together.

This study determines the pairwise dependency structures between the annual frequency dataset and the variables of CPI, PPI, exchange rate, and interest rate for the 2007-2022 period using copula models that do not require any assumptions, as these are powerful tools for characterizing variable interdependencies. The study interprets the results obtained between variables from an economic perspective.

The second part of the study continues by presenting research summaries utilizing copula methods with economic and financial data, followed by a detailed explanation of the materials and the methodology section. The presentation of empirical findings is then carried out, concluding with a section on the research results.

## 2. Literature Review

Numerous studies are found in the literature to have employed copula methodology. Table 1 summarizes some of the research that has been conducted using copula methodology in fields related to finance and economics.

**Table 1.** Literature Review

| Research | Variables | Method | Findings |
|---|---|---|---|
| Jowaheer and Ameerudden (2012) | American Dollar (USD), Indian Rupee (INR), and Mauritian Rupee (MUR). | t copula | The series exhibits an asymmetrical and fat-tailed nature, adhering to the hyperbolic distribution. The relationship between them is best represented by t copula, effectively capturing their dependence structure |
| Gülöksüz (2015) | The Consumer Price Index (CPI) and the exchange rate of the US Dollar against the Turkish Lira (USD/TRY). | Archimedean copula | According to the findings, the two-dimensional Archimedean copula function modeling the dependence structure between the Consumer Price Index (CPI) and the exchange rate of the US Dollar against the Turkish Lira (USD/TRY) has been estimated as Gumbel copula (θ=100). It is observed that the variables tend to increase together. |
| Büyükyılmaz (2016) | Producer Price Index (PPI) and Consumer Price Index (CPI). | Archimedean copula | The Gumbel-Hougaard copula family has been shown to better model the dependence between the Producer Price Index (PPI) and the Consumer Price Index (CPI). |
| Karakas and Doğan (2017) | The exchange rate of the US Dollar against the Turkish Lira (USD/TRY) and the deposit interest rate. | Joe Copula | There is a positive relationship between the exchange rate of the US Dollar and the deposit interest rate. |
| Eren and Erek (2020) | US 10-Year Bond Yield, Spot Gold, US Dollar, US Dollar Index, S&P 500, FTSE 100, NIKKEI 225 closing prices and Bitcoin. | Copula-Garch Approach | The analysis results indicate that there is not a strong mutual dependence between Bitcoin and leading financial indicators. |
| Karakaş et al. (2020) | Closing prices of Bitcoin, Bitcoin Cash, Ethereum, Litecoin and IOTA financial indicators. | CD Vine Copula Approach | D-vine copula is the most appropriate choice for modeling the dependence structure between indicators of cryptocurrencies. |
| Farnoudkıa and Purutçuoğlu (2020) | All sectors of Istanbul Stock Market (ISM). | R-Vine Copula | The sectoral relationship between construction and other sectors has been determined |
| Ünal (2020) | The Borsa Istanbul Electricity Company Stock Index and the exchange rate of the US Dollar against the Turkish Lira (USD/TRY). | Frank, Clayton, Gumbel copula | According to the calculations, the most suitable modeling based on the Mean Squared Error (MSE) is the Clayton copula. However, based on the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC), the Gumbel copula is determined to be the most appropriate. |
| Özgür and Sarıkovanlık (2021) | The 12 stocks traded on BIST 30. | R-Vine Copula | According to Expected Shortfall (ES) backtests, it has been found that R-vine copula GARCH demonstrates better performance in producing more accurate ES predictions. |
| Çelik (2022) | BIST 100 and USD/TRY. | t copula | The analysis results indicate that the model that best fits the data is determined to be the t-copula. |
| Yıldırım Külekci et al. (2023) | Shares of the banking sector traded on BIST 100. | Time Series and R-Vine Copula | When GARCH and R-Vine are jointly applied, findings suggest an improvement in Value at Risk (VaR) and expected ES risk measure predictions compared to traditional GARCH-based approaches. |

Upon reviewing the literature presented in Table 1, the relationships between macroeconomic variables have evidently been studied in a much more limited manner using copula methods. Macroeconomic indicators that reflect a country's overall economic situation over a specific period shape future expectations and economic activities and preferences based on these indicators. Considering the significance macroeconomic indicators have for a country, the primary motivation behind writing this research is the absence of studies in the literature that have comprehensively examined the variables of inflation, exchange rate, and interest rate through various copula methods.

## 3. Material and Methodology

Copulas are modeling tools used to understand the relationship between variables. To comprehend this dependency structure, a function is employed to describe the relationships between variables. Copulas represent these functions. Essentially, copulas have marginal distributions that are uniformly distributed over the range [0,1] for each variable individually. However, copulas link these univariate marginals to obtain multivariate distributions. In other words, copula functions are used to obtain multivariate distributions that reflect the dependency structure between variables. The main objective of copula functions is to obtain the most suitable multivariate distribution that fits the observed data. This distribution should accurately model the relationships and dependency structure between variables (Alhan, 2008). Consequently, one can better understand the characteristics of the data and the relationships between variables.

### 3.1. Two-Dimensional Copula

A two-dimensional copula, defined for $I$=[0,1], is described as follows:

$$C : I^2 \rightarrow I$$

$$(u, v) \rightarrow C(u, v)$$

$$C(u, 0) = C(0, v) = 0 \text{ for } \forall u, v \in I$$

$$C(u, 1) = u \text{ and } C(1, v) = v \text{ for } \forall u, v \in I$$

For $u_1, u_2, v_1, v_2 \in I$, if $u_1 \leq u_2$ and $v_1 \leq v_2$, then the following inequality hold:

$$C(u_2, v_2) - C(u_2, v_1) - C(u_1, v_2) + C(u_1, v_1) \geq 0 \quad (1)$$

The function C($u$,$v$) that satisfies these conditions is a two-dimensional copula function (Nelsen, 2006) and represents the two-dimensional distribution of C($u$,$v$). The value of the function depends on the marginal values of the point ($u$,$v$) and enables the accurate modeling of these marginal values. Moreover, the conditions of the function express the dependency structure between variables and require that this dependency follows a certain ordering and relationship.

#### 3.1.1. Joe Copula

Joe copula is an Archimedean copula. The copula function of Joe copula, parametrized by $\theta$, is expressed as follows:

$$c(u, v) = 1 - \left[(1-u)^{\theta} + (1-v)^{\theta} - (1-u)^{\theta}(1-v)^{\theta}\right]^{\frac{1}{\theta}}, 1 \leq \theta < \infty \quad (2)$$

In particular, as $\theta \rightarrow 1^+$, the Joe copula function converges to the product copula function $C(u, v) = \pi(u, v) = uv$. This indicates that as the $\theta$ parameter approaches 1, the Joe copula function approaches the independence copula function $\pi(u, v)$, implying that the variables $u$ and $v$ are independent (Evkaya et al., 2018).

The Joe copula exhibits right-tail dependence. This means that the *C(u,v)* function increases more rapidly as either the $u$ or $v$ variable increases. In other words, the relationship between the variables has a right-skewed distribution.

### 3.1.2. Gaussian Copula

The Gaussian copula is an elliptical copula. The copula function of the Gaussian copula, along with the $\theta$ dependence parameter, is expressed as follows:

$$C(u,v) = \Phi_G(\Phi^{-1}(u), \Phi^{-1}(v); \theta) = \int_{-\infty}^{\Phi^{-1}(u)} \int_{-\infty}^{\Phi^{-1}(v)} \frac{1}{2\pi\sqrt{1-\theta^2}} * \left( \frac{-(s^2 - 2\theta st + t^2}{2(1-\theta^2)} \right) dsdt \tag{3}$$

where $\phi$ represents the standard normal distribution function, and $\phi_G(u,v)$ represents the bivariate standard normal distribution function. This expression models the dependence structure and relationship between the variables in the Gaussian copula. The Gaussian copula function is represented by the $\theta$ dependence parameter, which corresponds to the Pearson correlation measure and is constrained to the range [-1, 1]. The $\theta$ parameter indicates the strength of the relationship between variables. As $\theta \to 0$, this corresponds to the independence copula, where the variables become independent. The Gaussian copula is a flexible model as it allows for both positive and negative dependencies to the same extent, capturing the nature of the relationship between variables in a flexible manner. The elliptical structure of the copula allows for accommodating various distribution shapes of the data (Trivedi & Zimmer, 2007).

### 3.1.3. Frank Copula

Frank copula is known as an Archimedean copula and is a copula function that can be expressed with the $\theta$ dependence parameter as follows:

$$C(u,v) = -\frac{1}{\theta} ln \left[ 1 + \frac{(e^{-\theta u} - 1)(e^{-\theta v} - 1)}{e^{-\theta} - 1} \right], \theta \in R - \{0\} \tag{4}$$

The $\theta$ parameter controls the shape and strength of the Frank copula function. Specifically, as $\theta \to 0$, the Frank copula function converges to the independence copula, $C(u,v) = \pi(u,v) = uv$. In this case, the variables u and v become independent. The Frank copula has a wide parameter space and can also model negative dependence between margins. This copula function is used to model observations with a strong negative or positive dependence (Meester & Mackay, 1994).

## 4. Findings and Discussion

This study uses the CPI, PPI, exchange rate, and interest rate data published by the Turkish Statistical Institute (TUIK, 2022) between 2007-2022. Table 2 presents descriptive statistics for the following variables:

- The CPI variable indicates a significant fluctuation in consumer prices when evaluating the mean and standard deviation. Additionally, positive kurtosis and positive skewness values suggest that consumer prices tend to deviate from the mean and exhibit a right-skewed distribution.
- The PPI variable has a high standard deviation and positive skewness, thus signifying a noticeable deviation from the mean in producer prices and indicating a right-skewed distribution. This implies fluctuations in prices within the producer sector.
- The exchange rate variable is characterized by a high standard deviation and positive skewness. It tends to deviate from the mean and exhibits a right-skewed distribution.
- The interest rate variable displays a relatively stable outlook compared to the other variables. However, the positive skewness value indicates that interest rates have a right-skewed distribution.

**Table 2.** Descriptive Statistics

| | CPI | PPI | Exchange rate | Interest rate |
|---|---|---|---|---|
| **Mean** | 14.99 | 20.77 | 4.71 | 9.66 |
| **Standart Deviation** | 15.09 | 27.8 | 5.02 | 5.53 |
| **Kurtosis** | 8.05 | 4.08 | 5 | 0.30 |
| **Skewness** | 2.78 | 2.22 | 2.23 | 0.75 |

CPI, PPI, exchange rates, and interest rates are considered random variables, and the optimal copula model has been identified for capturing the pairwise dependence structures among these variables. The parameters characterizing the dependence structure have been obtained using the maximum likelihood method, which is a parametric approach. These parameters play a significant role in determining dependence structures. Meanwhile, copula models are functions that define probability distributions. The most suitable copula model has been determined from among the obtained models by examining the Akaike information criterion (AIC) and Bayesian information criterion (BIC) values. The copula model with the minimum AIC or BIC value represents the best model for capturing the dependence between two variables.

The study examines the pairwise dependence structures between the variables of CPI and PPI, of CPI and exchange rates, of CPI and interest rates, of PPI and exchange rates, of PPI and interest rates, and of exchange rates and interest rates. Table 2 shows the AIC and BIC values that were obtained for the copula models. The pairwise dependence structures between variables have been determined based on the minimum AIC and BIC values. Table 3 presents the selected optimal copula models for the variables and their respective parameter values.

With a parameter value of 5.8, the Joe copula model best captures the dependence between the CPI and PPI variables, between which a strong right-tail dependence is found. This means that the CPI and PPI variables are more likely to increase than decrease together. In other words, when CPI increases, PPI also tends to increase.

With a parameter value of 3.82, the Joe copula model stands out again as the most effective model for capturing the relationship between CPI and exchange rates. While the dependency between CPI and exchange rates may not be as pronounced as the one between CPI and PPI, a notable right-tail dependence is still found to be present. In other words, when CPI experiences an upward trend, exchange rates also tend to increase.

With a parameter value of 0.75, the Gaussian copula model best captures the dependence between CPI and interest rates. This result indicates a strong positive dependence between CPI and interest rates. In other words, when CPI increases, interest rates also tend to increase, and when CPI decreases, interest rates also tend to decrease.

With a parameter value of 3.06, the Joe copula model is the best model for capturing the dependence between PPI and exchange rates. Although not as strong as the CPI-exchange rate dependence, a right-tail dependence is also found between PPI and exchange rates. One can say that when PPI increases, exchange rates also tend to increase. Namely, PPI and exchange rates are more inclined to increase together.

With a parameter value of 1.72, the Joe copula model is also the best model for capturing the dependence between PPI and interest rates. The PPI-interest rate variables exhibit right-tail dependence. However, the relationship is weaker compared to the dependence between CPI-PPI, between CPI-exchange rates, and between PPI-exchange rates. Namely, when PPI increases, interest rates also tend to increase, and PPI and interest rates are more inclined to increase together.

With a parameter value of 2.74, the Frank copula model best captures the dependence between exchange rates and interest rates. A moderate level of positive dependence exists between exchange rates and interest rates.

Figure 1 illustrates the dependence structures between the variables of CPI and PPI, of CPI and exchange rates, of CPI and interest rates, of PPI and exchange rates, of PPI and interest rates, and of exchange rates and interest rates. The economic variables can be observed to tend to move together, indicating a tendency for joint movement. CPI and PPI generally exhibit a strong mutual correlation, indicating that changes in consumer prices are often associated with changes in producer prices. This relationship can be attributed to factors such as raw material costs, production expenses, and overall market dynamics. A strong dependency exists between CPI and exchange rates. Fluctuations in consumer prices impact currency values; conversely, changes in exchange rates also affect the cost of imported goods, subsequently influencing CPI. Understanding the relationship between CPI and interest rates is critical for comprehending the impact monetary policy has on inflation. Central banks often adjust interest rates to control inflation, thus revealing the complex interplay between CPI and interest rates.

A relationship has been observed to occur between PPI and exchange rates, reflecting how changes in production costs and the value of a currency can affect each other. This connection is associated with the dynamics of international trade and production expenses. Understanding the relationship between PPI and interest rates is crucial, as interest rates affect borrowing costs and, consequently, production expenses. The interaction between exchange rates and interest rates is a fundamental aspect of the global economy. Discrepancies in interest rates influence capital flows and can impact currency values, while in turn, exchange rate movements affect export and import dynamics and interest rate expectations.

**Table 3.** The AIC and BIC values of Copula Models

| Variables | Copula | AIC | BIC |
|---|---|---|---|
| CPI-PPI | Gaussian | -14.8 | -14.1 |
| | Student's t | -18.3 | -16.88 |
| | Clayton | -10.28 | -9.57 |
| | Gumbel | -19.83 | -19.13 |
| | Frank | -13.12 | -12.41 |
| | **Joe** | **-22.46** | **-21.76** |
| CPI-exchange rates | Gaussian | -10.26 | -9.55 |
| | Student's t | -8.14 | -6.73 |
| | Clayton | -3.83 | -3.13 |
| | Gumbel | -12.68 | -11.97 |
| | Frank | -9.4 | -8.69 |
| | **Joe** | **-14.92** | **-14.21** |
| CPI-interest rates | **Gaussian** | **-7.19** | **-6.48** |
| | Student's t | -5.12 | -3.7 |
| | Clayton | -6.61 | -5.9 |
| | Gumbel | -5.89 | -5.18 |
| | Frank | -6.26 | -5.56 |
| | Joe | -4.05 | -3.35 |
| PPI-exchange rates | Gaussian | -6.74 | -6.03 |
| | Student's t | -4.59 | -3.18 |
| | Clayton | -2.25 | -1.54 |
| | Gumbel | -8.39 | -7.68 |
| | Frank | -5.31 | -4.6 |
| | **Joe** | **-10.02** | **-9.31** |
| PPI-interest rates | Gaussian | -0.36 | 0.35 |
| | Student's t | 1.72 | 3.14 |
| | Clayton | 0.88 | 1.58 |
| | Gumbel | -0.64 | 0.06 |
| | Frank | 0.16 | 0.86 |
| | **Joe** | **-0.96** | **-0.26** |
| Exchange rates-interest rates | Gaussian | 0.56 | 1.27 |
| | Student's t | 1.72 | 3.13 |
| | Clayton | 1.05 | 1.75 |
| | Gumbel | 0.06 | 0.77 |
| | **Frank** | **-0.04** | **0.67** |
| | Joe | 0.08 | 0.79 |

**Table 4.** The most suitable copula models and parameter values of the variables

| **Variables** | **Copula** | **par1** | **par2** | **Tau** |
|---|---|---|---|---|
| CPI-PPI | Joe | 5.8 | 0 | 0.71 |
| CPI- exchange rates | Joe | 3.82 | 0 | 0.60 |
| CPI- interest rates | Gaussian | 0.75 | 0 | 0.54 |
| PPI- exchange rates | Joe | 3.06 | 0 | 0.52 |
| PPI-interest rates | Joe | 1.72 | 0 | 0.29 |
| Exchange rates- interest rates | Frank | 2.74 | 0 | 0.28 |

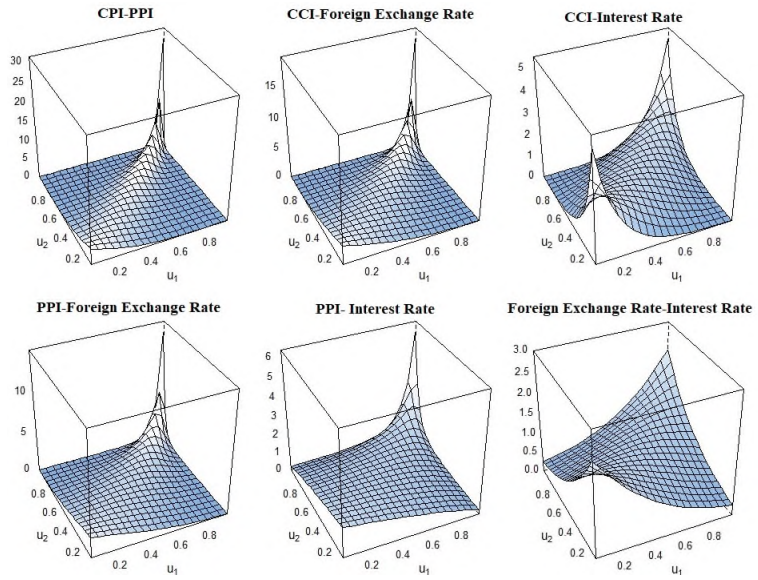



**Figure 1.** Dependency Structures Between Variables

Figure 2 presents the correlations between the pairs of economic variables. Upon examining Figure 2:

- A high positive correlation is observed between CPI and PPI ($p$=0.79), indicating that CPI and PPI tend to change similarly and are closely dependent on each other.
- A high positive correlation also exists between exchange rates and CPI ($p$=0.76), indicating that when the value of the Turkish lira decreases, the cost of imported goods increases, leading to an increase in CPI.
- The correlation between PPI and exchange rate is lower than the correlation between CPI and exchange rate ($p$=0.64), indicating that PPI is less associated with exchange rates compared to CPI.
- A moderate positive correlation is found between interest rates and CPI ($p$=0.66). This suggests that CPI tends to decrease alongside a rise in interest rates rise and increase in credit interest, which result in a decrease in consumer spending. The correlation between interest rates and exchange rates is low ($p$=0.34), indicating that interest rates have a limited influence on exchange rates and that other factors have a larger impact on exchange rate fluctuations.

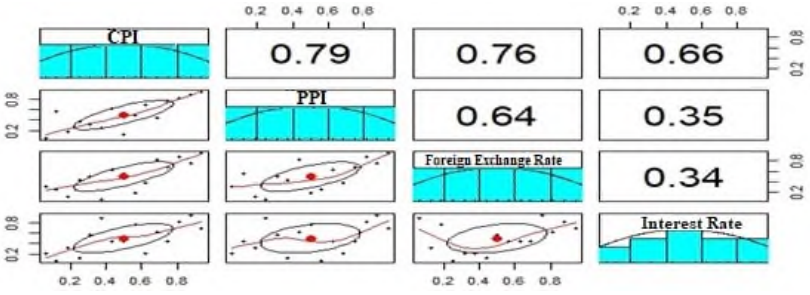



**Figure 2.** Correlation Between Selected Economic Variables

## 5. Conclusions

The main purpose of this research is to investigate the interrelationships between key macroeconomic variables, especially CPI, PPI, exchange rates, and interest rates in Türkiye. These variables have crucial importance in determining price levels within the country, and analyzing dependency patterns is crucial for a comprehensive understanding of the overall economic situation. In addition, the study includes other important economic factors that have a significant impact on price levels, such as exchange rates and interest rates.

The copula method has been used to model the relationship between these variables. Unlike traditional approaches

that assume the data to be normally distributed, the copula method offers a more realistic and flexible framework. The study uses the copula method and CPI, PPI, exchange rates, and interest rate data to examine the dependency structures of economic variables. The selection of the most suitable copula model has been based on the minimization of the AIC and BIC values.

The analysis reveals the Joe copula model to be the most suitable one for capturing the dependence between the variable pairs of CPI and PPI, of CPI and exchange rates, of PPI and exchange rates, and of PPI and interest rates with respective parameter values of 5.8, 3.82, 3.06, and 1.72. These findings suggest that there is a right-tailed dependency among the variables, indicating tendencies to act together.

Similarly, the Gaussian copula model with a parameter value of 0.75 was determined as the most suitable model for capturing the dependence between CPI and interest rates. This implies a relationship characterized by a Gaussian distribution. This result indicates a strong positive relationship between CPI and interest rates. In other words, CPI and interest rates tend to move together. The Frank copula model revealed the best dependence between exchange rates and interest rates with a parameter value of 2.74, indicating a moderately positive dependence between these variables. Therefore, exchange rates and interest rates are related and tend to move together.

A high positive correlation and a strong relationship are found between CPI and PPI. This shows that a strong link to exist between the prices consumers pay and the costs producers incur. A high positive correlation and a strong relationship are found between CPI and exchange rates. This shows that changes in exchange rates have a significant effect on consumer prices. The moderate relationship between CPI and interest rates indicates that changes in interest rates have a moderate effect on consumer prices. A moderate positive correlation and relationship exist between PPI and exchange rates, while the relationship between PPI and interest rates is weak. This shows a moderate relationship to be present between producer costs and exchange rates, whereas interest rates have a minimal effect on producer costs. A very weak positive correlation and relationship have been found between exchange rates and interest rates, indicating a minimal relationship between these two variables. The primary reason for this situation is that market participants expect a specific change in interest rates, and the failure to meet this expectation indicates a weak relationship between the two variables.

This study is an important step in analyzing the dependency structures between the variables that determine price levels in Türkiye and in modeling this structure more accurately using the copula method. Moreover, given the applicability the copula method has toward other variables, this study can serve as a valuable reference for economic research. The findings of this study can be used in various fields such as economic policy planning and future price level forecasting.

The accurate modeling and prediction of future values for macroeconomic indicators or the relationships between these indicators in a country has great importance in shaping expectations and economic activities. These indicators are closely monitored not only by domestic stakeholders but also by external market players and provide insights into a country's economic stability. The results presented in this research are considered to be particularly valuable as an guide for helping policymakers understand the level of relationships between macroeconomic indicators compared to econometric models. This study can serve as an example for advanced research aimed at determining relationships between paired macroeconomic indicators, and the results can be compared with other research conducted using econometric models.

**Hakem Değerlendirmesi:** Dış bağımsız.

**Yazar Katkıları:** Çalışma Konsepti/Tasarım- M.S., Ç.S.; Veri Toplama- M.S., Ç.Ş., O.Ş.; Veri Analizi/Yorumlama- M.S., Ç.Ş.; Yazı Taslağı- M.S., Ç.Ş. ; İçeriğin Eleştirel İncelemesi- M.S., Ç.Ş., O.Ş.; Son Onay ve Sorumluluk- M.S., Ç.Ş., O.Ş.

**Çıkar Çatışması:** Yazarlar çıkar çatışması beyan etmemişlerdir.

**Finansal Destek:** Yazarlar finansal destek beyan etmemişlerdir.

**Peer Review:** Externally peer-reviewed.

**Author Contributions:** Conception/Design of Study- M.S., Ç.Ş.; Data Acquisition- M.S., Ç.Ş., O.Ş.; Data Analysis/Interpretation- M.S., Ç.Ş.; Drafting Manuscript- M.S., Ç.Ş.; Critical Revision of Manuscript- M.S., Ç.Ş., O.Ş. ; Final Approval and Accountability- M.S., Ç.Ş., O.Ş.

**Conflict of Interest:** Authors declared no conflict of interest.

**Financial Disclosure:** Authors declared no financial support.

**ORCID:**

Mervenur Sözen 0000-0001-5603-5382
Çağlar Sözen 0000-0002-3732-5058
Onur Şeyranlioğlu 0000-0002-1105-4034

## REFERENCES / KAYNAKLAR

Alhan, A. (2008). Bağımsızlık kapulasını içeren kapula aileleri, kapula tahmin yöntemleri ve İstanbul Menkul Kıymetler Borsasında sektörler arası bağımlılık yapısı. Doktora Tezi, Gazi Üniversitesi Fen Bilimleri Enstitüsü İstatistik Anabilim Dalı, 162, Ankara.

Büyükyılmaz, A. (2016). Some Archimedean Copulas On Producer Price Index And Consumer Price Index: A Case Of Turkey. Mehmet Akif Ersoy Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 1(13), 206-215.

Çelik, S. Copula ile Portföy Riskinin Hesaplanması: BİST100 ve USD Kuru Üzerine Bir Uygulama.

Eren, B. S., and Erek, M. (2020). The Interdependence of Bitcoin and Financial Markets: A Copula-Garch Approach. Liberal Düşünce Dergisi, 25 (98), 35-63. DOI: 10.36484/liberal.662625

Evkaya, O. O., Yozgatligil, C., and Selcuk-Kestel, A. S. (2018). Measuring Dependence between Electricity Consumption and Contributing Indicators via Copulas: Turkish Case. *Gazi University Journal of Science, 31*(4), 1284-1296.

Farnoudkıa, H., and Purutçuoğlu, V. (2020). Application of r-vine copula method in Istanbul stock market data: A case study for the construction sector. Journal of Turkish Operations Management,4(2),509-518.

Gülöksüz, Ç. T. (2015). Dolar kuru ile tüketici fiyat endeksi arasındaki ilişkinin Archimedean Kapula ile modellenmesi. *Bankacılık ve Sigortacılık Araştırmaları Dergisi, 2*(7), 53-62.

Jowaheer, V., and Ameerudden, N. Z. B. (2012). Modelling the Dependence Structure of MUR/USD and MUR/INR Exchange Rates using Copula. International Journal of Economics and Financial Issues, 2 (1), 27-32.

Karakas, A., and Doğan, M. (2017). With Copula function analysis of structure dependence relation between Exchange rate of dollars and Deposit rate of Turkey. Natural Science and Discovery, 3 (1), 1-12. DOI: 10.20863/nsd.297636.

Karakaş, A., Demir, A., and Çalik, S. (2020). Interdependence of Bitcoin and Other Crypto Money Indicators: CD Vine Copula Approach, *Bitlis Eren Üniversitesi Fen Bilimleri Dergisi*, c. 9, sayı. 4, ss. 1527-1536.

Meester S. G., and Mackay, J. (1994). A parametric model for cluster correlated categorical data. Biometrics 954-963.

Mishkin, F. S., and Eakins, S. G. (2019). Financial markets. Pearson Italia.

Nelsen, R. B. (2006). Archimedean copulas. *An introduction to copulas*, 109-155.

Nelsen, R. B. (2007). *An introduction to copulas*. Springer science & business media.

Ozgur, C., and Sarikovanlik, V. (2021). An application of Regular Vine copula in portfolio risk forecasting: evidence from Istanbul stock exchange. *Quantitative Finance and Economics, 5*(3), 452-471.

Seyrek, İ., and Mızırak, Z. (2009). Faiz teorileri üzerine bir inceleme: Finansal istikrarsızlık hipotezinin temel dayanağı. Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 22, 383-394.

Trivedi P., and Zimmer D. (2007). Copula modeling: An introduction for practitioners. Foundations and Trends in Econometrics 1(1): 1-111.

TUİK, Türkiye İstatistik Kurumu. Tüketici Fiyat Endeksi, Üretici Fiyat Endeksi, Döviz Kuru, Faiz oranı (10 Mayıs 2022). https://tuik.gov.tr

Ünal, T. (2022). Modelıng the dependence structure of financial data with A copula: Electricity index – an example of the dollar exchange rate. AYBU Business Journal, 2 (1),35-45.

West, K. D., and Cho (1994). The predictive ability of several models of exchange rate volatility. Journal of Econometrics, 69, 367-391.

Woodford, M., and Walsh, C. E. (2005). Interest and prices: Foundations of a theory of monetary policy. *Macroeconomic Dynamics, 9*(3), 462-468.

Yıldırım Külekci, B., Poyraz, G., Gür, İ. And Evkaya, O. (2023). BIST100 Bankacılık Sektöründeki Bağımlılığın Asma Kopula ile İncelenmesi . İstanbul İktisat Dergisi , 73 (1) , 55-82 . DOI: 10.26650/ISTJECON2022-1229039

**How cite this article / Atıf biçinmi**

Sözen, M., Sözen, Ç., Şeyranlioğlu, O. (2024). Determining the dependency structure between selected macroeconomic variables using the copula method. *İktisat Politikası Araştırmaları Dergisi - Journal of Economic Policy Researches, 11*(1), 20–29. https://doi.org/10.26650/JEPR1317819

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
**JEPR** 2024, 11(1): 31–49
DOI: 10.26650/JEPR1318757

RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

# Üretici ve Tüketici Fiyatlarında Kur Geçişkenliği Etkisi: Türkiye, Brezilya ve Güney Afrika

## Effect of Exchange Rate Pass-through on Producer and Consumer Prices:Türkiye, Brazil, and South Africa

Ahmet Ekrem Kaya[1]

**ÖZ**

Makroekonomik istikrarsızlığın göstergelerinden olan enflasyonun en önemli belirleyicileri arasında döviz kuru da yer almaktadır. Döviz kurunun yurt içi fiyatlara aktarımı maliyet, beklentiler ve endeksleme kanalları üzerinden gerçekleşir. Bu kapsamda döviz kuru hem tüketici fiyatlarını hem de üretici fiyatlarını etkilemektedir. Kur üzerinde baskı oluşturabilecek zayıf uluslararası rezervler, kısa vadeli dış borç stoğu ve cari açık sorunları açısından trend benzerliği gösteren ülkelerin kur geçişkenliği açısından birbirlerine ne kadar benzediği bu çalışmanın araştırma sorusunu oluşturmaktadır. Çalışmada, döviz kurunun yükselmesine neden olacak göstergelerin benzeşiyor olmasının kur geçişkenliği açısından da benzerlik oluşturup oluşturmadığının incelenmesi amaçlanmaktadır. Böylece güçlü bir enflasyon dinamiği olan kur geçişkenliği karşılaştırmalı olarak değerlendirilebilecektir. Gecikmesi dağıtılmış otoregresif model yöntemiyle 1995Ç1:2020Ç1 dönemi için yürütülen analiz sonuçları Türkiye, Brezilya ve Güney Afrika'nın güçlü kur geçişkenliğine sahip olduğunu göstermektedir. Döviz kurundaki artış üç ülke içerisinde uzun dönemde en fazla Brezilya'da görece en az Türkiye'de fiyatların yükselmesine neden olmaktadır. Sonuçlar güçlü kur geçişkenliği açısından ülkelerin benzeştiğini, kur geçişkenliğinin düzeyi açısından ise farklılaştıklarını göstermektedir. Döviz kurundan Tüketici Fiyat Endeksi'ne üç ülkede de Granger nedenselliği tespit edilmektedir. Tüketici Fiyat Endeksi'nden döviz kuruna nedensellik ise sadece Türkiye ve Brezilya'da görülmektedir. Döviz kurundan Üretici Fiyat Endeksi'ne Granger nedensellik yalnızca Türkiye ve Brezilya için söz konusu iken Üretici Fiyat Endeksi'nden döviz kuruna nedensellik sadece Güney Afrika için tespit edilebilmektedir.

**Anahtar Kelimeler:** Kur geçişkenliği, enflasyon, ARDL, Toda-Yamamoto, Granger

**Jel Sınıflaması:** C22, E31, F31

[1]Dr. Öğr. Üye., İstanbul Sabahattin Zaim Üniversitesi, İşletme ve Yönetim Bilimleri Fakültesi, İktisat, İstanbul, Türkiye

**Sorumlu yazar /**
**Corresponding author:** Ahmet Ekrem Kaya
**E-mail / E-posta :** ekrem.kaya@izu.edu.tr

**Başvuru / Submitted** : 22.06.2023
**Revizyon Talebi / Revision Requested** : 10.09.2023
**Son Revizyon / Last Revision Received** : 19.09.2023
**Kabul / Accepted** : 31.10.2023

**ABSTRACT**

The exchange rate is one of the prominent determinants of inflation, among the macroeconomic instability indicators. It is transmitted to domestic prices via cost, expectation, and indexation channels. As such, the exchange rate affects both consumer prices and producer prices. Several countries show trend similarity in terms of weak international reserves, short-term external debt stock, and current account deficit problems that may put pressure on the exchange rate. The aim of the study is to examine whether the affinity of the indicators that will cause the exchange rate to increase creates a similarity regarding exchange rate pass-through. Thus, exchange rate pass-through, which is a strong inflation dynamic, can be evaluated comparatively. Analysis results for 1995Q1:2020Q1 using the Autoregressive Distributed Lag method show that Turkey, Brazil, and South Africa have strong exchange rate pass-through. The increase in the exchange rate causes prices to increase in the long run, with the highest increase in Brazil and the relatively least in Turkey, among the three countries. The results show that countries are similar regarding strong exchange rate pass-through but differ concerning the level of exchange rate pass-through. Granger causality is determined from the exchange rate to the Consumer Price Index in all three countries. Causality from the Consumer Price Index to the exchange rate is only seen in Türkiye and Brazil. While Granger causality from the exchange rate to the Producer Price Index is only valid for Turkey and Brazil, causality from the Producer Price Index to the exchange rate can only be determined for South Africa.

**Keywords:** Exchange rate pass-through, inflation, ARDL, Toda-Yamamoto, Granger

**Jel Code:** C22, E31, F31

**EXTENDED ABSTRACT**

Price stability is one of the most important components of macroeconomic stability. Exchange rate volatility is also one of the factors that cause the deterioration of a country's price stability. Increasing exchange rates will inevitably increase the cost of raw materials, intermediate goods, and capital goods. Because of the deterioration of future inflation expectations and inflation inertia issues, economic agents will be forced to accept the exchange rate as an anchor. Thus, exchange rate movements affect domestic prices through cost, expectations, and indexing behavior channels.

Low international reserve level, short-term external debt stock, and current account deficit problems are the main causes of the national currency's depreciation. This situation, which means an increase in the exchange rate, increases the production costs indexed to foreign currency and prices of imported final consumption products (i.e., inflation). Consequently, movements in the exchange rate are transferred to domestic prices.

This study aims to examine the exchange rate pass-through degrees of Turkey, Brazil, and South Africa, which show similar trends in weak international reserves, short-term external debt stock, and current account deficit problems. In other words, the study explores whether the similarity of the indicators that will pressure the exchange rate causes the exchange rate pass-through level in these countries to be similar.

Previous studies have focused on the effect of inflation environment, exchange rate volatility, and macroeconomic conditions on exchange rate pass-through. For example, Taylor's (2000) conclusion that low inflation environment reduces exchange rate pass-through is supported by the findings of Albuquerque and Portugal (2005), Edwards (2006), Silva and Vernengo (2008), and Junior (2010) for Brazil. Moreover, Oladipo (2017) showed that, in addition to inflation and the output gap, inflation targeting has a significant explanatory effect on the South African exchange rate. The finding that the inflation environment reduces the exchange rate pass-through is in line with the results of Kara et al. (2005) for Turkey.

Modenesi et al. (2017) argued that exchange rate pass-through has an asymmetric effect on CPI in Brazil. Meanwhile, Camara and Feijo (2017) asserted that more than 60% of industry inflation is due to changes in exchange rates. The studies conducted for South Africa reveal an asymmetric exchange rate pass-through, lower CPI pass-through than the PPI, and higher exchange rate pass-through than the oil price pass-through (Karoro et al., 2009; Ocran, 2010; Akdeniz et al., 2022). Miyajima (2019) argued that high exchange rate volatility increases core inflation, whereas Kabundi and Mlachila (2019) claimed that improving monetary policy credibility reduces exchange rate pass-through. High dollarization trends, insufficient industry competition, inflation inertia, and exchange rate anchoring are cited as reasons for exchange rate pass-through in Turkey (Leigh and Rossi, 2002). In Turkey, a strong pass-through from the exchange rate to consumer and producer prices is detected. It is concluded that the pass-through level has decreased with the adoption of the free-floating exchange rate regime and the implementation of the inflation targeting regime (Kara et al., 2007; Kara and Öğünç, 2008; Damar, 2010; Yüncüler, 2011; Çatık and Güçlü, 2012; Tümtürk, 2017).

The ARDL method is used in this study to analyze the pass-through effect from the exchange rate to domestic prices revealed by the literature for 1995Q1:2020Q1. Pesaran et al. (2001) developed an approach that allows us to investigate the cointegration relationship of series that become stationary at different levels. Furthermore, the long-term relationship between the exchange rate and the CPI & PPI indices can be analyzed. The change in CPI and PPI caused

by the exchange rate movement is analyzed by establishing two separate models for each country. In addition, the Toda and Yamamoto (1995) causality test is used to examine the bidirectional Granger causality relationship between the exchange rate and the CPI and PPI indices.

The results of Turkey, Brazil, and South Africa show a cointegration relationship between the exchange rate and the CPI and PPI indices. When the long-term effects are examined, the pass-through from exchange rate to CPI and PPI is highest in Brazil, South Africa, and Turkey, respectively. Although the proximity of the parameters that may cause the exchange rate to rise indicates a similarity concerning strong exchange rate pass-through in these countries, a differentiation exists between countries concerning the degree of pass-through.

The test results of Toda and Yamamoto (1995) show a Granger causality from exchange rate to CPI in three countries and to PPI only in Türkiye and Brazil. However, Granger causality is determined from the CPI to the exchange rate in Turkey and Brazil, and from the PPI to the exchange rate in South Africa. Based on these findings, we can argue that the literature findings on the effect of inflation environment on exchange rate pass-through overlap with the findings for Turkey, Brazil, and South Africa.

## 1. Giriş

Makroekonomik performansın temel göstergelerinden olan enflasyon yurtiçi fiyatlar düzeyindeki kalıcı ve sürekli artışı ifade eder. Ulusal ve uluslararası yatırımları, tüketimi, beklentileri ve fiyatlama davranışını bozarak, makroekonomik görünümün diğer iki temel göstergesi olan işsizlik ve büyüme rakamları üzerinde olumsuz bir etkiye neden olabilmektedir. Buradan hareketle makroekonomik istikrarın sürdürülmesinde fiyat istikrarı oldukça önemli bir yere sahiptir.

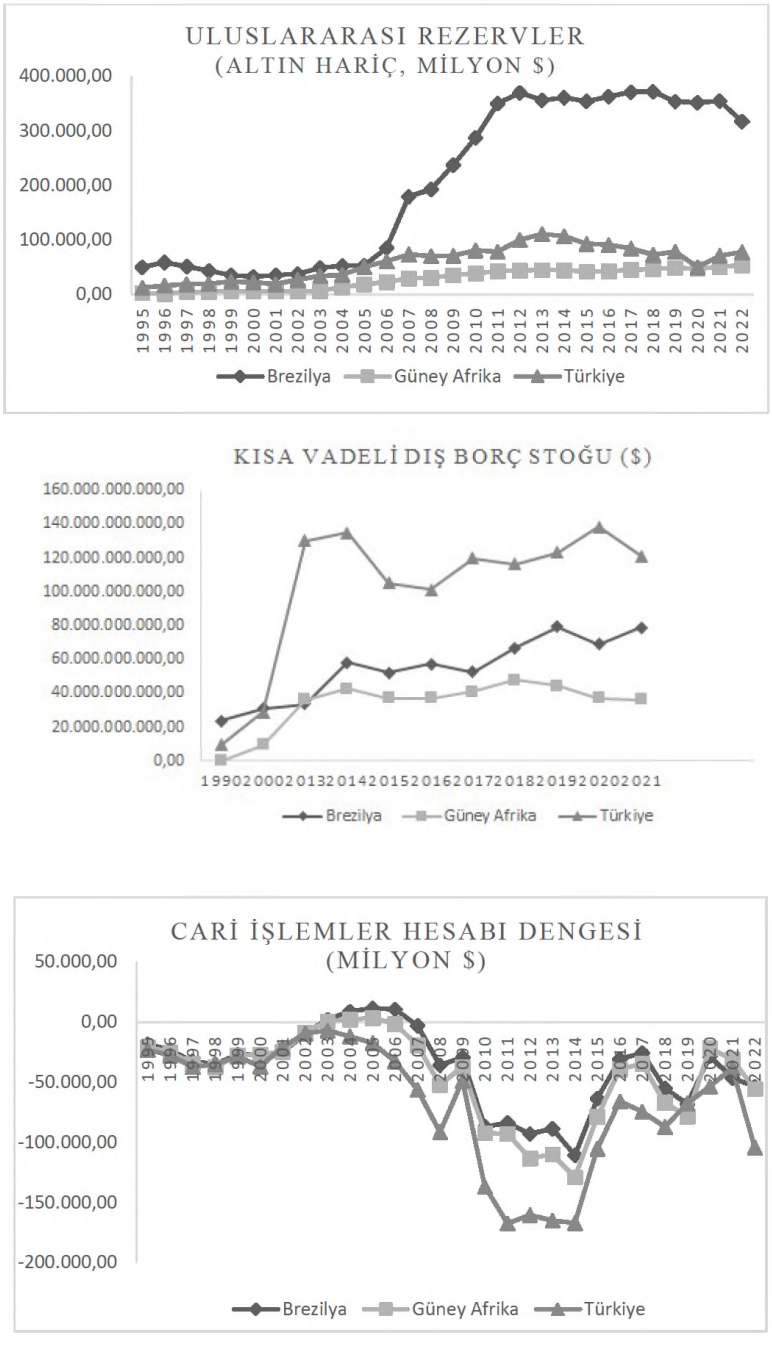
Üretici ve tüketici fiyatlarında enflasyon oluşumuna neden olacak şekilde fiyat artışı yaşanmasına yol açan unsurlardan biri döviz kurudur. Kur geçişkenliği olarak kavramsallaştırılan bu olgu makro ve mikroekonomik temellere sahiptir. Makroekonomik perspektif ile açıklanan kur geçişkenliği unsurlarından biri *çıktı açığıdır* ve bir ülkenin potansiyel üretimi ile fiili üretimi arasındaki fark anlamına gelir. Bu farkın doğuracağı talep artışı fiyatlar üzerinde baskı oluşturacaktır. Böylece oluşacak olan *enflasyon ortamı* maliyetlerdeki artışın fiyatlara aktarımı olasılığını artırarak kur geçişkenliğinin enflasyon üzerinde daha yoğun bir etki doğurmasına neden olur. Maliyetlerdeki artışın kalıcılık düzeyi kur geçişkenliğinin boyutuna etki etmektedir. Kur artışı geçici olduğunda bunun fiyatlara yansıması kısmi olurken, kurdaki önemli artışlar fiyat geçişkenliğinin de yüksek olmasıyla sonuçlanır. Ülkenin *dışa açıklık derecesi* de fiyatların kurdaki değişime gösterdiği hassasiyet açısından kur geçişkenliğinin makroekonomik unsurları arasında yer almaktadır. Kur geçişkenliğinin bir diğer nedeni *döviz kuru uyumsuzluğudur*. Ekonomik birimlerin kurun aşırı değerli olması durumunda bir devalüasyon beklentisine sahip olmalarından dolayı nispi fiyatları düzenlemeleri ile ortaya çıkar. Son olarak *döviz kuru oynaklığı* kur geçişkenliğine yol açan unsurlar arasında yer alır. Menü maliyetlerinin neden olacağı fiyat katılığına rağmen; fiyat değişimlerinin sağlayacağı kazanç menü maliyetlerinin üstünde olduğu sürece kur oynaklığı daha sık fiyat değişimleri sonucunu doğurur. Kur geçişkenliğinin mikro ekonomik yönü ise firmaların piyasa gücüne ve ekonomik birimlerin talebinin fiyat esnekliğine bağlıdır. Her iki unsur da kurdan doğan maliyet artışlarının tüketicilere yansıtılma düzeyini belirleyen temellerdir (de Souza vd., 2013).

Döviz kurundaki değişimin yurtiçi fiyatları aktarımı doğrudan ve dolaylı kanallar ile gerçekleşir. Ara ve sermaye malı fiyatlarının kurdaki artış nedeniyle yükselmesi maliyetlerde bir artışa neden olarak enflasyonist bir etki doğurmaktadır. İthal nihai mallar da kur artışı nedeniyle yurtiçi fiyatların yükselmesine sebebiyet verir. Diğer taraftan ekonomik birimler döviz kurundaki artışı bir çıpa olarak benimseyip kurdaki değişimle paralel bir fiyatlama yaklaşımı sergileyerek endeksleme davranışının ortaya çıkmasına neden olurlar (Berument, 2002; Kara vd., 2007; Kara & Öğünç, 2008). Kurdaki artışın ihracatı artırması ve ithalatın daha pahalı hale gelmesi nedeniyle yurtiçi ekonomik birimlerin ithal ikame ürünlere yönelmesi toplam talep üzerinde bir etki oluşturarak yurtiçi fiyatların dolaylı olarak da yükselmesine neden olmaktadır (Berument, 2002; McFarlane, 2002; Damar, 2010).

Zayıf uluslararası rezervler, kısa vadeli dış borç stoku ve cari açık kurun yükselmesine dayanak oluşturan temel göstergelerdendir. Bu parametrelerin seyri açısından Türkiye ile -düzey değerleri itibariyle olmasa bile- trend benzerliği gösteren Brezilya ve Güney Afrika'nın[1] (Grafik-1) kur geçişkenliği bağlamında birbirlerine ne kadar benzediği çalışmanın araştırma sorusunu oluşturmaktadır. Burada temel motivasyon bir enflasyon dinamiği olarak kur geçişkenliğinin karşılaştırmalı olarak ele alınmasıdır. Kur üzerinde yukarı yönlü baskıya yol açabilecek göstergelerin benzeşiyor olması kur geçişkenliği üzerinde de bir benzerlik oluşturur mu sorusunu ortaya koymaktadır. Böylece yurtiçi enflasyonun oluşumunda döviz kurunun söz konusu ülkelerde benzeyen bir etkisinin olup olmadığı sonucu

[1] Rusya ve Çin'in uluslararası rezervler ve cari açık pozisyonları bu ülkelerden ayrıştığı için çalışma kapsamı BRICS ülkeleri olarak genişletilmemiştir.

değerlendirilebilecektir. Söz konusu üç ülke yaklaşık aynı dönemlerde enflasyon hedeflemesi rejimini benimsemiş olsa da Eichengreen (2002) gelişmekte olan ülkelerin bu konuda üç temel handikap barındırdığını ileri sürmektedir: 1) Gelişmiş ülkelerden daha yüksek kur geçişkenliğine sahip olmaları 2) yükümlülük dolarizasyonu 3) politika yapıcıların kredibilite sorunu.




**Şekil 1.** Uluslararası Rezervler, Kısa Vadeli Dış Borç Stoğu ve Cari Açık

Gelişmekte olan ülkelerin kur rejimini seçerken veya kur düzeyini yönetirken temel motivasyonları fiyat istikrarını sağlamaktır. Enflasyon hedeflerine ulaşılabilmesi veya enflasyon tahminlerinde hata payının düşük olması kur geçişkenliğinin derecesiyle ilgilidir. Yüksek kur geçişkenliğine sahip ülkeler dış şoklara daha açık hale geleceğinden bunun yurt içi fiyatlara yansıması daha şiddetli olur (Fraga vd., 2003; Goldfajn ve Werlang, 2000). Bu kapsamda Calvo ve Reinhart (2000) tarafından ortaya konan kur geçişkenliğinin gelişmiş ülkelerde düşük, gelişmekte olan ülkelerde yüksek olduğuna dönük sonuçlar gelişmekte olan ülkeler kategorisine giren Türkiye, Brezilya ve Güney Afrika'nın birbirlerine ne kadar benzediği karşılaştırmalı olarak incelenerek daha ileri taşınacaktır.

Kur geçişkenliği çalışmaları para politikası müdahalesinin zamanlamasına ilişkin ipucu sunması nedeniyle önem arz eder. Çünkü kur geçişkenliğinin hızı ve düzeyi enflasyon tahminleri ve enflasyon şokları karşısında para politikasının tasarlanması açısından belirleyicidir (Maduku ve Kaseeram, 2018). Analize konu olan ülkelerin, kur geçişkenliğinde azaltıcı bir etkiye sahip olduğu ileri sürülen enflasyon hedeflemesi rejimi ve serbest dalgalı kur rejimlerine yaklaşık dönemlerde geçmeleri de kur geçişkenliğinin mukayeseli olarak incelenebilmesi için gerekli yapısal benzerliği sağlamış olmaktadır. Böylece çalışma, kur üzerinde baskı oluşturabilecek trend benzerliği gösteren temel üç göstergenin ülkeler arasında birbirine yakınsayan bir kur geçişkenliğine yol açıp açmadığını incelemeyi amaçlamaktadır. Yüksek enflasyon grafiğine sahip olmaları açısından bu ülkelerde kur geçişkenliğinin benzeyen veya ayrışan düzeyi döviz kuru haricindeki (enerji ithalatı, çıktı açığı, marjinal ithalat eğilimi, beklentilerin bozulması, endeksleme davranışının benimsenmesi, piyasaların rekabetçiliğe açık olması gibi) ülkeye özgü enflasyon dinamiklerini önemli hale getirecektir. Bu doğrultuda çalışmanın literatüre katkısı güçlü bir enflasyon dinamiği olan döviz kurunun Türkiye, Brezilya ve Güney Afrika'da ne düzeyde bir enflasyonist etki doğurduğunu karşılaştırmalı olarak ortaya koymaktır.

Çalışmanın izleyen bölümünde literatür özetine yer verilmektedir. Üçüncü bölümde yöntem ve veri setine ilişkin açıklamalar yer almaktadır. Dördüncü bölümde ampirik sonuçlar açıklanmakta ve beşinci bölümde sonuç yer almaktadır.

## 2. Literatür

Kur geçişkenliği literatüründe öne çıkan temel bulgular enflasyon ortamının, kur oynaklığının ve makroekonomik koşulların kur geçişkenliği üzerinde etkisinin olduğunu göstermektedir. Ampirik bulguların birbirinden farklılaşan yönü ise kullanılan yöntem, veri periyodu, verinin ayrıştırılmış veya bütünleşik olması, ürünlerin veya sektörlerin karakteristik özellikleri ve ülkeye özgü koşullardan kaynaklanmaktadır (Simo-Kengne vd., 2022).

Düşük enflasyon ortamının kur geçişkenliğini azalttığına yönelik geleneksel sonuç (Taylor, 2000) çok sayıda gelişmekte olan ülke için doğrulanmaktadır. Örneğin Brezilya için da Silva ve Vernengo (2008) yüksek enflasyon döneminde yüksek seyreden kur geçişkenliğinin Real Plan'ın sağladığı istikrarla 0,20 düzeyine kadar düştüğünü göstermektedir. Benzer bir şekilde Junior (2010) Brezilya'da enflasyonun belli bir eşik değeri geçmesiyle kurdaki %10'luk değer kaybının uzun dönemde %4'lük bir enflasyona yol açacağı, enflasyonun eşik değerin altında kalması durumunda ise kur geçişkenliğinin %0,8 olarak gerçekleşeceği sonucuna ulaşmaktadır.

Enflasyonla mücadelede en önemli unsurlardan biri enflasyon beklentisinin yönetilmesidir. Fiyat yükselişini yavaşlatmanın yolu gelecek dönem enflasyon tahminlerini iyileştirebilmeye dayanmaktadır. Ampirik bulgular da bu olguyu destekler niteliktedir. Edwars'ın (2006) sonuçları enflasyon hedeflemesi rejimi uygulayan ülkelerde döviz kurundan yurtiçi fiyatlara geçişkenliğin azaldığını göstermektedir. Albuquerque ve Portugal'ın (2005) sonuçları da enflasyon ortamının kur geçişkenliğini etkilediğine işaret etmektedir. Ayrıca ekonomik birimler tarafından algılanan kur rejiminin de tüketici fiyatları üzerinde kur geçişkenliği etkisi bulunmaktadır. *Real Plan*'ın uygulanması ve serbest dalgalı kur rejimine geçilmesi kur geçişkenliğini azaltan unsurlar olarak tespit edilmektedir.

Enflasyon ortamının kur geçişkenliğine yol açmadığı sonucuna ulaşan çalışmalar da vardır. de Souza vd., (2013) ekonomik büyümenin ve enflasyon beklentisinin kur geçişkenliğinde önemli hususlar olduğunu; ancak enflasyon ortamının kur geçişkenliğine yol açmadığı sonucuna ulaşmaktadır. Ekonometrik bulguların işaret ettiği güçlü kur geçişkenliği; kur oynaklığı, ticaret akımları ve para politikası ile açıklanmaktadır. Ayrıca kısa ve uzun dönem kur geçişkenliğinin azalma trendinde olduğu tespit edilmektedir.

Modenesi vd. (2017) Brezilya'da kur geçişkenliğinin TÜFE üzerinde asimetrik bir etkiye sahip olduğu sonucuna ulaşmaktadır. Brezilya Real'inin değer kaybı %16 oranında bir enflasyona yol açarken, ulusal paranın değer kazanması yalnızca %5.8 oranında bir geçişkenliğe neden olmaktadır. Camara ve Feijo (2017) sanayide oluşan enflasyonun %60'dan fazlasının döviz kurundaki değişimden kaynaklandığını ileri sürmektedir. Markov rejim değişim yaklaşımı ile Brezilya ekonomisinde kur geçişkenliği analizi yapan Marodin ve Portugal (2018) 'normal' ve 'kriz' olmak üzere iki ayrı rejim tespit etmektedir. 'Normal' dönemlerde geçişkenlik sıfıra yakın düzeyde iken (0,00057) 'kriz' rejiminde aynı düzeydeki kur şokunun etkisi % 0,1035 olarak tespit edilmektedir.

Kur oynaklığının ve enflasyon ortamının kur geçişkenliği üzerinde yol açtığı etkiler açısından Güney Afrika üzerine yürütülen çalışmalarda da Brezilya'ya benzer sonuçlara ulaşılmaktadır. Miyajima (2019) yüksek döviz kuru oynaklığının çekirdek enflasyonu artırmaya neden olduğunu ama Güney Afrika'da bunun sınırlı ölçüde kaldığını ortaya koymaktadır. Çalışmada çıktı açığının enflasyonun önemli belirleyicilerinden olduğu ileri sürülmektedir. Enflasyon hedeflemesinin gelecek dönem fiyat beklentileri üzerinde oluşturacağı olumlu etki fiyatlar genel düzeyinde bir gerilemeye yol açacağı gibi çıktı açığına da etki eder. Oladipo'nun (2017) sonuçları bu yaklaşımı destekler mahiyettedir. Enflasyon hedeflemesinin; enflasyonun seyri, çıktı açığı ve döviz kuru üzerinde anlamlı bir açıklayıcılığa sahip olduğu ileri sürülmektedir. Kabundi ve Mlachila (2019) son yirmi yılda kur geçişkenliğinde yaşanan azalmayı

para politikasının kredibilitesine dayandırmaktadır. Zira enflasyon hedeflemesi rejiminin uygulanması beklentilerin iyileşmesini sağlayarak kur geçişkenliğinin azalması gibi bir sonuç doğurmaktadır.

Kabundi ve Mbelu (2018) Güney Afrika'da kur geçişkenliğinin birinci aşamasının tamamlandığı ancak ikinci aşamasının bitmediğini göstermektedir[2]. Ekonominin ivme kazandığı dönemde geçişkenliğin yüksek, yavaşlama dönemlerinde ise küçük olması açısından kur geçişkenliğinin asimetrik sonucuna işaret etmektedir. Birinci aşama kur geçişkenliğinin küresel finansal krizden sonra, ikinci aşama kur geçişkenliğinin enflasyon hedeflemesinden sonra azaldığı da çalışmanın bulguları arasındadır.

Güney Afrika'da kur geçişkenliğini farklılaştıran diğer unsurlar ulusal paranın değer değişimi, ithalata konu olan malın türü/sektörü ve ithalatın hangi ülkeden yapıldığı gibi hususlardır. Karoro vd.'nin (2009) elde ettiği sonuçlar kur geçişkenliğinin yüksek olduğuna, ulusal paranın değer kaybettiği dönemdeki kur geçişkenliğinin değer kazandığı dönemdekinden daha yüksek olduğuna işaret etmektedir. Ocran (2010) ise TÜFE'ye geçişkenliğin (%13) ÜFE'nin (%20) altında kaldığını göstermektedir. Güney Afrika'da hizmetlere kur geçişkenliğinin nihai tüketim mallarından daha fazla olduğu tespit edilmektedir. İthalatın gerçekleştiği ülkeye bağlı olmak üzere ithalat kur geçişkenliği ise %60'lar düzeyindedir (Parsley, 2012). Maduku ve Kaseeram (2018) döviz kuru şokundan sonra üretici fiyatlarının %22 oranında artış kaydettiğini, ulusal paradaki değer kaybının fiyatlar üzerinde baskı oluşturarak ülkenin enflasyon ortalamasını olumsuz etkilediğini göstermektedir.

Güney Afrika verisiyle yürütülen analizde kur geçişkenliğinin petrol fiyatları geçişkenliğinden daha güçlü bir etkiye sahip olduğu tespit edilmektedir. Döviz kurundaki ve petrol fiyatlarındaki dalgalanmalar ithalat fiyatlarını ilki daha fazla olmak üzere anlamlı bir şekilde etkilemektedir. Döviz kurundaki ve petrol fiyatlarındaki dalgalanmaları tetikleyen yerel ve küresel hususların kur geçişkenliği derecesi ile bir ilişkisi bulunmaktadır (Akdeniz vd., 2022). Ayrıca ithalatta hangi para biriminin kullanılacağının ve sanayi sektörünün de döviz kuru geçişkenliğinin üretici fiyatlarına yansımasında etkili olduğu görülmektedir (Simo-Kengne, 2022).

Analize konu olan ülkelerden biri olan Türkiye tasarruf yetersizliği ve kronik cari açık sorunu nedeniyle dış şoklara açık ülkeler arasında yer almaktadır. Bunun düzeyi ise kur geçişkenliğinin derecesine ilişkin referans teşkil etmektedir. Leigh ve Rossi (2002) tarafından yürütülen çalışmada Türkiye'de dolarizasyonun yüksek olması, saniyede rekabetin yetersiz olması, enflasyon ataleti ve döviz kurunun bir çıpa olarak alınması nedeniyle kur geçişkenliğinin diğer gelişmekte olan ülkelerden daha yüksek olduğu ileri sürülmektedir.

Enflasyon ortamının kur geçişkenliğini azalttığı bulgusu Türkiye için Kara vd.'nin (2005) sonuçları ile desteklenmektedir. Yüksek enflasyonun düşürülmesi politikası ve serbest dalgalı kur rejimi uygulaması neticesinde kur geçişkenliğinin %68'den %15'e düştüğü tespit edilmektedir. Türkiye için benzer sonuçlara işaret eden çok sayıda çalışma bulunmaktadır (Kara vd., 2007; Kara ve Öğünç, 2008; Damar, 2010; Yüncüler, 2011; Çatık ve Güçlü, 2012). Tümtürk (2017) de önceki bulgularla uyumlu bir şekilde enflasyon hedeflemesi rejimine geçilmesiyle kur geçişkenliğinin %64'ten %28'e gerilediğini tespit etmektedir. Özetle Türkiye'de döviz kurundan tüketici ve üretici fiyatlarına güçlü bir geçişkenlik tespit edilmekte, serbest dalgalı kur rejiminin benimsenmesi ve enflasyon hedeflemesi rejiminin uygulanmasıyla geçişkenlik düzeyinin azaldığı sonucuna ulaşılmaktadır.

## 3. Metodoloji

ARDL yaklaşımı kullanılarak değişkenler arasındaki uzun dönemli seviye ilişkisi incelenebilmektedir. Pesaran vd. (2001) tarafından geliştirilen bu yöntem seriler I(0) ve I(1) gibi farklı derecelerde durağan hale gelse bile eşbütünleşme testine imkân vermektedir. ARDL analizinin ilk adımını birim kök testlerinin uygulanması oluşturmaktadır. Sonuçların seviye veya birinci farklarda durağan olduğu tespit edilebilirse eşbütünleşme testi yapılmaktadır. F istatistik sonuçları Pesaran vd. (2001)'de yer alan I(1) düzeyindeki kritik değerden büyükse "eşbütünleşme yoktur" sıfır hipotezi reddedilmektedir. Sonuçların I(0) düzeyindeki kritik değerden küçük olması durumunda ise eşbütünleşme ilişkisinden söz edilememektedir. Bu doğrultuda çalışmaya konu olan değişkenler açısından ARDL modeli şu şekilde kurulmaktadır:

$$\Delta \text{TÜFE}_t = \alpha_0 + \sum_{i=1}^{m} \alpha_1 \Delta \text{TÜFE}_{t-i} + \sum_{i=0}^{p} \alpha_2 \Delta DK_{t-i} + \alpha_3 \text{TÜFE}_{t-1} + \alpha_4 DK_{t-1} + \varepsilon_i \quad (1)$$

[2] Birinci aşama kur geçişkenliği döviz kuru hareketlerinin ithalat fiyatları üzerindeki etkisini, ikinci aşama kur geçişkenliği ithalat fiyatlarının tüm tüketici fiyatları üzerindeki etkisini ifade eder (Miyajima, 2019).

$$\Delta\text{ÜFE}_t = \beta_0 + \sum_{i=1}^{m} \beta_1 \Delta\text{ÜFE}_{t-i} + \sum_{i=0}^{p} \beta_2 \Delta DK_{t-i} + \beta_3 \text{ÜFE}_{t-1} + \beta_4 DK_{t-1} + v_i \quad (2)$$

Döviz kuru (DK) ile Tüketici Fiyat Endeksi *(TÜFE)* ve Üretici Fiyat Endeksi *(ÜFE)* arasındaki ilişkinin incelenebilmesi için iki ayrı model kurulmaktadır. Modellerde yer alan $\alpha$ ve $\beta$'lar değişken katsayılarıdır. $m$ ve $p$ optimal gecikmeyi, $\varepsilon$ ile v hata terimlerini göstermektedir. $\Delta$ fark operatörü ile değişkenlerin gecikmeli değerleri modele dâhil edilmektedir.

Farklı düzeylerde eşbütünleşik olan değişkenler arasındaki nedensellik ilişkisinin incelemesinde Toda ve Yamamoto (1995) yaklaşımının izlenmesi tercih edilmektedir. Bu doğrultuda VAR modeli kurulmakta ve optimal gecikme uzunluğu belirlenerek (bkz. Ek-2) değişkenler arasındaki Granger nedensellik ilişkisinin tespiti için Wald testleri uygulanmaktadır. AIC (*Akaike Information Criterion*) ve SC (*Schwarz Information Criterion*) gibi bilgi kriterleri kullanarak belirlenen optimal gecikme sayısına ($k$) en yüksek bütünleşme derecesi ($d_{maks}$) mutlaka eklenmelidir ($k + d_{maks}$).

$$\text{TÜFE}_t = \gamma_0 + \sum_{i=1}^{k+d} \gamma_{1i} \text{TÜFE}_{t-i} + \sum_{1=i}^{k+d} \gamma_{2i} \Delta DK_{t-i} + \omega_t \quad (3)$$

$$\text{ÜFE}_t = \delta_0 + \sum_{i=1}^{k+d} \delta_{1i} \text{Ü}FE_{t-i} + \sum_{1=i}^{k+d} \delta_{2i} DK_{t-i} + \theta_t \quad (4)$$

Döviz kurundan Tüketici Fiyatı Endeksine Granger nedenselliğin olup olmadığını tespit etmek için $\gamma_{2i} = 0$ hipotezi kurulmaktadır. Bu hipotezle gecikme katsayılarının sıfıra eşit olup olmadığı test edilmektedir. Üçüncü denklem için sıfır hipotezi "DK Granger nedeni değildir TÜFE" şeklinde oluşturulmaktadır. $p$ olasılık değeri dikkate alınarak sıfır hipotezinin reddedilmesi döviz kurundan TÜFE'ye Granger nedenselliği olduğu sonucuna işaret etmektedir. Döviz kurundan Üretici Fiyat Endeksine Granger nedenselliğini ortaya çıkarmak için de $\delta_{2i} = 0$ hipotezi kurulmaktadır. Benzer bir şekilde sıfır hipotezinin reddedilmesi döviz kurundan ÜFE'ye Granger nedenselliği olduğunu ortaya koymaktadır. Üçüncü ve dördüncü denklemler için kurulan sıfır hipotezlerinin reddedilememesi döviz kurundan her iki fiyat endeksine dönük bir Granger nedenselliği olmadığı anlamına gelmektedir.

Çalışmada analizler Türkiye, Brezilya ve Güney Afrika için yürütülmektedir. Kapsam BRICS-T ülkeleri olarak genişletilmek istenmiş ancak; Rusya ve Çin cari açık ve uluslararası rezervler açısından diğer ülkelerden pozitif ayrıştığı için veri setine dâhil edilmemiştir. Kur üzerinde yukarı yönlü baskı oluşturabilecek bu göstergelerin olumlu görünümü kur geçişkenliği açısından da bu ülkeleri diğer BRICS-T ülkelerinden ayrıştırabileceği için bu iki ülke analiz dışında bırakılmıştır. Çünkü döviz kurunun yükselmesine neden olacak göstergelerin benzerliği kur geçişkenliğinde de benzer bir etki doğurur mu sorusu çalışmanın odağını oluşturmaktadır.

Çalışmada döviz kuru olarak Amerikan doları alınmıştır. Döviz kuru, TÜFE ve ÜFE serileri Uluslararası Para Fonu'nun (IMF) Uluslararası Finansal İstatistikler (IFS) veri tabanından temin edilmiştir. Veri seti 1995Ç1:2020Ç1 aralığını kapsamaktadır.

## 4. Ampirik Bulgular

ARDL yaklaşımında değişkenler I(0) ve I(1) gibi farklı derecelerde durağan olsalar bile eşbütünleşme ilişkisi test edilebilmektedir. Serilerin durağanlığını tespit etmek amacıyla yürütülen Artırılmış Dickey-Fuller (ADF, 1981) ve *Phillips–Perron* (PP, 1988) birim kök testleri sonuçları serilerin seviye değerlerinde veya birinci farklarında durağan hale geldiklerini göstermektedir (Tablo 1).

ADF ve PP birim kök testleri; sabit terimsiz, sabit terimli, sabit terimli ve trendi olmak üzere üç formda yürütülmektedir. Türkiye verisinde TÜFE serisinin yalnızca sabit terimsiz formda seviye değerinde birim kök içerdiği, birinci farkı alındığında ise serinin durağan hale geldiği görülmektedir. Sabit terimli ve sabit terimli ve trendli versiyonlar ise seviye değerlerinde birim kök içermemektedir. ÜFE serisinde de benzer bulgular tespit edilmektedir. Döviz kuru serisi her iki testte de seviye değerlerinde birim kök sorunu içermemektedir. Brezilya verisinde ÜFE ve döviz kuru serilerinin her iki testte ve tüm versiyonlarda durağan olmadığı görülmektedir. Farkları alınarak birim kök testleri yenilendiğinde her iki seri tüm formlarda durağan hale gelmektedir. TÜFE serisinin yalnızca Phillips&Perron testinde sabit terimli ve trendli versiyonda düzey değerinde durağan olduğu, diğer test ve versiyonlarda farkları alındığında durağan hale geldiği görülmektedir. Güney Afrika'da tüm serilerin her iki testte ve her üç versiyonda seviye değerlerinde

birim kök içerdiği tespit edilmektedir. Birinci farkları alınarak birim kök testleri yenilendiğinde tüm serilerin her üç formda da %1 anlamlılık düzeyinde durağan hale geldiği görülmektedir.

**Tablo 1.** Birim Kök Testleri

| | | ADF | | | PP | | |
|---|---|---|---|---|---|---|---|
| | **Değişken** | **Sabit Terimsiz** | **Sabit Terimli** | **Sabit Terimli ve Trendli** | **Sabit Terimsiz** | **Sabit Terimli** | **Sabit Terimli ve Trendli** |
| Türkiye | TÜFE | 0.234 | -5.182*** | -4.547*** | 1.777 | -8.578*** | -4.820*** |
| | ΔTÜFE | -2.182** | | | -2.187** | | |
| | ÜFE | 1.931 | -7.295*** | -4.042** | 1.931 | -7.295*** | -4.042** |
| | ΔÜFE | -2.681*** | | | -2,681*** | | |
| | DK | -2.333** | -4.085*** | -3.286* | -2.333** | -4.085*** | -3.286* |
| | ΔDK | | | | | | |
| Brezilya | TÜFE | 3.481 | -0.795 | -2.050 | 7.311 | -2.395 | -3.614** |
| | ΔTÜFE | -2.618*** | -4.589*** | -4.525*** | -3.503*** | -5.640*** | |
| | ÜFE | 4.010 | -0.750 | -1.722 | 5.606 | -0.755 | -1.520 |
| | ΔÜFE | -5.289*** | -7.124*** | -7.105*** | -5.224*** | -7.124*** | -7.104*** |
| | DK | 1.163 | -1.098 | -1.609 | 1.120 | 1.10 | -1.688 |
| | ΔDK | -8.419*** | -8.669*** | -8.612*** | -8.358*** | -8.580*** | -8.520*** |
| Güney Afrika | TÜFE | 4.423 | -0.761 | -2.958 | 9.563 | -1.122 | -2.564 |
| | ΔTÜFE | -2.970*** | -5.654*** | -5.657*** | -2.666*** | -5.695*** | -5.700*** |
| | ÜFE | 4.683 | -0.353 | -2.948 | 7.227 | -0.515 | -2.547 |
| | ΔÜFE | -5.184*** | -7.010*** | -6.973*** | -5.184*** | -6.579*** | -6.530*** |
| | DK | 1.816 | -1.062 | -2.059 | 1.775 | -1.082 | -2.230 |
| | ΔDK | -8.667*** | -8.982*** | -8.922*** | -8.759*** | -9.005*** | -8.947*** |

Not: ***** %1, ** %5, * %10 anlamlılık düzeyini temsil etmektedir.**

**Tablo 2.** Zivot-Andrews Yapısal Kırılmalı Birim Kök Testi

| | Değişken | Gecikme | Kırılma Tarihi | Test İstatistiği |
|---|---|---|---|---|
| Türkiye | TÜFE | 1 | 2004Ç3 | 5.091** |
| | ΔTÜFE | 3 | 2002Ç2 | |
| | ÜFE | 1 | 2008Ç3 | 4.154 |
| | ΔÜFE | | 2003Ç2 | 7.998*** |
| | DK | | 2006Ç3 | 4.299 |
| | ΔDK | | 2001Ç4 | 10.697*** |
| Brezilya | TÜFE | | 2002Ç3 | 5.288** |
| | ΔTÜFE | 3 | 2000Ç3 | |
| | ÜFE | 1 | 1999Ç1 | 3.325 |
| | ΔÜFE | | 2003Ç2 | 8.085*** |
| | DK | | 2005Ç2 | 3.193 |
| | ΔDK | 2 | 2002Ç4 | 7.902*** |
| Güney Afrika | TÜFE | | 2003Ç4 | 3.787 |
| | ΔTÜFE | | 2003Ç2 | 10.485*** |
| | ÜFE | 1 | 2001Ç3 | 4.477 |
| | ΔÜFE | | 2009Ç4 | 8.839*** |
| | DK | | 2002Ç4 | 3.643 |
| | ΔDK | | 2002Ç1 | 10.005*** |

**Not:** *** %1, ** %5, * %10 anlamlılık düzeyini temsil etmektedir. Gecikme uzunlukları BIC bilgi kriterine göre belirlenmiştir. Kritik değerler %1, 5.34; %5,4.80; %10, 4.58.

Ayrıca yapısal kırılmaları tespit edebilmek amacıyla Zivot ve Andrews (1992) birim kök testi uygulanmış ve sonuçları Tablo 2'de verilmiştir. Türkiye'de TÜFE serisinin seviye değerinde, ÜFE ve döviz kuru serilerinin de birinci farklarında durağan hale geldikleri görülmektedir. Brezilya sonuçlarının da Türkiye ile benzerlik sergilediği tespit edilmektedir. Güney Afrika serilerinin tümü seviye değerlerinde birim kök içermektedir; ancak seriler birinci farklarında durağan hale gelmektedir. Yapısal kırılma tarihlerinin ülkelerin kriz dönemleriyle, küresel finansal kriz ile ve enflasyon hedeflemesi rejimine geçiş dönemleriyle uyumluluk gösterdiği görülmektedir. Hem Tablo 1'de yer verilen geleneksel birim kök sonuçları hem de Tablo 2'de gösterilen yapısal kırılmalı birim kök sonuçları ARDL sınır testi uygulaması için uygunluk göstermektedir.

**Tablo 3.** ARDL Sınır Testi Sonuçları

| | Türkiye | | Brezilya | | Güney Afrika | |
|---|---|---|---|---|---|---|
| Bağımlı Değişken | **TÜFE** | **ÜFE** | **TÜFE** | **ÜFE** | **TÜFE** | **ÜFE** |
| **m** | 5 | 2 | 4 | 2 | 2 | 3 |
| F-ist. | **5.967**** | **13.356***** | **4.885*** | **7.192**** | **6.977**** | **9.385***** |
| **$R^2$** | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| **Düz. $R^2$** | 0.99 | 0.99 | 0.99 | 0,99 | 0.99 | 0.99 |
| **LM** | 0.15 | 0.19 | 0.89 | 0.61 | 0.16 | 0.20 |
| **ARCH** | 0.15 | 0.10 | 0.10 | 0.80 | 0.24 | 0.17 |
| **Ramsey Reset** | 0.009 (0.92) | 0.096 (0.75) | 2.487 (0.11) | 0.132 (0.71) | 0.001 (0.97) | 1.556 (0.21) |

**Not**: m optimal gecikme sayısını, LM ve ARCH sonuçları sırasıyla otokorelasyon ve değişen varyans olasılık değerlerini göstermektedir. Optimal gecikme uzunlukları AIC bilgi kriterine göre belirlenmiştir. Parantez içindeki sonuçlar Ramsey Reset testi *p* olasılık değerini göstermektedir. Cusum test grafiklerine Ek-3'te yer verilmektedir. Kritik değerler Alt-Üst Sınır: %1, 6.84-7.84; %5, 4.94-5.73; %10, 4.04-4.78

Her bir ülke için sırasıyla birinci modelde döviz kuru ve TÜFE arasındaki, ikinci modelde döviz kuru ile ÜFE arasındaki eşbütünleşme ilişkisi test edilmektedir. Tablo 3'de yer alan sonuçlar tüm ülkelerde döviz kuru ile TÜFE ve ÜFE arasında eşbütünleşme ilişkisi olduğuna işaret etmektedir. TÜFE'de en yüksek eşbütünleşme katsayısına Güney Afrika'nın ÜFE'de ise Türkiye'nin sahip olduğu tespit edilmektedir. LM ve ARCH olasılık değerleri otokorelasyon ve değişen varyans sorunu olmadığını göstermektedir.

**Tablo 4.** Uzun Dönem Bulgular

| | TÜFE | | | ÜFE | | |
|---|---|---|---|---|---|---|
| | Değişken | Katsayı | Olasılık | Değişken | Katsayı | Olasılık |
| Türkiye | DK | 0.59*** | 0.0000 | DK | 0.85 | 0.0000 |
| | C | 2 | 0.0000 | C | 1.88 | 0.0000 |
| Brezilya | DK | 1.23** | 0.0214 | DK | 1.77 | 0.0007 |
| | C | 2.20 | 0.0000 | C | 1.71 | 0.0000 |
| Güney Afrika | DK | 0.94*** | 0.0086 | DK | 1.07 | 0.0000 |
| | C | 1.56 | 0.0009 | C | 0.78 | 0.0001 |

**Not:** Döviz kurunun TÜFE ve ÜFE üzerindeki uzun dönem etkileri

Tablo 4 'te yer alan sonuçlarda döviz kurunun TÜFE üzerinde uzun dönemli etkisinin en fazla Brezilya'da olduğu görülmektedir. Bunu sırasıyla Güney Afrika ve Türkiye izlemektedir. Döviz kurunun üretici maliyetlerindeki değişimin bir göstergesi olan ÜFE endeksini de aynı ülke sırasıyla etkilediği tespit edilmektedir. Bu sonuçlar Leigh ve Rossi'nin (2002) ortaya koyduğu Türkiye'nin diğer gelişmekte olan ülkelerden daha yüksek kur geçişkenliğine sahip olduğu bulgusu ile örtüşmemektedir. En azından analizde konu olan BRICS ülkeleri içerisinde döviz kurunun üretici ve tüketici fiyatlarını artırıcı etkisinin Türkiye'de diğer iki ülkeye nispetle düşük kaldığı gözlemlenmektedir. Ancak; bu sonuç Türkiye'de döviz kuru geçişkenliğinin yüksek olmadığı anlamına da gelmez.

Daha önce yapılan ampirik çalışmaların sonuçları enflasyon hedeflemesi rejimi ve serbest dalgalı kur rejiminin benimsenmesi neticesinde kur geçişkenliğinde önemli bir azalmaya işaret etse de yüksek cari açık ve enerjide dışa bağımlılık gibi yapısal sorunlar döviz kurunun Türkiye'de kırılgan olmaya devam etmesine ve böylece de kur geçişkenliğinin yükselmesi riskine neden olmaktadır. Bunun da hem ara ve sermaye malı ithalatı nedeniyle

ÜFE'de, nihai tüketim malı ithalatı nedeniyle de TÜFE endekslerine yansıması söz konusu olur. Kur geçişkenliğinde yapısal iyileşme sağlayabilmenin yolu üretimde yerli katma değerin artırılmasına, fiyat istikrarının sağlanmasına, dolarizasyonun düşürülmesine ve döviz riskinin azaltılmasına dayandığı ileri sürülebilir (Kara vd., 2017).

Brezilya ve Güney Afrika'da uzun dönemli kur geçişkenliği önceki çalışmalardan daha yüksek tespit edilmektedir. Güney Afrika'da döviz kurunda meydana gelecek %1 lik artışın hem ÜFE hem de TÜFE endeksleri üzerinde yaklaşık %1 lik bir artışa neden olduğu görülürken, Brezilya'da söz konusu etkinin daha yüksek düzeyde olduğu sonucuna ulaşılmaktadır. Bu farklılaşmaya iki ülkenin marjinal ithalat eğilimi, hammadde ve enerjide ithalat derecesi, fiyatları döviz kuruna endeksleme davranışının düzeyi, piyasaların rekabetçiliğe açık olması gibi unsurların etki edebileceği değerlendirilmektedir. Sırasıyla TÜFE'nin ve ÜFE'nin bağımlı değişkenler olduğu ülkelerin kısa dönem bulgularına da Tablo 5'te yer verilmektedir.

**Tablo 5.** Sırasıyla TÜFE'nin ve ÜFE'nin bağımlı değişkenler olduğu ülkelerin kısa dönem bulgularına da Tablo 5'te yer verilmektedir.

| Hata Düzeltme Katsayısı ve Kısa Dönem Bulgular (Türkiye) | | | | |
|---|---|---|---|---|
| Bağımlı Değişken: TÜFE | | | | |
| Değişken | Katsayı | Standart sapma | t-istatistiği | Olasılık |
| D(TÜFE(-1)) | 0.068979 | 0.100213 | 0.688324 | 0.4931 |
| D(TÜFE(-2)) | -0.114936 | 0.097322 | -1.180985 | 0.2409 |
| D(TÜFE(-3)) | -0.146334 | 0.094947 | -1.541216 | 0.1270 |
| D(TÜFE(-4)) | 0.278920 | 0.079890 | 3.491282 | 0.0008 |
| D(DK) | 0.0460762 | 0.024023 | 1.946566 | 0.0549 |
| D(DK(-1)) | 0.141751 | 0.024265 | 5.841834 | 0.0000 |
| D(DK(-2)) | 0.054259 | 0.027874 | 1.946593 | 0.0549 |
| D(DK(-3)) | 0.072342 | 0.026735 | 2.705897 | 0.0082 |
| D(DK(-4)) | 0.040625 | 0.028050 | 1.448296 | 0.1513 |
| ECM(-1)* | -0.039441 | 0.009211 | -4.282055 | 0.0000 |
| Bağımlı Değişken: ÜFE | | | | |
| D(ÜFE(-1)) | 0.120115 | 0.078053 | 1.538896 | 0.1272 |
| D(DK) | 0.108401 | 0.030470 | 3.557627 | 0.0006 |
| D(DK(-1)) | 0.196142 | 0.033210 | 5.906044 | 0.0000 |
| ECM(-1)* | -0.059226 | 0.009257 | -6.397633 | 0.0000 |
| Hata Düzeltme Katsayısı ve Kısa Dönem Bulgular (Brezilya) | | | | |
| Değişken | Katsayı | Standart sapma | t-istatistiği | Olasılık |
| Bağımlı Değişken: TÜFE | | | | |
| D(TÜFE(-1)) | 0.569022 | 0.095608 | 5.951632 | 0.0000 |
| D(TÜFE(-2)) | -0.315905 | 0.106893 | -2.955350 | 0.0040 |
| D(TÜFE(-3)) | 0.295078 | 0.080833 | 3.650448 | 0.0004 |
| D(DK) | 0.004380 | 0.007330 | 0.597561 | 0.5517 |
| D(DK(-1)) | 0.013131 | 0.007812 | 1.680797 | 0.0963 |
| D(DK(-2)) | 0.026961 | 0.007951 | 3.391138 | 0.0010 |
| ECM(-1)* | -0.003692 | 0.000954 | -3.871465 | 0.0002 |
| Bağımlı Değişken: ÜFE | | | | |
| D(ÜFE(-1)) | 0.220353 | 0.095278 | 2.312748 | 0.0229 |
| D(DK) | 0.062147 | 0.029272 | 2.123115 | 0.0364 |
| D(DK(-1)) | 0.072223 | 0.031093 | 2.322800 | 0.0224 |
| ECM(-1)* | -0.015940 | 0.003395 | -4.694996 | 0.0000 |
| Hata Düzeltme Katsayısı ve Kısa Dönem Bulgular (Güney Afrika) | | | | |
| Değişken | Katsayı | Standart sapma | t-istatistiği | Olasılık |
| Bağımlı Değişken: TÜFE | | | | |
| D(TÜFE(-1)) | 0.495885 | 0.084770 | 5.849743 | 0.0000 |
| D(DK) | -0.004267 | 0.009372 | -0.455317 | 0.6499 |
| D(DK(-1)) | 0.027570 | 0.009985 | 2.761283 | 0.0069 |
| ECM(-1)* | -0.005904 | 0.001277 | -4.624013 | 0.0000 |
| Bağımlı Değişken: ÜFE | | | | |
| D(ÜFE(-1)) | 0.419179 | 0.100796 | 4.158688 | 0.0001 |
| D(ÜFE(-2)) | -0.282433 | 0.102119 | -2.765711 | 0.0069 |
| D(DK) | -0.047007 | 0.018208 | -2.581599 | 0.0114 |
| D(DK(-1)) | 0.036089 | 0.019101 | 1.889331 | 0.0620 |
| ECM(-1)* | 0.020861 | 0.003889 | 5.364207 | 0.0000 |

Değişkenler arasındaki uzun dönemli ilişki nedensellik testiyle bir adım ileri götürülebilmektedir. Bu doğrultuda Toda ve Yamamoto (1995) yaklaşımı izlenerek Türkiye, Brezilya ve Güney Afrika'da döviz kuru ile TÜFE ve ÜFE arasındaki Granger nedensellik ilişkisi her iki yön için de test edilmektedir (Tablo 6). Türkiye'de döviz kurundan TÜFE ve ÜFE'ye güçlü Granger nedenselliği tespit edilmektedir. Döviz kurundan ÜFE'ye olan nedensellik ilişkisinin TÜFE'dekinden daha güçlü olduğu görülmektedir. Türkiye için çarpıcı bir diğer sonuç TÜFE'den döviz kuruna Granger nedenselliğin olmasıdır. Bu sonuç, düşük enflasyon ortamının kur geçişkenliğini de azalttığına dönük geleneksel yaklaşımla (Taylor, 2000) uyumluluk göstermektedir. Burada döviz kurunun ekonomik birimler tarafından bir çıpa olarak alınması, beklentilerin bozulması ve fiyatlama davranışının döviz kuruna endekslenmesi eğilimleri etkili olmaktadır. Zira yüksek enflasyonun tetikleyeceği dolarizasyon yeni bir enflasyon dalgasına veya enflasyon ataletine yol açmaktadır. Üretici fiyatlarından döviz kuruna yönelik bir nedensellik ilişkisi ise tespit edilememektedir.

Brezilya sonuçlarının Türkiye ile aynı olduğu görülmektedir. Döviz kuru ile TÜFE arasında iki yönlü Granger nedenselliği tespit edilirken, döviz kuru ile ÜFE arasında tek yönlü bir Granger nedensellik bulunmaktadır. Türkiye'de olduğu gibi Brezilya'da da tüketici fiyatlarındaki yükselmenin ekonomik birimlerde dolarizasyon eğilimini artırdığı değerlendirilmektedir. Bu kapsamda Türkiye ve Brezilya'da beklenti kanalı ve endeksleme davranışı açısından bir benzerlik olduğu tahmin edilmektedir.

**Tablo 6.** Toda-Yamamoto Nedensellik Testi Sonuçları

| Türkiye | | | |
|---|---|---|---|
| | **$X^2$** | **Olasılık** | **Sonuç** |
| DK Granger nedeni değildir TÜFE | 56.864*** | 0.000 | Ret |
| TÜFE Granger nedeni değildir DK | 16.659*** | 0.005 | Ret |
| DK Granger nedeni değildir ÜFE | 63.306*** | 0.000 | Ret |
| ÜFE Granger nedeni değildir DK | 0.701 | 0.704 | Reddedilemedi |
| Brezilya | | | |
| | **$X^2$** | **Olasılık** | **Sonuç** |
| DK Granger nedeni değildir TÜFE | 25.747*** | 0.000 | Ret |
| TÜFE Granger nedeni değildir DK | 3.398 | 0.639 | Ret |
| DK Granger nedeni değildir ÜFE | 15.079*** | 0.002 | Ret |
| ÜFE Granger nedeni değildir DK | 2.200 | 0.532 | Reddedilemedi |
| Güney Afrika | | | |
| | **$X^2$** | **Olasılık** | **Sonuç** |
| DK Granger nedeni değildir TÜFE | 16.400*** | 0.000 | Ret |
| TÜFE Granger nedeni değildir DK | 3.113 | 0.375 | Reddedilemedi |
| DK Granger nedeni değildir ÜFE | 6.568 | 0.161 | Reddedilemedi |
| ÜFE Granger nedeni değildir DK | 13.476*** | 0.009 | Ret |

Güney Afrika sonuçlarının diğer iki ülke ile benzeşen tek tarafı döviz kurundan TÜFE'ye Granger nedenselliğin bulunmasıdır. Güney Afrika'nın Türkiye ve Brezilya'dan farklılaşan yönü ise ÜFE'den döviz kuruna Granger nedenselliğin tespit edilmesidir. Bu bulgudan hareketle üretici maliyetlerinde döviz kurunun önemli bir etken olduğu değerlendirilebilir.

## 5. Sonuç

Zayıf uluslararası rezervler, kısa vadeli dış borç stoğu ve cari açık gibi unsurlar döviz kurunun yükselmesine neden olmaktadır. Kurdaki artışın da maliyet, beklentiler ve endeksleme davranışı gibi aktarım kanallarıyla yurtiçi fiyatlara yansıdığı bilinmektedir. Sayılan bu parametreler açısından trend benzerliği gösteren ülkelerin kur geçişkenliği açısından da birbirlerine benzeyip benzemediklerini incelemek bu çalışmanın temel amacını oluşturmaktadır.

ARDL yöntemi kullanılarak 1995Ç1:2020Ç1 dönemi için elde edilen sonuçlar Türkiye, Brezilya ve Güney Afrika'da döviz kuru ile TÜFE ve ÜFE endeksleri arasında eşbütünleşme ilişkisi olduğunu göstermektedir. Uzun dönemli etkiler incelediğinde döviz kurundan TÜFE ve ÜFE'ye geçişkenliğin sırasıyla en fazla Brezilya, Güney Afrika ve Türkiye'de olduğu görülmektedir. Analize konu olan ülkeler arasında geçişkenlik katsayısı görece küçük olan ülke Türkiye'dir.

Döviz kurunun yükselmesine neden olabilecek parametrelerin benzeşiyor olması söz konusu ülkelerde güçlü kur geçişkenliği açısından bir benzeşmeye işaret etse de geçişkenlik derecesi açısından ülkeler arasında bir farklılaşma olduğu görülmektedir.

Toda ve Yamamoto (1995) yaklaşımı izlenerek yürütülen Granger nedensellik sonuçları döviz kurundan TÜFE'ye üç ülkede de nedensellik olduğunu göstermektedir. Döviz kurundan ÜFE'ye nedensellik ise yalnızca Türkiye ve Brezilya için gözlemlenmektedir. Başka bir ifadeyle Güney Afrika'da döviz kurundan ÜFE'ye Granger nedenselliği bulunmamaktadır. Türkiye ve Brezilya'da TÜFE'den döviz kuruna, Güney Afrika'da da ÜFE'den döviz kuruna Granger nedenselliğin tespit edilmesi, enflasyon ortamının kur geçişkenliğini artırdığına dönük daha önceki bulguları destekler niteliktedir.

Yüksek döviz kuru geçişkenliğinin düşürülebilmesi açısından cari açığın dış ticaret ve sermaye politikalarıyla istikrar kazanması, yurt içi tasarrufların özendirilerek dış borç stoğunun azaltılması, doğrudan ve dolaylı yatırım kanalları ile uluslararası rezervlerin artırılması önem arz ermektedir. Bu doğrultuda yurt içi dengenin sağlanması, fiyat istikrarının tesis edilmesi ve sürdürülmesi, yüksek katma değerli üretime önem verilmesi, beklenti yönetiminin şeffaf bir şekilde yapılması, dolarizasyon eğiliminin düşürülmesi, bütün bunları sağlayabilecek eş güdümlü para ve maliye politikalarının yürütülmesi gerekmektedir.

**Hakem Değerlendirmesi:** Dış bağımsız.
**Çıkar Çatışması:** Yazar çıkar çatışması beyan etmemişlerdir.
**Finansal Destek:** Yazar finansal destek beyan etmemişlerdir.

**Peer Review:** Externally peer-reviewed.
**Conflict of Interest:** Author declared no conflict of interest.
**Financial Disclosure:** Author declared no financial support.

**ORCID:**
Ahmet Ekrem Kaya 0000-0002-0860-2001

## KAYNAKLAR / REFERENCES

Akdeniz, C., Çatık, A.N. & Ballı, E. (2022). Inflationary effects of oil price and exchange rate shocks in South Africa: Evidence from time-varying pass-through coefficients. *South African Journal of Economics, 90*( 3), 301– 328.

Albuquerque, C. R. & Portugal, M.S. (2005). Pass-through from exchange rate to prices in Brazil: An analysis using time-varying parameters for the 1980-2002 period. *Revista de economía (Banco Central del Uruguay), 12*(1), 17–74

Berument, H. (2020). Döviz kuru hareketleri ve enflasyon dinamiği: Türkiye örneği. *Bilkent University Department of Economics Working Paper No. 02-02, 2002*.

Calvo, G. & Reinhart, C. (2000). Fixing for your life. *NBER Working Paper* No. 8006, November, NBER, Cambridge, MA.

Câmara, F. & Feijo, C. (2017). Industrial pricing in Brazil in the 2010s: The pass-through effect. *EconomiA, 18*(2017), 60–72.

Carlos Eduardo Schönerwald da Silva & Matías Vernengo. (2008). The Decline of the exchange rate pass-through in Brazil: Explaining the fear of floating. *International Journal of Political Economy, 37*(4), 64–79.

Çatık, A. N. & Güçlü, M. (2012). Measuring exchange rate pass-through under structural changes: The case of Turkey. *International Journal of Statistics and Economics*, 8, S12, 21–42.

Damar, A. O. (2010). Türkiye'de döviz kurundan fiyatlara geçiş etkisinin incelenmesi. *TCMB Piyasalar Genel Müdürlüğü Uzmanlık Yeterlik Tezi* (ss. 1–80).

de Melo Modenesi, A., Luporini, V. & Pimentel, D. (2017). Asymmetric exchange rate pass-through: Evidence, inflation dynamics and policy implications for Brazil (1999–2016). In: Arestis, P., Troncoso Baltar, C., Prates, D. (eds) The Brazilian Economy since the Great Financial Crisis of 2007/2008. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-64885-9_4

Dickey, D.A., & Fuller, W.A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root author. *Econometrica, 49*, 1057–1072.

Eichengreen, B. (2002). Can emerging markets float? Should they inflation target? *Working Paper* No. 36, Banco Central do Brasil.

Edwards, S. (2006). The relationship between exchange rates and inflation targeting revisited. *NBER Working Paper* No. 12163, April, NBER, Cambridge, MA.

Fraga, A., Goldfajn, I. & Minella, A. (2003). Inflation targeting in emerging market economies. No.10019, July, NBER, Cambridge, MA.

Goldfajn, I. & Werlang, S. R. C. (2000). The pass-through from depreciation to inflation: a panel study. *Working Paper* No. 5, Banco Central do Brasil.

IMF. (2023). *Uluslararası rezervler, kısa vadeli dış borç stoğu, cari işlemler hesabı dengesi*. Uluslararası Para Fonu Uluslararası Finansal İstatistikler Veri Tabanından alınmıştır. https://data.imf.org/?sk=4c514d48-b6ba-49ed-8ab9-52b0c1a0179b&sid=1390030341854

Junior, Reginaldo Pinto Nogueira. (2010). Inflation environment and lower exchange rate pass-through in Brazil: Is there a relationship? *Revista Brasileira de Economia, 64*(1), 49–56.

Kabundi, A. & Mlachila, M. (2019). The role of monetary policy credibility in explaining the decline in exchange rate pass-through in South Africa. *Economic Modelling, 79*(2019), 173–185.

Kabundi, A. & Mbelu, A. (2018). Has the exchange rate pass-through changed in South Africa? *South African Journal of Economics, 86*(3), 339–360.

Kara, H., Küçük, H. Özlale Ü., Tuğer B., Yavuz D. & Yücel E. (2005). Exchange rate pass-through in Turkey: Has it changed and to what extent. *Türkiye Cumhuriyet Merkez Bankası Arastırma Tebliği*, No:4.

Kara, H., Küçük-Tuğer, H., Özlale, Ü., Tuğer, B., & Yücel, E. M. (2007). Exchange rate regimes and pass-through: Evidence from the Turkish Economy. *Contemporary Economic Policy, 25*(2), 206–225.

Kara, H., & Öğünç, F. (2008). Inflation targeting and exchange rate pass- through: The Turkish experience. *Emerging Markets Finance and Trade, 44*(6), 52–66.

Kara, H., Öğünç, F., Özmen, M. U. & Sarıkaya, Ç. (2017). Kurdan enflasyona geçiş: Sihirli bir rakam var mı? *Merkezin Güncesi*. Erişim: 21.06.2023

Karoro, T.D., Aziakpono, M.J. & Cattaneo, N. (2009). Exchange rate pass-through to import prices in South Africa: Is there asymmetry? *South African Journal of Economics, 77*(3), 380–398.

Leigh, D., & Rossi, M. (2002). Exchange rate pass-through in Turkey. *IMF Working Papers* 02/204, Kasım, IMF.

Maduku, H., & Kaseeram, I. (2018). An empirical analysis of exchange rate pass-through to prices in South Africa (2002-2016). *Journal of Economics and Behavioral Studies, 10*(5(J), 187–194.

Marodin, F. A. & Portugal, M. S. 2018. Exchange rate pass-through in Brazil: a markov switching estimation for the inflation targeting period (2000-2015). *Working Papers Series 473*, Central Bank of Brazil, Research Department.

McFarlane, L. (2002). Consumer price inflation and exchange rate pass through in Jamaica. *Bank of Jamaica*. Erişim: 21.06.2023

Miyajima, K. (2019). Exchange rate volatility and pass-through to inflation in South Africa. *IMF Working Paper 19/277*, December, IMF.

Ocran, M.K. (2010). Exchange rate pass-through to domestic prices: The case of South Africa. *Prague Economic Papers, 19*(4), 291–306.

Oladipo, O. (2017). Inflation targeting and exchange rate pass-through to domestic prices: evidence from South Africa. *Journal of Economic & Financial Studies, 5*(5), 1–11.

Parsley, D. C. (2012). Exchange rate pass-through in South Africa: Panel evidence from individual goods and services. *The Journal of Development Studies, 48*(7), 832–846.

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.

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

Rafael Martins de Souza, Luiz Felipe Pires Maciel & Adrian Pizzinga. (2013). State space models for the exchange rate pass-through: determinants and null/full pass-through hypotheses. *Applied Economics, 45*(36), 5062–5075.

Simo-Kengne B., D., Viljoen, J. & Nduku, P. M. (2022). Exchange rate pass-through to producer prices in South Africa: Evidence from panel contemporaneous correlated approach. *Journal of African Business, 23*(1), 225–245.

Taylor, J. (2000). Low inflation, pass-through and the pricing power of firms. *European Economic Review, 44*, 1389–1408.

Toda, H. Y. & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics, 66*(1-2), 225–250.

Tümtürk, O. (2017). Türkiye'de döviz kurlarının yurtiçi fiyatlara geçiş etkisi ve enflasyon hedeflemesi. *Yönetim ve Ekonomi Dergisi, 24*(3), 837–855.

Yunculer, C. (2011). Pass-through of external factors into price indicators in Turkey. *Central Bank Review, 11*(2), 71–84.

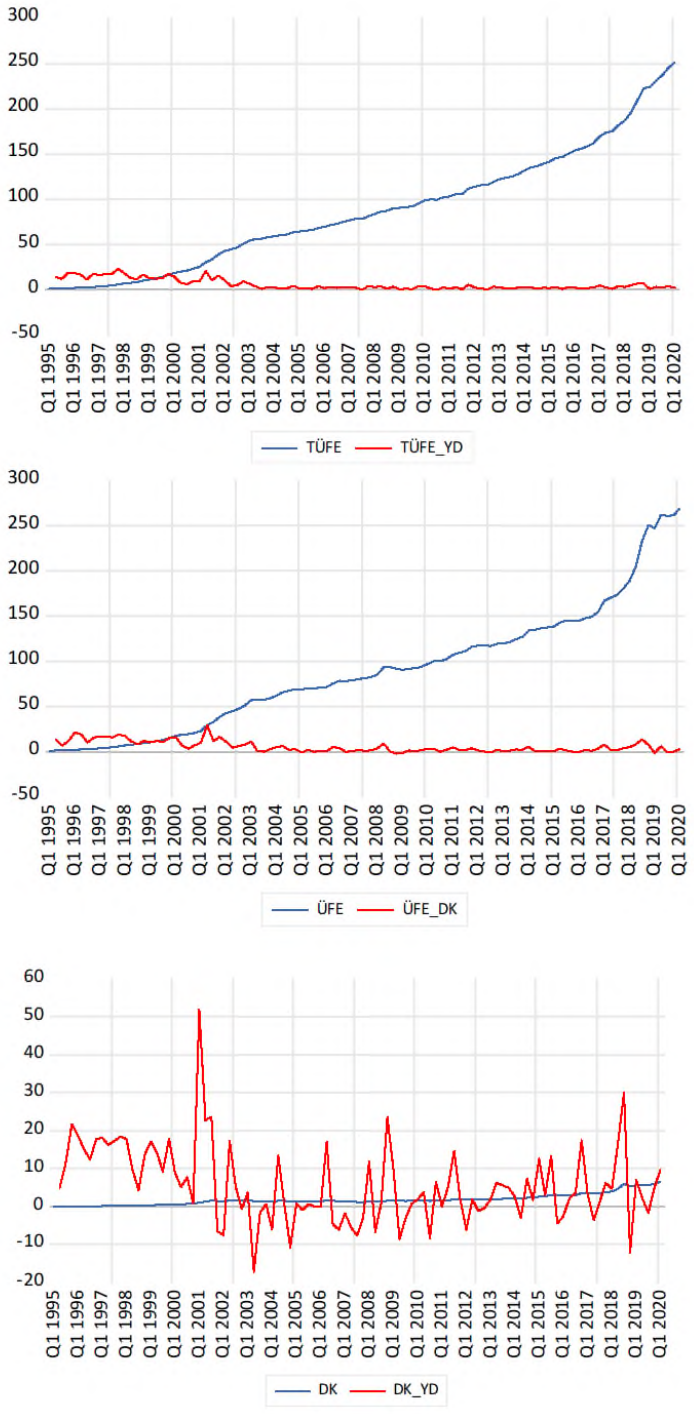
Zivot, E. & Andrews, D. W. K. (1992). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. *Journal of Business & Economic Statistics, 10*(3), 251–270.

**How cite this article / Atıf biçinmi**

Kaya, A.E. (2023). Üretici ve tüketici fiyatlarında kur geçişkenliği etkisi: Türkiye, Brezilya ve Güney Afrika. *İktisat Politikası Araştırmaları Dergisi - Journal of Economic Policy Researches, 11*(1), 31–49. https://doi.org/10.26650/JEPR1318757

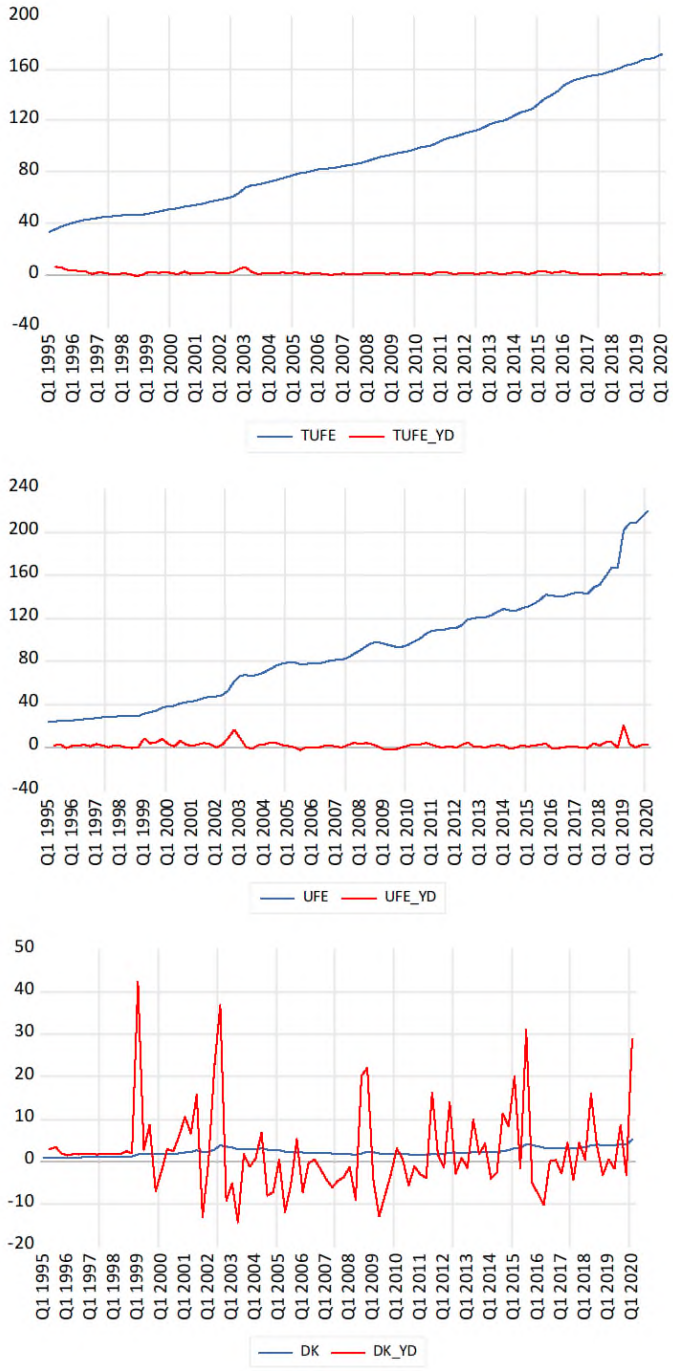
**Ekler:**

**Ek-1: TÜFE, ÜFE, DÖVİZ KURU (DK) Seviye ve Yüzdelik Değişim (YD) Grafikleri**



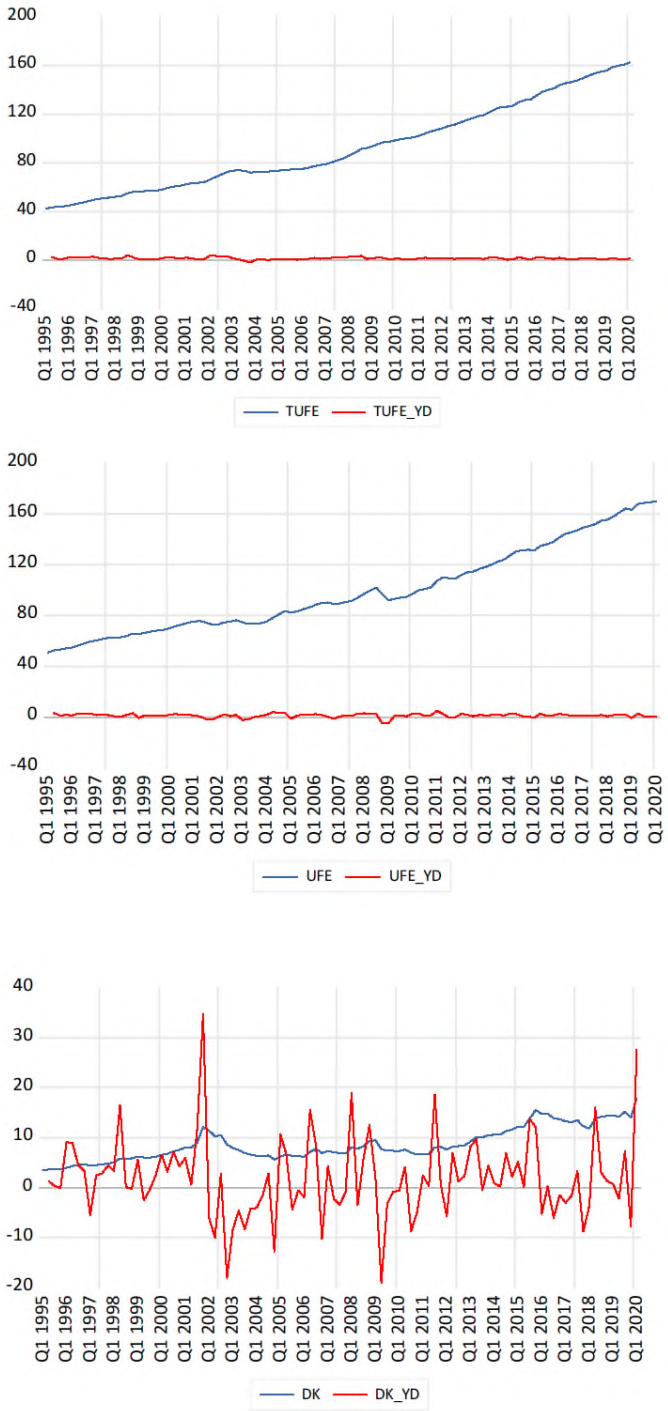

**Şekil 2.** Türkiye

Türkiye'de TÜFE ve ÜFE endekslerinin paralel bir seyir izlediği, döviz kurunun yüksek oynaklık sergilediği görülmektedir. 2001 yılında yaşanan ekonomik/finansal krizin döviz kurunda yüksek bir artışa neden olduğu, aynı dönemde tüketici fiyatlarında ve üretici maliyetlerinde önemli artış yaşandığı grafikler üzerinden görülebilmektedir. Döviz kurundaki diğer yüksek oynaklık dönemlerinin 2008-2009 küresel finansal kriz dönemi ve kur şokunun yaşandığı 2018 yılı olduğu gözlemlenmektedir.




**Şekil 3.** Brezilya

Brezilya'da da Türkiye'de olduğu gibi yüksek döviz kuru oynaklığı bulunmaktadır. Kur oynaklık marjının Türkiye'ye göre daha sık ve daha geniş olduğu görülmektedir. Üretici maliyetlerinde 2003 ve 2019 yıllarında dikkat çekici bir artış kaydedilmiştir.




**Şekil 4.** Güney Afrika

2008-2009 küresel finansal krizin Güney Afrika'da ÜFE endeksinde düşüşe yol açtığı gözlemlenmektedir. Ülkede pozitif döviz kuru şokları kadar negatif döviz kuru şokları da kaydedilmektedir.

## Ek-2: Optimal Gecikme Uzunlukları Türkiye (Bağımlı Değişken: TÜFE)

**Tablo 7.** Türkiye

**Türkiye (Bağımlı Değişken: TÜFE)**

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 25.20886 | NA | 0.002081 | -0.499115 | -0.444651 | -0.477124 |
| 1 | 473.7903 | 868.2221 | 1.47e-07 | -10.06001 | -9.896612 | -9.994032 |
| 2 | 489.9965 | 30.66987 | 1.13e-07 | -10.32251 | -10.05018* | -10.21255* |
| 3 | 492.0232 | 3.748244 | 1.18e-07 | -10.28007 | -9.898817 | -10.12613 |
| 4 | 495.6121 | 6.483232 | 1.19e-07 | -10.27123 | -9.781048 | -10.07331 |
| 5 | 504.6204 | 15.88556* | 1.07e-07* | -10.37893* | -9.779823 | -10.13703 |
| 6 | 507.1203 | 4.300937 | 1.10e-07 | -10.34667 | -9.638635 | -10.06079 |
| 7 | 512.0456 | 8.261862 | 1.08e-07 | -10.36657 | -9.549605 | -10.03670 |
| 8 | 513.6838 | 2.677428 | 1.14e-07 | -10.31578 | -9.389884 | -9.941930 |

**Türkiye (Bağımlı Değişken: ÜFE)**

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 24.17517 | NA | 0.002128 | -0.476885 | -0.422421 | -0.454894 |
| 1 | 446.5075 | 817.4173 | 2.64e-07 | -9.473279 | -9.309885 | -9.407305 |
| 2 | 463.9590 | 33.02659* | 1.97e-07* | -9.762559* | -9.490237* | -9.652603* |
| 3 | 465.0037 | 1.932202 | 2.10e-07 | -9.699005 | -9.317754 | -9.545067 |
| 4 | 467.8948 | 5.222630 | 2.16e-07 | -9.675158 | -9.184977 | -9.477237 |
| 5 | 469.5804 | 2.972401 | 2.27e-07 | -9.625385 | -9.026276 | -9.383482 |
| 6 | 471.9895 | 4.144634 | 2.35e-07 | -9.591172 | -8.883133 | -9.305286 |
| 7 | 474.4571 | 4.139241 | 2.43e-07 | -9.558217 | -8.741250 | -9.228349 |
| 8 | 476.2425 | 2.918120 | 2.56e-07 | -9.510592 | -8.584695 | -9.136741 |

**Tablo 8.** Brezilya

**Brezilya (Bağımlı Değişken: TÜFE)**

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 96.01609 | NA | 0.000454 | -2.021851 | -1.967387 | -1.999860 |
| 1 | 560.7423 | 899.4701 | 2.26e-08 | -11.92994 | -11.76655 | -11.86397 |
| 2 | 574.4086 | 25.86307 | 1.84e-08 | -12.13782 | -11.86550* | -12.02786 |
| 3 | 581.2923 | 12.73117 | 1.73e-08 | -12.19983 | -11.81858 | -12.04590* |
| 4 | 587.3109 | 10.87226 | 1.65e-08* | -12.24325* | -11.75306 | -12.04532 |
| 5 | 587.6350 | 0.571561 | 1.79e-08 | -12.16419 | -11.56508 | -11.92229 |
| 6 | 588.8803 | 2.142408 | 1.90e-08 | -12.10495 | -11.39691 | -11.81907 |
| 7 | 593.1253 | 7.120610 | 1.90e-08 | -12.11022 | -11.29325 | -11.78035 |
| 8 | 599.8524 | 10.99488* | 1.79e-08 | -12.16887 | -11.24297 | -11.79502 |

**Brezilya (Bağımlı Değişken: ÜFE)**

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 70.10046 | NA | 0.000793 | -1.464526 | -1.410062 | -1.442535 |
| 1 | 442.7022 | 721.1646 | 2.86e-07 | -9.391444 | -9.228051* | -9.325471 |
| 2 | 449.5752 | 13.00712* | 2.69e-07* | -9.453231* | -9.180909 | -9.343275* |
| 3 | 450.0131 | 0.809817 | 2.90e-07 | -9.376626 | -8.995375 | -9.222688 |
| 4 | 451.8047 | 3.236389 | 3.05e-07 | -9.329133 | -8.838952 | -9.131212 |
| 5 | 456.9071 | 8.997839 | 2.98e-07 | -9.352841 | -8.753732 | -9.110938 |
| 6 | 457.4716 | 0.971072 | 3.21e-07 | -9.278958 | -8.570920 | -8.993072 |
| 7 | 459.2657 | 3.009552 | 3.38e-07 | -9.231521 | -8.414553 | -8.901653 |
| 8 | 460.1919 | 1.513830 | 3.62e-07 | -9.165418 | -8.239521 | -8.791567 |

**Tablo 9.** Güney Afrika

**Güney Afrika (Bağımlı Değişken: TÜFE)**

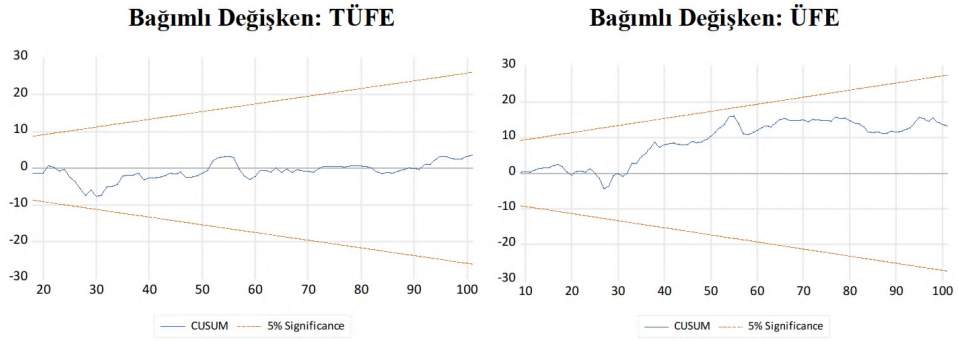
| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 148.1344 | NA | 0.000148 | -3.142674 | -3.088210 | -3.120683 |
| 1 | 569.6046 | 815.7489 | 1.87e-08 | -12.12053 | -11.95714 | -12.05456 |
| 2 | 586.0681 | 31.15664* | 1.43e-08* | -12.38856* | -12.11624* | -12.27860* |
| 3 | 589.2199 | 5.829227 | 1.46e-08 | -12.37032 | -11.98907 | -12.21638 |
| 4 | 593.4481 | 7.637961 | 1.45e-08 | -12.37523 | -11.88505 | -12.17731 |
| 5 | 595.8342 | 4.207776 | 1.50e-08 | -12.34052 | -11.74141 | -12.09862 |
| 6 | 598.9218 | 5.311946 | 1.53e-08 | -12.32090 | -11.61286 | -12.03501 |
| 7 | 601.7212 | 4.695808 | 1.58e-08 | -12.29508 | -11.47811 | -11.96521 |
| 8 | 605.8487 | 6.746022 | 1.58e-08 | -12.29782 | -11.37192 | -11.92397 |

**Güney Afrika (Bağımlı Değişken: ÜFE)**

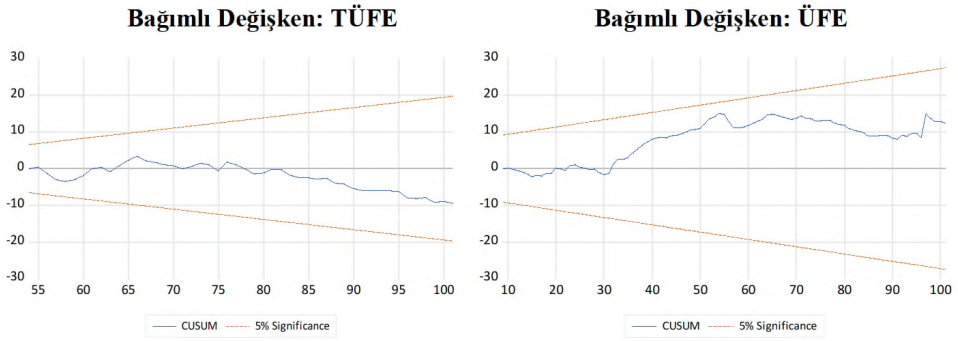
| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 163.3880 | NA | 0.000107 | -3.470709 | -3.416245 | -3.448718 |
| 1 | 520.5841 | 691.3474 | 5.36e-08 | -11.06633 | -10.90293* | -11.00035* |
| 2 | 526.3827 | 10.97374* | 5.16e-08 | -11.10501 | -10.83268 | -10.99505 |
| 3 | 531.0613 | 8.652902 | 5.08e-08* | -11.11960* | -10.73835 | -10.96566 |
| 4 | 533.6861 | 4.741577 | 5.24e-08 | -11.09002 | -10.59984 | -10.89210 |
| 5 | 535.7823 | 3.696438 | 5.46e-08 | -11.04908 | -10.44997 | -10.80718 |
| 6 | 539.4698 | 6.344010 | 5.51e-08 | -11.04236 | -10.33432 | -10.75647 |
| 7 | 544.5925 | 8.592991 | 5.39e-08 | -11.06651 | -10.24954 | -10.73664 |
| 8 | 549.0126 | 7.224303 | 5.35e-08 | -11.07554 | -10.14964 | -10.70169 |

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

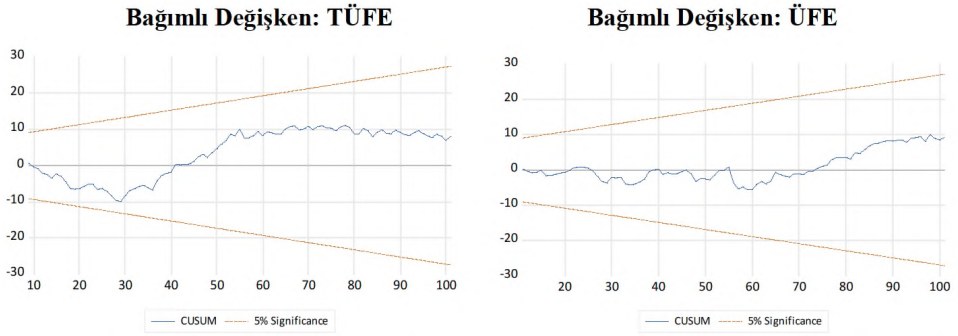
## Ek-3: Cusum Test Grafikleri




**Şekil 5.** Türkiye




**Şekil 6.** Brezilya




**Şekil 7.** Güney Afrika

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
**JEPR** 2024, 11(1): 51–61
DOI: 10.26650/JEPR1343548

RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

# Does Exchange Rate Volatility Affect the Bank Lending Channel?

## Döviz Kuru Oynaklığı Banka Kredi Kanalını Etkiliyor mu?

Burak Buyun[1]

**ABSTRACT**

The bank lending channel is one of the most debated channels of the transmission mechanism, especially in Turkey. According to many studies, exchange rate volatility is a good indicator of macroeconomic, financial and political instability. This study tests whether the bank lending channel is affected by exchange rate volatility in Turkey. Thus, we aim to obtain an important finding on why the bank lending channel works weakly in Turkey. To test this hypothesis, the Vector Auto Regression (VAR) model is used for the period January 2011- September 2023. Evidence from the impulse response function suggests that exchange rate volatility has a negative impact on loans, while variance decomposition results show that exchange rate volatility has a high power to explain the change in loans. Credit may not always respond to expansionary (contractionary) monetary policy in an increasing (decreasing) direction. In periods of high exchange rate volatility (political, financial, macroeconomic instability), banks may not increase lending even in a low interest rate environment. This is because when exchange rate volatility is high, banks avoid taking risks under uncertainty. Therefore, for the bank lending channel to work more effectively, macroeconomic, financial and political stability should be ensured in addition to monetary policy.

**Keywords:** exchange rate volatility, bank lending channel, monetary transmission channel, financial stability, var model

**Jel Code:** E50, E51, E59

[1]Res. Assist. İstinye University, Faculty of Economics, Administrative and Social Sciences / Department of Economics, İstanbul, Turkiye

**Sorumlu yazar /**
**Corresponding author:** Burak Buyun
**E-mail / E-posta :** burak.buyun@istinye.edu.tr.

**Submitted / Başvuru** : 15.08.2023
**Revision Requested / Revizyon Talebi** : 26.11.2023
**Last Revision Received / Son Revizyon** : 16.01.2024
**Accepted / Kabul** : 19.01.2024

**ÖZ**

Banka kredileri kanalı aktarım mekanizmasının, özellikle Türkiye'de, en çok tartışılan kanallardan birisidir. Döviz kuru oynaklığı ise pek çok çalışmaya göre makro ekonomik, finansal ve politik istikrarsızlığı yansıtması açısından iyi bir göstergedir. Bu çalışmada Türkiye'de banka kredileri kanalının döviz kuru oynaklığından etkilenip etkilenmediğini test edilmektedir. Böylelikle banka kredi kanalının Türkiye'de neden zayıf çalıştığına dair önemli bir bulgu elde etmek istenmektedir. Bu hipotezi test etmek için Vector Auto Regression (VAR) modeli 2011 Ocak – 2023 Eylül dönemi için kullanılmıştır. Etki tepki fonksiyonundan elde edilen bulgular döviz kuru oynaklığının krediler üzerinde negatif bir etkiye sahip olduğunu gösterirken, varyans ayrıştırma sonuçları döviz kuru oynaklığının kredilerdeki değişimi açıklamak için yüksek bir güce sahip olduğunu göstermektedir. Genişlemeci (daraltıcı) para politikasına krediler her zaman artan (azalan) yönde tepki vermeyebilmektedir. Döviz kuru oynaklığının yüksek olduğu (politik, finansal, makroekonomik istikrarsızlığın olduğu) dönemlerde düşük faiz ortamında bile bankalar kredileri artırmayabilmektedir. Çünkü döviz kuru oynaklığının yüksek olduğu dönemlerde bankalar belirsizlik altında risk almaktan kaçınmaktadırlar. Dolayısıyla banka kredileri kanalının daha etkili çalışması için para politikasının yanında makroekonomik finansal ve politik istikrarın da sağlanması gerekmektedir.

**Anahtar Kelimeler:** döviz kuru oynaklığı, banka kredileri kanalı, parasal aktarım mekanizması, finansal istikrar, var modeli

**Jel Sınıflaması:** E50, E51, E59

## 1. Introduction

Monetary transmission channels, especially the credit channel, have long been discussed among economists and policymakers. The discussion related to the effectiveness of bank lending channels and the strength of monetary policy on bank lending channels varies from country to country and time to time. On the other hand, the importance attributed to the stability of financial markets, asset prices, and financial intermediation has increased since the 2007-2008 global financial crisis. This situation has changed the dimension of debate related to the bank lending channel as well.

The early studies on bank loans implied that, contrary to the classical view of money, the transmission mechanism also operates with regard to the loans banks give. These studies frequently analyzed the relationship between bank loans and GDP (Bernanke, 1986; Bernanke & Blinder, 1988, 1990; Ramey, 1993; Bernanke & Gertler, 1995). Then studies regarding the bank lending channel referred to how much credit is affected by monetary policy. For example, Lown and Morgan (2002) argued credit standards to better explain fluctuations in credit than monetary policy. Similarly, Berkelmans (2005) stated with regard to explaining credit that monetary policy is effective in the short run, while macroeconomic variables such as output, inflation, and commodity price are more influential in the long run. Similar studies have been conducted for developing countries. For instance, Wrobel and Pawlowska (2002) investigated the impact of monetary policy on bank lending using bank-level data for Poland's economy. Their findings showed monetary policy to affect the bank lending channel more than individual and short-term credit, consistent with the findings of Kashyap and Stein (1994). Moreover, Ramlogan (2007) claimed the credit channel to be the most effective channel in Trinidad and Tobago due to the real sector depending on credit there.

The views on bank lending after the 2007-2008 financial crisis have emphasized bank-specific behaviors to be decisive in banks' lending process. Altunbas and Gambacorta (2010) investigated 3,000 banks in the European area using bank-level data. They suggested relatively more risk-free banks (those with healthier capital structure that use less leverage) create loans more easily and are less affected by market risk. Furthermore, they claimed the importance banks give to market risk perception to be increasing. Similarly, Gambacorta (2011) stated banks' capital, risks, and liquidity positions to have an impact on credit supply and therefore argues that financial stability and monetary policy should be addressed together.

Many studies have submitted that the bank lending channel had not worked through monetary policy since the 2007-2008 financial crisis. For example, Saprisa and Tamesvary's (2019) study covering the 1980-2008 period for the US economy argued the impact of monetary policy on bank loans to be stronger during periods of recovery. Moreover, their study claimed the bank lending channel to have not worked since 2007. Salachas et al. (2017) compared the implementation of conventional and unconventional monetary policies for six developed countries and their 480 commercial banks, using the generalized method of moments (GMM) and separating the 2001-2013 period into two sub-periods. Their result showed that prior to the crisis, conventional monetary policy (central bank rate) had been important for bank loans; after the crisis, however, unconventional monetary policy (asset purchases) had become more influential on bank loans than interest rates.

Meanwhile, Heider et al. (2019) examined a period of negative policy rates in the eurozone. They argued a negative policy rate to not affect loan supply, as banks are unwilling to pass these negative rates to their depositors. However, they also stated negative interest rates to be able to negatively affect financial stability.

Azofra et al.'s (2018) study on developing countries showed monetary policy to work through the credit channel in countries with more developed financial systems. In addition, they indicated monetary policy to have not been influential on the credit supply either before or after the crisis for countries with less developed financial systems. Choi's (2017) study regarding developing countries stated an increase in the USA's financial uncertainty to shrink the supply of developing countries' credit.

After the 2007-2008 financial crisis, the view that bank-specific characters, financial systems, and financial stability rather than monetary policy are also able to drive bank loans became more tangible. When considering this situation, the question arises as to whether the credit channel is directly affected by financial stability or uncertainty, macroeconomic stability, or other external factors. Due to the Central Bank of the Republic of Türkiye (CBRT) having created its policy framework by taking into account financial stability since 2011, Türkiye serves as a good example for answering this question.

Many central banks such as the CBRT began considering financial stability after the 2007-2008 financial crisis when designing monetary policy. The CBRT has added financial stability to its target since 2011 (Ozatay, 2011). The novel policy framework is designed by considering the structure of the Turkish economy and has two main targets. The first of these is to slow short-term capital inflows and the second is to limit credit growth. Basci and Kara (2011) indicated the main reason for choosing these targets to be that short-term capital inflow facilitates access to credit and separates domestic and foreign demand by creating an appreciation pressure on the Turkish lira. They stated the economy's dependence on short-term capital inflows for financing the current account deficit to have also increased macroeconomic and financial fragility. The CBRT has been using new monetary policy tools since 2011 in orderto overcome financial instability.

Some studies have shown exchange rate volatility to be closely related to financial and macroeconomic stability. For example, Jehan and Hamid (2017) stated exchange rate volatility to negatively affect short-term and long-term capital inflows. They also claimed that a developed financial system reduces the harmful impact on capital inflows. Meanwhile, Krol (2014) argued macroeconomic uncertainty to increase exchange rate volatility. Likewise, Bush and Lopez Noria (2021) investigated the impact of uncertainty on the Mexican peso. Their findings showed both global and domestic uncertainty to have a positive impact on the Mexican peso.

In addition, many studies have shown the CBRT's new policy tools to reduce exchange rate volatility. For example, Oduncu et al. (2013) suggested the new policy tool that had been designed to ensure financial stability to decrease exchange rate volatility. Degerli and Fendoglu's (2015) study also supports these findings. Moreover, Basci (2009) claimed the reason for lower Turkish lira volatility compared to other developing countries during the crisis to have been the strong structure of the Turkish financial system.

Many of the studies mentioned above show the bank lending channel to affect output. Therefore, a central bank's ability to influence the bank lending channel increases its capacity to influence macroeconomic variables. As a result, obtaining new evidence on the functioning of the bank lending channel will help the CBRT formulate better policies.

However, the above-mentioned studies also revealed the power of monetary policy to affect the bank lending channel to weaken from time to time and under different circumstances. However, these studies do not explain why the CBRT's influence on the bank lending channel has weakened. The bank lending channel is thought to be affected by macroeconomic uncertainty, as well as political and financial instability. This is because banks will be reluctant to lend during periods of high economic and financial uncertainty.

This study aims to test the hypothesis that the bank credit channel is affected by macroeconomic uncertainty and financial and political instability. The various studies mentioned above have stated exchange rate volatility to reflect macroeconomic, financial, and political instability. Therefore, in order to test this hypothesis, the current study will use the vector autoregression (VAR) model to test the effect of exchange rate volatility on the bank lending channel. The reason for choosing the VAR model is that it will help investigate the effect of exchange rate volatility on banks' lending tendencies without using a theoretical background rather than testing the effect of the bank lending channel on macroeconomic variables such as output. Policy implications will be made in light of the obtained results. Therefore, the study aims to utilize the atheoretical structure of the VAR model.

The finding of a significant relationship between the bank lending channel and exchange rate volatility is expected to contribute to the understanding of why the bank lending channel works weakly in Türkiye and why the bank lending channel weakens under different economic conditions. In addition, such a finding is expected to provide information about the reason why the bank lending channel works through banks' idiosyncratic characteristics, as has been found in micro-scale studies. The current study is also expected to provide new findings regarding the extent to which the central bank can control the bank lending channel when making policy.

This paper is structured as follows: Section 2 provides a literature review, Section 3 provides the data set and

econometric model used in this paper, Section 4 presents the empirical results, and Section 5 includes concluding remarks.

## 2. Literature Review

A large literature exists on the bank lending channel in Türkiye. Because this study examines the impact of monetary policy on the bank lending channel, it includes studies that have examined the interaction between monetary policy variables such as interest rates and the bank lending channel rather than those that have examined the impact of the bank lending channel on macroeconomic variables. Studies on the impact monetary policy has on the bank lending channel in Türkiye have shown the monetary policy to have limited impact on the bank lending channel at both the macro and micro levels.

As one of the first studies to examine this relationship, Cavusoglu (2002) investigated the 1988-1999 period and analyzed the effect of monetary policy on the bank lending channel using the generalized method of moments (GMM). The study found no significant effect on loans from the reserve requirement ratio, which was taken as a monetary policy variable. Ozsuca and Akbostancı (2012) conducted a similar study, analyzing the effect of monetary policy on the bank lending channel using bank-level data. Their study compared two different periods, 1988-2001 and 2002-2009. While their findings indicated the existence of a bank lending channel in both periods, the study argued the bank lending channel to have strengthened after the 2001 crisis, with macroeconomic stability, the regulation of the financial system, and the consolidation of the banking sector having been achieved. Such a finding is also important for the current study, because macroeconomic stability and financial stability have increased with the structural reforms implemented after the 2001 crisis. Therefore, the finding that such a structural transformation has a positive impact on the bank lending channel strengthens the hypothesis this study examines. After the 2001 crisis, another study showing the bank lending channel to work through monetary policy was the study by Kılınc and Kılınc (2020), which used the VAR model for the 2003Q1-2018Q4 period. Their study analyzed the relationship loans to the non-financial sector have with interest rates, M2, exchange rate, industrial production index, and inflation. The negative response of loans to interest rates in the period under study indicated the bank lending channel to operate through monetary policy.

Meanwhile, studies analyzing the interaction of monetary policy with the bank lending channel have often argued the effect of monetary policy to be weak and the bank lending channel to be driven by bank-specific characteristics.

For example, Sengonul and Thorbacke (2005) investigated the impact monetary policy has on the bank lending channel in Türkiye for the period of 1997-2001 using panel data techniques. Their findings suggested banks with more liquidity to be less affected by tight monetary policy compared ot banks with less liquidity. A similar study was conducted by Meral (2015). Covering the 2002Q4-2008Q4 period, Meral's study showed banks with stronger capital to be less sensitive to interest rate changes. Another study suggesting that bank-specific characteristics affect the bank loans channel more than monetary policy variables such as interest rates was conducted by Adanur and Nargelecekenler (2018). Their study covered the period of 1998Q1-2001Q and observed the liquidity level of banks to affect credit supply more than monetary policy does. Ozsuca (2002) investigated the effect of unconventional monetary policy instruments implemented after 2010 on the bank lending channel. The study argued the new monetary policy instruments to affect the bank lending channel, but bank-specific characteristics to be determinant with regard to credit supply.

Micro-level studies have suggested the bank lending channel to work through banks' optimization behavior. In addition, monetary policy variables have been argued to have a limited effect on the bank lending channel. Meanwhile, macro-level studies have shown the impact of monetary policy on the bank lending channel to be limited; however, these did not take bank-specific characteristics into account. For instance, Belke and Kaya (2017) examined the bank lending channel over the period between January 2003-December 2016 using the VAR model. Their findings supported the presence of a bank lending channel. However, their study also argued banks' lending tendency to shifts to riskier assets in times of moral hazard, such as the 2008 crisis, and resultantly the bank lending channel to weaken under such circumstances. Elsewhere, Ocal and Kar (2021) examined the impact of monetary policy on the bank lending channel during periods of expansion and contraction using the Markov switching vector autoregression (MS-VAR) model for the period between January 2005-December 2019. While they observed monetary policy to have been effective on the bank lending channel during the expansion period, they also observed the bank lending channel to have not worked during the contraction period. The fact that the bank lending channel does not work during the contraction is highly relevant to the subject of this study. In recessionary periods, the increase in macroeconomic uncertainty and the weakening of financial stability often become more pronounced. Therefore, the fact that the bank lending channel does not work during the recession supports the presence of the problem mentioned in the introduction of this study. Similarly, Canbazoglu and Gunes (2011) showed the bank lending channel to be weak in Türkiye. Their study comparatively analyzed the bank lending channel in Argentina and Türkiye for the period of 2003:1-2010:8. The findings from their study, which used

the VAR model to separately estimate for the two countries, showed the interest rate channel to be effective in Türkiye and the bank lending channel to be effective in Argentina. According to their study, the reason why the bank lending channel is more effective in Argentina is that Argentina had a long period of hyperinflation.

Studies analyzing the impact of monetary policy on the bank lending channel show the channel to work weakly both at the micro and macro levels. However, studies have shown the bank lending channel to work weakly through monetary policy, but they did not provide any empirical interpretation as to the reasons. This paper tests the argument as to why the bank lending channel does not work. The findings from this study are expected to fill the gap in the literature regarding the reasons for the weak bank lending channel in Türkiye. Moreover, this is the first study to examine the relationship between exchange rate volatility and the bank lending channel.

## 3. Methodology and Data

Macroeconomic relationships have complex and small-scale structures. In such cases, explaining these relationships with a single equation may not be the appropriate method. In addition, determining which variable is endogenous or exogenous can be troublesome at times. For these cases, Sims (1980) proposed a multi-variable multi-dimensional method in which all variables are accepted as being endogenous. Accordingly, the simple bivariate VAR model can be representted as follows (Enders, 2015, pp. 285–309):

$$a_t = \delta_{10} - \delta_{12}x_t + \gamma_{11}a_{t-1} + \gamma_{12}x_{t-1} + \varepsilon_{a,t} \tag{1}$$

$$x_t = \delta_{20} - \delta_{21}a_t + \gamma_{21}a_{t-1} + \gamma_{22}x_{t-1} + \varepsilon_{x,t} \tag{2}$$

where $\varepsilon_{a,t}$ and $\varepsilon_{x,t}$ represent error terms that have a constant variance and normal distribution. $\delta_{10}$ and $\delta_{20}$ represent constants, and$\delta_{ii}$ and $\gamma_{ii}$ represent the unknown coefficients. The system shown above is retrospective, because both $a_t$ and $x_t$ are affected by their own and the other's past values. On the other hand, the ordinary least-squares (OLS) method is not used to estimate the system, because both $a_t$ and $x_t$ also affect their own present values. In such a case, because the error terms and explanatory variables are related, OLS estimates would suffer from simultenaous equation bias. The above system can be shown as the following matrix:

$$\begin{bmatrix} 1 & \delta_{12} \\ \delta_{21} & 1 \end{bmatrix} \begin{bmatrix} \alpha_t \\ x_t \end{bmatrix} = \begin{bmatrix} \delta_{10} \\ \delta_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix} \begin{bmatrix} \alpha_{t-1} \\ x_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{a,t} \\ \varepsilon_{x,t} \end{bmatrix} \tag{3}$$

Or

$$Bf_t = \Gamma_0 + \Gamma_1 f_{t-1} + \varepsilon_t \tag{4}$$

$$\text{where B=} \begin{bmatrix} 1 & \delta_{12} \\ \delta_{21} & 1 \end{bmatrix}, f_t = \begin{bmatrix} \alpha_t \\ x_t \end{bmatrix}, \Gamma_0 = \begin{bmatrix} \delta_{10} \\ \delta_{20} \end{bmatrix}, \Gamma_1 = \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}, \varepsilon_t = \begin{bmatrix} \varepsilon_{\alpha,t} \\ \varepsilon_{x_t} \end{bmatrix}. \text{ The classical VAR} \tag{5}$$

form can be achieved by multiplying Equation 4 by $B^{-1}$:

$$f_t = A_0 + A_1 f_{t-1} + \varepsilon_t \tag{6}$$

$$\text{where} A_0 = B^{-1}\Gamma_0, A_1 = B^{-1}\Gamma_1 \text{and} \varepsilon_t = B^{-1}\varepsilon_t$$

Because VAR models do not include contemporaneous effects, the coefficients frequently are not commented on. However, VAR models have some features such as impulse response function and variance decomposition, which allow the dynamic structure of external shocks to be shown and the relationship among the residuals to be examined.

VAR models are one of the widely used methods in studies related to transmission channels. Because VAR models include impulse response function and variance decomposition, this study can also benefit from it. Therefore, the VAR model of the current study can be expressed as shown in the form of Equation 5, where $f_t$ is the vector of the endogenous variables in the study. The variables used in the model are shown in Table 1.

All variables in the model are taken from the CBRT's Electronic Data Delivery System. The study covers the period from January 2011, when the CBRT started to implement its financial stability target, to September 2022. Because the

**Table 1.** *Variables in the Model*

| Variable | Process | Abbreviation |
|---|---|---|
| Reel Effective Exchange Rate Volatility | $\sqrt{\frac{1}{m}\sum_{i=1}^{m}(LR_{t+i-1} - LR_{t+i-2})\text{^}2}$ | VOL |
| Weighted Average Cost of Funding | Level | INT |
| Total Deposits of Banking Sector | Log | DEP |
| Interest Rate of Consumer Loan | Level | INTC |
| Total Credit of Banking Sector | Log | CREDIT |

CBRT has followed unconventional policies regarding credit and exchange rates, the ending period of study is limited to this date. The exchange rate volatility variable expressed in the first line of Table 1 has been calculated based on the method used in the studies of Kennen and Rodrik (1986), Chowdhury (1993), and Kasman (2003). This method obtains the volatility of the relevant variable by fixing the standard deviation based on the moving average. Due to this study using monthly data, the coefficient m has been taken as 12. Although volatility calculations such as the ARCH and GARCH models are found in the literature, these technique were not chosen here because the study does not conduct a volatility modeling and accordingly does not want to make too many changes to the data. Meanwhile, the study has preferred the real exchange rate over the nominal exchange rate because it is used more frequently in the literature and because the real effective exchange rate is a more comprehensive variable.

## 4. Empirical Findings

Whether the variables have a unit root or not is important with regard to the time series analysis. If the variables include a unit root, the estimates and policy inferences may be misleading. To avoid this situation, whether the variables have unit roots or not has been tested with the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. Table 2 indicates the results from the unit root tests.

**Table 2.** *Unit Root Test Results*

| | ADF | | PP | |
|---|---|---|---|---|
| Variable | Level | First Difference | Level | First Difference |
| Credit | 0.9560 | 0.0000** | 0.9478 | 0.0000** |
| Deposit | 1 | 0.0000** | 1 | 0.0000** |
| INT | 0,0592* | 0,0147* | 0.3420 | 0.0000** |
| INTC | 0,1605 | 0.0000** | 0,4443 | 0.0000** |
| VOL | 0,0000* | 0.0000** | 0,0000* | 0.0000** |

**Note:** All test results are shown as probabilities. * reflects a 5% prob., and ** reflects a 1% prob.

The null hypothesis of both tests is that the series has a unit root. The null hypothesis has been rejected for the variables of Credit, Deposit, INT, and INTC that were subjected to the ADF and PP tests. When the first difference is taken for the four variables, the variables are seen to be stationary. The ADF and PP tests indicate the null hypothesis to be accepted for the volatility (VOL) series. Therefore, Credit, Deposit, INT, and INTC are I(1), and VOL is I(0).

Due to the variables not being stationary at the same level, the study does not investigate their long-term relationships. In order to benefit from the features of the VAR model, such as impulse response function and variance decomposition, the study uses the unrestricted VAR model, in which the included variables are stationary, as suggested in the studies of Sims (1980), Engle and Granger (1987), Johansen (1988), and Johansen and Jeselius (1990).

The second stage of the VAR model involves determining the appropriate lag length. The lag that minimizes the values of such information criteria as LogL, LR, FPE, AIC, SC, and HQ has been chosen as the appropriate lag for the VAR model. Table 3 shows the lag length of the VAR model.

**Table 3.** *Optimal Lag Length*

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 1309,785 | NA | 1,79E-15 | -19,76947 | -19,66027 | -19,72509 |
| 1 | 1403,352 | 178,6281 | 6,32E-16 | -20,80836 | -20,15318* | -20,54213* |
| 2 | 1441,966 | 70,79351 | 5,15E-16 | -21,01464 | -19,81348 | -20,52654 |
| 3 | 1471,259 | 51,4846 | 4,85E-16 | -21,07969 | -19,33254 | -20,36973 |
| 4 | 1509,418 | 64,17614* | 4,00e-16* | -21,27906* | -18,98593 | -20,34724 |
| 5 | 1522,674 | 21,28996 | 4,84E-16 | -21,10112 | -18,262 | -19,94744 |
| 6 | 1544,774 | 33,81977 | 5,15E-16 | -21,05719 | -17,67208 | -19,68163 |
| 7 | 1565,862 | 30,67237 | 5,61E-16 | -20,9979 | -17,06681 | -19,40049 |
| 8 | 1592,276 | 36,41984 | 5,69E-16 | -21,01933 | -16,54225 | -19,20005 |

The suitable lag length that has been made for minimizing the LR, FPE, and AIC information criteria was chosen as four. Table 4 presents the autocorrelation test results for the VAR(4) model.

**Table 4.** *Autocorrelation Test Results*

| Lag | LRE* stat | df | Prob. | Rao F-stat | df | Prob. |
|---|---|---|---|---|---|---|
| 1 | 16,81823215 | 25 | 0,8883 | 0,667412555 | (25,395.3) | 0,8884 |
| 2 | 28,12384561 | 25 | 0,3022 | 1,131825675 | (25,395.3) | 0,3026 |
| 3 | 24,46845178 | 25 | 0,4925 | 0,98025475 | (25,395.3) | 0,4929 |
| 4 | 34,49528737 | 25 | 0,0977 | 1,399295638 | (25,395.3) | 0,0980 |
| 5 | 19,04153783 | 25 | 0,7951 | 0,757725022 | (25,395.3) | 0,7954 |

Table 4 shows the LM autocorrelation test results. The null hypothesis of the LM autocorrelation test is that no correlation is present for any lag. According to the LM test results, the null hypothesis is accepted up to five lags for the VAR(4) model. Another stage of the VAR model selection criteria involves whether the characteristic roots of the model are stable or not. If the characteristic roots remain within the unit circle, the selected model is stable, with Figure 1 showing that the characteristic roots remain within the unit circle.

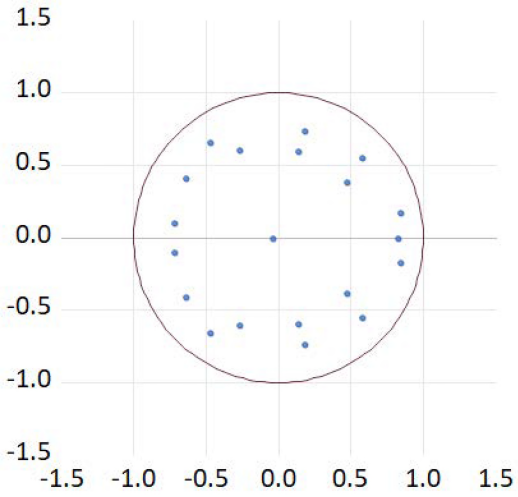



**Figure 1.** The characteristic roots of the VAR(4) model.

### 4.1. Impulse Response Functions

The impulse response function expresses the response from one endogenous variable in the system to a one standard deviation shock in the error of another exogenous variable in the VAR model. Figure 2 presents the impulse response function of the VAR model.

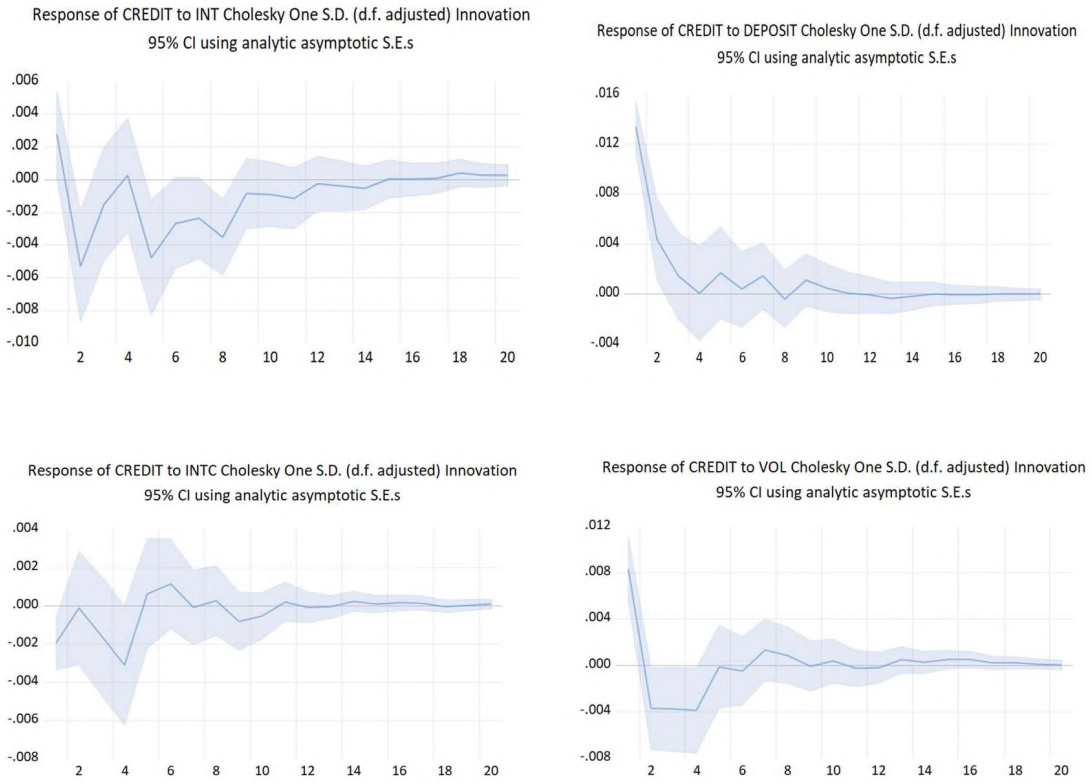



**Figure 2.** Impulse response functions of the VAR model.

Figure 2a shows the response of loans to a one-unit standard deviation shock in the error term of the INT variable. The effect is negative in the second period, as well as in the fifth and seventh periods. This result is consistent with the theory that an increase in policy rate will lead to a decrease in credits. Therefore, even if the effect is weak, the bank lending channel can be said to work through monetary policy. Figure 2b shows the response from loans to a one-unit standard deviation shock to deposit. Initially, the response of loans to the shock was positive and statistically significant. At the same time, the response of loans to deposits persisted until the end of the third period and then disappeared. When a banks' deposits increase, their tendency to lend is expected to increase. The result obtained in Figure 2b is also in line with expectations. The response of loan rates to bank loans is shown in Figure 2c. The response of loans to credit interest rates is negative and loses its statistical significance at the end of the second period. Because loan demand will decrease when loan rates increase, a negative response regarding loans appears plausible.

Figure 2d tests whether exchange rate volatility has a significant effect on loans. The response of loans to a shock in exchange rate volatility was negative and statistically significant from the second to the fifth period. An increase in the exchange rate volatility reduces credits in the short run. This result suggests that loans are affected by exchange rate volatility.

### 4.2. *Variance Decomposition*

Variance decomposition expresses how much of the change in the variance of one of the variables in the VAR model is caused by other variables and itself. Table 5 shows the variance decomposition results of the VAR model regarding credits.

The 20-period variance decomposition for loans is presented in Table 5, with deposits being the variable that explains the change in loans at the highest rate. An approximately 55% change in loans in the first period was explained by deposits. At the end of the 20th period, the explanatory power of deposits had become about 38%. While interest rate

**Table 5.** *Variance Decomposition with Regard to Credit*

| Period | VOL | INT | DEPOSIT | INTC | CREDIT |
|---|---|---|---|---|---|
| 1 | 21,23156339 | 2,342053681 | 55,2154679 | 1,183280795 | 20,02763424 |
| 2 | 20,15107528 | 8,629607873 | 48,33100741 | 0,939281248 | 21,94902819 |
| 3 | 22,45764438 | 8,730741866 | 46,45165316 | 1,482592371 | 20,87736822 |
| 4 | 24,11969495 | 8,138690985 | 43,22033599 | 3,4529757 | 21,06830237 |
| 5 | 22,75098952 | 12,27606449 | 41,34785682 | 3,335562427 | 20,28952674 |
| 6 | 22,39305323 | 13,46536756 | 40,65423549 | 3,535557536 | 19,95178618 |
| 7 | 22,31048233 | 14,28386552 | 40,28292845 | 3,468643109 | 19,65408058 |
| 8 | 21,87520765 | 16,28840656 | 39,26215388 | 3,390576328 | 19,18365559 |
| 9 | 21,69408577 | 16,28677091 | 39,17739839 | 3,489057336 | 19,35268759 |
| 10 | 21,66033988 | 16,39209501 | 39,11407471 | 3,533539424 | 19,29995097 |
| 11 | 21,59554656 | 16,57479633 | 38,97678265 | 3,528332022 | 19,32454244 |
| 12 | 21,57226498 | 16,56159921 | 38,92033561 | 3,524543002 | 19,42125719 |
| 13 | 21,58358206 | 16,56380124 | 38,87720406 | 3,519479939 | 19,4559327 |
| 14 | 21,55584739 | 16,58202624 | 38,80994798 | 3,523069266 | 19,52910912 |
| 15 | 21,58054656 | 16,56599776 | 38,77170931 | 3,521019138 | 19,56072722 |
| 16 | 21,61363218 | 16,55508309 | 38,74659443 | 3,523365658 | 19,56132464 |
| 17 | 21,61484648 | 16,54955821 | 38,73206383 | 3,525393562 | 19,57813792 |
| 18 | 21,61387639 | 16,57253878 | 38,71506856 | 3,524089927 | 19,57442634 |
| 19 | 21,61272169 | 16,58296774 | 38,7081734 | 3,523649483 | 19,57248768 |
| 20 | 21,60956574 | 16,59261623 | 38,70206568 | 3,524651622 | 19,57110072 |

explains about 2% of the change in loans in the first period, this ratio had increased and reached about 16% by the end of the 20$^{th}$ period. The reflection of the change in interest rate on lending cost and conditions was observed to occur over time. The reason for this is believed to be the set of new policies the central bank had started to implement after 2010. As the financial stability target started to be taken into account, the central bank started to use the short-term interest rate effectively within the corridor. The fluctuation of the short-term interest rate within the corridor delayed the effect of the AOFM variable on loans over time.

Loan rates' explanatory power over changes in loans ranged from 1% in the first period to approximately 3% by the end of the 20th period. Loan rate is the variable with the lowest explanatory power for explaining a change in credits in the model. After deposits, exchange rate volatility has the highest explanatory power for a change in loans. Exchange rate volatility explained about 21% of the change in loans in the first period, 24% in the fourth period, and about 21% by the end of the 20$^{th}$ period.

## 5. Conclusion

This study has investigated whether the bank lending channel is affected by exchange rate volatility. For this purpose, the study constructed a VAR model covering the period from January 2011-2023. The results obtained from the VAR model have shown exchange rate volatility to have a significant negative impact on loans.

The fact that the bank lending channel is negatively affected by exchange rate volatility suggests that macroeconomic uncertainty and financial and political instability also affect the bank lending channel. This implies that financial and macroeconomic stability are complementary with regard to central bank policymaking. This is because in the absence of macroeconomic or financial stability, the central bank will not be able to use its policy instruments effectively. Therefore, the negative impact of exchange rate volatility on the bank lending channel lends support to studies that have suggested the bank lending channel to function weakly in Türkiye. On the other hand, the findings also clarify the results of studies that have suggested the bank lending channel to be more affected by banks' optimization behaviors than by a central bank's policies. When exchange rate volatility increases, banks behave with greater optimization, as the central bank cannot effectively signal the bank lending channel.

This study's findings suggest that the central bank's ability to make more effective policy parallels the achievement of macroeconomic and financial stability. Therefore, monetary policy cannot be considered separate from other macroeconomic, financial, and political conditions. Ensuring financial and macroeconomic stability will pave the way for the CBRT to have a healthier impact on the economy.

**Hakem Değerlendirmesi:** Dış bağımsız.
**Çıkar Çatışması:** Yazarlar çıkar çatışması beyan etmemişlerdir.
**Finansal Destek:** Yazarlar finansal destek beyan etmemişlerdir.

**Peer Review:** Externally peer-reviewed.
**Conflict of Interest:** Authors declared no conflict of interest.
**Financial Disclosure:** Authors declared no financial support.

**ORCID:**
Burak Buyun 0000-0003-2594-7287

## REFERENCES / KAYNAKLAR

Aklan , N., & Nargeleçekenler, M. (2008). Para Politikalarının Banka Kredi Kanalına Etkileri. *İstanbul Üniversitesi Siyasal Bilgiler Fakültesi Dergisi, 109*(39), pp. 109-132.

Altunbaş, Y., Gambacorta , L., & Marquez-Ibanez, D. (2010). Bank risk and monetary policy. *Journal of Financial Stability, 6*(3), pp. 121-129.

Başçı , E., & Kara, H. (2011). Financial stability and monetary policy.

Berkelmans, L. (2005). Credit and monetary policy: An Australian SVAR.

Bernanke, B. S. (1986). Alternative explanations of the money-income correlation. *NBER*.

Bernanke, B., & Blinder , A. (1990). The federal funds rate and the channels of monetary transnission. *NBER*.

Bernanke, B., & Blinder, A. (1988). Credit, money, and aggregate demand. *NBER*.

Bernanke, B., & Gertler , M. (1995). Inside the black box: the credit channel of monetary policy transmission. Journal of Economic Perspectives, 9(4), pp. 27-48.

Bush, G., & Noria, G. (2021). Uncertainty and exchange rate volatility: Evidence from Mexico. *International Review of Economics & Finance,* 75, pp. 704-722.

Cambazoğlu, B., & Güneş , S. (2011). Monetary transmission mechanism in Turkey and Argentina. International Journal of Economics and Finance Studies, 3(2), pp. 23-33.

Choi, S. (2017). The impact of US financial uncertainty shocks on emerging market economies An international credit channe. *Open Economies Review*, pp. 89-118.

Chowhudry, A. (1993). Does exchange rate volatility depress trade flows? Evidence from error-correction models. *The review of economics and statistics*, pp. 700-706.

Çatik, A., & Karacuka, M. (2012). The bank lending channel in Turkey: has it changed after the low-inflation regime? *Applied Economics Letters*, pp. 1237-1247.

Çavuşoğlu, A. (2002). Credit transmission mechanism in Turkey: an empirical investigation. *Middle East Technical University ERC Working Papers in Economics, 2*(03), pp. 1-30.

Değerli , A., & Fendoğlu, S. (2015). Reserve option mechanism as a stabilizing policy tool: Evidence from exchange rate expectations. nternational Review of Economics & Finance, 35, pp. 166-179.

Enders, W. (2015). Applied econometric time series fourth edition. New York (US)): University of Alabama.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: journal of the Econometric Society,* pp. 251-276.

Gambacorta, L., & Marques-Ibanez, D. (2011). The bank lending channel: lessons from the crisis. *Economic policy*, 26(66), pp. 135-182.

Heider, F., Saidi, F., & Schepens, G. (2019). Life below zero: Bank lending under negative policy rates. *The Review of Financial Studies, 32*(10), pp. 3728-3761.

Jehan, Z., & Hamid, A. (2017). Exchange rate volatility and capital inflows: role of financial development. *Portuguese Economic Journal*, 16, pp. 189-203.

Joahnsen, S. (1988). Statistical analysis of cointegration vectors. *Journal of economic dynamics and control*, 12(2-3), pp. 231-254.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with appucations to the demand for money. *Oxford Bulletin of Economics and statistics*, 52(2), pp. 169-210.

Kashyap, A., & Stein, J. (1994). Monetary policy and bank lending. *The University of Chicago Press*, pp. 221-261.

Kasman, A. (2003). Türkiye'de reel döviz kuru oynaklığı ve bunun ihracat üzerine etkisi: Sektörel bir analiz. *Uludağ Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, pp. 169-186.

Kaya, H., & Belke , M. (2015). TÜRKİYE'DE PARA POLİTİKALARININ KREDİ KANALI AKTARIMI: VAR YAKLAŞIMI. *Finans Ekonomi ve Sosyal Araştırmalar Dergisi*, pp. 185-208.

Kennen , P., & Rodrik, D. (1986). Measuring and analyzing the effects of short-term volatility in real exchange rates. *The Review of Economics and Statistics*, pp. 311-315.

Kılınç, N., & Kılınç, E. (2020). Türkiye'de banka kredi kanalının etkinliği. *Afyon Kocatepe Üniversitesi Sosyal Bilimler Dergisi, 22*(2), pp. 418-431.

Krol, R. (2014). Economic policy uncertainty and exchange rate volatility. *International Finance, 17*(2), pp. 241-256.

Lown, C., & Morgan, D. (2002). Credit effects in the monetary mechanism. *Economic Policy Review.*

Meral, G. (2015). The effect of bank size and bank capital on the bank lending channel for Turkish banks. *American Scientific Research Journal for Engineering, Technology, and Sciences„ 12*, pp. 1-28.

Oduncu, A., Akcelik, Y., & Ermisoglu, E. (2013). Reserve options mechanism and FX volatility. *Central Bank of the Republic of Turkey Working Paper.*

Ozsuca, E. (2022). Revisiting the bank lending channel in Turkey under the unconventional monetary policy framework. *Business & Management Studies: An International Journal*, pp. 1011-1021.

Öcal, F., & Kar, A. (2021). Türkiye'de Banka Kredi Kanalının İşleyişi-MS-VAR Analizi. *Uluslararası Ekonomik Araştırmalar Dergisi, 7*(3), pp. 83-108.

Özatay, F. (2011). Merkez Bankası'nın yeni para politikası: İki hedef-üç ara hedef-üç araç. *Iktisat Isletme ve Finans, 26*(302), pp. 27-43.

Özsuca , E., & Akbostancı, E. (2012). An empirical analysis of the bank lending channel in Turkey. *Middle East Technical University ERC Working Papers in Economics*, pp. 1-33.

Ramey, V. (1993, December). How important is the credit channel in the transmission of monetary policy? *In Carnegie-Rochester Conference Series on Public Policy*, 39, pp. 1-45.

Ramlogan , C. (2007). Anism of monetary policy in small developing countries: an application to Trinidad and Tobago. *The Journal of Developing Areas*, pp. 79-91.

Salaches, E., Laopodis, N., & Kouretas, G. (2017). The bank-lending channel and monetary policy during pre-and post-2007 crisis. *Journal of International Financial Markets, Institutions and Money*, 47, pp. 176-187.

Sanfilippo-Azofra, S., Torre-Olmo, B., Cantero-Saiz, M., & Lopez-Gutierrez, C. (2018). Financial development and the bank lending channel in developing countries. *Journal of Macroeconomics*, 55, pp. 215-234.

Saprisa, H., & Tamesvary, J. (2019). How does the strength of monetary policy transmission depend on real economic activity?

Sengonul, A., & Thorbecke, W. (2005). The effect of monetary policy on bank lending in Turkey. *Applied Financial Economics, 15*(13), pp. 931-934.

Sims, C. (1980). Comparison of interwar and postwar business cycles: Monetarism reconsidered.

TCMB. (2009). 2010 Yılında Para ve Kur Politikası. Ankara: Türkiye Cumhuriyet Merkez Bankası.

Wrobel, E., & Pawlowska, M. (2002). Monetary transmission in Poland: some evidence on interest rate and credit channels. *NBP Bureau of Macroeconomic Research Working Paper.*

**How cite this article / Atıf biçinmi**

Buyun, B. (2024). Does exchange rate volatility affect the bank lending channel? *İktisat Politikası Araştırmaları Dergisi - Journal of Economic Policy Researches, 11*(1), 51–61. https://doi.org/10.26650/JEPR1343548

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
**JEPR** 2024, 11(1): 63–74
DOI: 10.26650/JEPR1349411

RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

# The Asymmetric Impacts of Economic, Social, and Political Globalization on Inflation

## Ekonomik, Sosyal ve Siyasi Küreselleşmenin Enflasyon Üzerindeki Asimetrik Etkileri

Hande Aksoz Yılmaz[1]

**ABSTRACT**

This study aims to investigate the asymmetric effects of globalization on inflation. While theoretical and applied studies emphasize the negative effect of globalization on inflation, they explain this through market mechanisms and efficiency. In an open economy, the need for seigniorage incomes decreases, as the incomes obtained as a result of trade will increase. An economy that increases foreign trade revenues needs less seigniorage revenues. Foreign trade income will result in a decline in inflation if an increase in the money supply is the primary cause of inflation. Romer (1993) emphasizes that the other channel that reveals the negative effect of globalization on inflation is the market mechanism. In this instance, the presence of foreign currencies that can take the place of the national currency in an open economy helps to lower inflation. Also, inflation is reduced by economic openness because it allows for specialization and economies of scale. This study uses the annual data of Turkey's consumer price index, GDP per capita, general government final consumption expenditures (% of GDP), globalization index-KOF (economic, political, and social globalization indexes), and exchange rate variables for 1970-2021. The non-linear autoregressive distributed lags (NARDL) estimation method is used in the analysis of the asymmetric effect of different components of globalization on inflation. The findings reveal that economic and social globalization has an asymmetric effect on inflation; however, also revealed is the non-significance of the asymmetrical effect of political globalization on inflation.

**Keywords:** Economic Globalization, Social Globalization, Political Globalization, Inflation, Non-Linear ARDL

**Jel Code:** B23, F6, E31

[1]Doç. Dr., Kirsehir Ahi Evran University, Economics Department, Kirsehir, Turkiye

**Corresponding author /**
**Sorumlu yazar:** Hande Aksoz Yılmaz
**E-mail / E-posta :** hande.yilmaz@ahievran.edu.tr

**Submitted / Başvuru** : 24.08.2023
**Accepted / Kabul** : 30.10.2023

**ÖZ**

Bu çalışma, küreselleşmenin enflasyon üzerindeki asimetrik etkilerini araştırmayı amaçlamaktadır. Teorik ve uygulamalı çalışmalar küreselleşmenin enflasyon üzerindeki olumsuz etkisini vurgulamaktadır. Bu negatif etki, piyasa mekanizması ve verimlilik üzerinden açıklamaktadır. Senyoraj gelirlerine bağımlı olan kapalı bir ekonomi yerine dışa açık bir ekonominin geçmesi, dış ticaret sonucu elde edilen gelirleri artıracağından senyoraj gelirlerine olan ihtiyaç azalmaktadır. Dış ticaret gelirlerini artıran bir ekonomi, daha az senyoraj gelirine ihtiyaç duyar. Enflasyonun ana nedeni para arzındaki artış olarak kabul edilecek olursa, dış ticaret geliri enflasyonda düşüşe neden olacaktır. Romer (1993), küreselleşmenin enflasyon üzerindeki olumsuz etkisini ortaya koyan diğer kanalın piyasa mekanizması olduğunu vurgulamaktadır. Bu durumda açık bir ekonomide ulusal paranın yerini alabilecek yabancı para birimlerinin varlığı enflasyonun düşürülmesine yardımcı olmaktadır. Ayrıca, üretimde uzmanlaşmaya ve ölçek ekonomisine izin verdiği için ekonomik açıklık enflasyonu azaltmaktadır. Bu çalışmada 1970-2021 yılları için Türkiye'nin tüketici fiyatları endeksi, kişi başına düşen GSYİH, Genel Devlet Nihai Tüketim Harcamaları (GSYİH'nin yüzdesi), Küreselleşme Endeksi-KOF (ekonomik, politik ve sosyal küreselleşme endeksleri) ve döviz kuru değişkenlerinin yıllık verileri kullanılmaktadır. Küreselleşmenin farklı bileşenlerinin enflasyon üzerindeki asimetrik etkisinin analizinde Doğrusal Olmayan Otoregresif Dağıtılmış Gecikme (NARDL) modeli tahmin yöntemi kullanılmaktadır. Çalışmanın bulguları, ekonomik ve sosyal küreselleşmenin enflasyon üzerinde asimetrik bir etkiye sahip olduğunu ortaya koymaktadır. Bunun yanı sıra politik küreselleşmenin enflasyon üzerindeki etkisi anlamsızdır.

**Anahtar Kelimeler:** Ekonomik Küreselleşme, Sosyal Küreselleşme, Siyasi, Küreselleşme, Enflasyon, Doğrusal Olmayan ARDL

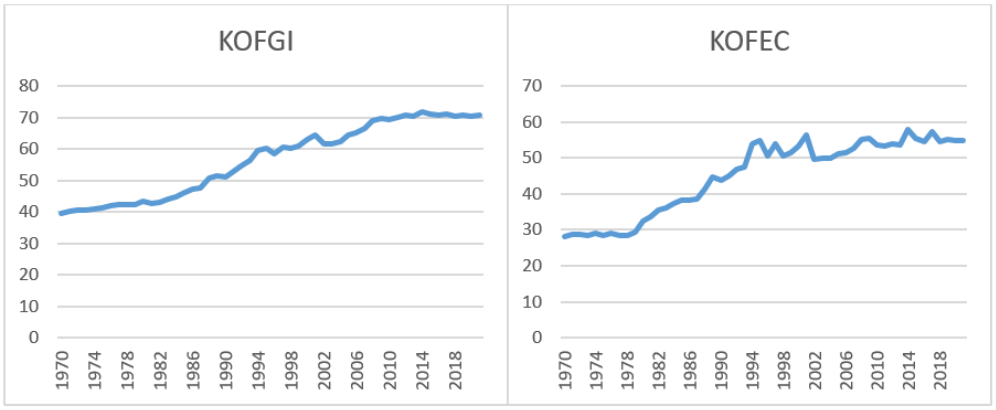
**Jel Sınıflaması:** B23, F6, E31

## 1. Introduction

Since the 1970s, policies such as increasing free capital movements and foreign direct investment flows, as well as the establishment of regional economic and trade unions have increased the foreign trade of all countries of the world and accelerated globalization. The extension of commercial globalization into the financial sector has improved economic, social, and political ties between all nations in the world. Globalization, with its narrow definition and in the economic context, expresses the interdependent relations of the countries of the world. In a broad sense, globalization means an increase in the relations of countries with each other in all fields. Similar to the global economic climate, in the 1960s and 1970s Turkey implemented a basic economic development strategy based on import-substitution policies. Due to the fixed exchange rate regime, the overvalued local currency limited Turkey's competition power in exports. While large public investments to produce heavy industry and capital goods aimed to meet domestic demand, there were quantitative restrictions on foreign trade. The emergence of the oil crisis as a result of the reduction of oil supply by the OPEC (Organization of Petroleum Exporting Countries) in 1979 and the low domestic savings and investment environment in Turkey led to a balance of payments crisis. To get out of the crisis, "January 24, 1980 decisions" were implemented, and Turkey's trade liberalization process began. Within the framework of these decisions, export-led growth was encouraged and the Turkish lira was allowed to depreciate in real terms to increase Turkey's competitiveness in exports by providing export subsidies. As a result of these developments, Turkey's level of globalization began an increasing trend after 1980. Economic globalization took a horizontal path between 1985 and 1987. Turkey liberalized its foreign exchange policy in 1989 with Decision No. 32, and the country's economy proceeded to become more globally integrated until 1995. The 1994 crisis was caused by the sharp rise in the domestic debt stock, inflation, and deficits in the budget and current account. After this, a package of economic measures was unveiled on April 5, 1994, and a 14-month stand-by agreement was made with the International Monetary Fund (IMF). Turkey's globalization index rose between 1995 and 2001. Despite the fact that Turkey's financial sector suffered a crisis environment in 2000 and 2001, the globalization index rose after 2003 as a result of economic reforms and a stable political climate.

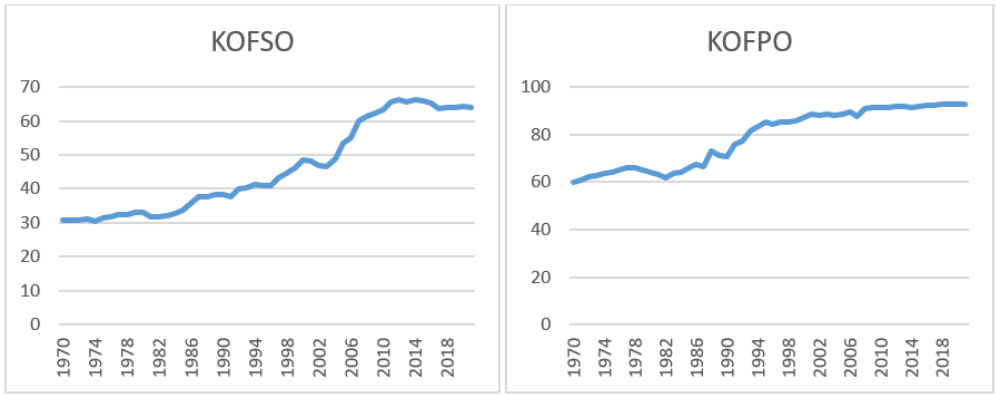
Today, international developments touch every country in the world, even at various levels. Undoubtedly, the phenomenon of globalization affects many macroeconomic variables such as economic development, employment and inflation. The studies of Iyoha (1971), Romer (1993) and Terra (1998) were pioneering studies investigating the effect of openness on the consumer price index, that is, the effect of globalization on inflation. They reached mixed results. The primary reason for these contradictory conclusions is that linked studies depend on linear modeling of the effect of globalization on inflation. The second argument is that the measures of globalization and openness are not exactly the same (Kouton, 2018). While openness is mostly measured by the ratio of the total of exports and imports to national income, the globalization index is calculated by weighting on multi-factor sub-items[1]. While analyzing the

[1] The KOF Globalization Index measures the economic, social and political dimensions of globalization. Globalization in the economic, social and political fields has been on the rise since the 1970s, receiving a particular boost after the end of the Cold War.




**Source**: KOF index developed by the Swiss Institute of Economics, The terms "general globalization index" and "economic globalization index" stand for KOFGI and KOFEC respectively.

**Figure 1.** Turkey's Globalization Index and Economic Globalization Index (1970-2021)




**Source**: KOF index developed by the Swiss Institute of Economics, The terms "social globalization index" and "political globalization index" stand for KOFSO and KOFPO respectively.

**Figure 2.** Turkey's Social Globalization Index and Economic Political Globalization Index (1970-2021)

effect of globalization on inflation, the preference for linear models can lead to misleading estimation results. Shin, Yu, & Greenwood (2014) introduced the NARDL model, which provides the opportunity to estimate the asymmetric effect of the independent variable on the dependent variable by including the positive and negative changes of the residual variables in the model.

This study aims to investigate the asymmetric effects of globalization on inflation. The objective of this study is to estimate the short- and long-term effects of negative and positive changes in globalization on inflation by using the NARDL model, which reveals nonlinear asymmetric relations. In this study, the NARDL approach follows the model suggested by Shin et al. (2014). For this purpose, we use Turkey's consumer price index, GDP per capita, general government final consumption expenditures (as a percentage of GDP), globalization index-KOF (economic, political, and social globalization indices), and exchange rate data for the period 1970-2021.

## 2. Literature Review

Market mechanisms and productivity channels are used by theoretical and practical investigations to explain how globalization harms inflation. Romer (1993) focused on the effect of openness in his theory that expresses the trade-off between inflation and output. He emphasized that openness hurt inflation, but he stated that inflation in developed countries was not affected by openness. In an open economy, there is less need for seigniorage incomes because more money is made through foreign trade. It is clear from the context that creating money is the primary cause of inflation. As a result, an open economy generates more money through foreign trade. Lower inflation rates are associated with

economies that generate fewer seigniorage revenues. Romer (1993)[2] highlights that the market mechanism is the other channel that demonstrates the negative impact of globalization on inflation. In this instance, the presence of foreign currencies that can take the place of the national currency in an open economy helps to lower inflation. Additionally, openness reduces inflation by increasing competition.

According to Jin (2000), more foreign investment, better capacity utilization, and more effective resource usage are the major mechanisms via which openness hurts inflation. Thus, it appears that more effective resource allocation with the impact of foreign investments is a factor in lowering inflation in open economies. While Iyoha (1973) reveals the negative effect of openness on inflation for underdeveloped countries, Triffin and Grudel (1962) and Whitman (1969) found results confirming the same effect for developed countries. Iyoha (1973) used the import/income ratio to measure openness. This negative effect is that the increase in openness promotes capital accumulation and thus reduces inflation. Sachsida et al. (2003) determined that openness had a negative effect on inflation in 152 countries using the same clearance formula as Iyoha (1973). Samimi et al. (2012) used a panel data technique to explain the effect of openness on inflation in developed and developing countries by measuring openness as the ratio of the sum of imports and exports to GDP. They show that openness has a positive effect on inflation. When the KOF globalization index—another indicator of openness—is utilized, however, the effect of openness on inflation is negative. On the other hand, using a mechanism similar to that of Philips and employing the KOF index for openness, Syed (2012) reveals that an increase in openness increases output and employment and causes an increase in inflation. Similarly, Syed and Zwick (2015) reached their conclusions by doing a theoretical investigation of the relationship between trade openness and inflation in the framework of a nonlinear convex Philips curve. An increase in openness leads to an increase in economic activity. This has a negative effect on unemployment and inflation, especially for countries with high export potential. The import price channel is also a theoretical channel in which openness affects inflation negatively. In fact, low-cost imports have a significant impact on lowering inflation in high-priced economies.

Using the ARDL model, Afzal et al. (2013) found a negative relationship between inflation and openness in both the short and long run for Pakistan during the period 1970-2009, Ajaz et al. (2016) used the NARDL model to investigate the relationship between openness and inflation in India from 1970 to 2014. They pointed out that there was no long-term asymmetry between the negative and positive components of openness, but there was asymmetry in the short term. The inflation rate was positively and significantly impacted by the long-term negative component. Ozcag and Bolukbas (2018) found that there was a long-term "hidden" cointegration relationship between trade openness and inflation in Turkey during the 1980-2015 period. Demir (2021) used panel cointegration tests with the annual data for the years 2000–2019. He reached the conclusion that trade openness had a statistically significant effect on inflation in the D-8 economies. The studies conducted by Mercan and Gocer (2014) and Çoban (2020) do not support the Romer (1993) hypothesis. According to their findings, openness has a positive effect on inflation.

## 3. Model and Method

In our study, the NARDL model is used to assess the asymmetric effect of globalization on inflation in Turkey from 1970 to 2021. As such we begin with the following long-run model:

$$lcpi_t = a + blgdp_t + clggfce_t + dlkof_t + elexc_t + \varepsilon_t \quad (1)$$

where cpit is Turkey's consumer price index. It is assumed that the consumer price index depends on the level of economic activity in Turkey (gdp), on general government final consumption expenditures (ggfce), and on the globalization index (kof). Since increased globalization level boosts foreign economic integration and contact, we expect an estimate of "d" to be positive. By way of construction, a increase in the exchange rate signifies a depreciation of Lira and if Lira depreciation is to reduce imports and increase its exports, an estimate of "e" is expected to be positive and negative depending on the import dependency of intermediate goods in production. Estimates of b, c, d and e in equation (1) are long-run estimates. To estimate the short-run effects of all four exogenous variables on the consumer price index, we specify (1) in an error-correction format as follows:

[2] Openness was controlled as an import/GDP ratio. The main finding of the study is that inflation can be reduced as a result of controlled management of expansionary monetary policies of open countries. The cost advantages provided by specialization and economies of scale create disinflationary effects in an economy. When the level of openness of a country increases, the monetary policies implemented are affected by the general trend of global monetary policies. For this reason, in a global economy where inflation is constantly suppressed, individual economies continue their anti-inflationary policies as the level of openness increases.

$$\Delta lcpi_t = a^{'} + \Sigma_{k=1}^{n} b_k^{'} \Delta lcpi_{t-k} + \Sigma_{k=0}^{n} c_k^{'} \Delta lgdp_{t-k} + \Sigma_{k=0}^{n} d_k^{'} \Delta lggfce_{t-k} + \Sigma_{k=0}^{n} e_k^{'} \Delta lkof_{t-k} + \Sigma_{k=0}^{n} f_k^{'} \Delta lexc_{t-k} + \lambda_0 lcpi_{t-1} + \lambda_1 lgdp_{t-1} + \lambda_2 lggfce_{t-1} + \lambda_3 lkof_{t-1} + \lambda_4 lexc_{t-1} + \varepsilon_t \quad (2)$$

Depending on the positive and negative changes, the effect of globalization on inflation is effective at different levels and in different directions.

$$POSITIVE_t = \Sigma_{i=1}^{t} \Delta lkof_i^{+} = \Sigma_{i=1}^{t} max(\Delta lkof_i, 0)$$
$$NEGATIVE_t = \Sigma_{i=1}^{t} \Delta lkof_i^{-} = \Sigma_{i=1}^{t} min(\Delta lkof_i, 0) \quad (3)$$

Following the approach and asymmetric cointegration and error-correction approach of Shin et al. (2014), we modify (4) so that we can also evaluate the short-run and long-run asymmetric effects of globalization index changes. The revised model takes the following form::

$$\Delta lcpi_t = a^{'} + \Sigma_{k=1}^{n1} b_k^{'} \Delta lcpi_{t-k} + \Sigma_{k=0}^{n2} c_k^{'} \Delta lgdp_{t-k} + \Sigma_{k=0}^{n3} d_k^{'} \Delta lggfce_{t-k} + \Sigma_{k=0}^{n4} e_k^{'} \Delta lkofpos_{t-k} + \Sigma_{k=0}^{n5} f_k^{'} \Delta lkofneg_{t-k} + \Sigma_{k=0}^{n6} g_k^{'} \Delta lexc_{t-k} + \delta_0 lcpi_{t-1} + \delta_1 lgdp_{t-1} + \delta_2 lggfce_{t-1} + \delta_3 lkofpos_{t-1} + \delta_4 lkofneg_{t-1} + \delta_5 lexc_{t-1} + \varepsilon_t \quad (4)$$

The NARDL model was developed to explain the effect of negative and positive globalization changes on inflation. The significant effect of both the positive and negative changes of globalization on inflation demonstrates the asymmetries of this influence. To determine whether the asymmetric effect is valid, it is crucial to assess the validity of both short- and long-term asymmetry. $\Sigma e_k^{'} \neq \Sigma f_k^{'}$ condition is required for short-term asymmetry to be valid and $\delta_3 \neq \delta_3$ for the long-term asymmetry. The Wald statistic tests the short and long-term validity of asymmetric effects.

### 3.1. Data Definition and Sources

In this study, we used annual data from Turkey's KOF index (economic, political, and social globalization indices), consumer price index, GDP per capita, general government final consumption expenditures, and exchange rate variables from 1970 to 2021.

The consumer price index is used to measure inflation, and the data is obtained from the IMF database. The KOF, also known as the globalization index, is one of the variables that measures a country's openness. Although the ratio of a country's total imports and exports to its national GDP is frequently used to measure openness, the KOF index, which was developed by the Swiss Institute of Economics, is considered as a more comprehensive indicator of globalization (Samimi et al., 2012; Syed, 2012). Information regarding a country's economic, social, and political globalization is included in the KOF index, which was created by accounting for the many aspects of globalization. Economic globalization comprises trade and financial globalization; social globalization considers interpersonal, informational, and cultural globalization. Political globalization is concerned with the interaction of local and foreign governments, as well as the extent to which governments can access foreign resources. The value range for the KOF index is between 1 and 100. 1 value indicates a closed country with no globalization, whereas the KOF index of the nation with the maximum amount of globalization is stated with 100 value. GDP per capita, general government final consumption expenditure (as a percentage of GDP), and exchange rate are additional control variables utilized in the NARDL model. These aforementioned control variables have been widely preferred in studies dealing with the relationship between openness and inflation. The World Bank database provided the information for these variables. The model includes each variable in its natural logarithmic form.

### 3.2. Unit Root Test

The stationarity levels of the series must be established before estimating the NARDL model. The variables must not be second-order integrated for the NARDL model to be valid. Also, the dependent variable must be first order integrated I(1) and the independent variables must be level I(0) or first-order integrated I(1). Unit root testing, which especially takes into consideration structural break, should be employed to be compatible with the nonlinear characteristics of the NARDL model. Thus, when there is considered to be a structural break in the data, consistent results are obtained regarding the stochastic characteristics of the data. The unit root test proposed by Zivot and Andrews (1992) is used in

**Table 1. Zivot-Andrews Unit Root Test Results**

| Variable | Intercept | | | | Trend | | | | Intercept and Trend | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Breakpoint | Lag | Min. t value | 5% Critical Value | Breakpoint | Lag | Min. t value | %5 Critical Value | Breakpoint | Lag | Min. t value | 5% Critical Value |
| **lcpi** | 2010 | 1 | -7.47 | -4.93 | 2005 | 1 | -7.60 | -4.42 | 2003 | 1 | -7.88 | -5.08 |
| **lkof$^{+}$** | 1992 | 0 | -2.41 | -4.93 | 2008 | 0 | -3.17 | -4.42 | 1996 | 1 | -4.31 | -5.08 |
| **lkof$^{-}$** | 2002 | 0 | -4.55 | -4.93 | 2003 | 1 | -8.04 | -4.42 | 1996 | 0 | -4.56 | -5.08 |
| **lkofec$^{+}$** | 1988 | 0 | -2.59 | -4.93 | 1981 | 1 | -8.18 | -4.42 | 1994 | 0 | -5.32 | -5.08 |
| **lkofec$^{-}$** | 2002 | 0 | -3.43 | -4.93 | 2003 | 1 | -8.27 | -4.42 | 1996 | 1 | -9.21 | -5.08 |
| **lkofpo$^{+}$** | 1988 | 0 | -3.92 | -4.93 | 2001 | 0 | -3.39 | -4.42 | 1991 | 0 | -3.91 | -5.08 |
| **lkofpo$^{-}$** | 1979 | 0 | -3.98 | -4.93 | 1990 | 0 | -4.03 | -4.42 | 1983 | 1 | -5.20 | -5.08 |
| **lkofso$^{+}$** | 2004 | 0 | -3.77 | -4.93 | 2013 | 0 | -2.58 | -4.42 | 2004 | 1 | -6.95 | -5.08 |
| **lkofso$^{-}$** | 1981 | 0 | -4.50 | -4.93 | 1982 | 0 | -3.84 | -4.42 | 1983 | 1 | -7.04 | -5.08 |
| **lgdp** | 1979 | 0 | -3.62 | -4.93 | 2002 | 0 | -3.26 | -4.42 | 2011 | 1 | -7.08 | -5.08 |
| **lggfce** | 1989 | 1 | -7.50 | -4.93 | 1991 | 1 | -6.75 | -4.42 | 1986 | 1 | -7.65 | -5.08 |
| **lexc** | 1991 | 0 | -3.32 | -4.93 | 2001 | 0 | -4.38 | -4.42 | 1994 | 0 | -5.13 | -5.08 |

this investigation. While the alternative hypothesis states that the series does not have unit roots with a structural break, the null hypothesis expresses the existence of a unit root with a breakpoint.

The results of the unit root test by Zivot and Andrews (1991) are presented in specifications including Intercept, Trend, and Intercept-Trend in Table 1. The specification with intercept should be preferable when examining at the serial graphs of the variables. Also, while lcpi and lggfce are stationary in first-order I(1), other variables are stationary in level I(0).

**Table 2. Breakpoint Unit Root Test (Perron and Vogelsang, 1992; Vogelsang and Perron, 1998)**

| Variable | Level | First deference |
|---|---|---|
| **Lcpi** | -4.31 | -7.90* |
| **lkof$^{+}$** | -4.02 | -6.74* |
| **lkof$^{-}$** | -3.34 | -11.18* |
| **lkofec$^{+}$** | -3.02 | -7.70* |
| **lkofec$^{-}$** | -3.04 | -10.46* |
| **lkofpo$^{+}$** | -5.62* | -8.02 |
| **lkofpo$^{-}$** | -5.23* | -7.30 |
| **lkofso$^{+}$** | -2.28 | -6.21* |
| **lkofso$^{-}$** | -1.86 | -8.84* |
| **Lgdp** | -2.12 | -7.24* |
| **Lggfce** | -3.60 | -7.31* |
| **Lexc** | -4.58** | -4.66 |

The unit root test results of the specification with intercept are shown in Table 2. While lkofpo+ , lkofpo- and lexc are stationary in I(0), other variables are stationary in I(1).

## 3.3. Results and Findings

**Table 3. NARDL Model Results**

| Variable | Model-1 Globalization | Model-2 Economic Globalization | Model-3 Social Globalization | Model-4 Political Globalization |
|---|---|---|---|---|
| $lcpi_{t-1}$ | -0.70*** | -0.27*** | -1.01*** | -0.54*** |
| | (0.12) | (0.10) | (0.13) | (0.09) |
| $lkof^{-}_{t-1}$ | 30.31*** | 9.31*** | -8.94* | 3.88 |
| | (6.43) | (1.45) | (4.46) | (3.21) |
| $lkof^{+}_{t-1}$ | -10.70*** | -7.83*** | -7.72*** | -2.10 |
| | (2.55) | (1.68) | (1.53) | (1.67) |
| $lexc_{t-1}$ | -0.45*** | -0.35*** | -0.10* | 0.01 |
| | (0.12) | (0.12) | (0.05) | (0.08) |
| $lgdp_{t-1}$ | 4.07*** | 7.32*** | 2.74*** | 1.43*** |
| | (0.71) | (0.99) | (0.67) | (0.35) |
| $lggfce_{t-1}$ | 0.96*** | -0.10 | 0.63** | -0.09 |
| | (0.33) | (0.27) | (0.29) | (0.30) |
| $\Delta lexc$ | -0.95*** | | -1.04*** | -0.96*** |
| | (0.26) | | (0.20) | (0.28) |
| $\Delta lexc_{t-2}$ | 0.38 | | -0.41* | -0.53** |
| | (0.24) | | (0.22) | (0.23) |
| $\Delta lexc_{t-3}$ | | | -0.66*** | |
| | | | (0.22) | |
| $\Delta lexc_{t-4}$ | | | | -0.48** |
| | | | | (0.22) |
| $\Delta lcpi_{t-1}$ | | -0.45*** | 0.28* | |
| | | (0.15) | (0.11) | |
| $\Delta lcpi_{t-2}$ | | -0.49*** | | -0.32*** |
| | | (0.13) | | (0.10) |
| $\Delta lcpi_{t-3}$ | -0.36*** | -0.46*** | | -0.37*** |
| | (0.10) | (0.13) | | (0.10) |
| $\Delta lcpi_{t-4}$ | | -0.30** | | |
| | | (0.13) | | |
| $\Delta lggfce_{t-1}$ | | | | 1.45*** |
| | | | | (0.44) |
| $\Delta lggfce_{t-3}$ | | | 1.20*** | |
| | | | (0.42) | |
| $\Delta lgdp$ | | | | -2.94*** |
| | | | | (1.05) |
| $\Delta lgdp_{t-1}$ | -1.88** | -6.88*** | | -2.01** |
| | (0.97) | (1.52) | | (0.93) |

**Table 3.** Continued

| | | | | |
|---|---|---|---|---|
| $\Delta lgdp_{t-2}$ | | -3.54*** | | |
| | | (1.18) | | |
| $\Delta lgdp_{t-3}$ | | -2.69** | | |
| | | (1.02) | | |
| $\Delta lkof^{-}$ | | | 6.88 | |
| | | | (4.04) | |
| $\Delta lkof^{-}_{t-1}$ | -12.18** | -4.95*** | 18.37*** | |
| | (6.07) | (1.72) | (5.27) | |
| $\Delta lkof^{-}_{t-2}$ | | | 26.94*** | 13.73** |
| | | | (5.94) | (5.69) |
| $\Delta lkof^{-}_{t-3}$ | -8.73** | | 18.75*** | |
| | (4.91) | | (5.66) | |
| $\Delta lkof^{-}_{t-4}$ | | | 15.26*** | |
| | | | (5.38) | |
| $\Delta lkof^{+}$ | -8.56** | | -8.58*** | |
| | (3.82) | | (1.97) | |
| $\Delta lkof^{+}_{t-2}$ | | | | 6.94** |
| | | | | (2.62) |
| $\Delta lkof^{+}_{t-3}$ | 9.86*** | | 6.19*** | 7.47*** |
| | (3.47) | | (1.65) | (2.46) |
| $\Delta lkof^{+}_{t-4}$ | | 3.76** | -2.98* | 6.43** |
| | | (1.52) | (1.65) | (2.44) |
| **Constant** | -28.30*** | -54.18*** | -19.23*** | -9.97*** |
| | (5.09) | (7.24) | (5.21) | (2.97) |
| $R^2$ | 0.76 | 0.76 | 0.87 | 0.84 |
| **Adj.** $R^2$ | 0.66 | 0.65 | 0.77 | 0.74 |
| **F-stat.** | 11.05*** | 15.19*** | 19.47*** | 10.63*** |
| $Wald_{long}$ | 6.89*** | 3.04*** | -0.31 | 1.60 |
| $Wald_{short}$ | -2.88*** | -3.21*** | -4.08*** | -0.74 |
| $lkof^{-}_{long}$ | 43.3 | 34.48 | -8.85 | 7.18 |
| $lkof^{+}_{long}$ | -15.28 | -29.00 | -7.64 | -3.88 |
| **Ramsey** | 0.47 | 0.01 | 0.0006 | 0.72 |
| **B.G. LM test** | 0.98 | 1.38 | 4.19** | 2.98* |
| **B.P.G. test** | 0.84 | 1.29 | 2.21** | 1.02 |
| **Jarque-Bera Normality test** | 0.45 | 0.97 | 0.38 | 1.17 |

**Note:** 10%, 5%, 1% and standard errors are represented as significance levels by ***, **, *, and ( ) respectively. The critical values of Pesaran et al. (2001) in case III are 4.29 and 5.61 for I(0) and I(1), respectively. Long-term coefficients of globalization variables are $lkof^{-}_{long}$ and $lkof^{+}_{long}$; the $Wald_{long}$ and $Wald_{short}$ which inform as to whether long and short-term coefficients are asymmetrical.

The NARDL model estimates four diferent models, including general globalization (model 1), economic globalization (model 2), social globalization (model 3), and political globalization (model 4), to evaluate the impact of globalization on inflation. A maximum of four lags are imposed to the variables because the series are utilized annually in the model, and the Akaike Information Criterion (AIC) is also used to determine the optimal lags. Table 3 shows short-term coefficient estimates, long-term coefficient estimates, and diagnostic test results. If we look at the short-term estimations in Table 3, we can see that there are significant effects of general globalization, economic globalization, social globalization, and political globalization on inflation in models 1, 2, 3, and 4. The results of the long-term coefficient estimation is used to determine whether or not this relationship continues long-term. The long-term coefficient is calculated by dividing the coefficients of the positive and negative globalization variables to the negative coefficient of the dependent variable. While the long-term effects of general globalization, economic globalization and social globalization on inflation are significant in Turkey, the effect of political globalization on inflation is not significant. The variables may be cointegrated because at least one of the long-term coefficients is significant (there is a long-term relationship). The F test result is used to determine whether cointegration exists, and the conclusion was reached that cointegration exists because the calculated test statistical value is larger than the critical value. The effects of positive and negative globalization on inflation are not equal in magnitude and direction when regarded as sub-items of globalization. The interpretation of the coefficients provides a better understanding of the non-linear effects of globalization on inflation. First, it is concluded that a 1% increase in general globalization decreases inflation by 15.28%, and a 1% decrease in general globalization reduces inflation by 43.3% in model 1. According to these findings, globalization's negative effects result in a greater reduction in inflation. Model-2 estimation results, which explain the effect of positive and negative changes in economic globalization on inflation, show that a 1% decrease in economic globalization reduces inflation by 34.48%; a 1% increase in economic globalization reduces inflation by 29%. The negative effects of economic globalization have a greater impact on inflation. The results of Model-3 show that when social globalization decreases by 1%, the inflation rate increases by 8.85%, and when it increases by 1%, it decreases by 7.64%. The Walt test is used to determine whether the short- and long-term asymmetric effects are valid (Shin et al., 2014). Only the short-term asymmetry is valid in Model 3, but long and short term asymmetry are both valid in Models 1 and 2. Both long term and short term asymmetry are invalid in Model 4. An examination of the serial correlation between the residues of the NARDL model shows that there is no autocorrelation except in model 3. Again, the constant variance assumption is valid for all models except model 3. The series reveals a normal distribution in all models when we examine the data distribution of the variables. The result of the reset test demonstrates the validity of the specified NARDL model specification. For the stability of the short-term and long-term coefficient estimates, Pesaran et al. (2001) suggest the well-known CUSUM (stated by CUSM) and CUSUMSQ (stated by CUSM2). The coefficient estimates are found to be within the stability limit when the CUSUM and CUSMQ tests provided in Figures 3, 4, 5, and 6 are reviewed. Finally, the strength of model fit is determined by the adjusted R2. The adjusted R2 value indicates how much of the variation in the dependent variable can be explained by all independent variables, and it is 0.66, 0.65, 0.77, and 0.74 for models 1–4, respectively.

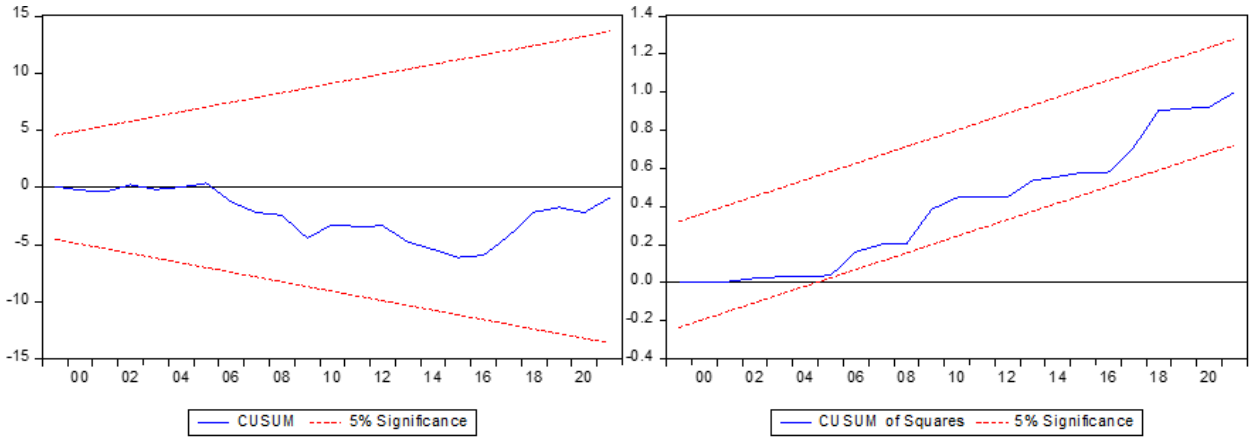



**Figure 3. Model-1 CUSUM ve CUSMQ Results**

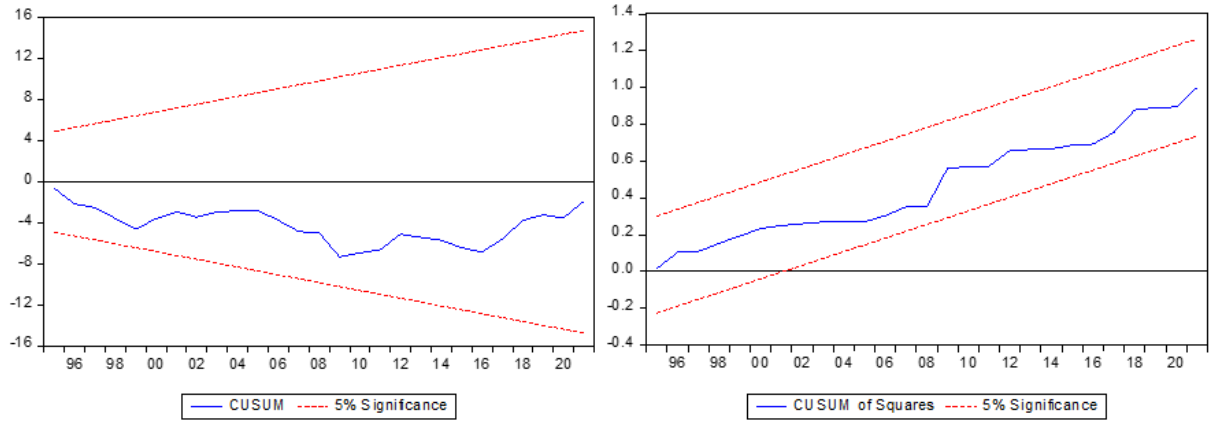



**Figure 4. Model-2 CUSUM ve CUSMQ Results**

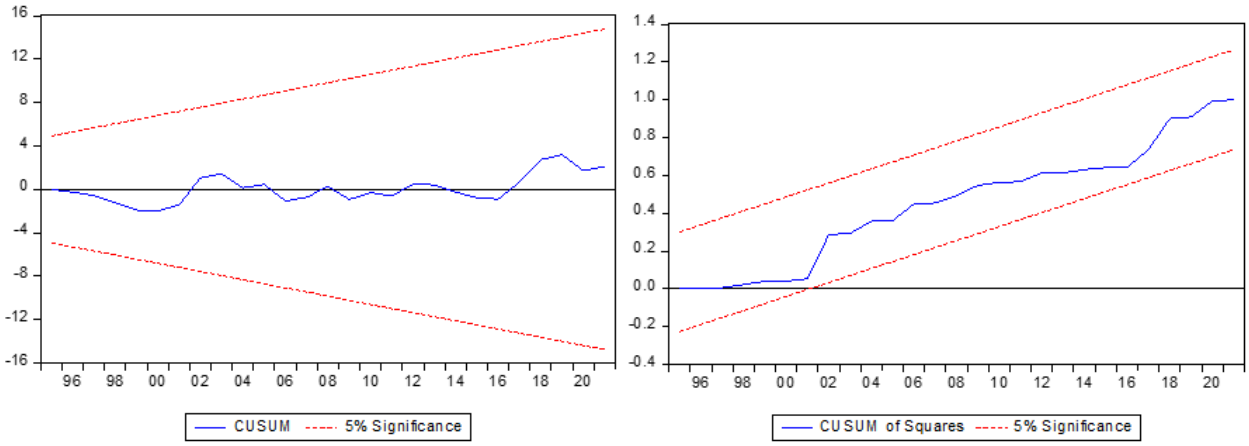



**Figure 5. Model-3 CUSUM ve CUSMQ Results**

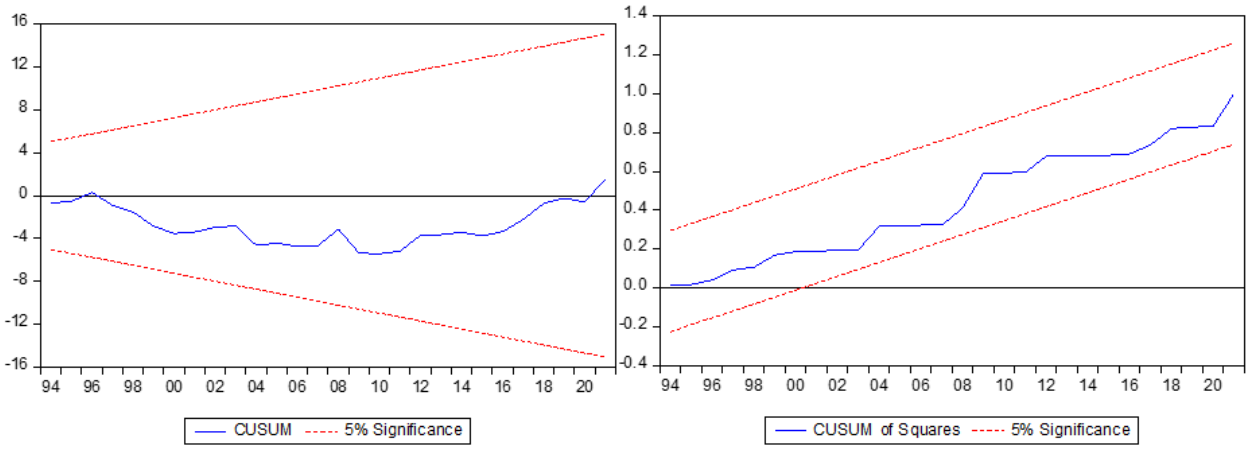



**Figure 6. Model-4 CUSUM ve CUSMQ Results**

## 4. Conclusion

The impact of globalization on inflation varies depending on the degrees of economic growth, openness, monetary policies, and production systems of the various countries. In developed countries, increased openness either does not affect inflation or reduces it. Openness has a growing impact on inflation in developing economies that rely largely on imports of intermediate products for production. Also, the use of seigniorage revenues to raise government revenues and pay debts is one of the major sources of inflation in undeveloped countries. In these economies, seigniorage income

is less necessary because of the rise in production brought on by exports and the rise in customs revenues brought on by opening up and globalization. If seigniorage revenues are the major motivation of inflation, economic openness mostly lowers inflation in underdeveloped countries. As a result, both developed and developing economies may experience a decrease in inflation as a result of globalization. However globalization and openness in the economy have different effects on inflation through several mechanisms. On one hand, economic openness decreases inflation as a result of monetary policies used in developed countries. On the other hand, economic openness decreases inflation in developing countries because it increases government revenues and decreases emission volume. Romer (1993) noted that monetary policies implemented to control inflation have a declining impact on inflation as a result of the effects of globalization and economic openness.

In general, openness is measured as the ratio of the sum of imports and exports to GDP when analyzing the relationship between inflation and openness. Samim et al. (2012), Syed (2012), and Kouton (2018) considered the globalization index to be a better measure of openness because it included several characteristics. In actuality, although foreign trade is an important measure of a country's openness, taking into account the social and political processes carried out with other countries provides comprehensive information about globalization. Based on the aforementioned considerations, the globalization index was utilized in our investigation.

Using a non-linear model, the asymmetric effects of globalization on inflation are estimated. To reveal the asymmetric effects, we considered negative and positive changes of globalization. In this study, with the help of the NARDL model, we estimated the effect on inflation when globalization is negative and positive. In Turkey, inflation responds strongly to a decrease in globalization rather than an increase in the long-term. In Turkey, where dependency on imported intermediate goods is high, a decrease in globalization reduces inflation. Due to foreign dependence on intermediate goods, one of the main outcomes of the rise in production is an increase in the import rate. Therefore, it is observed that production slows down and inflation declines in a period where imports decline. Globalization decreases by 1%, which lowers inflation by 43.3%. Again, 1% decreased economic globalization results in a 34% decrease in inflation. The findings of Kouton (2018), which control openness using the globalization index and assess its impact on inflation using the NARDL model, are consistent with the finding that the negative change of globalization is effective in reducing inflation.

After 2000, the Turkish economy put up an effective fight against inflation by implementing the Transition to Strong Economy Program and the IMF-stand-by agreement. While the Customs Union Agreement signed with the EU in 1995 led to an increase in commercial integration and economic globalization, the start of EU membership negotiations in the post-2000 period caused globalization to accelerate in social and political areas. The general feature of this period is that it is a period in which globalization increased but in which the effective struggle against inflation also continued. The study's findings demonstrate that the positive impact of globalization on inflation is consistent with Romer's findings (1993). It has been concluded that a 1% increase in globalization and economic globalization reduces inflation by 15% and 29% respectively while a 1% increase in social globalization reduces inflation by 7.6%. A 1% decrease in social globalization increases the inflation rate by 8.85%. In addition to all this, our study found that political globalization bears no significance on inflation. The growth in economic globalization has the biggest impact on lowering inflation when all aspects of globalization are considered.

As it demonstrates asymmetrical links, it is anticipated that this study will provide perspective to earlier studies that have considered the symmetrical relationships between openness/globalization and inflation. The study's findings, however, indicate that to fully analyze this relationship, it is important to take into account implemented monetary policies. In the light of the conclusions acquired from this study, our intention for subsequent studies is to construct a model in which monetary policies are included.

**Peer Review:** Externally peer-reviewed.

**Conflict of Interest:** Author declared no conflict of interest.

**Financial Disclosure:** Author declared no financial support.

**Hakem Değerlendirmesi:** Dış bağımsız.

**Çıkar Çatışması:** Yazar çıkar çatışması beyan etmemiştir.

**Finansal Destek:** Yazar finansal destek beyan etmemiştir.

**ORCID:**

Hande Aksoz Yılmaz 0000-0002-1115-7535

## REFERENCES / KAYNAKLAR

Afzal, M., Malik, M.E., Butt, A.R., & Fatima, K. (2013). Openness, inflation and growth and relationships in Pakistan: An application of ARDL bounds testing approach. *Pakistan Economic and Social Review, 51*(1), 13–53.

Ajaz, T., Naina, M.Z., & Kamaiah, B. (2016). Inflation and openness in India: An asymmetric approach. *Macroeconomics and Finance in Emerging Market Economies, 9*(2), 190–203.

Çoban, M. N. (2020). Romer hipotezi kapsamında ticari dışa açıklık ve enflasyon ilişkisi: Next 11 ülkeleri için panel ARDL analizi. *Gümüşhane Üniversitesi Sosyal Bilimler Enstitüsü Elektronik Dergisi, 11*(3), 651–660.

Demir, Y. (2021). Ticari dışa açıklık ve enflasyon ilişkisi: d-8 ülkeleri için panel eş bütünleşme analizi [The relation between trade openness and inflation: Panel cointegration analysis for the d-8 countries]. *Gümüşhane Üniversitesi Sosyal Bilimler Dergisi, 12*(2), 325–337. Retrieved from https://dergipark.org.tr/tr/pub/gumus/issue/62554/852300.

IMF, (2015). International Financial Statistics, Retrieved from https://data.imf.org/?sk=4c514d48-b6ba-49ed-8ab9-52b0c1a0179b&sId=1390030341854.

Iyoha, M.A. (1973). Inflation and openness: in less developed economies: A cross-country analysis. *Economic Development and Cultural Change, 22*(1), 31–38.

Jin, J. (2000). Openness and growth: An interpretation of empirical evidence from East Asian countries. *The Journal of International Trade and Economic Development, 9*(1), 5–17.

Kouton, J. (2018). An asymmetric analysis of the relationship between openness and inflation in Côte d'Ivoire. *International Journal of Economics and Financial Issues, 8*(6), 65–75.

Mercan, M., & Gocer, İ. (2014). Ticari dışa açıklığın ekonomik etkileri: Orta Asya ülkeleri için ampirik bir analiz [economic effects of trade openness: an empiricial analysis for Central Asian countries]. *Uluslararası Yönetim İktisat ve İşletme Dergisi, 10*(22), 27–44.

Ozcag, M., & Bolukbas M. (2018). Ticari dışa açıklık ve enflasyon ilişkisi: Romer hipotezi çerçevesinde Türkiye için bir analiz [The relationship between trade openness and inflation: an analysis for Turkey within the frame of Romer hypothesis], *Maliye Dergisi*, 174, 112–130.

Pesaran, M.H., Shin, Y., & Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationship. *Journal of Applied Econometrics, 16*(3), 289–326.

Pesaran, M,. & Shin, Y. (1999). An autoregressive distributed lag-modeling approach to cointegration analysis. In: Strom, S., editor. Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium. Cambridge: Cambridge University Press.

Romer, D. (1993). Openness and inflation: theory and evidence, *The Quarterly Journal of Economics, 113*(2), 649–652.

Sachsida, A., Carneiro, F.G., & Loureiro, P. R. (2003). Does greater trade openness reduce inflation? further evidence using panel data techniques, *Economics Letters, 81*, 315–319.

Samimi, A.J., Ghaderi, S., Hosseinzadeh, R., & Nademi, Y. (2012). Openness and inflation: new empirical panel data evidence. *Economics Letters, 117*, 573–577.

Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDLframework. In: Sickles, R.C., Horrace, W.C., ediots. Festschrift in Honor of Peter Schmidt: Econometric Methods and Applications. New York, NY: Springer, 281–314.

Syed, A.S., & Zwick, H.S. (2015). Convex Phillips curve explaining openness and inflation nexus, *Theoretical Economics Letters, 5*, 739–748.

Syed, S.A. (2012), Does greater economic openness grasp the elements of inflation "surprise"? New evidence using panel data techniques. *International Economics, 13*, 33–58.

Terra, C.T. (1998), Openness and inflation: A new assessment. *The Quarterly Journal of Economics, 113*(2), 641–648.

Triffin, R., & Grubel, H. (1962). The adjustment mechanism to differential rates of monetary expansion among the countries of the European economic community. *The Review of Economics and Statistics, 44*(4), 486–491.

Vogelsang, T,. & Perron, P. (1998). Additional test for unit root allowing for a break in the trend function at an unknown time, *International Economic Review, 39*, 1073–1100.

World Bank, (2021) World Development Indicator. Retrieved from https://databank.worldbank.org/source/world-development-indicators.

Zivot, E., & Andrews, D. (1992). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. *Journal of Business and Economic Statistics, 10*(3), 251–270.

**How cite this article / Atıf biçimi**

Aksoy Yilmaz, H. (2024). The asymmetric impacts of economic, social, and political globalization on inflation. *İktisat Politikası Araştırmaları Dergisi - Journal of Economic Policy Researches, 11*(1), 63–74. https://doi.org/10.26650/JEPR1349411

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
**JEPR** 2024, 11(1): 76–85
DOI: 10.26650/JEPR1232910

RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

# The Relationship Between Unemployment and Economic Growth in Selected Large Emerging Countries: A Revisit Using Threshold Regression Analysis

## Seçilmiş Gelişmekte Olan Büyük Ülkelerde İşsizlik ve Ekonomik Büyüme Arasındaki İlişki: Eşik Regresyon Analizi Kullanılarak Yeniden Bir İnceleme

Mustafa Şit[1]

[1]Assoc. Prof., Harran University, Faculty of Tourism, Macro Economy, Şanlıurfa, Turkiye

**Sorumlu yazar /**
**Corresponding author:** Mustafa Şit
**E-mail / E-posta :** msit@harran.edu.tr

**ABSTRACT**

This study aims to estimate the minimum rate of economic growth required to reduce unemployment in the large emerging markets economies of the Fragile Five (i.e., Brazil, India, Russia, South Africa, and Türkiye). As proposed by Hansen (1999), the study conducts a panel threshold analysis based on Okun's law to determine threshold effects. This paper presents new evidence regarding Okun's law over the past three decades for five large emerging markets. The findings suggest the relationship between the cyclical components of unemployment and GDP growth to be characterized by non-linearities. In particular, unemployment will fall if economic growth exceeds an average threshold of 5.5%. This result proves the validity of Okun's Law regarding the threshold for the country group under investigation. This study has also proven that economic growth must exceed a certain level in order to reduce the unemployment rate in these economies. Policymakers in the Fragile Five should consider a minumum of 5.50% as an economic growth target to provide employment. When considering the unstable economic performance of the Fragile Five's economies, structural reforms should be made to ensure adequate economic growth and increase employment. To address the problem of poor growth, this study can propose economic measures such as reducing employment taxes, producing investment and employment-based policies, and increasing the effectiveness of private employment offices.

**Keywords:** Okun's law, Nonlinearities and asymmetries, Panel threshold model, the Fragile five, Economic growth

**Jel Code:** C23, E24, O11

**Submitted / Başvuru** : 11.01.2023
**Revision Requested / Revizyon Talebi** : 07.12.2023
**Last Revision Received / Son Revizyon** : 20.01.2024
**Accepted / Kabul** : 30.01.2024

**ÖZ**

Bu çalışma, Kırılgan Beşlinin gelişmekte olan büyük ekonomilerinde (Brezilya, Hindistan, Rusya, Güney Afrika ve Türkiye) işsizliği azaltmak için gereken minimum ekonomik büyüme oranını tahmin etmeyi amaçlamaktadır. Çalışmada Hansen (1999) tarafından önerildiği gibi eşik etkilerini belirlemek için Okun kanununu temel alan bir panel eşik analizi yapılmaktadır. Bu makale, gelişmekte olan beş büyük pazar için son otuz yılda Okun yasasına ilişkin yeni kanıtlar sunmaktadır. Bulgular, işsizliğin döngüsel bileşenleri ile GSYİH büyümesi arasındaki ilişkinin doğrusal olmama durumuyla tanımlanabileceğini öne sürüyor. Özellikle ekonomik büyüme ortalama %5,5 eşiğini aşarsa işsizlik azalacaktır. Bu sonuç, incelenen ülke grubu için eşik değere ilişkin Okun Yasasının geçerliliğini kanıtlamaktadır. Kırılgan Beşli'deki politika yapıcılar, istihdam sağlamak için en az %5,50'yi ekonomik büyüme hedefi olarak görmelidir. Kırılgan Beşli ekonomilerinin istikrarsız ekonomik performansı göz önüne alındığında, yeterli ekonomik büyümeyi sağlamak ve istihdamı artırmak için yapısal reformlar yapılmalıdır. Zayıf büyüme sorununu ele almak için bu çalışma, istihdam vergilerinin düşürülmesi, yatırım ve istihdama dayalı politikalar üretilmesi ve özel istihdam bürolarının etkinliğinin artırılması gibi ekonomik önlemler önerebilir.

**Anahtar Kelimeler:** Okun yasası, Nonlineer ve asimetriler, Panel eşik modeli, Kırılgan beşli, Ekonomik büyüme

**Jel Sınıflaması:** C23, E24, O11

## 1. Introduction

Okun's law postulates a negative relationship to exist between the cyclical components of unemployment and GDP growth and was initially detected in the United States. On average, if actual GDP growth exceeds its long-run expansion path by one percentage point, unemployment is expected to fall by approximately 0.5 percentage points. In combination with the Phillips curve, the Okun equation constitutes the aggregate supply curve for an economy. As such, it is a cornerstone of many modern macroeconomic models. The law should be noted as an empirical regularity that ties labor market development to the business cycle. Since the seminal work of Arthur Okun in the 1960s, many studies have investigated the relationship between different advanced countries through a variety of econometric methods.

One of economists' most debated issues regarding Okun's law is the extent of growth needed to reduce unemployment. This is particularly evident in fragile economies characterized by unstable growth rates. The reason for examining the economies of the Fragile Five (i.e., Brazil, India, Russia, South Africa, and Türkiye) is that they have common economic characteristics. According to Stanley (2013), these countries are defined as the Fragile Five for the following reasons: their large current account deficit, high inflation rates, and poor growth performance. In addition to these common features, the study will discuss the impact these countries' unstable economic growth rates have on unemployment, as well as the threshold of economic growth needed to reduce unemployment. These countries had an average growth rate of 4.17% during the analyzed period. In contrast, their average unemployment rate was 10.69%. Analyzing the Fragile Five in terms of the high risk in combating unemployment will also have significance for developing countries.

The outline of this paper is as follows. The next section will review the literature and provides arguments for the existence of nonlinearities regarding Okun's law. The third section will discuss the study's empirical approach, which involve tests for poolability and non-linearities. The fourth section will present the data and an estimation of the growth threshold. The final section will then conclude with policy recommendations.

## 2. Literature Review

The findings from past studies can be categorized into three main strands of literature. The first strand of literature focuses on the validity of Okun's law. Caraiani (2006a) found Okun's Law to hold in Korea over the 1994-2004 period. Moreover, Gali et al. (2013) also supported Okun's law and added that the Okun coefficient is stable. Meanwhile, Friedman (1988), Altig et al. (1997), and McKinsey (2011) argued the Okun coefficients to lack robustness. Most studies have shown Okun's law to have different parameters. Prachowny (1993) found the marginal contribution of a one percentage point decrease in the unemployment rate to be only 1.66%. Attfield and Silverstone (1997) found the Okun coefficient value to be closer to -2.25. Caraiani's (2006b) results indicated an Okun coefficient of about -0.17, which suggests some rigidity in the labor market. Furthermore, Daly et al. (2012), Owyang et al. (2012), and Meyer et al. (2012) found Okun's coefficients to be unstable and to change over time.

The second strand of literature investigated the possibility of an asymmetrical link between output growth and unemployment rate. Courtney (1991) and Palley (1993) are among those who have contributed to the idea that the Okun coefficient may differ with regard to economic growth and contraction. Researchers have often reported asymmetries between the cyclical components of both variables. Lee (2000) added that the type of asymmetry depends on the method used, while Virén (2001) presented a model in which short-term changes in unemployment are based on changes in economic growth. Jula and Jula (2013) determined an asymmetric relationship to exist between growth

and recession with regard to regional employment. Phiri's (2014) empirical analysis of South Africa found significant asymmetric co-integration to occur with unemployment when output growth is the dependent variable.

The third strand of literature has extended the analysis toward the threshold (i.e., non-linearity) of Okun's law. Fouquau (2008) indicated the null hypothesis to be rejected regarding a linear relationship between cyclical output and cyclical unemployment with all specifications applied. Flaig & Rottmann (2001) derived short- and long-run employment thresholds from an input demand system and empirically showed these to depend on factor prices and capital accumulation. Bod'a and Považanová (2021) showed Okun's law to be asymmetric and non-linear for 21 OECD countries.

Kosfeld and Dreger (2006) estimated the respective output growth thresholds for creating employment and reducing unemployment, stating that, while the average employment threshold amounted to 1.4% over the 1993-2000 sample period, the average unemployment threshold had an average value of 2.8%. Azorín and De La Vega (2017) stated employment and unemployment to clearly show differentiated responses to changes in output during boom and recession periods. Their results showed that for the overall period of 2001–2011, a threshold of 0.7% was enough for employment to increase, while a threshold of 2.5% was enough for unemployment to fall. Aydın and Esen (2017) investigated the role the inflation threshold effect has on the relationship between unemployment and economic growth for Türkiye. They determined an inverse linear relationship to exist between growth and unemployment when the inflation rate is below the threshold value.

In addition, some papers have stated the business cycles impact on unemployment to differentiate with regard to age and gender (Hutengs & Stadtmann, 2014; Marconi et al., 2016; Dunsch, 2017; Blázquez-Fernández et al., 2018; Butkus & Seputiene, 2019).

This study proceeds to fill the gap by investigating the threshold. Non-linearities have critical relevance in this article due to how they affect the appropriate size of stabilization policies. This paper presents new evidence regarding Okun's law over the past three decades for five large emerging markets (e.g., Brazil, India, Russia, South Africa, and Türkiye).

These five economies are of interest because they share common characteristics. According to Stanley (2013), they are classified as fragile due to having a large double deficit in the current account and public budget, their strong dependence on foreign direct investment flows, high inflation, government debt, weak institutions, and low weight of their industrial sectors, thus implying a lack of competitiveness in many parts of the economy. Compared to other emerging markets (e.g., Argentina, Egypt, Pakistan), their poor economic records are striking, particularly in terms of GDP growth and unemployment. The average growth rate in these countries barely exceeds 4%, while their unemployment rates persistently remain above 10%. Thus, the basic problem here involves how to stimulate higher growth that might reduce unemployment.

The analysis of Okun's law reveals strong non-linearities between the cyclical components of GDP and unemployment at the unique threshold value of 5.1%. In other words, if economic growth exceeds this value, a decline in the unemployment rate can be expected. The threshold value is uncovered by the panel threshold approach as suggested by Hansen (1999). The main contribution of this study apart from its selection of the large and fragile emerging markets is the application of the econometric method.

## 3. Method

Okun's law refers to the empirical order between cyclical unemployment and cyclical output. Weber (1995) used the following equation to express this relationship:

$$y_{it}^{c} \equiv y_{it} - y_{it}^{n}$$

$$u_{it}^{c} \equiv u_{it} - u_{it}^{n}$$

$$u_{it}^{c} = \alpha u_{it}^{c} - \varepsilon_{it} \qquad \alpha < 0 \tag{1}$$

where i indexes the country and t indexes time; $y_{it}^{c}$ represents the periodic economic growth level (output gap), $y_{it}$ represents the logarithm of real growth, and $y_{it}^{n}$ represents the potential (i.e., trend level) of growth. Similarly, $u_{it}^{c}$ represents the periodic unemployment rate (unemployment gap), $u_{it}$ represents the observed unemployment rate, and $u_{it}^{n}$ represents the natural unemployment rate. Furthermore, $\varepsilon_{it}$ is the stochastic error term. Okun's coefficient ( $\alpha$ parameter) is considered to be negative.

One important issue regarding Okun's law involves taking into account the asymmetry in employment dynamics for data decomposition procedures, with Harris and Silverstone (2001) pointing to four elements: capacity constraints,

signal extraction, cost adjustments, and downward nominal wage rigidity. Therefore, this study uses the panel threshold model developed by Hansen (1999) to test the relationship between economic growth and unemployment. The $\alpha_i$ model is as follows:

$$U_{it}^{c} = \mu_i + \beta_0^{'} y_{it}^{c} II(q_{it} \leq c) + \beta_1^{'} y_{it}^{c} II(q_{it} > c) + \varepsilon_{it} \quad (2)$$

where $q_{it}$ is the threshold variable, and c is the threshold parameter. $U_{it}^{c}$ indicates the transition function, which equals 1 when the threshold conditions in the parentheses are met, otherwise it equals 0. In this model, observations are divided into two regimes. These regimes depend on whether the threshold variable is less than or greater than the value of c. Regimes are distinguished using different regression slopes (e.g., $\beta_0^{'}$ and $\beta_1^{'}$). The advantages of this model are that it allows parameters to vary among countries (heterogeneity problem) and time (stationarity problem), depending on the number of regimes (Fouquau, 2008, p. 3). This study also adds inflation and nominal interest rates, which are thought to be related to economic growth and unemployment, to the model as control variables, similar to Aydın and Esen (2017).

In the panel threshold regression model, the variables included in the model must not contain a unit root (be stationary) in order to avoid a false regression. Therefore, the stationarity of the series was primarily determined using the panel unit root tests developed by Levin et al. (LLC; 2002) and Im et al. (IPS; 2003).

The LLC unit root test offers a more robust panel unit root test procedure than tests that perform individual unit root tests for each horizontal section unit. The test can be used for medium-sized panels with a horizontal cross-sectional dimension ($n$) of 10-250 and a time dimension ($t$) of 25-250. The hypotheses of this test are as follows (Levin et al., 2002, p. 4; Baltagi, 2013, pp. 278–279).

$H_0 : \lambda = 0$ The series is not stationary,

$H_1 : \lambda \neq 0$ The series is stationary.

The basic equation of this test, which applies the augmented Dickey-Fuller (ADF) regression for each horizontal cross-section, is shown in Equation 3.

$$\Delta y_{it} = \Delta y_{it-1} + \Sigma_{L=1}^{P_i} \varphi_{IL} \Delta y_{it-L} + \alpha_{mi} \alpha d_{mt} + \varsigma_{it} m \quad (3)$$

Equation 3 represents the vector of the deterministic variables, with representing the lag length (Levin et al., 2002, pp. 4–5). The IPS test was developed by Im, Peasaran, and Shin (2003) to test the unit root hypothesis in heterogeneous panels. They proposed a test based on the ADF statistics for each group in the panel, called the t-bar ($\bar{t}$) test. This test is related to the different series correlation properties of the error term in Equation 3 regarding the basic equation of the LLC unit root test among the horizontal cross-sections. Therefore, the ADF averages test statistics. The Monte Carlo methods examine the small sample properties of the IPS test. In cases where no relationship exists between successive values of the error term, even for small time dimensions (e.g., t = 10), these methods allow the test to demonstrate good performance (Im et al., 2003, pp. 54–73).

Is regression the same among all the observations of a sample or can it be classified into different categories? This question can be addressed using threshold regression techniques. Hansen (1999) proposed an estimation strategy for $y_{it}, q_{it}, x_{it}, k_{it} : 1 \leq i \leq n, 1 \leq t \leq$balanced panels with individual specific effects and observations. Here, i represents individual effects, represents time, $y_{it}$ represents dependent variable, $q_{it}$ represents threshold variable while $x_{it}$ represents a vector of external regressors with $k$ dimensions. Threshold regression models indicate that individual observations can be classified based on the value of an observed variable.

$$y_{it} = \mu_i + \beta_1^{'} x_{it} I(q_{it} \leq \gamma) + \beta_2^{'} x_{it} I(q_{it} > \gamma) + \varepsilon_{it} \quad (4)$$

where $I(.)$ denotes the indicator function, and $\gamma$ is the threshold value. When $q_{it}$ is smaller or greater than $\gamma$ , the equation is divided into two regimes with slope parameters $\beta_1$ and $\beta_2$, with $q_{it}$ being assumed to not change over time. Alternatively, Equation 4 may be rewritten as follows:

$$y_{it} = \mu_i + \beta_1^{'} X_{it} + e_{it}, q\_it \leq \gamma, @\mu_i + \beta_2^{'} x_{it} + e_{it}, q\_it \leq \gamma.)$$

$$y_{it} = (\mu_i + \beta_1' X_{it} + \varepsilon_{it}, q_{it} \leq \gamma, @\mu_i + \beta_2' x_{it} + \varepsilon_{it}, q\_it \leq \gamma)$$

The equation above can be manipulated and established in a different form. In the case of

$$x_{it} = (\gamma)\begin{pmatrix} x_{it} I(q_{it} \leq \gamma) \\ x_{it} I(q_{it} > \gamma) \end{pmatrix}$$

and $\beta = (\beta_1' \beta_2')$, Equation 4 can be rewritten as Equation 5 (Hansen, 1999, p. 347).

$$y_{it} = \mu_i + \beta' x_{it}(\gamma) + \varepsilon_{it} \tag{5}$$

## 4. Data

The data used in the analysis were obtained from the World Bank database. The data covers the period of 1990-2017. Table 1 shows the descriptive statistics for the variables. The minimum unemployment rate is seen to be 2.26% and the maximum to be 33.43%. The average unemployment rate during the period is 10.69%.

**Table 1.** *Definitions and Descriptive Statistics of Variables*

| Variable | Explanation | Observation | Mean | Std. Dev. | Min. | Max |
|---|---|---|---|---|---|---|
| Growth(grw) | Change of real GDP in percentage (i.e. | 140 | 4.173494 | 3.555515 | -13.12673 | 11.11350 |
| Unemployment(unemp | GDP (million dollars) | 140 | 10.69750 | 9.121413 | 2.268000 | 33.47300 |
| Inflation(inf) | Consumption Price Index | 140 | 70.17971 | 44.38511 | 0.000893 | 174.9687 |
| İnterest(int) | Average interest rate (long term) | 140 | 162.0048 | 950.4448 | -1.983849 | 93.94293 |

## 5. Results

### 5.1. *Unit Root Test Results*

The results from the unit root tests regarding the variables are shown in Table 2. According to the LLC panel unit root test results, the hypothesis is rejected. The growth rate (*grw*) series is seen to be stationary in both the constant as well as the constant plus trend models at a 1% level of significance level [$I(0)$] . The other series are stationary at the [$I(1)$] level. The results obtained from the IPS test resemble those from the LLC test.

**Table 2.** *Panel Unit Root Test Results*

| | LLC | | IPS | |
|---|---|---|---|---|
| | Intercept | Trend-Intercept | Intercept | Trend-Intercept |
| ***grw*** | -3,585 (0,000)*** | -2,781 (0,002)*** | -4,339 (0,000)*** | -3,015 (0,001)*** |
| ***unemp*** | -0,951 (0,170) | -0,429 (0,333) | **-1,418 (0,078)*** | -0,665 (0,252) |
| **Δ unemp** | -4,595 (0,000) *** | -3,445 (0,000)*** | **-4,049 (0,000)***** | -2,636 (0,004)*** |
| ***inf*** | 3,705 (0,999) | -0,597 (0,275) | 5,842 (1,000) | 0,635 (0,737) |
| **Δ inf** | -1,475 (0,070) * | -1,417 (0,078)* | **-1,952 (0,025)**** | -1,969 (0,024)** |
| ***int*** | -0,396 (0,345) | -0,288 (0,386) | -1,156 (0,123) | -2,604 (0,004)*** |
| **Δ int** | -5,663 (0,000) *** | -3,459 (0,000)*** | **-9,038 (0,000)***** | -7,607 (0,000)*** |

**Note:** The delay length was automatically selected based on the Schwarz Information Criteria. Values in parentheses represent the probability value. ***, ** and * indicate the significance levels of 1%, 5%, and 10%, respectively.

### 5.2. *Panel Threshold Analysis: Estimation Results*

The study conducts the threshold value analysis to determine an estimate of the relationship between economic growth and unemployment using the least squares method. The least squares method (LSM) is the most widely used method in regression analysis and has much sought-after statistical properties under certain assumptions that will be discussed below. The study uses LSM to express as realistically as possible the mathematical connection between two interdependently varying physical quantities in an equation. Firstly, Table 3 presents the test results for the model with a single threshold value as explained in Equation 7 regarding the growth series.

**Table 3.** *Test Results for Single Threshold Effect*

| Threshold Value | F-Statistic | P-Value | Critical Values | | |
|---|---|---|---|---|---|
| $(\gamma_1)$ | | | %10 | %5 | %1 |
| **5,501** | 7.79 | 0.046 | 6.3239 | 7.7332 | 11.1441 |

**Note**: 300 bootstrap replication was used in the model.

Table 3 shows the *p*-value of the threshold value parameter to have been estimated as $p = 0.046$. As for the *F* statistic, it exceeds the critical value of 5%. This result rejects the hypothesis at the 5% level. Therefore, no linear relationship is indicated to be present between economic growth and unemployment; however, this indicates the presence of a threshold effect. The next step tests the multiple threshold model to determine more than one threshold for the growth variable. Table 4 shows the three different threshold value parameters estimated in the model as $\gamma_1$, $\gamma_2$, and $\gamma_3$; the F statistics regarding these parameters; and the respective likelihood and critical values.

**Table 4.** *Test Results for Multiple Threshold Effects*

| Threshold Value | F-Statistic | P-Value | Critical Values | | |
|---|---|---|---|---|---|
| | | | %10 | %5 | %1 |
| $(\gamma_1)$ **5,501** | 7.79 | 0.046 | 6.3239 | 7.7332 | 11.1441 |
| $(\gamma_2)$ **6.640** | -1.74 | 1.0000 | 6.7309 | 8.5055 | 12.4917 |
| $(\gamma_3)$ **6.3450** | 4.33 | 0.4367 | 8.1676 | 9.6216 | 12.1576 |

**Note**: 300 bootstrap replication was used in the model.

Table 4 shows the F statistic of the first threshold parameter to be greater than the 5% critical value, with the p-likelihood value being 0.046. The F statistics for the second and third threshold parameters are smaller than all three critical values and have respective p-probability values of 1,000 and 0.436. The findings reveal the threshold parameters of $\gamma_2$ and $\gamma_3$ to not be significant according to the *F* statistics and *p*-likelihood values in the model. Thus, the model is proven to have a single threshold effect. The estimates for the single threshold level in Table 3 indicate a change in regime when the growth rate exceeds a certain level.

As a function of the growth threshold, the LR statistic is used to determine confidence intervals in threshold estimation. The 95% confidence interval in the model is [5,482, 5,557]. The least squares threshold estimation that minimizes the LR ($\gamma$) function is $\gamma$ = 5,501. This result indicates that the threshold estimates are very precise. Therefore, Figure 1 provides strong evidence that support single threshold in the relationship between economic growth and unemployment.

Table 5 shows the panel threshold regression estimates for the relationship between economic growth and unemployment rate. The regime coefficients indicate no linear relationship to be present between economic growth and unemployment rate. $\beta_1$ and $\beta_2$ are coefficients that indicate the regime-dependent effect of economic growth on the unemployment rate. $\beta_1$ is negative and statistically insignificant, while $\beta_2$ is negative but statistically significant at a level of 1%. According to these results, a growth rate above the threshold of 5.5 (grw > 5.501) negatively ($\beta_2$ =-0.0107) affects the unemployment rate.

The model also examines the effects the INF and INT control variables, which are frequently used in the literature on empirical growth, have on the unemployment rate. However, the results obtained from these control variables were statistically insignificant.

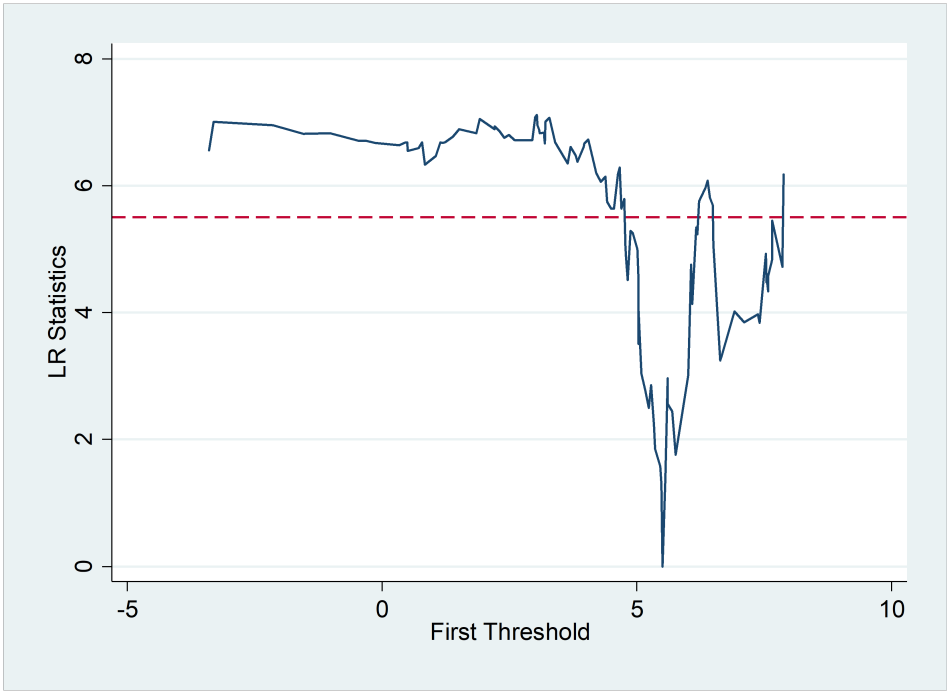



**Figure 1.** Confidence intervals in the single threshold model.

**Table 5.** *Growth Threshold Value and Unemployment Rate Model Estimation Results*

| | |
|---|---|
| ***Threshold Value Estimation*** | |
| **Threshold Value Parameter** $(\gamma_1)$ | 5,501 |
| **p-value** | (0,046) |
| ***grw Regime Coefficients*** | |
| $\beta\_1$ | -0,001 |
| | (-0.45 ) |
| $\beta\_2$ | -0.0107 *** |
| | (-4.08 ) |
| ***Control Variables*** | |
| ***inf*** | 5.88 |
| | (0.03) |
| **Int** | -0.01 |
| | (-1,25) |

**Note:** Values in parentheses are the *t*-statistic values.
***, **, and * represent the respective significance levels of 1%, 5%, and 10%.

Table 6 shows the number of countries that fall into both regimes in the 1990-2017 period. Throughout the 19 years included in the analyzed period, the growth rates of many countries are below the threshold level. On the other hand, the rates are above the threshold level regarding the eight-year period (1990-1997). These findings show the Fragile Five's economies are able to achieve a growth potential of 5.50%.

**Table 6.** *Number of Countries in Each Regime by Year*

| Years | $q_{it} \leq \gamma$ | $q_{it} > \gamma$ | Number of Country (N) |
|---|---|---|---|
| **1990** | 1 | 4 | 5 |
| **1991** | 3 | 2 | 5 |
| **1992** | 4 | 1 | 5 |
| **1993** | 3 | 2 | 5 |
| **1994** | 3 | 2 | 5 |
| **1995** | 2 | 3 | 5 |
| **1996** | 2 | 3 | 5 |
| **1997** | 3 | 2 | 5 |
| **1998** | 4 | 1 | 5 |
| **1999** | 4 | 1 | 5 |
| **2000** | 4 | 1 | 5 |
| **2001** | 5 | - | 5 |
| **2002** | 4 | 1 | 5 |
| **2003** | 3 | 2 | 5 |
| **2004** | 2 | 3 | 5 |
| **2005** | 2 | 3 | 5 |
| **2006** | 2 | 3 | 5 |
| **2007** | 1 | 4 | 5 |
| **2008** | 3 | 2 | 5 |
| **2009** | 4 | 1 | 5 |
| **2010** | 1 | 4 | 5 |
| **2011** | 3 | 2 | 5 |
| **2012** | 4 | 1 | 5 |
| **2013** | 2 | 3 | 5 |
| **2014** | 4 | 1 | 5 |
| **2015** | 3 | 2 | 5 |
| **2016** | 4 | 1 | 5 |
| **2017** | 3 | 2 | 5 |
| **Total** | **83** | **57** | **140** |

**Note:** Created by Authors.

## 6. Conclusions

The aim of this study has been twofold: to prove the validity and non-linearity of Okun's law, and then to test it using threshold panel data models. The study's findings demonstrate the validity of Okun's law and the relationship of asymmetry in the Fragile Five's economies. Furthermore, a single threshold (grw = 5.501) was found in the relationship between economic growth and unemployment. According to these results, a growth rate above the threshold value (grw > 5.501) negatively ($\beta_2$ = -0.0107) affects the unemployment rate. This study's results are consistent with those of Huang and Chang (2005), Fouquau (2008), Jardin et al. (2012), and Wang and Huang (2017). The current study has also proven that economic growth must exceed a certain level in order to reduce the unemployment rate in these economies.

Due to the East Asian crisis of 1997, the growth rates of the Fragile Five's economies experienced instability. The growth rates were determined to be below the threshold until 2004, after which they experienced a recovery. After the 2008 global crisis, however, the growth rates remained below the threshold again. As a result, the growth rates in the analyzed period were generally not above the threshold that is able to reduce unemployment. Unstable growth rates being a common feature of the analyzed country group were reflected in the empirical findings. By taking into account the mean economic growth rate of the Fragile Five (grwm = 4.17), one could argue that these rates are not at a high enough level to reduce unemployment ($4.17 \not> 5.501$).

Kosfeld and Dreger (2006) also stated unemployment and employment to not react too much to changes in economic growth during many periods. Nevertheless, their study revealed the minimum economic growth rate to be well below

the level required for the unemployment rate to drop. According to their paper, the ordering between the thresholds might be related institutional settings regarding the labor market, and these numbers are only rough guidelines for policymakers. The current study's results also resemble those of their study.

In this respect, the current study is expected to be able to contribute to the practices of policy makers in the Fragile Five. These policy makers should consider a minimum maximum of 5.50% as a growth target for providing employment. When considering the unstable economic performance of the Fragile Five's economies, structural reforms should be made to ensure adequate economic growth and increase employment. To address the problem of poor growth, this study can propose economic measures such as reducing employment taxes, producing investment and employment-based policies, and increasing the effectiveness of private employment offices. As Vinayagathasan (2013) pointed out, economic growth can also be increased by reducing trade barriers and motivating investment. In order to create a net job increase, labor market reform policies may be required. However, these policies have to be more flexible and active. In this way, countries can develop policies devoted to boosting GDP.

Of course, this study has limitations. First, owing to the exogeneity restriction, control variable may also be endogenous, our estimated coefficient may be biased. Second, we do not examine the causality relationship, but only a correlation relationship. Third, since each country has a different geopolitical and economic environment, it should not be forgotten that growth targets may be country specific. For further studies, these limitations can be providing direction. The study can be improved with different coefficient estimators and dynamic threshold value analysis techniques.

**Hakem Değerlendirmesi:** Dış bağımsız.
**Çıkar Çatışması:** Yazar çıkar çatışması beyan etmemişlerdir.
**Finansal Destek:** Yazar finansal destek beyan etmemişlerdir.

**Peer Review:** Externally peer-reviewed.
**Conflict of Interest:** Author declared no conflict of interest.
**Financial Disclosure:** Author declared no financial support.

**ORCID:**
Mustafa Şit 0000-0001-9694-0547

## REFERENCES / KAYNAKLAR

Altig, D., Fitzgerald, T. & Rupert, P. (1997). Okun's law revisited: Should we worry about low unemployment. *Federal Reserve Bank of Cleveland Economic Commentary.*

Attfield, C. L. & Silverstone, B. (1997). Okun's coefficient: a comment. *Review of economics and statistics*, 79 (2), 326-329.

Aydin, C. & Esen, Ö. (2017). Inflationary Threshold Effects on the Relationship between Unemployment and Economic Growth: Evidence from Turkey. *International journal of economic perspectives*, 11 (2), 88-97.

Azorín, J. D. B. (2017). Output growth thresholds for the creation of employment and the reduction of unemployment: A spatial analysis with panel data from the Spanish provinces, 2000–2011. *Regional Science and Urban Economics*, 67, 42-49.

Baltagi, B. H. (2013). *Econometric Analysis of Panel Data (Fifth Edition)*. West Sussex: John Wiley and Sons.

Blázquez-Fernández, C., Cantarero-Prieto, D. & Pascual-Sáez, M. (2018). Okun's Law in Selected European Countries (2005-2017): An Age and Gender Analysis. *Economics and Sociology*, 11 (2).

Bod'a, M. & Považanová, M. (2021). Output-unemployment asymmetry in Okun coefficients for OECD countries. *Economic Analysis and Policy*, 69, 307-323.

Butkus, M. & Seputiene, J., 2019. The output gap and youth unemployment: An analysis based on Okun's law. *Economies*, 7 (108).

Caraiani, P. (2006a). The relationship between unemployment and output cycles in Korea. *Romanian Journal of Economic Forecasting*, 1, 51-64.

Caraiani, P. (2006b). Alternative methods of estimating the Okun coefficient. Applications for Romania. *Romanian Journal of Economic Forecasting*, 7 (4), 82-89.

Chan K.S. (1993). Consistency and limiting distribution of the least squares estimator of a threshold autoregressive model. *The Annals of Statistics,* 21, 520-533

Courtney, H.G. (1991). *The Beveridge Curve and Okun's Law: A Re-Examination of Fundamental Relationships in the United States*, Ph.D. thesis, Massachusetts Institute of Technology.

Daly, M. C., G. Fernald, Ò Jordà, & F. Nechio (2012). Okun's Macroscope: Output and Employment after the Great Recession, *Manuscript, Federal Reserve Bank of San Francisco.*

Dunsch, S. (2017). Age- and gender-specific unemployment and Okun's law in CEE countries. *East. Eur. Econ*., 55, 377–393.

Flaig, G., & Rottmann, H. (2001). Input Demand and the Short-and Long-Run Employment Thresholds: An Empirical Analysis for the German Manufacturing Sector. *German Economic Review, 2* (4), 367-384.

Fouquau, J. (2008). Threshold effects in Okun's law: a panel data analysis. *Economics Bulletin*, 5, pp-1-15.

Friedman, B. M. (1988). Lessons on Monetary Policy from the 1980s. *Journal of Economic Perspectives*, 2, 51-72.

Galí, J., Smets, F. & Wouters, R. (2012). Slow recoveries: A structural interpretation. *Journal of Money, Credit and Banking*, 44, 9-30.

Gordon, Robert J. (1998). *Macroeconomics*. New York: Harper Collins.

Göçer, İ. (2015). Okun yasası: Türkiye üzerine bir uygulama. *Uluslararası Ekonomik Araştırmalar Dergisi*, 1 (1).

Hansen, B. E. (1999). Threshold Effects in Non-Dynamic Panels: Estimation, Testing, And Inference. *Journal of Econometrics,* 93, 345-368.

Harris, R. & Silverstone, B. (2001). Testing for asymmetry in Okun's law: A cross-country comparison. *Economics bulletin, 5* (2), 1-13.

Hsing, Y. (1991). Unemployment and the GNP gap: Okun's Law Revisited. *Eastern Economic Journal*, 17 (4), 409-416.

Huang, H. C. & Chang, Y. K. (2005). Investigating Okun's law by the structural break with threshold approach: Evidence from Canada. *The Manchester School*, 73(5), 599-611.

Hutengs, O. & Stadtmann, G. (2014). Age-and gender-specific unemployment in Scandinavian countries: An analysis based on Okun's law. *Comparative Economic Studies*, 56 (4), 567-580.

Im, K.S., Peseran M.H. & Shin Y. (2003). Testing for Unitroots in Heterogeneous Panels. *Journal of Econometrics*, 115 (1), 53–74

Jardin, M. & Gaétan, S. (2012). How Okun's law is non-linear in Europe: a semi-parametric approach. *Rennes, University of Rennes, 16th annual conference on macroeconomic analysis and international finance, April 2012*

Jula, D. & Jula, N. M. (2013). Economic growth and structural changes in regional employment. *Romanian Journal of Economic Forecasting*, 16 (2), 52-69.

Kosfeld, R. & Dreger, C. (2006). Thresholds for employment and unemployment: A spatial analysis of German regional labour markets, 1992–2000. *Papers in Regional Science*, 85 (4), 523-542.

Lee, J. (2000). The robustness of Okun's law: Evidence from OECD countries. *Journal of macroeconomics, 22* (2), 331-356.

Levin, A., Lin C.F. & Chu C.S.J. (2002). Unitroot Tests in Panel Data: Asymptotic and Finite-Sample Properties. *Journal of Econometrics*, 108 (1), 1–24.

Mankiw, N. G. (1994). *Macroeconomics*. New York: Worth Publishers.

Marconi, G., Beblavý, M. & Maselli, I. (2016). Age effects in Okun's law with different indicators of unemployment. *Appl. Econ. Lett*., 23, 580–583.

McKinsey Global Institute (2011). *An Economy That Works: Job Creation and America's Future*, June 2011 report.

Meyer, B. & Tasci, M. (2012). An unstable Okun's Law, not the best rule of thumb. *Economic Commentary*, June 7.

Owyang, M T., & T. Sekhposyan. (2012). Okun's law over the business cycle: was the great recession all that different? *Federal Reserve Bank of St. Louis Review*, 94 (5), 399-418.

Palley, T.I. (1993). Okun's Law and the Asymmetric and Changing Cyclical Behaviour of the USA Economy. *International Review of Applied Economics,* 7, 144-62.

Phiri, A. (2014). Nonlinear co-integration between unemployment and economic growth in South Africa. *Managing Global Transitions,* 12 (2), 81–102.

Prachowny, M. F. J. (1993). Okun's Law: Theoretical Foundations and Revised Estimates. *Review of Economics and Statistics*, 75, 331–336.

Sheehan, Richard G., and Frank Zahn. (1980). The Variability of the Okun Coefficient. *Southern Economic Journal*, 47, 488-97.

Stanley, M. (2013). FX Pulse. Accessed August 01 2013. https://www.morganstanley.com/institutional/research/pdf/FXPulse_20130801.pdf

Vinayagathasan, T. (2013). Inflation and economic growth: A dynamic panel threshold analysis for Asian economies. *Journal of Asian Economics*, 26, 31-41.

Virèn, M. (2001). The okun curve is non-linear. *Economics letters*, 70, 253–257.

Wang, X. & Huang, H. C. (2017). Okun's law revisited: a threshold in regression quantiles approach. *Applied Economics Letters*, 24 (21), 1533-1541.

Weber, C. (1995). Cyclical output, cyclical unemployment, and Okun's coefficient: a new approach. *Journal of Applied Econometrics*, 10, 433–446.

Worldbank Database, (2019). PWT 9.0 Datas, https://data.worldbank.org/

**How cite this article / Atıf biçinmi**

Şit, M. (2024). The relationship between unemployment and economic growth in selected large emerging countries: a revisit using threshold regression analysis. *İktisat Politikası Araştırmaları Dergisi - Journal of Economic Policy Researches, 11*(1), 76–85. https://doi.org/10.26650/JEPR1232910

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
**JEPR** 2024, 11(1): 87–97
DOI: 10.26650/JEPR1328992

ARAŞTIRMA MAKALESİ / RESEARCH ARTICLE

# Vergi Politikasının BIST 100 ve Katılım 30 Endeksine Etkisinin Karşılaştırmalı Analizi

## Comparative Analysis of the Effect of Tax Policy on the BIST 100 and Participation 30 Index

Server Demirci[1] Musa Onur Beskisiz[2]

**ÖZ**

Vergi politikası, maliyenin en güçlü politika seçeneklerinden biridir. Vergi politikası, devlete gelir sağlamanın yanı sıra tüketime, tasarrufa, yatırıma, ihracata ve ithalata yön vermek, adil bir gelir dağılımını sağlamak gibi birçok amaçla kullanılır. Vergi politikası ile hedeflenmese bile menkul ve gayrimenkul birçok varlığın fiyatı etkilenebilir. Verginin varlık değeri üzerindeki etkisi, verginin kapitalizasyonu ve verginin amortismanı kavramları ile açıklanabilir.

Birçok nedenle borsalar, yatırımların tamamını çekememektedir. Bu nedenlerinden biri olan yatırım yapılacak şirketin faaliyet konusuna duyulan hassasiyet çalışmamızın hareket noktasını oluşturmaktadır. Bu durumu ortadan kaldırmak için İstanbul Borsası bünyesinde 25.11.2021 tarihinden itibaren eşanlı fiyatlardan hesaplanan katılım endeksleri oluşturulmuştur.

Faaliyet konusu hassasiyeti olan yatırımcıların, sermaye kazancından ziyade kâr payı elde etmek amacıyla yatırım yapabileceklerini dolayısıyla da kâr payı dağıtımı üzerinden alınan vergide olabilecek değişikliklere tepki verebileceklerini düşünmekteyiz. Bu savı test etmek için çalışmamızda 22 Aralık 2021 tarihli kâr payı dağıtımlarındaki vergi kesintisi indiriminin etkilerini inceledik. Olay çalışması yöntemini kullandığımız çalışmamızda; bağımsız değişken olarak vergi oranı değişikliğini, bağımlı değişken olarak hisse senedi fiyat değişikliklerini aldık. Bu düzenlemenin Borsa İstanbul 100 ve Katılım 30 endeksine dâhil şirketlerin hisse fiyatları üzerindeki etkilerini karşılaştırmalı olarak inceledik. İnceleme konusu vergi indiriminin Borsa İstanbul 100 endeksinde yer alan firmaların hisse senedi fiyatlarında anlamlı bir değişikliğe neden olmadığı sonucuna ulaştık. Diğer taraftan aynı vergi değişikliğinin Katılım 30 endeksinde yer alan firmaların hisse senedi fiyatında anlamlı değişikliğe neden olduğu bulgusuna ulaştık. Başka bir ifadeyle beklentilerimiz doğrultusunda vergi indirimi, Katılım 30 endeksindeki firmaların hisse fiyatlarını arttırmıştır; endekste kapitalizasyon etkisi yaratmıştır. Ayrıca ulaştığımız sonuçlar, Katılım 30 endeksinin yarı güçlü formda etkin olmadığını göstermiştir.

**Anahtar Kelimeler:** Katılım 30 endeksi, hisse senedi fiyatı, vergi politikası, verginin kapitalizasyonu, olay çalışması

**Jel Sınıflaması:** E62, G12, G14

[1]Prof. Dr. Marmara Üniversitesi, Bankacılık ve Sigortacılık Enstitüsü, İstanbul, Türkiye
[2]Marmara Üniversitesi, Bankacılık ve Sigortacılık Enstitüsü, Sermaye Piyasası ve Borsa Doktora Programı, İstanbul, Türkiye

**Sorumlu yazar /**
**Corresponding author:** Musa Onur BESKİSİZ
**E-posta / E-mail:** onur_beskisiz@yahoo.com

**Başvuru / Submitted** : 18.07.2023
**Kabul / Accepted** : 17.10.2023

**ABSTRACT**

Tax policy is one of the most powerful policy options in finance. The effect of tax on asset value can be explained by the concepts of tax capitalization and tax depreciation. The first concept is that the tax increase reduces the price of the relevant asset; The second concept expresses that the tax decrease increases the price of the related asset.

For many reasons, stock markets are not able to attract all investments. One of these reasons, the sensitivity to the field of activity of the company to be invested, constitutes the starting point of our study. We think that investors with sensitivity to their field of activity may invest in order to gain dividends rather than capital gains, and therefore they may react to possible changes in the tax levied on dividend distribution. In order to test this argument, in our study, we comparatively examined the effects of the tax regulation dated December 22, 2021 on the share prices of companies included in the Borsa Istanbul 100 and Participation 30 index. We have reached the conclusion that the tax deduction, which is the subject of the review, did not cause a significant change in the stock prices in the BIST 100 index. On the other hand, we found that the same tax change caused a significant change in the stock price of the companies included in the Participation 30 index. In addition, our results showed that the Participation 30 index hasn't a semi-strong form of market efficiency.

**Keywords:** Participation 30 index, stock price, tax policy, tax capitalization, case study

**Jel Code:** E62, G12, G14

**EXTENDED ABSTRACT**

Tax policy, as a sub-branch of fiscal policy, is one of the most powerful policy options of finance. In addition to providing income to the state, tax policy is used for many purposes, such as influencing consumption, savings, investment, exports, and imports, and ensuring a fair income distribution. As a result of tax policy, even if not specifically targeted, the legislator can influence the price of many assets, movables, and real estate. The concepts of tax capitalization and tax depreciation can explain the effect of tax on asset value. The first concept refers to enacting a new tax or a tax increase that reduces the price of the relevant asset, whereas the second concept refers to the abolition or reduction of an existing tax that increases the price of the relevant asset.

Investors seeking halal income base their decisions on the activities of the companies. As a result of the difficulties in obtaining this information, some investors were barred from becoming partners with companies traded in the stock market. To attract investors who stay away from investment in the stock market, participation indices calculated at simultaneous prices have been created within the body of the Istanbul Stock Exchange as of November 25, 2021. Borsa İstanbul discloses to the public information that will meet all relevant investors' expectations, particularly the fields of activity of companies included in the index.

Two types of income can be generated in the stock market: capital gain arising from the stock price differences and the profit share on the stock. We think that these investors make profit-share-oriented investments because the logic of participation in the company's earnings is at the forefront of the investors in question. Hence, they are likely to be more sensitive to decisions regarding the dividend.

To test this argument, our study examined the effects of the legal regulation with the December 22, 2021, announcement date. With the tax regulation, the tax withholding rate in dividend distributions was reduced from 15% to 10%. We examined the effects of this regulation on the stock returns of companies in the Borsa Istanbul 100 and the Participation 30 indexes. As a result of our study, we expect a decrease in the tax rate and an increase in the stocks of the companies in the Participation 30 index. We used the event study method and employed the change in tax rates as the independent variable and stock prices as the dependent variable. The event study is an econometric method that examines the share price movements of companies around events related to the companies. We accepted the event day as the date of the law change announcement, the event window as +/10 days from the event day, and the forecast window as 250 days before the event day.

We have not determined that the tax deduction under consideration causes a significant change in the stock prices of the companies included in the Borsa Istanbul 100 index. However, we concluded that the same tax change caused a significant change in the stock price of the companies included in the Participation 30 index. In other words, the tax cut increased the stocks of the companies in the Participation 30 index, as expected. According to the efficient markets hypothesis, this result, which supports our argument, also shows that the Participation 30 index has low market efficiency.

## 1. Giriş

Kâr payı stopaj vergisinin %15'den %10'a indirilmesini içeren vergi düzenlemesi, 21 Kasım 2021 tarihinde kamuoyuna duyurulmuştur. Çalışmamamızda, söz konusu düzenlemesinin Borsa İstanbul'da işlem gören firmaların hisse senedi fiyatlarına etkisi incelenmektedir. Faaliyet konusu hassasiyeti olan yatırımcıların sermaye kazancından ziyade kâr payı elde etmek amacıyla yatırım yapabileceklerini ve dolayısıyla da kâr payı dağıtımı üzerinden alınan vergide olabilecek değişikliklere tepki verebileceklerini düşünüyoruz. Bu bağlamda söz konusu vergi indiriminin Katılım-30 endeksindeki şirketler üzerindeki etkilerini inceledik. Diğer taraftan aynı vergi düzenlemesinin Borsa İstanbul 100 (BİST-100) endeksine etkileri inceleyerek karşılaştırmalı bir analiz yaptık. Çalışmamızda, BİST-100 endeksini, vergi değişikliğin tüm hisselere olan etkisini topluca görmek için seçtik. Katılım-30 endeksini, vergi değişikliğinin katılım finans ilkelerine uygun faaliyet gösteren ve piyasadaki ağırlığı en fazla olan şirketler üzerindeki etkilerini ortaya koyabilmek için tercih ettik.

Katılım endeksleri, katılım finansmanı esaslarına göre yatırım yapmak isteyen bireysel ve/veya kurumsal yatırımcıların, katılım esaslarına uygun faaliyet gösteren şirketlere yatırım yapabilmesini sağlamak maksadıyla Borsa İstanbul tarafından oluşturulmuştur. Diğer taraftan katılım endeksleri sayesinde yatırımcı çekmek isteyen firmaların, katılım finansmanı farkındalıklarının arttırılarak sektöre katılımını teşvik etmek ve şirketlerin söz konusu sektördeki fonlama imkanlarından daha fazla yararlanabilmeleri hedeflenmiştir. Şirket esas sözleşmesinde faaliyet konusu olarak; alkollü içecek üretim ve ticareti, faizli finans işlemleri gibi faaliyetler bulunan şirketlerin payları, katılım endeksi kapsamı dışında bırakılarak finansman imkanları genişletilmeye çalışılmaktadır. Bu endekslere örnek olarak katılım tüm, katılım sürdürülebilirlik ve katılım temettü endekslerinin yanı sıra katılım 100, katılım 50 ve katılım 30 endekslerini gösterebiliriz.

Endekslerde yer alacak şirket payları belirlenirken yalnızca faaliyet konusu bağlamında değerlendirme yapılmamaktadır. Borsa İstanbul A.Ş. endekslerde yer alacak firmaları belirlerken Türkiye Katılım Bankaları Birliği ile eşgüdümlü çalışmaktadır. Bu iş birliği esasen Türkiye Katılım Bankaları Birliği bünyesinde yer alan Danışma Kurulu tarafından "Pay Senedi İhracı ve Alım-Satımı Standardı" (Standart) ile "Katılım Finans İlkelerine Uygun Faaliyet Gösteren Şirketlerin Belirlenmesinde Esas Alınacak Rehber" (Rehber) esas alınarak gerçekleştirilir. Danışma Kurulu tarafından oluşturulan Rehber, Standardın uygulamasına yönelik detayları içerecek şekilde tasarlanmıştır. Şirketler yapacakları başvuruları, Standart ve Rehber dikkate alınarak oluşturulan "Bilgi Formu" nu doldurarak gerçekleştirirler. Şirketlerin Standart'a uygunluğu bu form üzerinden değerlendirmeye alınır.

Katılım endeksleri, yılda 2 kez endeks değerlendirmesine tabi tutulur. Bu değerlemede çeşitli aşamalar izlenmektedir. Süreç, şirketlerin cari mali dönemleriyle ilgili olarak dolduracakları Bilgi Formları ile başlar. Aşamalarla ilgili detaylı bilgi, Borsa İstanbul'un https://borsaistanbul.com/tr/endeks/1/3/katilim resmi internet adresinden alınabilir.

Ayrıca çalışmamıza vergi politikalarının hisseler üzerindeki etkilerini inceleyen diğer çalışmaların aksine, verginin kapitalizasyonu ve amortismanı kavramlarını da dâhil ettik. Bu sayede yeni sayılabilecek verginin kapitalizasyonu ve amortismanı kavramlarının literatürde daha fazla yer almasını sağlamayı hedefledik. Vergi politikalarının muhafazakâr yatırımcı üzerindeki etkilerini katılım endeksi aracılığıyla inceleyen çalışmamızın literatüre önemli katkı sağlayacağını düşünmekteyiz.

## 2. Literatür

Araştırmamızda üzerinde durduğumuz gelir vergisi stopaj oranlarındaki değişikliklerin hisse senedi getirileri üzerindeki etkilerini araştıran çalışmalar, sayı ve kapsam olarak sınırlıdır. Literatür taramamamızda gelir vergisi stopaj oranlarındaki değişikliklerin (vergi politikasının) katılım endeksine etkilerini inceleyen herhangi bir araştırmaya rastlanılmamıştır. Vergi oranlarındaki değişikliklerin hisse senedi fiyatları üzerine etkilerini inceleyen belli başlı çalışmalar şu şekildedir:

Downs ve Hendershott (1987) ABD'de yatırımcıların 1986 Vergi Reform Yasası'nın hisse senedi fiyatları üzerindeki etkisini analiz etmişlerdir. Çalışmalarında nakit akışı değerleme modelini kullanmışlardır. 1986 tarihli Vergi Reform Yasası'nın hisse senedi fiyatlarını %10 ila %13 artırması gerektiği sonucuna ulaşmışlardır.

Cutler (1989) çalışmasında, 1986 Vergi Reform Kanununun ABD'deki varlık değerlerine etkisini incelemiştir. Çalışmasında olay analizi yöntemini kullanmıştır. Vergi mevzuatındaki değişiklik haberlerine piyasanın sınırlı tepki verdiği ve aynı günlerdeki anormal getirilen birbirleriyle ilişkisiz olduğu sonucuna ulaşılmıştır.

Amoako-Adu, Rashid ve Stebbins (1992) çalışmalarında Kanada'da gerçekleşen vergi indiriminin hisse fiyatlarına etkisini araştırmışlardır. Çalışmada 1985 ve 1987 yıllarındaki sırasıyla $500.000 ve 100.000$ olan sermaye vergisi muafiyetinin, temettü getirisi düşük ve yüksek olan hisse senetleri üzerindeki etkileri analiz edilmiştir. Çalışma sonuçlarına göre; hisse fiyatları 1985 yılında gerçekleşen ilk vergi muafiyeti değişimine istatistiksel olarak anlamlı

tepki vermemektedir. Ayrıca 1987 yılında gerçekleşen vergi muafiyeti uygulamasının yüksek temettü getirili firmaların hisse fiyatlarında, düşük temettü getirili firmalara kıyasla daha küçük bir değişikliğe neden olduğu sonucuna ulaşılmıştır. Araştırmacılar, vergi düzenlemesinin hisse senedi üzerindeki etkisinin vergi reformu önerisinin Kanada Meclisi'nde okunmasından bir gün önce ve bir gün sonra gerçekleştiğini tespit etmişlerdir.

Gordon ve Lee (1999) çalışmalarında, ABD'deki basamaklı artan bir yapıya sahip kurumlar vergisi oranlarının (çalışmanın yapıldığı dönemde ABD'deki kurumlar vergisi oranları %15 ile %52 arasında değişmekteydi) şirketlerinin sermaye yapısı tercihlerine etkisini incelemişlerdir. Çalışmada, 1950-1995 döneminde verisine ulaşılan tüm firmalar incelenmiştir. Regresyon analizinden yararlanılan çalışmada, şirketlerinin sermaye yapısında verginin istatistiksel olarak anlamlı etkiye sahip olduğu sonucuna ulaşılmıştır.

Ayers, Cloyd ve Robinson (2002) çalışmalarında, ABD'de 1993 yılında kâr payı üzerinden alınan vergi oranını arttıran vergi düzenlemesinin pay fiyatları üzerindeki etkisini incelemişlerdir. 1.312 firmanın incelendiği araştırmada, regresyon analizinden yararlanılmış ve bağımlı değişken olarak planlanan vergi oran artışının kamuoyu ile paylaşıldığı dönemdeki kümülatif anormal getirileri kullanılmıştır. Araştırmada, firmaların kâr payı getirisi yükseldikçe pay fiyatlarının olumsuz yönde etkilendiği sonucuna ulaşılmıştır.

Sialm (2005) çalışmasında, 1917-2004 yılları arasında ABD'de zaman serisi değişimini (regresyon analizi) kullanarak hisse senetleri üzerindeki kişisel vergilerin, hisse senedi değerlemeleriyle ilişkili olup olmadığını analiz etmiştir. Çalışmada varlık değerlemeleri ile kişisel vergi oranları arasında istatistiksel ve ekonomik anlamlı ilişki bulunmuştur.

Auerbach ve Hassett (2005) çalışmalarında, ABD'de 2003 yılında yapılan ve birçok vergisel konuyla ilgili değişikliklerin yer aldığı vergi düzenlemesinden hareketle kâr payı kazançları üzerinden alınan vergilerin firma değerleri üzerindeki etkilerini incelemişlerdir. Araştırmada olay çalışması yöntemi kullanılmıştır. Çalışma sonuçlarına göre önceden temettü ödemiş olan firmalar arasında yapılan analizde; daha çok temettü ödeyen firmaların -daha az temettü firmalara göre- daha iyi performans gösterdiği (yaklaşık %1,5) anlaşılmıştır. Diğer yandan temettü ödemeyen firma hisse senetlerinin, diğer firmaların hisse senetlerine göre daha fazla anormal getiri (%3,7- %8,6 arası) sağladıkları belirlenmiştir. Benzer bir bulgu, bu durumun yeni hisse senedi ihraç edecek şirketler için de geçerli olduğudur. Yeni hisse ihracı gerçekleştirecek firma hisse senetlerinin diğer firmalara göre anormal getiri (yaklaşık %0,2) sağladığı görülmüştür.

Chetty, Rosenberg ve Saez (2005) çalışmalarında, 2003 yılında ABD'de yapılan sermaye kazancı ve kâr payı üzerinden alınan -azaltıcı yöndeki- vergi düzenlemesinin, firmaların kâr payı ile ilgili duyurularının kâr payı ödeme günü sonrasında oluşan anormal getiriler üzerindeki etkilerini araştırmışlardır. Çalışmada kâr payı üzerinden alınan vergilerdeki indirimin, kâr payı ödemesinden sonra oluşan anormal getirileri arttırdığı ve temettü ödeme günü sonrasında oluşan anormal getirilerin, 2002 yılına nispeten 2004 yılında arttığı sonucuna ulaşılmıştır.

Dhaliwal, Krull ve Li (2007) çalışmalarında, 2003 yılında ABD'de hisse senedi yatırımlarından elde edilen sermaye ve kâr payı kazançlarını daha düşük oranda vergilendirilmesini (sırasıyla %20'den %15'e ve %38,1'den %15'e indirilmesini) öngören vergi düzenlemesinin firma değerleri üzerindeki etkisini araştırmışlardır. Araştırmacılar beklentilerinin aksine; öz sermaye maliyetindeki düşüşün temettü ödemeyen firmalarda temettü ödeyen firmalara göre daha fazla olduğu sonucuna ulaşmışlardır.

Amromin, Harrison ve Sharpe (2008) çalışmalarında, 2003 yılında ABD'de yapılan kâr payı ve sermaye kazançları üzerinde alınan vergide yapılan indirimin şirketlerin özsermaye maliyetleri ve hisse senedi fiyatlarına etkisini incelemişlerdir. Çalışmalarında olay çalışması yöntemini kullanmışlardır. Çalışma sonucuna göre kâr payı üzerinden alınan vergilerdeki azalmanın, hisse senedi piyasası üzerinde anlamlı etkisinin olmadığı sonucuna ulaşılmıştır.

Blandón, Blasco ve Bosch (2011) çalışmalarında, 2006 tarihinde İspanya'da gerçekleştirilen vergi reformunun (kâr paylarının vergilendirilmesine yönelik düzenleme ile kâr payı ve sermaye kazancı vergileri eşitlenmiştir) temettü ödemesini takip eden günlerdeki hisselerin getirilerine olan etkisini, eski temettü anomalisi kavramı üzerinden incelemişlerdir. Analiz neticesinde, vergi düzenlemesinin, hisse senetlerinin getirileri üzerinde, kâr payı ödemesinden sonraki gün etkili olduğu sonucuna ulaşılmıştır.

Christian Imboden (2018) çalışmalarında, ABD eyaletlerinde 1994 ve 2017 yılları arasında kurumlar vergisi oran değişikliklerin Amerika Birleşik Devletleri'nin büyük borsalarında listelenen hisse senetlerinin değeri üzerindeki etkilerini incelemişlerdir. Çalışmada önce düzenlemelerin kamuya açıklandıkları tarih itibariyle olay çalışmasından faydalanılmış daha sonra regresyon analizi ile her bir olay karşılaştırılmıştır. Çalışma neticesinde; söz konusu hisse senedi değerleme değişikliklerinin zamanlamasının vergi oranı düşüşleri ve vergi oranı artışları için farklı olduğu; vergi indirimlerine bağlı hisse senedi fiyat artışlarının çoğunluğunun vergi kanun teklifinin getirilmesinden çok önce meydana geldiği ve değişikliğin yasalaştığında ortadan kalktığı ve diğer taraftan vergi artışlarından kaynaklanan fiyat düşüşlerinin çoğunun ancak yasa tasarısı yasalaşmak için sunulduğunda gerçekleştiği sonuçlarına ulaşılmıştır.

Yalçın (2010) çalışmasında, finansal araçların vergilendirilmesinin BİST-30 endeksindeki hisselerin (23 adet hisse

senedinin) fiyat ve hacim hareketleri üzerindeki etkisini incelemiştir. Çalışma ile menkul kıymetler üzerindeki vergi oranı değişikliklerinin, çok küçük miktarda anormal getiri sağladığı ve vergi düzenlemesi öncesi ve sonrasında olağandışı hacim davranışlarına neden olduğu sonuçlarına ulaşılmıştır.

Kandır ve Yakar (2012), 29.11.2005 tarihli kurumlar vergisi oran değişikliği açıklamasının hisse senetlerine etkisini araştırmışlardır. 2004 yılında en fazla kurumlar vergisi ödeyen beş şirketin olay dönemindeki anormal getirileri incelemiştir. Araştırma sonucunda vergi indirimi açıklamasının, araştırma konusu şirket hisselerinde olay günü itibariyle anormal bir etkiye neden olduğu bulgusuna ulaşılmıştır. Vergi indirimi açıklamasının hisse senetlerinde hızlı ve anlamlı tepkiye neden olması; piyasanın yarı güçlü formda piyasa etkinliğine sahip olduğunu göstermektedir.

Kütük (2014) çalışmasında, 2005 yılında yapılan kurumlar vergisi değişikliği açıklamasının varlık fiyatları üzerine etkisini incelemiştir. Kütük çalışmasında olay döneminde bu iki farklı örneklem seti içinde varlık fiyatlarında anlamlı değişmelerin olmadığı sonucuna ulaşmıştır. Çalışma, yasanın yürürlük tarihi itibariyle de tekrarlanmış ancak sonuç değişmemiştir. Elde edilen sonuca göre BİST, kamuya açıklanmış bilgileri fiyatlayan yarı güçlü etkin bir piyasadır.

Güre ve Kütük (2016), çalışmalarında 29.11.2005 tarihli kurumlar vergisi oran değişikliği duyurusunun hisse senetleri üzerindeki kısa dönemli etkilerini incelemişlerdir. Çalışmalarında olay çalışması yöntemini kullanmışlardır. Çalışmada, vergi indirimi duyurusunun hisse senetlerinde anormal getiriye neden olmadığı sonucuna ulaşılmıştır.

## 3. Veri ve Değişkenler

Çalışmamızda BİST-100 endeksi ve Katılım-30 endeksi hisse senetlerinin kapanış verileri kullanılmıştır. Hisse senedi kapanış verileri Halk Yatırım'dan temin edilmiştir. Bağımsız değişken 21.12.2021 tarihli (olay günü) kâr payı stopaj oranı değişikliğidir. Bağımlı değişken ise BİST-100 endeksi ve Katılım-30 endeksine dâhil şirket hisse senedi fiyat değişiklikleridir.

Katılım-30 endeksi, 25.11.2021 tarihinden itibaren eşanlı fiyatlardan hesaplanmaya başlanmıştır. Katılım-30 endeksi, endekste yer alan şirketlerin %15 oranında eşit ağırlıklandırılarak Borsa İstanbul tarafından hesaplanmaktadır. Yapılacak analiz için tahmin aralığında Borsa İstanbul'da Katılım-30 endeksi hesaplanmadığı için söz konusu endeks verisi, olay günü itibariyle Katılım-30 endeksinde yer alan firmalar için BİST tarafından yapılan hesaplamaya sağdık kalarak tarafımızca hesaplanmıştır.

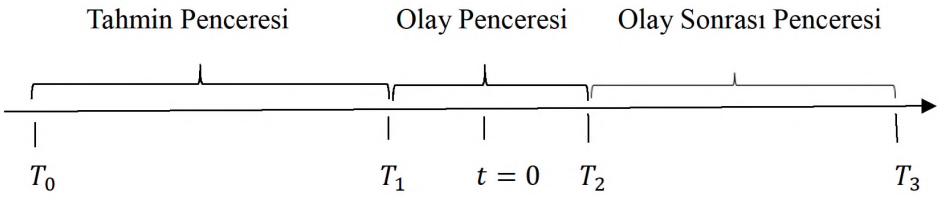
Çalışmadaki hesaplamalar STATA programı kullanılarak yapılmıştır.

## 4. Model

Araştırmamızda olay çalışması yöntemi kullanılmıştır. Olay çalışmasını, şirketlerle ilgili olduğu düşünülen olayların etkilerini, yine aynı şirketlerin pay fiyatı hareketleriyle açıklamaya çalışan istatiksel bir yöntem olarak ifade edebiliriz (Eckbo, 2007, s. 5).

Olay çalışmasında; kriterlerin belirlenmesi, olayın tanımlanması, normal ve anormal getirilerin hesaplanması ve en son olarak sonuçların yorumlanması adımları izlenmektedir.

**Şekil 1: Olay Çalışması Zaman Aralıkları**




Kaynak: Yazarlar tarafından oluşturulmuştur.

Olay çalışmasında olayın gerçekleştiği tarih "t=0" olarak gösterilir (Mackinlay, 1997, s. 19). Olay çalışması zaman aralıkları Şekil 1'de gösterilmiştir. T0-T1 aralığı tahmin penceresi, T1-T2 aralığı olay penceresi, T2-T3 aralığı ise olay sonrası penceresi olarak tanımlanmaktadır. Çalışmamızda olay günü, vergi değişikliği ilan edildiği 21.12.2021 tarihi olarak belirlenmiştir.

Literatür incelendiğinde, olay ve tahmin penceresinin ne kadarlık bir süreyi kapsayacağı -kaç gözlemin kullanılacağı- hakkında görüş birliğinin olmadığı görülecektir. Çalışmanın konu aldığı olayın niteliklerine bağlı olarak araştırmacılar

farklı süreler seçilebilmektedir (Mazgit, 2013, s. 233). Çalışmamızda olay penceresi olay gününden itibaren +5/-3 gündür.

Corrado ve Zivney (1992) tahmin penceresini 39, 89 ve 239 gün olarak kabul ederek bu sürelerin çalışmaya etkisini gözlemlemişlerdir. Çalışma sonucunda; 89 günlük tahmin penceresi, 239 günlük tahmin penceresine göre fark göstermemiştir. 39 gün olarak belirlenen tahmin penceresindeki çalışmada ise 89 ve 239 gün olarak belirlenenlere göre çok az bir fark belirlenmiştir. Çalışmamızda tahmin penceresi 250 gün (gözlem) olarak belirlenmiştir.

Olay penceresi istatistiksel testlerin uygulandığı ve çıkarımların yapıldığı dönemi ifade eder (Kandır ve Yakar 2012, s. 179). Olay penceresinin tahmin penceresine görece kısa tutulmaktadır. Bunun temelde iki nedeni vardır. İlk olarak, olayın fiyat değişikliğine ani etkisinin araştırmaların odak noktasını oluşturmasıdır. İkinci ve son olarak, olayın etkisinin başka bir açıklamayla karışmasının önüne geçmektir.

Anormal getiri, beklenen getiriler ile gerçekleşen getiriler arasındaki farktır. Beklenen getiriler, tahmin penceresindeki veriler üzerinden hesaplanmaktadır. Hisselerin anormal getirileri ile hisse senetlerinin incelenen olaylara verdiği anormal tepki ifade edilmektedir (Yılmaz, 2018, s. 90).

Anormal getiri, istatistiksel ve ekonomik modeller kullanılarak hesaplanmaktadır. İstatistiksel modellere örnek olarak; piyasa modeli, sabit ortalama getiri modeli ve sermaye varlıklarını fiyatlama modeli verilebilir (Eryiğit, 2007, s. 58). Ekonomik model olarak, sermaye varlıklarını fiyatlama modeli ve arbitraj fiyatlama modeli kullanılmaktadır (Koçyiğit ve Kılıç 2008, s. 170). Bu çalışmada, anormal getirilerin hesaplanmasında piyasa modeli kullanılmıştır. Bu amaçla çalışmamızda BİST-100 endeksi kullanılmıştır.

$$AR_{i,t} = R_{i,t} - R_{m,t} \tag{1}$$

$AR_{i,t}$ : t zamanındaki i firmasının anormal getirisi,
$R_{i,t}$ : t zamanındaki i firmasının hisse senedi getirisi,
$R_{m,t}$ : t zamanındaki piyasa getiri.

Piyasa modelinde en küçük kareler regresyon analizi yaparak beklenen getiriler hesaplanır. İlgili gündeki getiri ile beklenen getiri arasındaki farklar anormal getiri olarak belirlenir. Literatürde anormal getirilerin hesaplanması için en çok Piyasa Modeli kullanılmaktadır. Bu yöntem piyasa faktörlerini ve her hissenin riskini de hesaba katmaktadır. Daha detaylı modellerin bir fayda sağladığı görülemediği gibi araştırmayı zorlaştırmaktadır (Yılmaz, 2021, s. 25).

$$R_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} + \varepsilon_{it} \tag{2}$$

$R_{it}$ : t zamanındaki i firmasının hisse senedi getirisi,
â$\alpha_i$, $\beta_i$ : En küçük kareler yöntemi ile hesaplanan parametreler,
$R_{mt}$ : t zamanındaki piyasa getirisi,
$\varepsilon_{it}$ : standart hata terimi.

Model oluşturulduktan sonra parametreler kullanılarak hesaplanan getiri ile hisse getirisi arasındaki fark anormal getiriyi oluşturur:

$$AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt} \tag{3}$$

$AR_{it}$ : t zamanındaki i firmasının anormal getirisi,
$R_{it}$ : t zamanındaki i firmasının hisse senedi getirisi,
â$_i$ : En küçük kareler yöntemi ile hesaplanan parametreler,
$R_{mt}$ : t zamanındaki piyasa getirisi.

Belirli bir zaman aralığındaki etkinin gözlemlenmesi için bu zaman aralığında hesaplanan anormal getirilerin birbirlerine eklenmesi gerekmektedir. Olay penceresindeki anormal getirilerin (AR) toplanması ile oluşan değer Kümülatif Anormal Getiri (Cumulative Abnormal Return) ve kısaca CAR olarak adlandırılır. CAR hesaplandıktan sonra seçilen yönteme göre de test istatistikleri uygulanarak sonucun anlamlılığı irdelenir. CAR kısa vadeli anormal getirilerin hesaplanmasında en yaygın kullanılan yöntemdir (Yılmaz, 2021, s. 28). Hesaplama yöntemi 4 numaralı denklemdeki gibidir.

$$CAR_i(T_1, T_2) = \Sigma_{t=T_1+1}^{T_2} AR_{it} \tag{4}$$

Kümülatif anormal getiri tanımlanan olay penceresi içinde bulunduktan sonra bu tek gözlem incelenen olayın

hipotezini doğrulamak için yeterli olmayacaktır. Bu nedenle çalışmalarda incelenecek olaylar birbirlerine eklenerek gözlemler yapılmalıdır. Bu gözlemler yapılırken verilerde herhangi bir çakışma gözlenmediği teyit edilmesi gerekir (Mackinlay, 1997, s. 32). Bu işlemden sonra örnekler (N sayıda olay için) birbirlerine eklenip N sayısına bölünerek ortalama anormal getiriler (t günü için) hesaplanabilir. Böylelikle ortalama anormal getiriler birbirlerine eklenerek ortalama kümülatif anormal getirilere ulaşılmış olunur. Hipotez testi yapılırken bu şekilde hesaplanmış olan ortalama kümülatif anormal getiriler kullanılmalıdır. Anormal getirinin ortalaması denklem 5'deki gibi hesaplanmaktadır.

$$AAR_t = \frac{1}{N}\Sigma_{i=1}^{N} AR_{it} \quad (5)$$

Kümülatif anormal getirilerin (CARt) 0'a eşit, ya da 0'a çok yakın olması durumunda, vergi düzenlemesi ilanının endeks getirilerini etkilemediği söylenebilir. Bu durum, ilgili piyasanın yarı güçlü formda etkin olduğu anlamına gelir. Diğer taraftan kümülatif anormal getirinin (CARt) 0'dan farklı olması halinde, vergi düzenlemesi ilanının endeks getirilerini etkileyerek anormal getiri elde edilmesini mümkün kılacaktır. Böyle bir piyasa yarı güçlü formda etkin değildir. Kümülatif anormal getirinin 0'dan farklı olması durumunda, yatırımcılar kamuya açıklanan duyurulardan yararlanarak anormal getiriler elde edebilirler (Yıldırım, Yazgan ve Sakarya 2019, s. 417).

T testi hipotez testlerinde kolaylığı nedeniyle yaygın olarak kullanılmaktadır. Olay penceresindeki ortalama anormal getiriler, tahmin penceresindeki ortalama getirilerin standart sapma değerine bölünerek t değeri hesaplanır.

T testinin yorumlanması şu şekilde olacaktır: Hesaplanan t istatistiği değeri -1,96 ve + 1,96 arasında yer alıyorsa, elde edilen bulgunun %5 olasılık düzeyinde istatistiksel olarak anlamlı olduğu; hesaplanan t istatistiği değeri -1,64 ve + 1,64 arasında yer alıyorsa, elde edilen bulgunun %10 olasılık düzeyinde istatistiksel olarak anlamlı olduğu değerlendirmesi yapılacaktır (Yıldırım ve ark., 2019, s. 416).

## 5. Bulgular

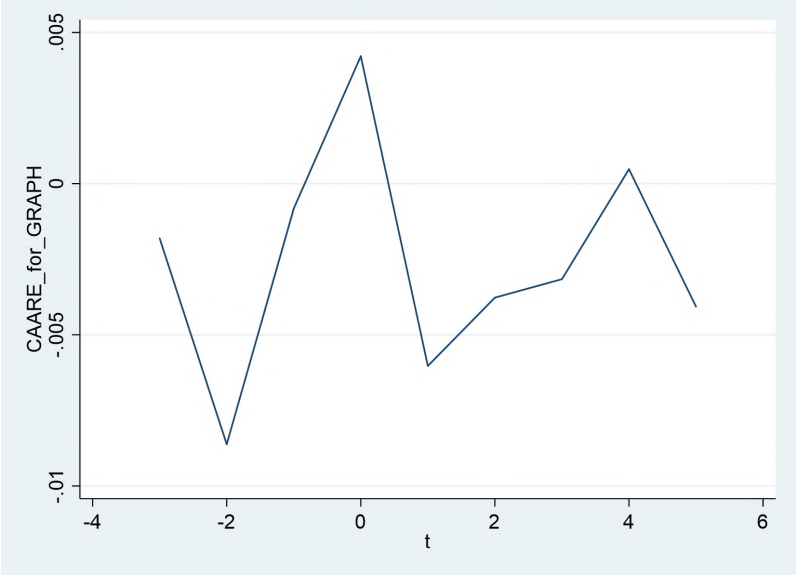
Tablo 1'de 2021 yılındaki kanun değişikliğinin, hisse senedi birikimli getirileri üzerinde anlamlı etkisi olup olmadığı BIST-100 endeksinde yer alan firmaları için test edilmiştir. Olay günü, olay gününün 3 gün öncesi ve 5 gün sonrası için hesaplanmış kümülatif anormal getiriler (KAG) ve onlara ilişkin t istatistiği değerleri belli pencereler açısından Tablo 1'de yer almaktadır.

**Tablo 1: BIST 100 Firmalarının KAG ve İlgili t-İstatistikler**

| Olay Penceresi | BTG | T-istatistik |
|---|---|---|
| (-3,1) | -0,0060 | -1,02 |
| (-3,2) | -0,0037 | -0,58 |
| (-3,3) | -0,0032 | -0,45 |
| (-3,4) | 0,0005 | 0,06 |
| (-3,5) | -0,0040 | 0,52 |
| (-2,1) | -0,0042 | -0,80 |
| (-2,2) | -0,0019 | -0,33 |
| (-2,3) | -0,0013 | -0,20 |
| (-2,4) | 0,0022 | 0,33 |
| (-2,5) | -0,0023 | -0,30 |
| (-1,1) | 0,0026 | 0,57 |
| (-1,2) | 0,0049 | 0,92 |
| (-1,3) | 0,0054 | 0,93 |
| (-1,4) | 0,0090 | 1,41 |
| (-1,5) | 0,0045 | 0,66 |

Tablo 1'de görüleceği üzere, olay pencerelerinin hiçbirinde KAG'nin istatistiksel olarak anlamlı şekilde sıfırdan farklı olduğu iddia edilemez. İlgili t-istatistik değerlerinin tamamı %5 anlamlılık düzeyinin kritik t-istatistiği olan 1.96'dan mutlak değer itibariyle düşüktür.

**Grafik 1. BIST-100 Firmalarının Ortalama Anormal Getirileri**




Grafik 1'de görüleceği üzere kanun değişikliği öncesi ve sonrası, ortalama anormal getiri 0 bandı etrafında gidip gelmektedir. Bu da kanun değişikliğinin firma hisse senetleri üzerinde anlamlı bir etkisinin olmadığına işaret etmektedir.

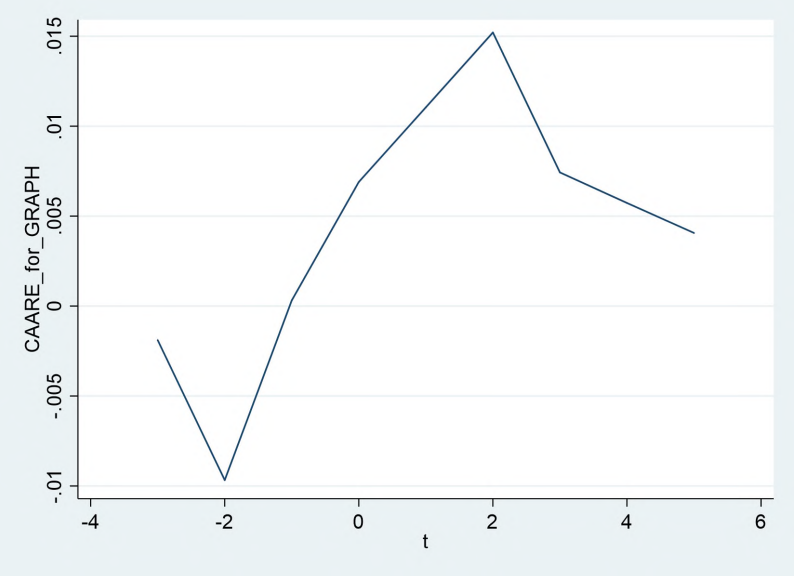
Tablo 2'de ise 2021 yılındaki kanun değişikliğinin, hisse senedi birikimli getirileri üzerinde anlamlı etkisi olup olmadığı 26 adet katılım endeksine dahil edilen firmalar için test edilmiştir. Aynı şekilde olay günü, olay gününün 3 gün öncesi ve 5 gün sonrası için hesaplanmış kümülatif anormal getiriler (KAG) ve onlara ilişkin t istatistiği değerleri belli pencereler açısından Tablo 2'de yer almaktadır.

**Tablo 2: Katılım-30 Firmalarının KAG ve İlgili t-İstatistikler**

| Olay Penceresi | BTG | t-istatistik |
|---|---|---|
| (-3,1) | 0,0111 | 0,88 |
| (-3,2) | 0,0152 | 1,11 |
| (-3,3) | 0,0074 | 0,50 |
| (-3,4) | 0,0057 | 0,36 |
| (-3,5) | 0,0041 | 0,24 |
| (-2,1) | 0,0129 | 1,16 |
| (-2,2) | 0,0171 | 1,37 |
| (-2,3) | 0,0093 | 0,68 |
| (-2,4) | 0,0076 | 0,52 |
| (-2,5) | 0,0129 | 1,16 |
| **(-1,1)** | **0,0207** | **2,14** |
| **(-1,2)** | **0,0249** | **2,23** |
| (-1,3) | 0,0171 | 1,38 |
| (-1,4) | 0,0154 | 1,13 |
| (-1,5) | 0,1370 | 0,93 |

Tablo 2'de Tablo 1'den farklı olacak şekilde olay gününün bir gün öncesi, olay günü ve olay gününün bir gün sonrasına ilişkin KAG %2.07 çıkmış, ilgili t-istatistiği ise 2.14 ile 1.96 kritik değerinin üzerinde gerçekleşmiştir. Benzer şekilde olay penceresinin (-1,2) olduğu durumda da KAG %2.49 ve ilgili t-istatistiği 2.23 çıkmıştır. Bu durum kanun değişikliğinin, katılım endeksinde yer alan firmaların getirilerini anlamlı şekilde arttırdığı şeklinde yorumlanabilir. Grafik 2'de ise Katılım-30 endeksinde yer alan firmaların ortalama anormal getirilerinin grafiğine yer verilmiştir.

**Grafik 2. Katılım Endeksi Firmalarının Ortalama Anormal Getirileri**




Grafik 2'de görüleceği üzere, kanun değişikliğinin yayınlanmasının bir gün öncesinde ortalama anormal getiri pozitif değer almış, kanun değişikliğinin yayınlandığı gün ve onu takip eden iki gün ortalama anormal getirisi ard arda artmıştır. Grafik 2'de yer alan grafikte kanun değişikliğinin, katılım endeksine dâhil olan firmaların hisse senedi getirilerini anlamlı şekilde arttırdığı şeklinde yorumlanabilir.

Olay çalışması sonucu elde edilen bulgulara göre; kanun değişikliğinin BİST-100 endeksinde yer alan firmaların getirisi üzerinde anlamlı etkisi olmazken, aynı kanun değişikliğinin Katılım-30 endeksinde yer alan firmaların getirileri üzerinde anlamlı etkisi olmuştur. Bu etki özellikle olay gününden önceki gün, olay günü ve olay gününü takip eden iki gün kendisini göstermiştir.

## 6. Sonuç

İnceleme konusu 21.12.2021 tarihli vergi indiriminin, BİST-100 endeksinde yer alan firmaların hisse senedi fiyatlarında anlamlı bir değişikliğe neden olduğu sonucuna ulaşılamamıştır. Diğer taraftan aynı vergi değişikliğinin, Katılım-30 endeksinde yer alan firmaların hisse senedi fiyatında anlamlı değişikliğe neden olduğu sonucuna ulaşılmıştır. Başka bir ifadeyle, beklentilerimiz doğrultusunda vergi indirimi, Katılım-30 endeksindeki firma hisse senet fiyatlarını arttırmıştır. Bu sonuç helal kazanç elde etmek isteyen yatırımcıların kâr payı değişikliklerine tepki vereceği savımızı doğrular niteliktedir. Yine ulaştığımız bu sonuç; vergi indiriminin, Katılım-30 endeksinde yer alan firmalarda kapitalizasyon etkisi yarattığını göstermektedir. Diğer taraftan söz konusu değişikliğin Katılım-30 endeksi firma hisselerini arttırması, söz konusu endeks özelinde piyasanın yarı güçlü formda etkin olmadığını göstermektedir.

**Hakem Değerlendirmesi:** Dış bağımsız.

**Yazar Katkıları:** Çalışma Konsepti/Tasarım- S.D., M.O.B.; Veri Toplama- M.O.B.; Veri Analizi/Yorumlama- M.O.B.; Yazı Taslağı- S.D., M.O.B.; İçeriğin Eleştirel İncelemesi- S.D., M.O.B.; Son Onay ve Sorumluluk- S.D., M.O.B.

**Çıkar Çatışması:** Yazarlar çıkar çatışması beyan etmemişlerdir.

**Finansal Destek:** Yazarlar finansal destek beyan etmemişlerdir.

**Peer Review:** Externally peer-reviewed.

**Author Contributions:** Çalışma Konsepti/Tasarım- S.D., M.O.B.; Veri Toplama- M.O.B.; Veri Analizi/Yorumlama- M.O.B.; Yazı Taslağı- S.D., M.O.B.; İçeriğin Eleştirel İncelemesi- S.D., M.O.B.; Son Onay ve Sorumluluk- S.D., M.O.B.

**Conflict of Interest:** Authors declared no conflict of interest.

**Financial Disclosure:** Authors declared no financial support.

**ORCID:**

Server Demirci 0000-0003-3930-3554
Musa Onur Beskisiz 0009-0008-0361-1348

## KAYNAKLAR / REFERENCES

Amoako-Adu, B., Rashid M. & Stebbins M. (1992). Capital gains tax and equity values: empirical test of stock price reaction to the ıntroduction and reduction of capital gains tax exemption. Journal of Banking and Finance, 16(2), 275-287.

Amoako-Adu, B., Rashid M. & Stebbins M. (1992). Capital gains tax and equity values: empirical test of stock price reaction to the ıntroduction and reduction of capital gains tax exemption. Journal of Banking and Finance, 16(2), 275-287.

Amromin, G., Harrison P. & Sharpe, S. (2008). How did the 2003 dividend tax cut affect stock prices? Financial Management, 37(4), 625-646.

Auerbach, A. J. & Hassett, K. A. (2005). The 2003 dividend tax cuts and the value of the firm: an event study. NBER Working Paper. No:11449. https://www.nber.org/system/files/working_papers/w11449/w11449.pdf.

Ayers, B. C., Cloyd C. B. & Robinson, J. R. (2002). The effect of shareholder-level dividend taxes on stock prices: evidence from the revenue reconciliation act of 1993. The Accounting Review, 77(4), 933-947.

Blandón, J. G., Blasco, M. M. & Bosch J. A. (2011). Ex-dividend day returns when dividend and capital gains are taxed at the same rate. Czech Journal of Economics and Finance, 61(2), 140-152.

Chetty, R., Rosenberg, J. & Saez, E. (2005). The effects of taxes on market responses to dividend announcements and payments: what can we learn from the 2003 dividend tax cut? NBER Working Paper, No:11452. https://www.nber.org/system/files/working_papers/w11452/w11452.pdf.

Corrado C. J. & Zivney, T. L. (1992). The specification and power of the sign test in event study hypothesis tests using daily stock returns. The Journal Of Financial And Quantitative Analysis, 27(3), 465-478.

Cutler, D. M. (1988). Tax reform and the stock market: an asset price approach. American Economic Review, 78(5), 1107-1117.

Derin Güre, P. & Kütük, S. (2016). Türkiye'de kurumlar vergisi değişikliğinin hisse senedi fiyatları üzerine kısa dönemli etkisi. Ankara Üniversitesi SBF Dergisi, 71(1), 303-322.

Dhaliwal, D., Krull L. & Zhen Li O. (2007). Did the 2003 tax act reduce the cost of equity capital? Journal of Accounting and Economics, 43(1), 121-150.

Downs, T. & Hendershott, P. H. (1987). Tax policy and stock prices. National Tax Journal, 40(2), 183-190.

Eckbo (Ed.), B. E. (2007). Handbook of Corporate Finance: Empirical Corporate Finance. Amsterdam.

Eryiğit, M. (2007). Stock market reaction to developments in Turkish-European union relations. Ekonomik Yaklaşım, 18(63), 55-68.

Gordon, R. H. & Lee, Y. (1999). Do taxes affect corporate debt policy? evidence from us corporate tax return data, NBER Working Paper, No:7433. https://www.nber.org/papers/w7433.

Imboden, C. (2018). Do stock prices respond to changes in Corporate income tax rates? University of Oregon Department of Economics.

https://ntanet.org/wpcontent/uploads/2019/03/Session1237_Paper1665_FullPaper_1.pdf%20in%20corporate.pdf.

Kandır, S. Y. & Yakar, S. (2012). Kurumlar vergisi oranındaki değişikliğin hisse senedi getirileri üzerindeki etkisinin incelenmesi. Maliye Dergisi, (163), 170-186.

Kütük, S. (2014). Impacts of the corporate ıncome tax change on asset prices in Turkey. (Yüksek Lisans Tezi). Orta Doğu Teknik Üniversitesi Sosyal Bilimler Okulu, Ankara.

Koçyiğit, M. & Kılıç, A. (2008). Leasing sektöründe kdv oranı değişikliğinin İmkb'de işlem gören leasing şirketlerinin hisse senedi getirisine etkisi. Muhasebe ve Finansman Dergisi, (40), 165-174.

Mackinlay, A. C. (1997). Event studies in economics and finance. Journal of Economic Literature, 35(1), 13-39.

Mazgit, İ. (2013). Endeks kapsamında olmanın hisse senedi getirilerine etkisi: Bist temettü 25 endeksi üzerine bir uygulama. Sosyo Ekonomi Dergisi, 20(20), 226-264.

Sialm C. (2005). Tax changes and asset pricing: time-series evidence, NBER Working Paper, No:11756. https://www.nber.org/papers/w11756.

Yalçın, C. (2010). The effects of taxaion of financial ınstruments on stock returns traded in İstanbul Stock Exchange: evidence from ise-30 index. (Yüksek Lisans Tezi). Dokuz Eylül Üniversitesi Sosyal Bilimler Enstitüsü, Ankara.

Yıldırım, H. H., Yazgan, K. F. & Sakarya, Ş. (2019, Nisan). Vergi oranlarındaki indirimin sektör endeksleri üzerindeki etkisi: Bist'de bir araştırma. New Economic Trends and Business Opportunities Konferansı, Bursa.

Yılmaz, C. (2021). Filiz girişim (startup) yatırımlarının hisse senedi değerlerine etkisinin olay çalışması ile analizi. (Yüksek Lisans Tezi). İstanbul Teknik Üniversitesi, Lisansüstü Eğitim Enstitüsü, İstanbul.

Yılmaz, Y. (2018). Hisse senedi getirileri üzerinde beklenmedik olaylar ve politik seçimlerin etkilerinin araştırılması: Bist'te bir uygulama. (Doktora Tezi). Atatürk Üniversitesi, Sosyal Bilimler Enstitüsü, Erzurum.

**Atıf biçimi / How cite this article**

Demirci, S., Beskisiz, M.O. (2023). Vergi politikasının BIST 100 ve katılım 30 endeksine etkisinin karşılaştırmalı analizi. *İktisat Politikası Araştırmaları Dergisi - Journal of Economic Policy Researches, 11*(1), 87–97. https://doi.org/10.26650/JEPR1328992

İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
**JEPR** 2024, 11(1): 99–114
DOI: 10.26650/JEPR1392777

RESEARCH ARTICLE / ARAŞTIRMA MAKALESİ

# How Does Information and Communication Technologies Affect Economic Growth? A Comparative Analysis of the Economies of the European Union and Asia-Pacific Region*

## Bilgi ve İletişim Teknolojileri Ekonomik Büyümeyi Nasıl Etkiler? Avrupa Birliği ve Asya Pasifik Bölgesi Ekonomileri İçin Karşılaştırmalı Bir Analiz

Tamerlan Mashadihasanlı[1], Haluk Zülfikar[2]

**ABSTRACT**

In the contemporary era of digitization, economies have been significantly influenced by the emergence of information and communication technology (ICT). In this digital age, the ICT sector all over the world has entered a period of rapid growth. The swift advancements within the ICT sector have played a pivotal role in shaping the global economy while simultaneously influencing the economic landscape of the European Union (EU) and Asia-Pacific region (APAC) countries. The purpose of this study is to comparatively evaluate ICT, its place in the EU and APAC countries' economies, and how it affected economic growth between 2007-2019. The dataset was analyzed using the Levin, Lin, and Chu unit root test, pooled ordinary least-squares (OLS), fixed effects, random effects, and two-step system generalized method of moments (GMM) estimators. The two-step system GMM findings show ICT's effects on economic growth to vary according to regional conditions. While Internet use has been found to contribute positively to the economic growth of the countries within the EU, this situation was observed to have had the opposite effect in the APAC region countries. These region-specific dynamics highlight the need for tailored policy considerations, suggesting the impact of ICT on economic development to be contingent upon regional conditions. The novelty of this research lies in its cross-regional perspective, thus contributing valuable knowledge for informed policy decisions in the increasingly interconnected global landscape. This study emphasizes the importance of regional dynamics in understanding the influence ICT has on economic growth and can guide policy makers and business leaders in shaping ICT strategies and investments according to regional characteristics.

**Keywords:** ICT, economic growth, GMM, European Union countries, Asia-Pacific region countries

**Jel Code:** O11, O20, O33

[1]Istanbul University, Institute of Social Sciences/Department of Economics (English), Istanbul, Turkiye
[2]Istanbul University, Institute of Social Sciences/Faculty of Economics, Department of Economics, Istanbul, Turkiye

**Sorumlu yazar/**
**Corresponding author:** Tamerlan MASHADIHASANLI
**E-mail/E-posta:** tamerlan.mashadihasanli@ogr.iu.edu.tr

*This article was produced from the doctoral thesis titled "Analyzing of the Role of Information and Communication Technologies in Stimulating Economic Growth: Evidence from OECD Countries" prepared by Tamerlan Mashadihasanli at Istanbul University Institute of Social Sciences.

**Submitted / Başvuru** : 18.11.2023
**Revision Requested / Revizyon Talebi** : 17.12.2023
**Last Revision Received / Son Revizyon** : 26.01.2024
**Accepted / Kabul** : 12.02.2024

**ÖZ**

Çağdaş dijitalleşme çağında ekonomi, bilgi ve iletişim teknolojilerinin (BİT) ortaya çıkmasından önemli ölçüde etkilenmektedir. İçinde bulunduğumuz dijital çağda tüm dünyada BİT sektörü hızlı bir büyüme sürecine girmiştir. Bu hızlı ilerlemeler, BİT sektörlerinde, dünya ekonomisini ve buna paralel olarak Avrupa Birliği (AB) ve Asya-Pasifik bölgesi (APAC) ülkelerinin ekonomisini etkileme eğilimindedir. Bu çalışmanın yürütülmesindeki amaç BİT'in AB ve APAC ülkeleri ekonomisindeki yeri ve ekonomik büyümeyi nasıl etkilediği konusunda 2007-2019 yılları arasında karşılaştırmalı bir değerlendirme yapmaktır. Veri seti Levin, Lin & Chu birim kök testi, Pooled OLS, Sabit Etkiler, Rastgele Etkiler ve iki adımlı sistem Genelleştirilmiş Momentler (GMM) tahmin edicileri kullanılarak analiz edilmiştir. İki aşamalı sistem GMM bulguları, BİT'in ekonomik büyüme üzerindeki etkilerinin bölgesel koşullara göre değişebileceğini göstermektedir. AB ülkelerinde internet kullanımının ekonomik büyümeyi olumlu etkilediği saptanırken, APAC bölgesi ülkelerinde bu durumun tam tersi etki yarattığı gözlemlenmiştir. Bu bölgeye özgü dinamikler, özel politika değerlendirmelerine olan ihtiyacın altını çiziyor ve BİT'in ekonomik kalkınmadaki rolünün bölgesel koşullara bağlı olduğunu öne sürüyor. Araştırmamızın yeniliği, giderek birbirine bağlanan küresel ortamda bilinçli politika kararlarına değerli bilgiler katan bölgeler arası perspektifinde yer almaktadır. Bu çalışma, BİT'in ekonomik büyüme üzerindeki etkilerinin anlaşılmasında bölgesel dinamiklerin önemini vurgulamakta ve politika yapıcılara ve iş dünyası liderlerine BİT stratejilerini ve yatırımlarını bölgesel özelliklere göre şekillendirmede yol göstermektedir.

**Anahtar Kelimeler:** BİT, ekonomik büyüme, GMM, Avrupa Birliği ülkeleri, Asya-Pasifik bölgesi ülkeleri

**Jel Sınıflaması:** O11, O20, O33

## 1. Introduction

While the boundaries of technology are expanding daily, information and communication technology (ICT) is transforming nations' economic structures and reshaping their growth capacities. Although this transformative impact on economic growth varies between developed and developing countries, broad consensus exists that the proliferation and use of ICT have profound and wide-ranging impacts on the global economy (Tunalı & Güz, 2021; Farhadi & Fooladi, 2020; Kurniawati, 2021). This paper aims to comparatively examine the effects ICT has on the economic growth in 27 European Union (EU) and 20 Asia-Pacific (APAC) region countries.

The EU is recognized as a region that has led the way in ICT adoption and innovation, as well as economic integration and policy coordination. Countries in this region have taken steps to increase their growth and competitiveness through their investments in ICT infrastructure and government policies. The APAC region also stands out with its rapidly changing technological landscape and dynamic growth in this field. While the region leads the way in adopting and disseminating technological innovations with its developed economies, it also seeks growth and development opportunities with its developing economies (Koç, 2021; Alper, 2018; David & Grobler, 2020).

The relationship between ICT and economic growth has been a focus of scholarly investigation in an era of rapid technological advancement. ICT's ability to revolutionize economies has attracted a lot of interest, which has made conducting in-depth studies necessary that explore the complex mechanisms at work. This research aims to further this conversation by performing a thorough examination of the relationship between ICT and economic growth, with a particular emphasis on identifying regional implications.

This study will not only provide a comprehensive understanding of how ICT shapes economic growth but will also aim to optimize the relationship between technological development and economic growth by providing policymakers with concrete recommendations. The results of the paper will provide strategic information for guiding future policy-making in EU and APAC countries and for maximizing the potential ICT has to contribute to economic growth. This information will provide an in-depth perspective on how digital transformation can play a role in reducing inequalities on a global scale and in achieving the Sustainable Development Goals (SDGs), as well as serve as a road map for decision makers in both regions.

The corpus of already completed research offers insightful information about how ICT generally affects economic development. However, ICT's varied impacts on economic growth and their regional variations remain barely understood. Comprehending these regional differences is essential for developing focused and efficient strategies that capitalize on ICT's potential in a variety of settings. In order to close this gap, this study uses the two-step system generalized method of moments (GMM) to analyze the effects ICT components (i.e., phone lines, mobile phone usage, and Internet usage) have on economic growth in different regions.

To examine in depth the role ICT has on economic growth, the study uses a comprehensive dataset obtained from 27 EU and 20 APAC region countries between 2007-2019. The paper evaluates the relationship between the development of ICT infrastructure and economic growth during this period using specific indicators such as number of fixed telephone lines, mobile phones, and Internet users. These indicators represent different aspects of technological access and

penetration, with gross domestic product (GDP) per capita being used as a proxy for economic growth. The two-step system GMM was particularly preferred to address the internal dynamics of these variables over time, as well as any potential endogeneity problems. The two-step system GMM analysis allows for both contemporaneous and lagged variables to be taken into account, thus enabling a more dynamic and constructive modeling of the impact ICT has on economic growth. This approach aims to provide policymakers with important insights while also allowing for a detailed assessment of the short- and long-term impacts of ICT investments. As a result, this analysis aims to elucidate the multidimensional structure of the relationship between ICT and economic growth and thereby contribute to the more effective design of regional developmental strategies.

In summary, the research moves forward with a thorough investigation in the following sections. Section 3 is titled Materials and Method and explains the research design with a focus on the selected variables and procedures. Section 4 is the findings and examines them in detail using econometric methods and stationarity conditions. Finally, Section 5, titled the Conclusion, summarizes these results alongside their implications and contributions. Together, these sections provide a thorough examination of how ICT affects economic growth regionally and will be able to inform future research and policy decisions.

## 2. Literature Review

This section examines existing research on the effects ICT has on economic growth. This review has been undertaken to understand the expanding role ICT plays in the global economy and how the impact of these technologies may vary within different economic structures. The literature review includes various theoretical and empirical studies that have analyzed ICT's contributions to economic growth and covers key theories, key findings, and current research trends in this field. This literature review provides in-depth context for the analysis of the research and relates the findings to existing academic studies.

Appiah-Otoo and Song (2021) examined the effects of ICT on economic growth in developed, developing, and underdeveloped countries using the panel analysis method between 2002-2017 over a total of 123 countries, including 45 developed, 58 developing, and 20 underdeveloped countries. As a result, their study showed having mobile phones, Internet access, and a fixed broadband connection to have a positive impact on economic growth in each country group. Koç (2021) used linear discrete-time stochastic state space models between 2001-2018 on data from Türkiye and established a model based on nine independent variables to explain growth. As a result, that study revealed individual Internet use and having a mobile phone subscription to have a growth-enhancing effect. The utilization of information technologies and the integration of ICT-based equipment contribute to the advancement of economic growth (Zhou et al., 2018). Moreover, ICT has the potential to boost economic performance by offering market information, facilitating the dissemination of information, promoting competition, supporting entrepreneurial activities, aiding job search processes, and facilitating the distribution of ideas (Czernich et al., 2011).

Tunalı and Güz (2021) conducted a study to examine the effect the ICT Development Index (IDI) has on economic growth using the panel analysis method between 2010-2016, based on the results of data from 79 countries, they observed the IDI to have a positive effect on economic growth. Myovella et al. (2020) used the GMM and ordinary least-squares (OLS) models between 2006-2016 over a total of 74 countries, including 41 sub-Saharan Africa (SSA) countries and 33 Organisation for Economic Co-operation and Development (OECD) countries. They discussed the comparative analysis they had made on the basis of countries whose growth had been impacted. According to their results, while mobile technologies had a greater effect on economic growth in SSA countries, this effect was not significant for OECD countries. They showed individual Internet usage to have a positive impact on economic growth for each country group; however, its impact on economic growth was low in SSA countries due to the underdevelopment of Internet infrastructures. The positive impact of ICT on economic growth has been substantiated by various research initiatives conducted at the cross-country level. Notably, the positive correlation between ICT and economic growth was confirmed by Khan et al. (2020) for South Asia, by Asongu and Odhiambo (2019) for Africa, by Alshubiri et al. (2019) for the Gulf Cooperation Council (GCC), by Kurniawati (2020) for the OECD, by Ghosh (2017) for the Middle East and North Africa (MENA), by Zhang and Danish (2019) for Asia, and by Donou-Adonsou and Lim (2018) for SSA.

Hekim Yılmaz and Kırışkan (2020) analyzed the effects of telecommunication infrastructure on economic growth using unit root tests and cointegration tests between 1980-2015 on data from Türkiye; their results showed the development of telecommunication infrastructure to have had an increasing effect on economic growth. Farhadi and Fooladi (2020) analyzed the effect of ICT-access on economic growth using GMM models between 2006-2015 based on data from 142 countries. According to the results of their studies, although the effect of ICT on economic growth was greater in high-income countries, it had an increasing effect in each country. In country-specific investigations,

numerous scholars have emphasized the significance ICT have in bolstering economic growth. For instance, the role ICT has in promoting economic development was underscored by Adedoyin et al. (2020) for the USA, by Chakpitak et al. (2018) for Thailand, by Kumar et al. (2016) for China, by Agarwal et al. (2018) for India, by Salahuddin and Gow (2016) for South Africa, by Ishida (2015) for Japan, and by Salahuddin and Alam (2015) for Australia.

Alper (2018) created two models using the panel data method for 24 countries between 1996-2016 and analyzed the relationship between ICT and economic growth. According to Alper's results, ICT increases economic growth. Niebel (2018) tried to explain the relationship between ICT and economic growth according to country groups (developed, developing, and underdeveloped countries) by performing a regression analysis on 59 countries between 1995-2010. According to the study's results, ICT contributes to economic growth. By using data from 1998-2016 for selected African countries, David and Grobler (2020) showed ICT penetration to have positive effects on economic growth and development. Moreover, Kurniawati's (2021) research found high Internet penetration to positively affect growth in the 25 Asian countries that were selected between 2000-2018. Nair et al. (2020) stated RD and ICT infrastructure to have contributed to economic growth in OECD countries between 1961-2018.

The literature review highlights the contribution ICT has made to economic growth, as well as the potential challenges and opportunities the diffusion of these technologies has on economic structures. The research has shown the findings from the literature to help at better understanding ICT's role throughout the analyzed period and in different regional contexts. This review has provided valuable insights into how the findings of the current study can be positioned within a broader academic dialogue.

## 3. Materials and Method

### 3.1. Methodology

This study section develops a two-step system GMM to examine the effects ICT has had on economic growth using data obtained from 27 EU and 20 APAC countries between 2007-2019. The two-step system GMM approach is a panel data method that takes into account both time-constant individual effects and specific time series characteristics. It has been developed specifically to provide consistent and efficient estimates in dynamic panel data models filled with potentially endogenous independent variables.

System GMM was first proposed by Arellano and Bover (1995) and Blundell and Bond (1998) and consists of two main components, the first being level equations and the second being difference equations. The instruments used in system GMM capture time-constant but individual-varying properties of the model, thereby mitigating potential endogeneity issues associated with time-dependent variables.

Mathematically, the econometric representation of the system GMM is expressed for the level equation as:

$$y_{it} = \alpha y_{i,t-1} + x_{it}^{'}\beta + \mu_i + \epsilon it \tag{1}$$

and for the difference equation as:

$$\Delta y_{it} = \alpha \Delta y_{i,t-1} + \Delta x_{it}^{'}\beta + \Delta \epsilon_{it} \tag{2}$$

where $y_{it}$ represents the dependent variable of the $i^{th}$ individual at time t, $x_{it}^{'}$ represents the vector of independent variables, $\mu_i$ represents the individual-specific constant, and $\epsilon_{it}$ represents the random error term. The $\Delta$ operator denotes first differences (i.e., $y_{it} - y_{i,t-2}$).

The econometric analysis applies Arellano and Bond's two-step estimation procedure, which first corrects the results obtained with the difference GMM estimator and then calculates the results obtained with the system GMM estimator using the corrected standard errors. This procedure aims to reduce the bias caused by potential endogenous variables in the model.

This study uses the program Stata 18 to conduct the system GMM analyses. Stata 18's xtabond2 command is standard for implementing the system GMM estimator and includes widely accepted tests such as the Arellano-Bond serial correlation test and Hansen's test for overidentification of instruments using the J statistic. These tests are critical for evaluating the appropriateness of the specification of the estimated model and the validity of the instruments that are used.

This analysis investigates the influence of ICT on economic growth with a specific focus on 27 EU and 20 APAC countries, each characterized by distinct geographical and economic structures. Conducted over the period from 2007-2019, this comparative study utilizes a two-step system GMM estimator separately for both groups. The primary

objective is to uncover the variations in the impact ICT has on economic growth within these regions, thus contributing to a nuanced understanding of the relationship. The findings will help policymakers understand ICT investments and the effects these have on economic growth. Each estimator is equipped with carefully selected instruments to better understand the impact of the dynamics and variables specific to one's geographic group. In this way, the obtained results will be more robust and valid by taking regional characteristics into account.

The study's econometric model aims to examine the effects of ICT on economic growth (i.e., GDP per capita). The model constructs the logarithm of GDP as a linear relationship dependent on the logarithm of historical GDP, the logarithm of ICT indicators, and the logarithm of other control variables. The formulation of the econometric model is as follows:

$$lnGDP_{ti} = \beta_0 + \beta_1 lnGDP_{ti-1} + \beta_2 lnICT_{ti} + \beta_s lnZ_{ti} + y_i + \eta_i + \varepsilon_{it} \quad (3)$$

where:

- ln $GDP_{ti}$ is the natural logarithm of the i$^{th}$ country's GDP per capita at time $t$.
- ln $GDP_{ti-1}$ is the natural logarithm of the i$^{th}$ country's GDP per capita at time $t1$, representing the time-lagged dependent variable and reflecting the past performance of the economy.
- ln $ICT_{ti}$ is the natural logarithm of the variables showing the level of ICT usage in the i$^{th}$ country at time $t$. The study uses this as an indicator that includes the number of fixed telephone lines, mobile phone plans, and Internet users.
- ln $Z_{ti}$ is the natural logarithm of the control variables of the i$^{th}$ country at time t and aims to control the effect of other factors. The study uses consumer price index, trade openness, and final consumption expenditure as the control variables.
- $y_i$ refers to country fixed effects and captures unobserved country-specific constant characteristics.
- $\eta_i$ expresses time fixed effects and captures unobserved time-constant properties.
- $\varepsilon_{it}$ is the random error term and represents random variation due to other factors not accounted for in the model.

The model was estimated with the two-step system GMM approach. This methodology is particularly recommended when time-lagged variables such as ln $GDP_{ti-1}$ are present and potentially endogenous. System GMM addresses endogeneity using a set of endogenous and exogenous instruments, thereby improving the consistency and efficiency of the estimators.

The model estimation evaluated the validity of the instruments by using the Arellano-Bond serial correlation test and Hansen's J statistic. These provide important information about the fit of the model and the validity of the instruments used. The Arellano-Bond test tests whether a first-order autocorrelation is present in the error term of the model (which is expected) but not a second-order autocorrelation (which is not expected). Hansen's J statistic checks the over-identification of the instruments used in the model; namely, it checks whether the instruments are actually correlated with the endogenous variables in the model. The results of both tests are critical to the validity of the model predictions.

The system GMM approach generally prefers to take the logarithms of the variables in order to ensure their stationarity and obtain econometrically sound results. Logarithmic transformation is more sensitive when measuring proportional changes and can normalize the skewed distribution of economic data. This approach also facilitates interpreting proportional effects in econometric models.

While estimating this model, the study used the advanced tools offered by the Stata 18 software for panel data analysis. This software facilitates implementing the system GMM estimator and evaluating the accuracy of the results with statistical tests. In addition, the study has taken time and country fixed effects in the model in order for the estimation results to reflect the changing economic structures and fixed characteristics of various countries over time.

Consequently, this econometric model has been designed to comprehensively examine the impact ICT has on economic growth. The developed econometric strategy and applied statistical tests were used to ensure the robustness and consistency of the estimates obtained in the model. These findings offer policymakers and researchers robust insights by supplying valuable information to enhance their understanding of how ICT investments influence economic growth.

### 3.2. Variables and Data Collection

The variables considered in this study represent different aspects of economic growth for both the 27 EU and 20 APAC countries. The roles of the variables vary depending on the economic structure and level of ICT adoption in each region.

The dependent variable is GDP per capita and directly reflects the economic performance of each region. While higher GDP-per-capita values are generally observed in the EU countries, these values were observed to be distributed over a wide range in the APAC region. This reveals economic homogeneity to be present within the EU and economic heterogeneity to be present in the APAC region. The numbers for fixed telephone lines (*TEL*), mobile phone users (*MOB*), and Internet users (*INT*) were chosen as the independent variables and measure ICT's prevalence and degree of penetration in each region.

The control variables are consumer price index (*CPI*), trade openness (*TRD*), and final consumption expenditures (*PCNS*) and were chosen to take into account the economic conditions of both regions and their reactions to external shocks. These indicators organize the economic context in order to more clearly reveal the impact ICT has on economic growth.

The sources, summary statistics, and normality tests for all the variables used in this study are given in Tables 1 and 2. These tables contain descriptive statistics regarding the datasets, the sources for the variables, and the operational definitions of the variables that are used so that readers can clearly see the basis of the analysis and the scope of the dataset. This transparent approach increases the reliability of the study and the reproducibility of the results.

**Table 1.** *Variables for EU Countries*

| *Variables* | *Definition* | *Source* | *Values* | |
|---|---|---|---|---|
| **GDP** | GDP per capita | World Bank | Mean | 10.21 |
| | | | SD | 0.64 |
| | | | Min | 8.68 |
| | | | Max | 11.72 |
| | | | Skewness | 0.7711 |
| | | | Kurtosis | 0.0012 |
| | | | Jarque-Bera | 0.0082 |
| **TEL** | Fixed telephone lines (per 100 inhabitants) | World Bank | Mean | 3.50 |
| | | | SD | 0.44 |
| | | | Min | 1.58 |
| | | | Max | 4.19 |
| | | | Skewness | 0.0000 |
| | | | Kurtosis | 0.0014 |
| | | | Jarque-Bera | 0.0000 |
| **MOB** | Mobile phone user (per 100 inhabitants) | World Bank | Mean | 4.80 |
| | | | SD | 0.12 |
| | | | Min | 4.49 |
| | | | Max | 5.14 |
| | | | Skewness | 0.0255 |
| | | | Kurtosis | 0.3787 |
| | | | Jarque-Bera | 0.0560 |
| **INT** | Internet user (per 100 inhabitants | World Bank | Mean | 4.26 |
| | | | SD | 0.22 |
| | | | Min | 3.34 |
| | | | Max | 4.58 |
| | | | Skewness | 0.0000 |
| | | | Kurtosis | 0.0006 |
| | | | Jarque-Bera | 0.0000 |
| **CPI** | Consumer price index | World Bank | Mean | 4.64 |
| | | | SD | 0.06 |
| | | | Min | 4.41 |
| | | | Max | 4.81 |
| | | | Skewness | 0.0001 |
| | | | Kurtosis | 0.0293 |
| | | | Jarque-Bera | 0.0002 |
| **TRD** | Trade openness | World Bank | Mean | 4.72 |
| | | | SD | 0.46 |
| | | | Min | 3.81 |
| | | | Max | 5.93 |
| | | | Skewness | 0.0014 |
| | | | Kurtosis | 0.4218 |
| | | | Jarque-Bera | 0.0072 |
| **PCNS** | Final consumption expenditure | World Bank | Mean | 4.30 |
| | | | SD | 0.12 |
| | | | Min | 3.72 |
| | | | Max | 4.52 |
| | | | Skewness | 0.0000 |
| | | | Kurtosis | 0.0000 |
| | | | Jarque-Bera | 0.0000 |

**Table 2.** *Variables for APAC Countries*

| *Variables* | *Definition* | *Source* | *Values* | |
|---|---|---|---|---|
| **GDP** | GDP per capita | World Bank | Mean | 8.52 |
| | | | SD | 1.39 |
| | | | Min | 5.95 |
| | | | Max | 11.12 |
| | | | Skewness | 0.0030 |
| | | | Kurtosis | 0.0000 |
| | | | Jarque-Bera | 0.0000 |
| **TEL** | Fixed telephone lines (per 100 inhabitants) | World Bank | Mean | 2.01 |
| | | | SD | 1.47 |
| | | | Min | -1.81 |
| | | | Max | 4.10 |
| | | | Skewness | 0.0007 |
| | | | Kurtosis | 0.1333 |
| | | | Jarque-Bera | 0.0026 |
| **MOB** | Mobile phone user (per 100 inhabitants) | World Bank | Mean | 4.45 |
| | | | SD | 0.51 |
| | | | Min | 2.03 |
| | | | Max | 5.20 |
| | | | Skewness | 0.0000 |
| | | | Kurtosis | 0.0000 |
| | | | Jarque-Bera | 0.0000 |
| **INT** | Internet user (per 100 inhabitants | World Bank | Mean | 3.32 |
| | | | SD | 1.03 |
| | | | Min | 0.00 |
| | | | Max | 4.56 |
| | | | Skewness | 0.0000 |
| | | | Kurtosis | 0.8066 |
| | | | Jarque-Bera | 0.0001 |
| **CPI** | Consumer price index | World Bank | Mean | 4.72 |
| | | | SD | 0.18 |
| | | | Min | 4.17 |
| | | | Max | 5.24 |
| | | | Skewness | 0.0051 |
| | | | Kurtosis | 0.4329 |
| | | | Jarque-Bera | 0.0195 |
| **TRD** | Trade openness | World Bank | Mean | 4.28 |
| | | | SD | 0.62 |
| | | | Min | 3.19 |
| | | | Max | 6.08 |
| | | | Skewness | 0.0001 |
| | | | Kurtosis | 0.7326 |
| | | | Jarque-Bera | 0.0013 |
| **PCNS** | Final consumption expenditure | World Bank | Mean | 4.32 |
| | | | SD | 0.24 |
| | | | Min | 3.79 |
| | | | Max | 5.24 |
| | | | Skewness | 0.0000 |
| | | | Kurtosis | 0.0000 |
| | | | Jarque-Bera | 0.0000 |

This study performs separate analyses on two different datasets. The first dataset includes 27 countries that are EU members, while the second dataset covers 20 APAC countries. The relevant countries are detailed in Tables 3 and 4. The total number of observations for both groups is 564 observations, with 324 for the EU and 240 for the APAC countries. These observations were collected to cover the period between 2007-2019. A detailed examination of the datasets from the two regions allows the study to evaluate the impact ICT has on economic growth while taking into account geographical and economic diversity.

**Table 3.** *European Union (EU) Countries*

| | | | |
|---|---|---|---|
| Austria | Estonia | Italy | Portugal |
| Belgium | Finland | Latvia | Romania |
| Bulgaria | France | Lithuania | Slovak Republic |
| Croatia | Germany | Luxembourg | Slovenia |
| Cyprus | Greece | Malta | Spain |
| Czechia | Hungary | Netherlands | Sweden |
| Denmark | Ireland | Poland | |

**Table 4.** *Asia-Pacific Region Countries*

| | | | |
|---|---|---|---|
| Australia | India | Nepal | Thailand |
| Bangladesh | Indonesia | New Zealand | Timor-Leste |
| Bhutan | Japan | Pakistan | Tonga |
| China | Korea, Rep. | Philippines | Vanuatu |
| Fiji | Malaysia | Singapore | Vietnam |

## 4. Findings

This section conducts a comparative analysis involving 27 EU and 20 APAC countries to assess the impact of ICT on economic growth. The methods used in this analysis include a stationarity test, pooled OLS, fixed and random effects estimators, and the two-step system GMM estimations. The findings comparatively reveal the effects of ICT on economic growth based on the data that were obtained using the specified methods. The results obtained through the use of these analytical methods provide critical information about the economic performance of these country groups.

### 4.1. Stationarity Condition

The Levin, Lin, and Chu unit root test was applied to the macroeconomic time series data of 27 EU and 20 APAC countries, thus forming the basis of the study. This test is critical for understanding whether the series is stationary or not, because non-stationary series can produce misleading results. The test results are summarized in Table 5 for the 27 EU member countries and in Table 6 for the 20 APAC countries.

**Table 5.** *The Levin, Lin, and Chu Unit Root Rest Results for the EU Countries*

| Variables | In level and with intercept | One difference and with intercept | Variable | In level and with intercept | One difference and with intercept |
|---|---|---|---|---|---|
| **GDP** | -8.21*** (.000) | -19.68*** (.000) | TEL | 0.82 (.998) | -16.91*** (.000) |
| **CPI** | -3.36 (.488) | -13.68*** (.000) | MOB | -9.41*** (.000) | -20.63*** (.000) |
| **TRD** | -6.46*** (.006) | -33.84*** (.000) | INT | -13.44*** (.000) | -15.48*** (.000) |
| **PCNS** | -8.35 (.013) | -26.35*** (.000) | | | |

**Notes: p-value in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%**

**Table 6.** *The Levin, Lin, and Chu Unit Root Rest Results for APAC Countries*

| Variables | In level and with intercept | One difference and with intercept | Variable | In level and with intercept | One difference and with intercept |
|---|---|---|---|---|---|
| **GDP** | -6.12*** (.000) | -14.28*** (.000) | TEL | -11.44*** (.000) | -31.49*** (.000) |
| **CPI** | -7.71*** (.000) | -7.45 (.032) | MOB | -7.80*** (.000) | -11.58*** (.000) |
| **TRD** | -6.68*** (.002) | -15.87*** (.000) | INT | -3.31 (.058) | -22.79*** (.000) |
| **PCNS** | -7.61*** (.000) | -14.71*** (.000) | | | |

**Notes: p-value in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%**

According to the Levin, Lin, and Chu unit root test results, some economic variables (i.e., gross domestic product (GDP) per capita [*GDP*], trade openness [*TRD*], mobile phone user [*MOB*], and internet user [*INT*]) are found to be stationary at both levels and first differences for the 27 EU countries. These variables have statistically significant unit root test results and can be used directly in models. Meanwhile, the variables of consumer price index [*CPI*], final consumption expenditure [*PCNS*], and fixed telephone lines [*TEL*] are not stationary at levels, but are stationary when taking first differences into account. According to the results, *GDP, TRD, MOB*, and *INT* should be used at level, and *CPI, PCNS*, and *TEL* should be used in the first-difference stationary form in econometric models.

According to the results for the 20 APAC countries, all variables (*GDP, CPI, TRD, PCNS, TEL,* and *MOB*) are found to be stationary at levels and first differences, while *INT* is not stationary at level but shows stationarity at first differences. These results show that most of the macroeconomic indicators in the APAC countries are stationary series that can be directly included in the analysis. The fact that *INT* is not stationary indicates that this variable should be used in the first-difference stationary form in econometric models.

### 4.2. Pooled OLS, Fixed Effect, and Random Effect Estimators

The first stage uses the pooled OLS, fixed effects, and random effects estimators to analyze ICT's impact on economic growth. Pooled OLS estimates an overall effect across all countries, while the fixed and random effects models focus more on countries' individual characteristics. The fixed effects model takes into account the unique characteristics of each country that do not change over time and attempts to control for the impact these characteristics have on the dependent variable. Meanwhile, the random effects model attempts to model country-specific random effects by taking into account random variations in the error term alongside fixed effects. The estimation results obtained for each

country group have been comprehensively examined for a better understanding of the dynamics of both regions and the impacts of ICT, as well as for the comparative analysis. The results are summarized in Tables 7 and 8.

**Table 7.** *Pooled OLS, Fixed Effect and Random Effect Results for EU Countries*

| **Dependent variable: GDP per capita (GDP)** | | | |
|---|---|---|---|
| **Variables** | Pooled OLS | Fixed Effect | Random Effect |
| **GDP (-1)** | 0,9758*** | 0,9896*** | 0,9758*** |
| | (0,004) | (0,034) | (0,003) |
| **ΔCPI** | 0,1385 | 0,1533 | 0,1385 |
| | (0,200) | (0,196) | (0,157) |
| **TRD** | 0,0114** | 0,1030 | 0,0114** |
| | (0,003) | (0,065) | (0,003) |
| **ΔPCNS** | -0,7768*** | -0,7457*** | -0,7768*** |
| | (0,128) | (0,166) | (0,152) |
| **ΔTEL** | 0,0246 | 0,0471 | 0,0246 |
| | (0,032) | (0.048) | (0.027) |
| **MOB** | 0,0384** | 0,0171 | 0,0384** |
| | (0,014) | (0.037) | (0.013) |
| **INT** | 0,0505** | 0,0376 | 0,0505*** |
| | (0,020) | (0,038) | (0,012) |
| **Number of observations** | 324 | 324 | 324 |
| **Number of countries** | 27 | 27 | 27 |
| **$R^2$** | 0.9974 | 0.9935 | 0.9974 |

**Notes: The significance level of 10%, 5%, and 1% are indicated, respectively, by *, **, and ***. The coefficient estimates are followed by the standard errors, which are given in parentheses.**

**Table 8.** *Pooled OLS, Fixed Effect and Random Effect Results for APAC Countries*

| **Dependent variable: GDP per capita (GDP)** | | | |
|---|---|---|---|
| **Variables** | Pooled OLS | Fixed Effect | Random Effect |
| **GDP (-1)** | 0,9778*** | 0,7459*** | 0,9729*** |
| | (0,007) | (0,041) | (0,010) |
| **CPI** | 0,0323 | 0,2135* | 0,0313 |
| | (0,045) | (0,078) | (0,038) |
| **TRD** | -0,0009 | -0,0791 | -0,0006 |
| | (0,007) | (0,063) | (0,100) |
| **PCNS** | -0,0532* | -0,1872* | -0,0648 |
| | (0,022) | (0,079) | (0,034) |
| **TEL** | 0,0053 | 0,0177 | 0,0096 |
| | (0,007)l | (0.018) | (0.009) |
| **MOB** | -0,00002 | -0,0335 | -0,0105 |
| | (0,015) | (0.024) | (0.019) |
| **ΔINT** | 0,0281 | -0,0098 | 0,0193 |
| | (0,032) | (0,029) | (0,034) |
| **Number of observations** | 240 | 240 | 240 |
| **Number of countries** | 20 | 20 | 20 |
| **$R^2$** | 0.9980 | 0.9931 | 0.9979 |

**Notes: The significance level of 10%, 5%, and 1% are indicated, respectively, by *, **, and ***. The coefficient estimates are followed by the standard errors, which are given in parentheses.**

According to the pooled OLS, fixed effects and random effects estimator results for the 27 EU countries, the previous year's *GDP* -1 year strongly affects the current year's *GDP* values, and this effect is statistically significant at the 1% level in all three models. The Δ*CPI* has a positive but not statistically significant effect on *GDP* in all three prediction models. *TRD* is also found to be positive and significant at the 5% level in the pooled OLS and random effects models, but is not significant in the fixed effects model. The Δ*PCNS* has a significantly negative impact on *GDP* at the 1% level

in all three models. The Δ*TEL* and *MOB* are positive in some models but not statistically significant in others. While *INT* is found to be positive and significant at the 5% and 1% levels in the pooled OLS and random effects models, it is not significant in the fixed effects model. The results generally show the ICT components to have had positive effects on economic growth in the 27 EU countries.

According to the pooled OLS, fixed effects, and random effects estimation results obtained using data from 20 Asia-Pacific countries, *GDP* -1 year has a significantly positive effect in all models, while *CPI* shows a significantly positive effect only in the fixed effects model. *TRD* and *PCNS* show a negative effect in all models, with the effect of *PCNS* being significant in the pooled OLS and fixed effects estimations. *TEL* and Δ*INT* do not have a significant effect on GDP in all three models, though the effects are positive; only Δ*INT* shows a negative effect in the fixed effects estimation. Meanwhile, *MOB* showed a negative but not statistically significant effect in all three models. These results show the ICT components of fixed telephone lines and Internet users to have a positive effect on economic growth in the 20 APAC countries, while the number of mobile phone users has a negative effect.

### 4.3. GMM Estimator

The two-step system GMM estimator was used to examine the impact of ICT on economic growth between 2007-2019. This estimator is ideal for addressing potential issues such as endogeneity and serial correlation regarding data for both the 27 EU and 20 APAC countries. Two-step system GMM takes into account the endogenous relationships between the dependent and independent variables and reduces biases in dynamic panel data models. This approach is particularly suitable for situations where past values can influence future changes in time series data. This method was used to analyze the impact of the ICT components on economic growth separately for both regions, with the results then being comparatively evaluated. The findings for each country group are summarized in Tables 9 and 10 and accompanied by detailed analyses and interpretations.

**Table 9.** *Dynamic Panel-Data Estimation: Two-Step System GMM Results for EU Countries*

| **Dependent variable: GDP per capita (GDP)** | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | Coef. | Corrected Std. Err. | t | P > t | [95% Conf. | Interval] |
| **GDP(-1)** | 0.9353309 | 0.028855 | 32.41 | 0.000*** | 0.8760186 | 0.9946432 |
| **ΔCPI** | 0.9656473 | 0.384292 | 2.51 | 0.019* | 0.1757239 | 1.755571 |
| **TRD** | -0.0004139 | 0.0125927 | -0.03 | 0.974 | -0.0262986 | 0.0254709 |
| **ΔPCNS** | -0.7263033 | 0.1788759 | -4.06 | 0.000*** | -1.093988 | -0.3586187 |
| **ΔTEL** | 0.1001883 | 0.0742192 | 1.35 | 0.189 | -0.0523715 | 0.2527481 |
| **MOB** | 0.0766612 | 0.047375 | 1.62 | 0.118 | -0.0207195 | 0.1740419 |
| **INT** | 0.1690276 | 0.0706208 | 2.39 | 0.024* | 0.0238645 | 0.3141908 |
| **Arellano-Bond test AR(1):** | | z = -1.99 Pr > z = 0.046 | | | | |
| **Arellano-Bond test AR(2):** | | z = -0.59 Pr > z = 0.554 | | | | |
| **Sargan test:** | | chi2(34) = 74.33 Prob > chi2 = 0.000 | | | | |
| **Hansen test:** | | chi2(34) = 12.78 Prob > chi2 = 1.000 | | | | |
| **Number of observations** | | 324 | | | | |
| **Number of countries** | | 27 | | | | |
| **Number of instruments** | | 53 | | | | |

**Note: Variables with "*", "**", and "***" are significant at p<1%, p<5%, and p<10% respectively. The estimation includes year dummies as well.**

**Table 10.** *Dynamic Panel-Data Estimation: Two-Step System GMM Results for APAC Countries*

| **Dependent variable: GDP per capita (GDP)** | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | Coef. | Corrected Std. Err. | t | P > t | [95% Conf. | Interval] |
| **GDP(-1)** | 0.7626895 | 0.2055129 | 3.71 | 0.001** | 0.332546 | 1.192833 |
| **CPI** | -0.0109286 | 0.4189276 | -0.03 | 0.979 | -0.8877541 | 0.8658968 |
| **TRD** | 0.065531 | 0.0557888 | 1.17 | 0.255 | -0.0512363 | 0.1822983 |
| **PCNS** | 0.9520769 | 1.128982 | 0.84 | 0.410 | -1.410909 | 3.315063 |
| **TEL** | 0.1947948 | 0.180987 | 1.08 | 0.295 | -0.1840154 | 0.5736049 |
| **MOB** | 0.2469984 | 0.2244638 | 1.10 | 0.285 | -0.2228099 | 0.7168066 |
| **ΔINT** | -0.6581321 | 0.2819701 | -2.33 | 0.031* | -1.248302 | -0.0679619 |
| **Arellano-Bond test AR(1):** | | z = -2.21 Pr > z = 0.027 | | | | |
| **Arellano-Bond test AR(2):** | | z = -0.79 Pr > z = 0.427 | | | | |
| **Sargan test:** | | chi2(36) = 70.02 Prob > chi2 = 0.001 | | | | |
| **Hansen test:** | | chi2(36) = 2.04 Prob > chi2 = 1.000 | | | | |
| **Number of observations** | | 240 | | | | |
| **Number of countries** | | 20 | | | | |
| **Number of instruments** | | 77 | | | | |

**Note: Variables with "*", "**", and "***" are significant at p<1%, p<5%, and p<10% respectively. The estimation includes year dummies as well.**

The two-step system GMM estimates show that the *GDP* -1 year and Δ*CPI* to have had a significantly positive effect on *GDP* for the 27 EU countries, while *TRD* and Δ*PCNS* had a negative effect on *GDP*. The effect was insignificant for *TRD* and at a 1% level of significance for Δ*PCNS*. Moreover, Δ*TEL*, *MOB*, and *INT* had positive effects on *GDP*; while this effect was insignificant for Δ*TEL* and *MOB*, it is at a 5% significance level for *INT*. Similar results were also found by Appiah-Otoo and Song (2021), Kurniawati (2021), Tunalı and Güz (2021), and Farhadi and Fooladi (2020).

In addition, the validity of the model was confirmed by the Arellano-Bond and Sargan tests; however, the Sargan test indicates potential overidentification problems. The Hansen test verified the suitability of the model's instruments. These test results have been used to test the validity of the two-step system GMM estimator and the appropriateness of the instruments used in the model.

- ***Arellano-Bond Test AR(1).*** This test checks for a first-order autocorrelation, namely whether the error terms of the previous period in time series data are correlated with the current period. Due to the test statistic equaling -1.99 ($p = 0.046$), statistically significant evidence exists for a first-order autocorrelation in the model. This is generally an expected result because the error terms of the first lag are usually correlated.
- ***Arellano-Bond Test AR(2).*** This test checks for a second-order autocorrelation, namely whether the error terms of the two previous periods in time series data correlate with the current period. Due to the test statistic equaling -0.59 ($p = 0.554$), no second-order autocorrelation is present, indicating the GMM estimator to be valid.
- ***Sargan Test.*** This tests whether the instruments used in the model are over-identified. Due to the chi-square equaling 74.33 ($p = 0.000$), strong evidence exists that the instruments are over-specified, and thus some of them may be invalid.
- ***Hansen Test.*** Similar to the Sargan test, this tests the validity of instruments but is more robust for cases where the model is over-specified. Chi-square value is found to equal 12.78 (p = 1.000). This result indicates the instruments in the model to not be over-identified with the endogenous variables of the model and the specification of the model to be appropriate. In other words, the instruments used in the model are valid, and the predictions are reliable. This is a sign that the model is sound.

To briefly summarize the above results, according to the two-step system GMM estimation results, ICT had a positive impact on GDP for the 27 EU countries between 2007-2019.

According to the two-step system GMM results, consumer price index, fixed telephone lines, mobile phone users, and Internet users were observed to positively affect economic growth in the 27 European Union countries, while trade openness and final consumer expenditures had a negative effect. To explain the possible reasons for these results, *CPI* is an indicator of general price levels. A rise in *CPI* in Europe may reflect the buoyancy of economic activity and the strength of consumer demand. In this case, a mild inflation rate may increase consumer spending and investments, which then stimulates economic growth. Developing ICT infrastructure contributes to economic growth by increasing efficiency and innovation. In particular, fixed and mobile telephone services and Internet access facilitate communication between businesses and consumers, reduce transaction costs, and expand market access. Additionally, ICT stimulates growth in wider areas of the economy by supporting the digital economy and new business models such as e-commerce. A decline in trade volume may reflect a decline in global trade or the dependence of European economies on foreign trade. The negative impact on trade volume may be due to external factors such as global trade wars, protectionist policies, or economic crises. A decline in consumer spending may be related to factors such as economic uncertainty or low income growth. A decrease in consumer confidence in EU countries may limit consumption expenditures and therefore negatively affect economic growth.

According to the two-step system GMM results for the 20 APAC countries as shown in Table 10, *GDP* -1 year has a positive and statistically significant effect on *GDP* at a significance level of 1%. On the contrary, CPI had a negative and statistically insignificant effect on *GDP*. At the same time, *TRD, PCNS, TEL*, and *MOB* had a positive but insignificant effect on *GDP*, while Δ*INT* had a negative and statistically significant effect on *GDP* at a significance level of 5%. Other test results yielded the following results:

- ***Arellano-Bond Test AR(1).*** Due to the z-value equaling -2.21 ($p = 0.027$), a significant serial correlation is concluded to be present at the first lag of the model. This is an expected situation in panel data models.
- ***Arellano-Bond Test AR(2).*** Due to the z-value equaling -0.79 ($p = 0.427$), no significant serial correlation has been concluded to be present at the second lag. This indicates the model to be appropriate because no serial correlation should ideally exist at the second lag.
- ***Sargan Test.*** The chi-square(36) equaling 70.02 ($p = 0.001$) indicates overidentification problems to be present in the model. This may mean that some of the instruments that were used may be correlated with the endogenous variables of the model.

- ***Hansen Test.*** The chi-square(36) equaling 2.04 ($p = 1.000$) indicates the instruments in the model to be valid and no overidentification problem to be present.

According to these results, consumer price index had a negative and insignificant effect on GDP in the 20 APAC countries, while trade openness and final consumption expenditures had a positive and insignificant effect. To explain the possible reasons for this, the negative and insignificant effect of the consumer price index on GDP indicates that this variable does not have a direct impact on economic growth in APAC countries. This may be due to reasons such as countries in the region following different policies to combat inflation or changes in consumer prices having a less-than-expected impact on economic growth. The positive but insignificant effect of trade openness indicates the effect of this variable on economic growth to perhaps differ between countries in the region or the effect to be very small. This may indicate that the benefits some countries in the region derive from foreign trade may not be directly reflected onto economic growth or that the impact of trade policies and global trade conditions may be heterogeneous. The positive but insignificant impact of final consumption expenditures indicates these expenditures to not be a significant driver of GDP in regional economies. This can be explained by the fact that the contribution of consumption expenditures to GDP varies in the countries of the region due to different economic structures and consumption habits. Additionally, the impact of consumption expenditures on economic growth may vary depending on factors such as the structure, distribution, and financing of these expenditures.

Meanwhile, ICT can be said to have a complex impact on economic growth. In other words, neither fixed telephone lines nor mobile phone users showed a significant impact on GDP. This indicates these ICT features to have no direct positive impact on economic growth. However, the change in Internet users had a negative and statistically significant impact on GDP. This indicates that increased Internet usage may have a negative impact on economic growth in this region. Overall, these results indicate ICT to have no significant positive impact on economic growth in APAC countries, with an increase in Internet usage perhaps even having a negative impact. These findings may be related to the specific economic conditions of the region, the quality of ICT infrastructure, levels of access and use of technology, education level, and other socioeconomic factors.

Upon comparing the two-step system GMM results obtained for the 27 EU and 20 APAC countries:

- For both regions, the previous year's GDP had a positive and significant impact on the current year's GDP, indicating continuity of economic growth.
- While the consumer price index was significantly positive in the EU countries, it did not show a significant effect in APAC countries.
- Trade openness and final consumption expenditures showed no significant impact in either region.
- While the number of Internet users had a significantly positive effect in the EU, it was significantly negative in APAC. The other ICT variables showed no significant effects in either region.

This comparison shows that the impact of ICT on economic growth may vary depending on geographical and regional differences. Internet usage was seen to positively affect economic growth in the EU countries but to have the opposite effect in APAC countries. These differences may be related to the economic structure, technological infrastructure, policies, and socio-economic conditions of both regions.

## 5. Conclusion

This study has aimed to comparatively investigate the effects of ICT on economic growth over the 2007-2019 period covering 27 EU and 20 APAC countries. Because ICT is recognized as a major driver of the global economy and is rapidly evolving, examining how these impacts are shaped in different economic and geographical contexts is crucial. This study has been designed to better understand the contributions ICT makes to economic growth and to reveal how these technologies interact with different regional dynamics.

The analyses considered GDP per capita, which is a basic indicator of macroeconomic performance, as the dependent variable and took into account the number of fixed telephone lines, mobile phone users, and Internet users, which represent ICT, as the independent variables. Additionally, the analyses also included such control variables as consumer price index (*CPI*), trade openness (TRD), and final consumption expenditure (*PCNS*). This dataset was used to examine the effects ICT has on regional economic growth and to understand the dynamics between different economic structures. The data collection and analyses were carried out in order to reveal the regional differences and characteristics of the impact these technologies have on economic growth.

The two-step system GMM method was used to evaluate the effects of ICT on economic growth. This econometric method was preferred in order to address the time dependence and endogeneity problems that are especially encountered

in dynamic panel datasets. The two-step system GMM is able to deal with potentially endogenous variables in a dataset, as well as in particular to appropriately model the effects of past period values on the current period. This method takes into account time series characteristics and individual effects, allowing past values of the dependent variable to be used as instruments. This approach allows one to more accurately estimate the impact of ICT on economic growth and understand regional differences.

The Levin, Lin, and Chu unit root test was applied to the macroeconomic time series data for each country group. For the 27 EU countries, the LLC unit root test revealed *GDP, TRD, MOB*, and *INT* to be stationary at both levels and first differences. However, *CPI, PCNS*, and *TEL* were not stationary at levels but instead exhibited stationarity when first differences were taken into account. The analyses for the EU countries used *GDP, TRD, MOB*, and *INT* at the level while utilizing *CPI, PCNS,* and *TEL* in their first-difference stationary form. Conversely, the results for the 20 APAC countries indicated *GDP, CPI, TRD, PCNS, TEL*, and *MOB* to be stationary at both levels and first differences. However, INT was not stationary at the level but demonstrated stationarity at first differences. The analyses for the APAC countries used only the INT variable in its first-difference stationary form, while the other variables were employed at the level.

This study used pooled OLS, fixed effects, and random effects estimators for both country groups in the first stage. According to the pooled OLS, fixed effects, and random effects estimation results, all ICT components were found to have positive effects on economic growth in the 27 EU countries, while only the ICT components of fixed telephone lines and Internet users were observed to have a positive effect on economic growth in the 20 APAC countries, with the number of mobile phone users having a negative effect. A number of factors (e.g., market saturation, the limited economic benefits of basic mobile use, unequal access to advanced mobile technologies, differences in economic structures, regulatory challenges, and mismatched skill development within the workforce) may contribute to the negative effect that the number of mobile phone users had on economic growth in the APAC countries. These elements alone or in combination may lessen the favorable economic effects usually linked to the rise in mobile phone usage.

The results from the two-step system GMM estimation for EU countries revealed *GDP* (-1) and Δ*CPI* to have significantly and positively impacted GDP, while *TRD* and Δ*PCNS* had had a negative effect on *GDP*, with *TRD* being statistically insignificant and Δ*PCNS* being insignificant at the 1% level. Additionally, Δ*TEL*, *MOB*, and *INT* had exhibited a positive effect on GDP, with Δ*TEL* and *MOB* being insignificant and *INT* showing significance at the 5% level. In summary, ICT has demonstrated a positive impact on GDP for EU countries. Conversely, the two-step system GMM results for APAC countries indicated *GDP* (-1) to have had a positive and statistically significant effect on *GDP* at the 1% significance level. Contrarily, *CPI* had a negative and statistically insignificant effect on *GDP*. Additionally, *TRD, PCNS, TEL*, and *MOB* had positive and insignificant effects on *GDP*, while Δ*INT* had a negative and statistically significant effect on *GDP* at the 5% significance level. In conclusion, these findings suggest that ICT did not significantly contribute to positive economic growth in the APAC countries and that an increase in Internet usage may even have had a negative impact. Appiah-Otoo and Song (2021), Kurniawati (2021), Tunalı and Güz (2021), and Farhadi and Fooladi (2020) also reported similar findings.

The results from the Arellano-Bond test for both country groups indicated statistically significant evidence of first-order autocorrelation in the model with no second-order autocorrelation being observed, thus affirming the validity of the GMM estimation. Furthermore, the Sargan test results suggested strong evidence of instrument overspecification, implying that some instruments may be invalid. However, the Hansen test demonstrated the instruments in the model to not be over-identified concerning the endogenous variables, confirming the model's appropriateness and the validity of the instruments. In essence, the robustness of the model has been supported by these tests, indicating its predictions to be reliable and valid.

When comparing the two-step system GMM results obtained for the EU and APAC countries:

- For both regions, the previous year's GDP demonstrated a significantly positive impact on the current year's GDP, indicating a continuity of economic growth.
- The consumer price index exhibited a significantly positive effect in EU countries but showed no significant impact in APAC countries.
- Trade openness and final consumption expenditures demonstrated no significant impact in either region.
- Internet use had a significantly positive effect in the EU but was significantly negative in the APAC region. The other ICT variables exhibited no significant effects in either region.

This comparison shows the impact of ICT on economic growth to possibly vary depending on geographical and regional differences. Internet usage was seen to have positively affect economic growth in EU countries but to have had the opposite effect in APAC countries.

Based on the results of the study, the following recommendations can be stated regarding the impact of ICT on economic growth for both EU and APAC countries:

***For EU Countries:***

- ***Increase Digital Infrastructure Investments.*** When considering the positive impact of Internet use on economic growth, EU countries should increase investments to improve broadband access and digital infrastructure.
- ***Promote Education and Skills Development.*** Including technology and digital skills in education programs is important for being able to use ICT effectively and contribute to innovation.
- ***Support ICT R&D and Innovation.*** The development and dissemination of new technologies should be encouraged by investing more in research and development in the ICT sector.

***For APAC Countries:***

- ***Focus on Internet Access.*** When considering the negative impact Internet use had on economic growth, importance is had in reviewing Internet access policies in the region and developing strategies to improve the integration of Internet use into the economy.
- ***Improve Digital Literacy.*** Digital literacy and education programs need to be strengthened in order to encourage the effective use of technology and to reduce the digital divide.
- ***Invest in Technological Innovations.*** Regional countries should invest in R&D activities to develop technological solutions suitable for local conditions and integrate these into the economy.

These recommendations are aimed at optimizing the effects of ICT on economic growth in both regions and at maximizing the economic benefits of technological developments. Additionally, these recommendations should be tailored to take into account the unique circumstances and needs of each region.

The findings show how the effects of ICT on economic growth may vary geographically and regionally. This study makes a significant contribution to future research, especially research that wishes to examine the relationship between ICT and economic growth in different regional and economic contexts. Researchers can use this study's findings to analyze the effects of ICT on economic growth in more detail and to better understand how these effects vary under different geographical conditions. Additionally, this study provides important insights for policymakers and business leaders on how ICT strategies and investments should be shaped. By adopting the methodological approach of this research, future studies can evaluate the social and economic benefits of ICT in a broader framework and customize the effects of ICT investments on economic growth for different sectors and regions.

This study has some limitations regarding the analyses that were conducted on 27 EU and 20 APAC countries. Firstly, the datasets that were used cover a specific time period (2007-2019), which means that more recent developments and trends have been excluded. As the econometric model used in the analyses, the two-stage system GMM is also based on certain assumptions that necessitate caution when interpreting the results. In particular, the model's choice of instruments and the validity of these instruments may affect the accuracy of the study's results. Additionally, the selection and measurement of the variables used in the analyses may limit the study's findings. For example, more detailed indicators of ICT infrastructure and use may produce different results. Finally, this study is a quantitative analysis based on macroeconomic data and may not fully reflect the impact of qualitative factors or individual country conditions with regard to understanding the impact ICT has on economic growth. Future studies can take these limitations into consideration to examine the issue in greater depth using different methodologies and datasets.

**Hakem Değerlendirmesi:** Dış bağımsız.

**Yazar Katkıları:** Çalışma Konsepti/Tasarım- T.M.; Veri Toplama- T.M.; Veri Analizi/Yorumlama- T.M.; Yazı Taslağı- T.M.; İçeriğin Eleştirel İncelemesi- T.M.; Son Onay ve Sorumluluk- T.M., H.Z

**Çıkar Çatışması:** Yazarlar çıkar çatışması beyan etmemişlerdir.

**Finansal Destek:** Yazarlar finansal destek beyan etmemişlerdir.

**Peer Review:** Externally peer-reviewed.

**Author Contributions:** Conception/Design of Study- T.M.; Data Acquisition- T.M.; Data Analysis/Interpretation- T.M.; Drafting Manuscript- T.M.; Critical Revision of Manuscript- T.M. ; Final Approval and Accountability- T.M., H.Z.

**Conflict of Interest:** Authors declared no conflict of interest.

**Financial Disclosure:** Authors declared no financial support.

**ORCID:**

Tamerlan Mashadihasanlı 0000-0002-8186-8420
Haluk Zülfikar 0000-0002-9712-5373

## REFERENCES / KAYNAKLAR

Adedoyin, F. F., Bekun, F. V., Driha, O. M., & Balsalobre-Lorente, D. (2020). The effects of air transportation, energy, ICT and FDI on economic growth in the industry 4.0 era: Evidence from the United States. *Technological Forecasting and Social Change, 160*, 120297.

Agarwal, S., Sharma, G., Jhingran, V., Sharma, V., & Rawat, Y. (2018). Role of ICT in economic growth of India. *In Disruptive Technologies Transforming Businesses Conference.* Kanpur.

Alper, F. Ö. (2018). Bilgi ve İletişim Teknolojilerinin Ekonomik Büyüme ve İşsizlik Üzerine Etkisi: *Seçilmiş AB Ülkeleri ve Türkiye Örneği. Yasama Dergisi(36)*, 45-65.

Alshubiri, F., Jamil, S. A., & Elheddad, M. (2019). The impact of ICT on financial development: Empirical evidence from the Gulf Cooperation Council countries. international *Journal of engineering business management, 11*, 1847979019870670.

Appiah-Otoo, I., & Song, N. (2021). The impact of ICT on economic growth-Comparing rich and poor countries. *Telecommunications Policy, 45*(2).

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of econometrics, 68*(1), 29-51.

Asongu, S. A., & Odhiambo, N. M. (2019). How enhancing information and communication technology has affected inequality in Africa for sustainable development: An empirical investigation. *Sustainable Development, 27*(4), 647-656.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics, 87*(1), 115-143.

Chakpitak, N., Maneejuk, P., Chanaim, S., & Sriboonchitta, S. (2018). Thailand in the era of digital economy: How does digital technology promote economic growth?. In Predictive *Econometrics and Big Data TES2018* (pp. 350-362). Springer International Publishing.

Czernich, N., Falck, O., Kretschmer, T., & Woessmann, L. (2011). Broadband infrastructure and economic growth. *The Economic Journal, 121*(552), 505-532.

David, O. O., & Grobler, W. (2020). Information and communication technology penetration level as an impetus for economic growth and development in Africa. *Economic research-Ekonomska istraživanja, 33*(1), 1394-1418.

Donou-Adonsou, F., & Lim, S. (2018). On the importance of Chinese investment in Africa. *Review of development finance, 8*(1), 63-73.

Farhadi, M., & Fooladi, M. (2020). Impact of Information and Communication Technology Access on Economic Growth. *Journal of Practical Information Technology, 1(3)*, 11-22.

Ghosh, S. (2017). Broadband penetration and economic growth: Do policies matter?. *Telematics and informatics, 34(5)*, 676-693.

Hansen, L. 1982. Large sample properties of generalized method of moments estimators. *Econometrica 50(3)*: 1029–1054.

Hekim Yılmaz, D., & Kırışkan, I. (2020). Türkiye'de Telekomünikasyon Altyapısı ve Ekonomik Büyüme. *Türk Dünyası Sosyal Bilimler Dergisi(92)*, 55-84.

Ishida, H. (2015). The effect of ICT development on economic growth and energy consumption in Japan. *Telematics and Informatics, 32(1)*, 79-88.

Khan, H., Khan, U., Jiang, L. J., & Khan, M. A. (2020). Impact of infrastructure on economic growth in South Asia: Evidence from pooled mean group estimation. *The Electricity Journal, 33(5)*, 106735.

Koç, Ü. (2021). Bilişim Teknolojileri ve Ekonomik Büyüme. *Üçüncü Sektör Sosyal Ekonomi Dergisi, 56(2)*, 1231-1244.

Kumar, R. R., Stauvermann, P. J., & Samitas, A. (2016). The effects of ICT∗ on output per worker: A study of the Chinese economy. *Telecommunications Policy, 40(2-3)*, 102-115.

Kurniawati, M. A. (2020). The role of ICT infrastructure, innovation and globalization on economic growth in OECD countries, 1996-2017. *Journal of Science and Technology Policy Management, 11(2)*, 193-215.

Kurniawati, M. A. (2021). Analysis of the impact of information communication technology on economic growth: empirical evidence from Asian countries. *Journal of Asian Business and Economic Studies*, 1-17.

Myovella, G., Karacuka, M., & Haucap, J. (2020). Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies. *Telecommunications Policy, 44(2)*.

Nair, M., Pradhan, R. P., & Arvin, M. B. (2020). Endogenous dynamics between R&D, ICT and economic growth: Empirical evidence from the OECD countries. *Technology in Society, 62*, 101315.

Niebel, T. (2018). ICT and economic growth – Comparing developing, emerging and developed countries. *World Development(104)*, 197-211.

Salahuddin, M., & Alam, K. (2015). Internet usage, electricity consumption and economic growth in Australia: A time series evidence. *Telematics and Informatics, 32(4)*, 862-878.

Salahuddin, M., & Gow, J. (2016). The effects of Internet usage, financial development and trade openness on economic growth in South Africa: A time series analysis. *Telematics and Informatics, 33(4)*, 1141-1154.

Sargan, J. 1958. The estimation of economic relationships using instrumental variables. *Econometrica 26(3)*: 393–415.

Tunalı, H., & Güz, T. (2021). Bilgi ve İletişim Teknolojileri Gelişim Endeksi ve Ekonomik Büyüme İlişkisinin Panel Veri Modelleri ile Karşılaştırmalı Analizi. *İktisadi İdari ve Siyasal Araştırmalar Dergisi, 6(15)*, 249-261.

Zhang, J., & Danish. (2019). The dynamic linkage between information and communication technology, human development index, and economic growth: evidence from Asian economies. *Environmental Science and Pollution Research, 26,* 26982-26990.

Zhou, X., Zhou, D., & Wang, Q. (2018). How does information and communication technology affect China's energy intensity? A three-tier structural decomposition analysis. *Energy, 151*, 748-759.

**How cite this article / Atıf biçinmi**

Mashadihasanlı, T., Zülfikar, H. (2024). How Does Information and Communication Technologies Affect Economic Growth? A Comparative Analysis of the Economies of the European Union and Asia-Pacific Region. *İktisat Politikası Araştırmaları Dergisi - Journal of Economic Policy Researches, 11*(1), 99–114. https://doi.org/10.26650/JEPR1392777

## TANIM

İktisat Politikası Araştırmaları Dergisi-Journal of Economic Policy Researches, İstanbul Üniversitesi Ekonomi Politikaları Uygulama ve Araştırma Merkezi'nin yayınıdır. Açık erişimli, hakemli, uluslararası bilimsel bir dergi olarak yılda iki kere Ocak ve Temmuz aylarında yayınlanır. Dergiye yayınlanması için gönderilen bilimsel makaleler Türkçe ya da İngilizce olmalıdır.

## AMAÇ KAPSAM

İktisat Politikası Araştırmaları Dergisi-Journal of Economic Policy Researches, ulusal ve küresel düzeyde etkili olan iktisat politikaları üzerine yapılan kaliteli araştırma makaleleri yayınlamayı amaçlayan uluslararası hakemli bir dergidir. İktisat teorisi ve uygulamaları için uluslararası bir tartışma forumu niteliğindedir. Dergi, iktisat araştırmaları üzerinde uzun dönemli etkileri olacak seçkin ve güncel konularda referans niteliği taşıyan makaleler yayınlamayı hedeflemektedir. İktisat Politikası Araştırmaları Dergisi – Journal of Economic Policy Researches, politik iktisat, para teorisi ve politikası, maliye politikaları, finansal iktisat, kalkınma ekonomisi, çalışma ekonomisi, mikro ve makro teori, ulaştırma ekonomisi, uluslararası ticaret ve finans gibi birçok alanda analitik, yorumlayıcı ve ampirik çalışmaları kapsar.

## EDİTORYAL POLİTİKALAR VE HAKEM SÜRECİ

### Yayın Politikası

Dergi yayın etiğinde en yüksek standartlara bağlıdır ve Committee on Publication Ethics (COPE), Directory of Open Access Journals (DOAJ), Open Access Scholarly Publishers Association (OASPA) ve World Association of Medical Editors (WAME) tarafından yayınlanan etik yayıncılık ilkelerini benimser; Principles of Transparency and Best Practice in Scholarly Publishing başlığı altında ifade edilen ilkeler için: https://publicationethics.org/resources/guidelines-new/principles-transparency-and-best-practice-scholarly-publishing

Gönderilen makaleler derginin amaç ve kapsamına uygun olmalıdır. Orijinal, yayınlanmamış ve başka bir dergide değerlendirme sürecinde olmayan, her bir yazar tarafından içeriği ve gönderimi onaylanmış yazılar değerlendirmeye kabul edilir.

Makale yayınlanmak üzere Dergiye gönderildikten sonra yazarlardan hiçbirinin ismi, tüm yazarların yazılı izni olmadan yazar listesinden silinemez ve yeni bir isim yazar olarak eklenemez ve yazar sırası değiştirilemez.

İntihal, duplikasyon, sahte yazarlık/inkar edilen yazarlık, araştırma/veri fabrikasyonu, makale dilimleme, dilimleyerek yayın, telif hakları ihlali ve çıkar çatışmasının gizlenmesi, etik dışı davranışlar olarak kabul edilir. Kabul edilen etik standartlara uygun olmayan tüm makaleler yayından çıkarılır. Buna yayından sonra tespit edilen olası kuraldışı, uygunsuzluklar içeren makaleler de dahildir.

### İntihal

Ön kontrolden geçirilen makaleler, iThenticate yazılımı kullanılarak intihal için taranır. İntihal/kendi kendine intihal tespit edilirse yazarlar bilgilendirilir. Editörler, gerekli olması halinde makaleyi değerlendirme ya da üretim sürecinin çeşitli aşamalarında intihal kontrolüne tabi tutabilirler. Yüksek benzerlik oranları, bir makalenin kabul edilmeden önce ve hatta kabul edildikten sonra reddedilmesine neden olabilir. Makalenin türüne bağlı olarak, bunun oranın %15 veya %20'den az olması beklenir.

### Çift Kör Hakemlik

İntihal kontrolünden sonra, uygun olan makaleler baş editör tarafından orijinallik, metodoloji, işlenen konunun önemi ve dergi kapsamı ile uyumluluğu açısından değerlendirilir. Editör, makalelerin adil bir şekilde çift taraflı kör hakemlikten geçmesini sağlar ve makale biçimsel esaslara uygun ise, gelen yazıyı yurtiçinden ve /veya yurtdışından en az iki hakemin değerlendirmesine sunar, hakemler gerek gördüğü takdirde yazıda istenen değişiklikler yazarlar tarafından yapıldıktan sonra yayınlanmasına onay verir.

**Genel İlkeler**

Daha önce yayınlanmamış ya da yayınlanmak üzere başka bir dergide halen değerlendirmede olmayan ve her bir yazar tarafından onaylanan makaleler değerlendirilmek üzere kabul edilir.

Ön değerlendirmeyi geçen yazılar iThenticate intihal tarama programından geçirilir. İntihal incelemesinden sonra, uygun makaleler Editör tarafından orijinaliteleri, metodolojileri, makalede ele alınan konunun önemi ve derginin kapsamına uygunluğu açısından değerlendirilir.

Bilimsel toplantılarda sunulan özet bildiriler, makalede belirtilmesi koşulu ile kaynak olarak kabul edilir. Editör, gönderilen makale biçimsel esaslara uygun ise, gelen yazıyı yurtiçinden ve/veya yurtdışından en az iki hakemin değerlendirmesine sunar, hakemler gerek gördüğü takdirde yazıda istenen değişiklikler yazarlar tarafından yapıldıktan sonra yayınlanmasına onay verir.

Makale yayınlanmak üzere Dergiye gönderildikten sonra yazarlardan hiçbirinin ismi, tüm yazarların yazılı izni olmadan yazar listesinden silinemez ve yeni bir isim yazar olarak eklenemez ve yazar sırası değiştirilemez. Yayına kabul edilmeyen makale, resim ve fotoğraflar yazarlara geri gönderilmez.

**Yazarların Sorumluluğu**

Makalelerin bilimsel ve etik kurallara uygunluğu yazarların sorumluluğundadır. Yazar makalenin orijinal olduğu, daha önce başka bir yerde yayınlanmadığı ve başka bir yerde, başka bir dilde yayınlanmak üzere değerlendirmede olmadığı konusunda teminat sağlamalıdır. Uygulamadaki telif kanunları ve anlaşmaları gözetilmelidir. Telife bağlı materyaller (örneğin tablolar, şekiller veya büyük alıntılar) gerekli izin ve teşekkürle kullanılmalıdır. Başka yazarların, katkıda bulunanların çalışmaları ya da yararlanılan kaynaklar uygun biçimde kullanılmalı ve referanslarda belirtilmelidir.

Gönderilen makalede tüm yazarların akademik ve bilimsel olarak doğrudan katkısı olmalıdır, bu bağlamda "yazar" yayınlanan bir araştırmanın kavramsallaştırılmasına ve dizaynına, verilerin elde edilmesine, analizine ya da yorumlanmasına belirgin katkı yapan, yazının yazılması ya da bunun içerik açısından eleştirel biçimde gözden geçirilmesinde görev yapan birisi olarak görülür. Yazar olabilmenin diğer koşulları ise, makaledeki çalışmayı planlamak veya icra etmek ve / veya revize etmektir. Fon sağlanması, veri toplanması ya da araştırma grubunun genel süpervizyonu tek başına yazarlık hakkı kazandırmaz. Yazar olarak gösterilen tüm bireyler sayılan tüm ölçütleri karşılamalıdır ve yukarıdaki ölçütleri karşılayan her birey yazar olarak gösterilebilir. Yazarların isim sıralaması ortak verilen bir karar olmalıdır. Tüm yazarlar yazar sıralamasını Telif Hakkı Anlaşması Formunda imzalı olarak belirtmek zorundadırlar.

Yazarlık için yeterli ölçütleri karşılamayan ancak çalışmaya katkısı olan tüm bireyler "teşekkür / bilgiler" kısmında sıralanmalıdır. Bunlara örnek olarak ise sadece teknik destek sağlayan, yazıma yardımcı olan ya da sadece genel bir destek sağlayan, finansal ve materyal desteği sunan kişiler verilebilir.

Bütün yazarlar, araştırmanın sonuçlarını ya da bilimsel değerlendirmeyi etkileyebilme potansiyeli olan finansal ilişkiler, çıkar çatışması ve çıkar rekabetini beyan etmelidirler. Bir yazar kendi yayınlanmış yazısında belirgin bir hata ya da yanlışlık tespit ederse, bu yanlışlıklara ilişkin düzeltme ya da geri çekme için editör ile hemen temasa geçme ve işbirliği yapma sorumluluğunu taşır.

**Hakem Süreci**

Daha önce yayınlanmamış ya da yayınlanmak üzere başka bir dergide halen değerlendirmede olmayan ve her bir yazar tarafından onaylanan makaleler değerlendirilmek üzere kabul edilir. Gönderilen ve ön kontrolü geçen makaleler iThenticate yazılımı kullanılarak plagiarizm için taranır. Plagiarizm kontrolünden sonra, uygun olan makaleler baş editör tarafından orijinallik, metodoloji, işlenen konunun önemi ve dergi kapsamı ile uyumluluğu açısından değerlendirilir. Editör, makaleleri, yazarların etnik kökeninden, cinsiyetinden, cinsel yöneliminden, uyruğundan, dini inancından ve siyasi felsefesinden bağımsız olarak değerlendirir. Yayına gönderilen makalelerin adil bir şekilde çift taraflı kör hakem değerlendirmesinden geçmelerini sağlar.

Seçilen makaleler en az iki ulusal/uluslararası hakeme değerlendirmeye gönderilir; yayın kararı, hakemlerin talepleri doğrultusunda yazarların gerçekleştirdiği düzenlemelerin ve hakem sürecinin sonrasında baş editör tarafından verilir.

Hakemlerin değerlendirmeleri objektif olmalıdır. Hakem süreci sırasında hakemlerin aşağıdaki hususları dikkate alarak değerlendirmelerini yapmaları beklenir.

- Makale yeni ve önemli bir bilgi içeriyor mu?
- Öz, makalenin içeriğini net ve düzgün bir şekilde tanımlıyor mu?
- Yöntem bütünlüklü ve anlaşılır şekilde tanımlanmış mı?
- Yapılan yorum ve varılan sonuçlar bulgularla kanıtlanıyor mu?
- Alandaki diğer çalışmalara yeterli referans verilmiş mi?
- Dil kalitesi yeterli mi?

Hakemler, gönderilen makalelere ilişkin tüm bilginin, makale yayınlanana kadar gizli kalmasını sağlamalı ve yazar tarafında herhangi bir telif hakkı ihlali ve intihal fark ederlerse editöre raporlamalıdırlar. Hakem, makale konusu hakkında kendini vasıflı hissetmiyor ya da zamanında geri dönüş sağlaması mümkün görünmüyorsa, editöre bu durumu bildirmeli ve hakem sürecine kendisini dahil etmemesini istemelidir.

Değerlendirme sürecinde editör hakemlere gözden geçirme için gönderilen makalelerin, yazarların özel mülkü olduğunu ve bunun imtiyazlı bir iletişim olduğunu açıkça belirtir. Hakemler ve yayın kurulu üyeleri başka kişilerle makaleleri tartışamazlar. Hakemlerin kimliğinin gizli kalmasına özen gösterilmelidir.

## AÇIK ERİŞİM İLKESİ

Dergi açık erişimlidir ve derginin tüm içeriği okura ya da okurun dahil olduğu kuruma ücretsiz olarak sunulur. Okurlar, ticari amaç haricinde, yayıncı ya da yazardan izin almadan dergi makalelerinin tam metnini okuyabilir, indirebilir, kopyalayabilir, arayabilir ve link sağlayabilir. Bu BOAI açık erişim tanımıyla uyumludur.

Derginin açık erişimli makaleleri Creative Commons Atıf-GayrıTicari 4.0 Uluslararası (CC BY-NC 4.0) (https://creativecommons.org/licenses/by-nc/4.0/deed.tr) olarak lisanslıdır.

## ETİK

### Yayın Etiği İlke ve Standartları

İktisat Politikası Araştırmaları Dergisi-Journal of Economic Policy Researches, yayın etiğinde en yüksek standartlara bağlıdır ve Committee on Publication Ethics (COPE), Directory of Open Access Journals (DOAJ), Open Access Scholarly Publishers Association (OASPA) ve World Association of Medical Editors (WAME) tarafından yayınlanan etik yayıncılık ilkelerini benimser; Principles of Transparency and Best Practice in Scholarly Publishing başlığı altında ifade edilen ilkeler için adres: https://publicationethics.org/resources/guidelines-new/principles-transparency-and-best-practice-scholarly-publishing

Gönderilen tüm makaleler orijinal, yayınlanmamış ve başka bir dergide değerlendirme sürecinde olmamalıdır. Yazar makalenin orijinal olduğu, daha önce başka bir yerde yayınlanmadığı ve başka bir yerde, başka bir dilde yayınlanmak üzere değerlendirmede olmadığını beyan etmelidir. Uygulamadaki telif kanunları ve anlaşmaları gözetilmelidir. Telife bağlı materyaller (örneğin tablolar, şekiller veya büyük alıntılar) gerekli izin ve teşekkürle kullanılmalıdır. Başka yazarların, katkıda bulunanların çalışmaları ya da yararlanılan kaynaklar uygun biçimde kullanılmalı ve referanslarda belirtilmelidir. Her bir makale editörlerden biri ve en az iki hakem tarafından çift kör değerlendirmeden geçirilir. İntihal, duplikasyon, sahte yazarlık/inkar edilen yazarlık, araştırma/veri fabrikasyonu, makale dilimleme, dilimleyerek yayın, telif hakları ihlali ve çıkar çatışmasının gizlenmesi, etik dışı davranışlar olarak kabul edilir.

Kabul edilen etik standartlara uygun olmayan tüm makaleler yayından çıkarılır. Buna yayından sonra tespit edilen olası kuraldışı, uygunsuzluklar içeren makaleler de dahildir.

### Araştırma Etiği

İstanbul İktisat Dergisi araştırma etiğinde en yüksek standartları gözetir ve aşağıda tanımlanan uluslararası araştırma etiği ilkelerini benimser. Makalelerin etik kurallara uygunluğu yazarların sorumluluğundadır.

- Araştırmanın tasarlanması, tasarımın gözden geçirilmesi ve araştırmanın yürütülmesinde, bütünlük, kalite ve şeffaflık ilkeleri sağlanmalıdır.

- Araştırma ekibi ve katılımcılar, araştırmanın amacı, yöntemleri ve öngörülen olası kullanımları; araştırmaya katılımın gerektirdikleri ve varsa riskleri hakkında tam olarak bilgilendirilmelidir.
- Araştırma katılımcılarının sağladığı bilgilerin gizliliği ve yanıt verenlerin gizliliği sağlanmalıdır. Araştırma katılımcıların özerkliğini ve saygınlığını koruyacak şekilde tasarlanmalıdır.
- Araştırma katılımcıları gönüllü olarak araştırmada yer almalı, herhangi bir zorlama altında olmamalıdırlar.
- Katılımcıların zarar görmesinden kaçınılmalıdır. Araştırma, katılımcıları riske sokmayacak şekilde planlanmalıdır.
- Araştırma bağımsızlığıyla ilgili açık ve net olunmalı; çıkar çatışması varsa belirtilmelidir.
- İnsan denekler ile yapılan deneysel çalışmalarda, araştırmaya katılmaya karar veren katılımcıların yazılı bilgilendirilmiş onayı alınmalıdır. Çocukların ve vesayet altındakilerin veya tasdiklenmiş akıl hastalığı bulunanların yasal vasisinin onayı alınmalıdır.
- Çalışma herhangi bir kurum ya da kuruluşta gerçekleştirilecekse bu kurum ya da kuruluştan çalışma yapılacağına dair onay alınmalıdır.
- İnsan öğesi bulunan çalışmalarda, "yöntem" bölümünde katılımcılardan "bilgilendirilmiş onam" alındığının ve çalışmanın yapıldığı kurumdan etik kurul onayı alındığı belirtilmesi gerekir.

## DİL

Derginin yayın dili Türkçe ve Amerikan İngilizcesi'dir.

## YAZILARIN HAZIRLANMASI VE YAZIM KURALLARI

Aksi belirtilmedikçe gönderilen yazılarla ilgili tüm yazışmalar ilk yazarla yapılacaktır. Makale gönderimi online olarak ve http://jepr.istanbul.edu.tr adresinden erişilen http://dergipark.gov.tr/login üzerinden yapılmalıdır. Gönderilen yazılar, makale türünü belirten ve makaleyle ilgili detayları içeren (bkz: Son Kontrol Listesi) kapak sayfası ve sunuş yazısı ile gönderilmelidir. Makaleler, Microsoft Word 2003 ve üzerindeki versiyonları ile yazılmalıdır. Ayrıca tüm yazarların imzaladığı Telif Hakkı Anlaşması Formu eklenerek gönderilmelidir.

1. Çalışmalar, A4 boyutundaki kağıdın bir yüzüne, üst, alt, sağ ve sol taraftan 2,5 cm. boşluk bırakılarak, 12 punto Times New Roman harf karakterleriyle, Türkçe font kullanılarak ve 1,5 satır aralık ölçüsü ile hazırlanmalıdır.
2. Gönderilen makalelerin şekil, grafik ve tabloları derginin belirttiği formata uygun olması gereklidir. Dipnotlar, grafikler ve tablolar olabildiğince atıf yapılan sayfada veya hemen devamında yer almalıdır. Grafik ve tabloların altındaki notlar bu materyalleri ana metne bakmaksızın anlaşılabilir hale getirme amacını taşımalıdır. Metne konan tablolar yazılım programı çıktısı olarak konmamalı, sonuçları yazar/lar kendileri tablo haline getirmelidir, tablolar mümkün olduğunca A4 kağıt boyutuna uygun düzenlenmiş olmalıdır. Grafiklerin bilgisayar yazılım programı çıktısı olmamaları, çizim veya çizim resim halinde ve A4 kağıt boyutunu aşmayacak şekilde düzenlenmiş olmaları gerekmektedir
3. Giriş bölümünden önce 200-250 kelimelik Türkçe ve İngilizce öz ile 600-800 kelimelik İngilizce genişletilmiş özet yer almalıdır. Özetlerde; amaç, yöntem, bulgular ve sonuç bilgilerinin yer almasına özen gösterilmelidir. İngilizce ve Türkçe özlerin altında çalışmanın içeriğini temsil eden, 5 adet Türkçe, 5 adet İngilizce anahtar kelime yer almalıdır. Özlerde kısaltma kullanılmamalıdır.
4. Gönderilen makalelerde mutlaka, iki rakamlı düzeyde (örneğin; Q11) üç adet JEL (Journal of Economic Literature) sınıflaması yapılmalıdır. Makalenin konu başlığına göre seçilmesi gereken jel sınıflamaları için http://www.aeaweb.org/journal/jel_class_system.html adresinden yararlanılabilir.
5. Çalışmaların başlıca şu unsurları içermesi gerekmektedir: Türkçe başlık, öz ve anahtar kelimeler; İngilizce başlık öz ve anahtar kelimeler; İngilizce genişletilmiş özet, ana metin bölümleri, son notlar ve kaynaklar.
6. Araştırma makalesi bölümleri şu şekilde sıralanmalıdır: "Giriş", "Amaç ve Yöntem", "Bulgular" "Tartışma ve Sonuç", "Son Notlar", "Kaynaklar", "Tablolar ve Şekiller". Derleme ve yorum yazıları için ise, çalışmanın öneminin

belirtildiği, sorunsal ve amacın somutlaştırıldığı "Giriş" bölümünün ardından diğer bölümler gelmeli ve çalışma "Tartışma ve Sonuç", "Son Notlar", "Kaynaklar" ve "Tablolar ve Şekiller" şeklinde bitirilmelidir.

7. "Online Makale Sistemine" Türkçe ve İngilizce öz, makale metni ve kaynakça bilgilerinin yer aldığı tek bir Word dosyasının yüklenmesi gerekmektedir. Yazar/ların özgeçmişlerini içeren dosya, ve yazar/ların detaylı iletişim bilgilerini içeren sunum yazısı ile makale kapak sayfası ek dosya olarak yüklenmelidir.
8. Kapak sayfasında, makalenin başlığı, yazar veya yazarların bağlı bulundukları kurum ve unvanları, kendilerine ulaşılabilecek adresler, cep, iş ve faks numaraları, ORCID ve e-posta adresleri yer almalıdır (bkz. Son Kontrol Listesi).
9. Makalelerde dile getirilen düşüncelerden yazarları sorumludur.
10. Makalelerde Türk Dil Kurumu'nun (TDK yazım kılavuzu ve yazım kuralları örnek alınmalıdır. Detaylı bilgi için TDK'nın web sayfasına bakınız: *www.tdk.gov.tr*. Yabancı sözcükler yerine olabildiğince Türkçe sözlükler kullanılmalıdır. Türkçe'de alışılmamış sözcükler kullanılırken ilk geçtiği yerde yabancı dildeki karşılığı parantez içinde verilebilir.
11. İngilizce dilinde gönderilen makalelerin ve Türkçe gönderilen makalelerin İngilizce yazılmış bölümlerinin, gönderim öncesinde yetkin bir dil kontrolünden geçirilmiş olması gerekmektedir. İçerikten bağımsız olarak, dil yönüyle yetersiz olan makaleler iade/ret edilmektedir. Yazarların bu hususa azami dikkat göstermeleri önemlidir.
12. Makale sunum ve değerlendirme süreçlerine ilişkin tüm iletişim e-mail sistemi ile gerçekleştirilir. Telefonla bilgi verilmez.
13. Kaynaklara atıf ve referans formatı ilgili ayrıntılı bilgi Kaynaklar başlığı altında yer almaktadır.

**Kaynaklar**

Derleme yazıları okuyucular için bir konudaki kaynaklara ulaşmayı kolaylaştıran bir araç olsa da, her zaman orijinal çalışmayı doğru olarak yansıtmaz. Bu yüzden mümkün olduğunca yazarlar orijinal çalışmaları kaynak göstermelidir.

Kabul edilmiş ancak henüz sayıya dahil edilmemiş makaleler Early View olarak yayınlanır ve bu makalelere atıflar "advance online publication" şeklinde verilmelidir. Genel bir kaynaktan elde edilemeyecek temel bir konu olmadıkça "kişisel iletişimlere" atıfta bulunulmamalıdır. Eğer atıfta bulunulursa parantez içinde iletişim kurulan kişinin adı ve iletişimin tarihi belirtilmelidir. Bilimsel makaleler için yazarlar bu kaynaktan yazılı izin ve iletişimin doğruluğunu gösterir belge almalıdır. Kaynakların doğruluğundan yazar(lar) sorumludur. Tüm kaynaklar metinde belirtilmelidir. Kaynaklar alfabetik olarak sıralanmalıdır.

**Referans Stili ve Formatı**

İktisat Politikası Araştırmaları Dergisi-Journal of Economic Policy Researches, metin içi alıntılama ve kaynak gösterme için APA (American Psychological Association) kaynak sitilinin 6. edisyonunu benimser. APA 6. Edisyon hakkında bilgi için:

- American Psychological Association. (2010). Publication manual of the American Psychological Association ($6^{th}$ ed.). Washington, DC: APA.
- http://www.apastyle.org/

**Metin İçinde Kaynak Gösterme**

Kaynaklar metinde parantez içinde yazarların soyadı ve yayın tarihi yazılarak belirtilmelidir. Birden fazla kaynak gösterilecekse kaynaklar arasında (;) işareti kullanılmalıdır. Kaynaklar alfabetik olarak sıralanmalıdır.

**Örnekler:**

***Birden fazla kaynak;***
(Esin ve ark., 2002; Karasar 1995)

***Tek yazarlı kaynak;***
(Akyolcu, 2007)
***İki yazarlı kaynak;***
(Sayıner ve Demirci, 2007, s. 72)
***Üç, dört ve beş yazarlı kaynak;***
Metin içinde ilk kullanımda: (Ailen, Ciambrune ve Welch, 2000, s. 12–13) Metin içinde tekrarlayan kullanımlarda: (Ailen ve ark., 2000)
***Altı ve daha çok yazarlı kaynak;***
(Çavdar ve ark., 2003)

**Kaynaklar Bölümünde Kaynak Gösterme**

Kullanılan tüm kaynaklar metnin sonunda ayrı bir bölüm halinde yazar soyadlarına göre alfabetik olarak numaralandırılmadan verilmelidir.

**Kaynak yazımı ile ilgili örnekler aşağıda verilmiştir.**

**Kitap**

***a) Türkçe Kitap***
Karasar, N. (1995). *Araştırmalarda rapor hazırlama* (8.bs). Ankara: 3A Eğitim Danışmanlık Ltd.
***b) Türkçeye Çevrilmiş Kitap***
Mucchielli, A. (1991). *Zihniyetler* (A. Kotil, Çev.). İstanbul: İletişim Yayınları.
***c) Editörlü Kitap***
Ören, T., Üney, T. ve Çölkesen, R. (Ed.). (2006). *Türkiye bilişim ansiklopedisi*. İstanbul: Papatya Yayıncılık.
***d) Çok Yazarlı Türkçe Kitap***
Tonta, Y., Bitirim, Y. ve Sever, H. (2002). *Türkçe arama motorlarında performans değerlendirme*.Ankara: Total Bilişim.
***e) İngilizce Kitap***
Kamien R., & Kamien A. (2014). *Music: An appreciation*. New York, NY: McGraw-Hill Education.
***f) İngilizce Kitap İçerisinde Bölüm***
Bassett, C. (2006). Cultural studies and new media. In G. Hall & C. Birchall (Eds.), *New cultural studies: Adventures in theory* (pp. 220–237). Edinburgh, UK: Edinburgh University Press.
***g) Türkçe Kitap İçerisinde Bölüm***
Erkmen, T. (2012). Örgüt kültürü: Fonksiyonları, öğeleri, işletme yönetimi ve liderlikteki önemi. M. Zencirkıran (Ed.), *Örgüt sosyolojisi kitabı* içinde (s. 233–263). Bursa: Dora Basım Yayın.
***h) Yayımcının ve Yazarın Kurum Olduğu Yayın***
Türk Standartları Enstitüsü. (1974). *Adlandırma ilkeleri*. Ankara: Yazar.

**Makale**

***a) Türkçe Makale***
Mutlu, B. ve Savaşer, S. (2007). Çocuğu ameliyat sonrası yoğun bakımda olan ebeveynlerde stres nedenleri ve azaltma girişimleri. *İstanbul Üniversitesi Florence Nightingale Hemşirelik Dergisi, 15*(60), 179–182.
***b) İngilizce Makale***
de Cillia, R., Reisigl, M., & Wodak, R. (1999). The discursive construction of national identity. *Discourse and Society, 10*(2), 149–173. http://dx.doi.org/10.1177/0957926599010002002
***c) Yediden Fazla Yazarlı Makale***
Lal, H., Cunningham, A. L., Godeaux, O., Chlibek, R., Diez-Domingo, J., Hwang, S.-J. Heineman, T. C. (2015). Efficacy of an adjuvanted herpes zoster subunit vaccine in older adults. *New England Journal of Medicine, 372*, 2087–2096. http://dx.doi.org/10.1056/NEJMoa1501184
***d) DOI'si Olmayan Online Edinilmiş Makale***

Al, U. ve Doğan, G. (2012). Hacettepe Üniversitesi Bilgi ve Belge Yönetimi Bölümü tezlerinin atıf analizi. *Türk Kütüphaneciliği, 26*, 349–369. Erişim adresi: http://www.tk.org.tr/

***e) DOI'si Olan Makale***

Turner, S. J. (2010). Website statistics 2.0: Using Google Analytics to measure library website effectiveness. *Technical Services Quarterly, 27*,261–278. http://dx.doi.org/10.1080/07317131003765910

***f) Advance Online Olarak Yayımlanmış Makale***

Smith, J. A. (2010). Citing advance online publication: A review. *Journal of Psychology*. Advanceonline publication. http://dx.doi.org/10.1037/a45d7867

***g) Popüler Dergi Makalesi***

Semercioğlu, C. (2015, Haziran). Sıradanlığın rayihası. *Sabit Fikir, 52*, 38–39.

**Tez, Sunum, Bildiri**

***a) Türkçe Tezler***

Sarı, E. (2008). *Kültür kimlik ve politika: Mardin'de kültürlerarasılık*. (Doktora Tezi). Ankara Üniversitesi Sosyal Bilimler Enstitüsü, Ankara.

***b) Ticari Veritabanında Yer Alan Yüksek Lisans Ya da Doktora Tezi***

Van Brunt, D. (1997). *Networked consumer health information systems* (Doctoral dissertation). Available from ProQuest Dissertations and Theses. (UMI No. 9943436)

***c) Kurumsal Veritabanında Yer Alan İngilizce Yüksek Lisans/Doktora Tezi***

Yaylalı-Yıldız, B. (2014). *University campuses as places of potential publicness: Exploring the politicals, social and cultural practices in Ege University* (Doctoral dissertation). Retrieved from: Retrieved from http://library.iyte.edu.tr/tr/hizli-erisim/iyte-tez-portali

***d) Web'de Yer Alan İngilizce Yüksek Lisans/Doktora Tezi***

Tonta, Y. A. (1992). *An analysis of search failures in online library catalogs* (Doctoral dissertation, University of California, Berkeley). Retrieved from http://yunus.hacettepe.edu.tr/ tonta/yayinlar/phd/ickapak.html

***e) Dissertations Abstracts International'da Yer Alan Yüksek Lisans/Doktora Tezi***

Appelbaum, L. G. (2005). Three studies of human information processing: Texture amplification, motion representation, and figure-ground segregation. *Dissertation Abstracts International: Section B. Sciences and Engineering, 65*(10), 5428.

***f) Sempozyum Katkısı***

Krinsky-McHale, S. J., Zigman, W. B., & Silverman, W. (2012, August). Are neuropsychiatric symptoms markers of prodromal Alzheimer's disease in adults with Down syndrome? In W. B. Zigman (Chair), *Predictors of mild cognitive impairment, dementia, and mortality in adults with Down syndrome*. Symposium conducted at American Psychological Association meeting, Orlando, FL.

***g) Online Olarak Erişilen Konferans Bildiri Özeti***

Çınar, M., Doğan, D. ve Seferoğlu, S. S. (2015, Şubat). *Eğitimde dijital araçlar: Google sınıf uygulaması üzerine bir değerlendirme* [Öz]. Akademik Bilişim Konferansında sunulan bildiri, Anadolu Üniversitesi, Eskişehir. Erişim adresi: http://ab2015.anadolu.edu.tr /index.php?menu=5&submenu=27

***h) Düzenli Olarak Online Yayımlanan Bildiriler***

Herculano-Houzel, S., Collins, C. E., Wong, P., Kaas, J. H., & Lent, R. (2008). The basic nonuniformity of the cerebral cortex. *Proceedings of the National Academy of Sciences, 105*, 12593–12598. http:// dx.doi.org/10.1073/pnas.0805417105

***i) Kitap Şeklinde Yayımlanan Bildiriler***

Schneider, R. (2013). Research data literacy. S. Kurbanoğlu ve ark. (Ed.), Communications in Computer and Information Science: Vol. 397. *Worldwide Communalities and Challenges in Information Literacy Research and Practice* içinde (s. 134–140). Cham, İsviçre: Springer. http://dx.doi.org/10.1007/978-3- 319-03919-0

***j) Kongre Bildirisi***

Çepni, S., Bacanak A. ve Özsevgeç T. (2001, Haziran). *Fen bilgisi öğretmen adaylarının fen branşlarına karşı tutumları ile fen branşlarındaki başarılarının ilişkisi*. X. Ulusal Eğitim Bilimleri Kongresi'nde sunulan bildiri, Abant İzzet Baysal

Üniversitesi, Bolu

**Diğer Kaynaklar**

***a) Gazete Yazısı***
Toker, Ç. (2015, 26 Haziran). 'Unutma' notları. *Cumhuriyet*, s. 13.
***b) Online Gazete Yazısı***
Tamer, M. (2015, 26 Haziran). E-ticaret hamle yapmak için tüketiciyi bekliyor. *Milliyet*. Erişim adresi: http://www.milliyet
***c) Web Page/Blog Post***
Bordwell, D. (2013, June 18). David Koepp: Making the world movie-sized [Web log post]. Retrieved from http://www.david bordwell.net/blog/page/27/
***d) Online Ansiklopedi/Sözlük***
Bilgi mimarisi. (2014, 20 Aralık). Vikipedi içinde. Erişim adresi: http://tr.wikipedia.org/wiki/Bilgi_mimarisi
Marcoux, A. (2008). Business ethics. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy*.Retrieved from http://plato.stanford.edu/entries/ethics-business/
***e) Podcast***
Radyo ODTÜ (Yapımcı). (2015, 13 Nisan). *Modern sabahlar* [Podcast]. Erişim adresi: http://www. radyoodtu.com.tr/
***f) Bir Televizyon Dizisinden Tek Bir Bölüm***
Shore, D. (Senarist), Jackson, M. (Senarist) ve Bookstaver, S. (Yönetmen). (2012). Runaways [Televizyon dizisi bölümü]. D. Shore (Baş yapımcı), *House M.D.* içinde. New York, NY: Fox Broadcasting.
***g) Müzik Kaydı***
Say, F. (2009). Galata Kulesi. *İstanbul senfonisi* [CD] içinde. İstanbul: Ak Müzik.

**SON KONTROL LİSTESİ**

Aşağıdaki listede eksik olmadığından emin olun:

- Editöre mektup
  - Makalenin türü
  - Yazar(lar)ın özgeçmiş bilgisi
  - Başka bir dergiye gönderilmemiş olduğu bilgisi
  - Sponsor veya ticari bir firma ile ilişkisi (varsa belirtiniz)
  - İstatistik kontrolünün yapıldığı (araştırma makaleleri için)
  - İngilizce yönünden kontrolünün yapıldığı
  - Yazarlara Bilgide detaylı olarak anlatılan dergi politikalarının gözden geçirildiği
  - Kaynakların APA6'ya göre belirtildiği
- Telif Hakkı Anlaşması Formu
- Daha önce basılmış ve telife bağlı materyal (yazı-resim-tablo) kullanılmış ise izin belgesi
- Kapak sayfası
  - Makalenin türü
  - Türkçe ve İngilizce başlık
  - Yazarların ismi soyadı, unvanları ve bağlı oldukları kurumlar (üniversite ve fakülte bilgisinden sonra şehir ve ülke bilgisi de yer almalıdır), e-posta adresleri
  - Sorumlu yazarın e-posta adresi, açık yazışma adresi, iş telefonu, GSM, faks nosu
  - Tüm yazarların ORCID'leri

- Makale ana metni
  - Türkçe ve İngilizce başlık
  - Özetler 200-250 kelime Türkçe ve 200-250 kelime İngilizce
  - Anahtar Kelimeler: 5 adet Türkçe ve 5 adet İngilizce
  - Jel Kodlar: 3 adet
  - Makale Türkçe ise, 600-800 kelime İngilizce genişletilmiş özet (Extended Abstract)
  - Makale ana metin bölümleri
  - Finansal destek (varsa belirtiniz)
  - Çıkar çatışması (varsa belirtiniz)
  - Teşekkür (varsa belirtiniz)
  - Kaynaklar
  - Tablolar-Resimler, Şekiller (başlık, tanım ve alt yazılarıyla)

**İLETİŞİM İÇİN:**

E-mail: jepr@istanbul.edu.tr
Tel : +90 212 440 00 00 / 11629
Web Sitesi : http://jepr.istanbul.edu.tr
Addres : İstanbul Üniversitesi
Ekonomi Politikaları
Uygulama ve Araştırma Merkezi,
İktisat Fakültesi İktisat Politikası
Anabilim Dalı, 34119,
Beyazıt, Fatih, İstanbul - Türkiye

## DESCRIPTION

Journal of Economic Policy Researches - İktisat Politikası Araştırmaları Dergisi is the publication of Istanbul University Center for Practice and Research in Economic Policy. It is an open access, peer-reviewed, international, scholarly journal published biannually in January and July. The manuscripts submitted for publication inthe journal must be scientific and original work in Turkish or English.

## AIM AND SCOPE

Journal of Economic Policy Researches - İktisat Politikası Araştırmaları Dergisi aims to publish articles of high quality dealing with issues in economic policy which impact on national and global economies. The journal provides an international forum for economic theory and practice and aims to publish highly selective, widely cited articles of current relevance that will have a long-term impact on economics research.

Journal of Economic Policy Researches - İktisat Politikası Araştırmaları Dergisi covers analytical, interpretive, and empirical studies in a number of areas—including political economy, monetary theory and policy, fiscal policy, labor economics, development, micro- and macroeconomic theory, international trade and finance, financial economics, transport economics and social economics.

## EDITORIAL POLICIES AND PEER REVIEW PROCESS

### Publication Policy

The journal is committed to upholding the highest standards of publication ethics and pays regard to Principles of Transparency and Best Practice in Scholarly Publishing published by the Committee on Publication Ethics (COPE), the Directory of Open Access Journals (DOAJ), the Open Access Scholarly Publishers Association (OASPA), and the World Association of Medical Editors (WAME) on https://publicationethics.org/resources/guidelines-new/principles-transparency-and-best-practice-scholarly-publishing

The subjects covered in the manuscripts submitted to the Journal for publication must be in accordance with the aim and scope of the Journal. Only those manuscripts approved by every individual author and that were not published before in or sent to another journal, are accepted for evaluation.

Changing the name of an author (omission, addition or order) in papers submitted to the Journal requires written permission of all declared authors.

Plagiarism, duplication, fraud authorship/denied authorship, research/data fabrication, salami slicing/salami publication, breaching of copyrights, prevailing conflict of interest are unethical behaviors. All manuscripts not in accordance with the accepted ethical standards will be removed from the publication. This also contains any possible malpractice discovered after the publication.

### Plagiarism

Submitted manuscripts that pass preliminary control are scanned for plagiarism using iThenticate software. If plagiarism /self-plagiarism will be found authors will be informed. Editors may resubmit manuscript for similarity check at any peer-review or production stage if required. High similarity scores may lead to rejection of a manuscript before and even after acceptance. Depending on the type of article and the percentage of similarity score taken from each article, the overall similarity score is generally expected to be less than 15 or 20%.

### Double Blind Peer-Review

After plagiarism check, the eligible ones are evaluated by the editors-in-chief for their originality, methodology, the importance of the subject covered and compliance with the journal scope. The editor provides a fair double-blind peer review of the submitted articles and hands over the papers matching the formal rules to at least two national/international referees for evaluation and gives green light for publication upon modification by the authors in accordance with the referees' claims.

**General Principles**

Only those manuscripts approved by its every individual author and that were not published before in or sent to another journal, are accepted for evaluation.

Submitted manuscripts that pass preliminary control are scanned for plagiarism using iThenticate software. After plagiarism check, the eligible ones are evaluated by editor-in-chief for their originality, methodology, the importance of the subject covered and compliance with the journal scope.

Short presentations that took place in scientific meetings can be referred if indicated in the article. The editor hands over the papers matching the formal rules to at least two national/international referees for evaluation and gives green light for publication upon modification by the authors in accordance with the referees' claims. Changing the name of an author (omission, addition or order) in papers submitted to the Journal requires written permission of all declared authors. Refused manuscripts and graphics are not returned to the author.

**Author Responsibilities**

It is authors' responsibility to ensure that the article is in accordance with scientific and ethical standards and rules. And authors must ensure that submitted work is original. They must certify that the manuscript has not previously been published elsewhere or is not currently being considered for publication elsewhere, in any language. Applicable copyright laws and conventions must be followed. Copyright material (e.g. tables, figures or extensive quotations) must be reproduced only with appropriate permission and acknowledgement. Any work or words of other authors, contributors, or sources must be appropriately credited and referenced.

All the authors of a submitted manuscript must have direct scientific and academic contribution to the manuscript. The author(s) of the original research articles is defined as a person who is significantly involved in "conceptualization and design of the study", "collecting the data", "analyzing the data", "writing the manuscript", "reviewing the manuscript with a critical perspective" and "planning/conducting the study of the manuscript and/or revising it". Fund raising, data collection or supervision of the research group are not sufficient roles to be accepted as an author. The author(s) must meet all these criteria described above. The order of names in the author list of an article must be a co-decision and it must be indicated in the Copyright Agreement Form. The individuals who do not meet the authorship criteria but contributed to the study must take place in the acknowledgement section. Individuals providing technical support, assisting writing, providing a general support, providing material or financial support are examples to be indicated in acknowledgement section.

All authors must disclose all issues concerning financial relationship, conflict of interest, and competing interest that may potentially influence the results of the research or scientific judgment.

When an author discovers a significant error or inaccuracy in his/her own published paper, it is the author's obligation to promptly cooperate with the Editor-in-Chief to provide retractions or corrections of mistakes.

**Peer Review Process**

Only those manuscripts approved by its every individual author and that were not published before in or sent to another journal, are accepted for evaluation.
Submitted manuscripts that pass preliminary control are scanned for plagiarism using iThenticate software. After plagiarism check, the eligible ones are evaluated by editor-in-chief for their originality, methodology, the importance of the subject covered and compliance with the journal scope. Editorin-chief evaluates manuscripts for their scientific content without regard to ethnic origin, gender, sexual orientation, citizenship, religious belief or political philosophy of the authors and ensures a fair double-blind peer review of the selected manuscripts.

The selected manuscripts are sent to at least two national/international external referees for evaluation and publication decision is given by editor-in-chief upon modification by the authors in accordance with the referees' claims.

Editor in chief does not allow any conflicts of interest between the authors, editors and reviewers and is responsible for final decision for publication of the manuscripts in the Journal.

Reviewers' judgments must be objective. Reviewers' comments on the following aspects are expected while conducting the review.

- Does the manuscript contain new and significant information?
- Does the abstract clearly and accurately describe the content of the manuscript?
- Is the problem significant and concisely stated?
- Are the methods described comprehensively?
- Are the interpretations and consclusions justified by the results?
- Is adequate references made to other Works in the field?
- Is the language acceptable?

Reviewers must ensure that all the information related to submitted manuscripts is kept as confidential and must report to the editor if they are aware of copyright infringement and plagiarism on the author's side.

A reviewer who feels unqualified to review the topic of a manuscript or knows that its prompt review will be impossible should notify the editor and excuse himself from the review process.

The editor informs the reviewers that the manuscripts are confidential information and that this is a privileged interaction. The reviewers and editorial board cannot discuss the manuscripts with other persons. The anonymity of the referees is important.

## OPEN ACCESS STATEMENT

The journal is an open access journal and all content is freely available without charge to the user or his/her institution. Except for commercial purposes, users are allowed to read, download, copy, print, search, or link to the full texts of the articles in this journal without asking prior permission from the publisher or the author. This is in accordance with the BOAI definition of open access.



## ETHICS

### Standards and Principles of Publication Ethics

Journal of Economic Policy Researches - İktisat Politikası Araştırmaları Dergisi is committed to upholding the highest standards of publication ethics and pays regard to Principles of Transparency and Best Practice in Scholarly Publishing published by the Committee on Publication Ethics (COPE), the Directory of Open Access Journals (DOAJ), the Open Access Scholarly Publishers Association (OASPA), and the World Association of Medical Editors (WAME) on https://publicationethics.org/resources/guidelines-new/principles-transparency-and-best-practice-scholarly-publishing

All submissions must be original, unpublished (including as full text in conference proceedings), and not under the review of any other publication synchronously. Authors must ensure that submitted work is original. They must certify that the manuscript has not previously been published elsewhere or is not currently being considered for publication elsewhere, in any language. Applicable copyright laws and conventions must be followed. Copyright material (e.g. tables, figures or extensive quotations) must be reproduced only with appropriate permission and acknowledgement. Any work or words of other authors, contributors, or sources must be appropriately credited and referenced.

Each manuscript is reviewed by one of the editors and at least two referees under double-blind peer review process. Plagiarism, duplication, fraud authorship/denied authorship, research/data fabrication, salami slicing/salami publication, breaching of copyrights, prevailing conflict of interest are unnethical behaviors.

All manuscripts not in accordance with the accepted ethical standards will be removed from the publication. This also contains any possible malpractice discovered after the publication.

### Research Ethics

Journal of Economic Policy Researches - İktisat Politikası Araştırmaları Dergisi adheres to the highest standards in research ethics and follows the principles of international research ethics as defined below. The authors are responsible for the compliance of the manuscripts with the ethical rules.

- Principles of integrity, quality and ransparency should be sustained in designing the research, reviewing the design and conducting the research.
- The research team and participants should be fully informed about the aim, methods, possible uses and requirements of the research and risks of participation in research.
- The confidentiality of the information provided by the research participants and the confidentiality of the respondents should be ensured. The research should be designed to protect the autonomy and dignity of the participants.
- Research participants should participate in the research voluntarily, not under any coercion.
- Any possible harm to participants must be avoided. The research should be planned in such a way that the participants are not at risk.
- The independence of research must be clear; and any conflict of interest or must be disclosed.
- In experimental studies with human subjects, written informed consent of the participants who decide to participate in the research must be obtained. In the case of children and those under wardship or with confirmed insanity, legal custodian's assent must be obtained.
- If the study is to be carried out in any institution or organization, approval must be obtained from this institution or organization.
- In studies with human subject, it must be noted in the method's section of the manuscript that the informed consent of the participants and ethics committee approval from the institution where the study has been conducted have been obtained.

## LANGUAGE

The language of the journal is both Turkish and American English.

## MANUSCRIPT ORGANIZATION AND FORMAT

All correspondence will be sent to the first-named author unless otherwise specified. Manuscpript is to be submitted online via http://dergipark.gov.tr/login that can be accessed at http://jepr.istanbul.edu.tr It must be accompanied by a title page specifying the article category (i.e. research article, review etc.) and including information about the manuscript (see the Submission Checklist), a cover letter. Manuscripts should be prepared in Microsoft Word 2007 and upper versions. In addition, a Copyright Agreement Form that has to be signed by all authors must be submitted.

1. The manuscripts should be in A4 paper standards: having 2.5 cm margins from right, left, bottom and top, Times New Roman font style in 12 font size and line spacing of 1.5 format.
2. Footnotes, figures and tables should be placed as much as possible within the page in which they are referred or within the following page. The notes below the figures or tables should be aimed to make these materials understandable without returning to the main text. Tables and Graphics should not be computer output and must fit to A4 paper size.
3. Before the introduction part, there should be an abstract of 200-250 words both in English and Turkish. Extended abstract is not required for articles in English. The abstracts should concisely present the aim or the purpose of the study, the methodology, the results, and the conclusion remarks. The abstracts must not contain abbreviations or acronyms. Underneath the abstracts, 5 keywords that inform the reader about the content of the study should be specified in Turkish and in English.
4. Submitted manuscripts must involve three JEL codes (Journal of Economic Literature) at two digit level (i.e., Q11). For the JEL codes which should be chosen according to the subject of the manuscript, the JEL list given in the web address of http://www.aeaweb.org/journal/jel_class_system.html can be used.
5. The manuscripts should contain mainly these components: title in English and Turkish, abstract in English and Turkish and keywords in English and Turkish; extended abstract (if the article is in Turkish), sections, footnotes and references.

6. Research article sections are ordered as follows: "Introduction", "Aim and Methodology" "Findings", "Discussion and Conclusion", "Endnotes" and "References". For review and commentary articles, the article should start with the "Introduction" section where the purpose and the method is mentioned, go on with the other sections; and it should be finished with "Discussion and Conclusion" section followed by "Endnotes", "References" and "Tables and Figures".
7. Submitted manuscript should contain Turkish and English title of the manuscript, Turkish and English abstracts, Turkish and English keywords, JEL Classification, the main body of the manuscript and references. All should be submitted in one 2007 word document.
8. Title page including author information must be submitted together with the manuscript. The title page is to include fully descriptive title of the manuscript and authors' information (affiliation, title, e-mail address, postal address, phone, fax number and ORCID). See The Submission Checklist.
9. The responsibility of the articles published in the Journal of Economic Policy Researches belongs to the author.
10. In the manuscripts in Turkish, the orthography and writing rules of Turkish Language Association (TDK) should be followed. For detailed information, please go to the web site of TDK: www.tdk.gov.tr. Instead of foreign words, usage of Turkish words should be preferred. In case of using new or unfamiliar Turkish words, the English equivalent can be provided in parenthesis in the first occurrence.
11. All manuscripts submitted in English language, and all English parts of the Turkish manuscripts should be edited professionally before submission. Apart from its content, some of the manuscripts which are poor in language usage are returned/ rejected.
12. Communication regarding manuscript submission and evaluation procedure is done via e-mail.
13. For information regarding citations and reference format, please see References section.

**References**

Although references to review articles can be an efficient way to guide readers to a body of literature, review articles do not always reflect original work accurately. Readers should therefore be provided with direct references to original research sources whenever possible. On the other hand, extensive lists of references to original work on a topic can use excessive space on the printed page. Small numbers of references to key original papers often serve as well as more exhaustive lists, particularly since references can now be added to the electronic version of published papers, and since electronic literature searching allows readers to retrieve published literature efficiently. Papers accepted but not yet included in the issue are published online in the Early View section and they should be cited as "advance online publication". Citing a "personal communication" should be avoided unless it provides essential information not available from a public source, in which case the name of the person and date of communication should be cited in parentheses in the text. For scientific articles, written permission and confirmation of accuracy from the source of a personal communication must be obtained. Accuracy of citation is the author's responsibility. All references should be cited in text. Reference list must be in alphabetical order.

**Reference Style and Format**

Journal of Economic Policy Researches - İktisat Politikası Araştırmaları Dergisi complies with APA (American Psychological Association) style 6th Edition for referencing and quoting. For more information:

- American Psychological Association. (2010). Publication manual of the American Psychological Association ($6^{th}$ ed.). Washington, DC: APA.
- http://www.apastyle.org

Accuracy of citation is the author's responsibility. All references should be cited in text. Reference list must be in alphabetical order. Type references in the style shown below.

**Citations in the Text**

Citations must be indicated with the author surname and publication year within the parenthesis.

If more than one citation is made within the same paranthesis, separate them with (;).

**Samples:**

***More than one citation;***
(Esin, et al., 2002; Karasar, 1995)
***Citation with one author;***
(Akyolcu, 2007)
***Citation with two authors;***
(Sayıner & Demirci, 2007)
***Citation with three, four, five authors;***
First citation in the text: (Ailen, Ciambrune, & Welch, 2000) Subsequent citations in the text: (Ailen, et al., 2000)
***Citations with more than six authors;***
(Çavdar, et al., 2003)

**Citations in the Reference**

All the citations done in the text should be listed in the References section in alphabetical order of author surname without numbering. Below given examples should be considered in citing the references.

**Basic Reference Types**

**Book**

***a) Turkish Book***
Karasar, N. (1995). *Araştırmalarda rapor hazırlama* ($8^{th}$ ed.) [Preparing research reports]. Ankara, Turkey: 3A Eğitim Danışmanlık Ltd.
***b) Book Translated into Turkish***
Mucchielli, A. (1991). *Zihniyetler* [Mindsets] (A. Kotil, Trans.). İstanbul, Turkey: İletişim Yayınları.
***c) Edited Book***
Ören, T., Üney, T., & Çölkesen, R. (Eds.). (2006). *Türkiye bilişim ansiklopedisi* [Turkish Encyclopedia of Informatics]. İstanbul, Turkey: Papatya Yayıncılık.
***d) Turkish Book with Multiple Authors***
Tonta, Y., Bitirim, Y., & Sever, H. (2002). *Türkçe arama motorlarında performans değerlendirme* [Performance evaluation in Turkish search engines]. Ankara, Turkey: Total Bilişim.
***e) Book in English***
Kamien R., & Kamien A. (2014). *Music: An appreciation*. New York, NY: McGraw-Hill Education.
***f) Chapter in an Edited Book***
Bassett, C. (2006). Cultural studies and new media. In G. Hall & C. Birchall (Eds.), *New cultural studies: Adventures in theory* (pp. 220–237). Edinburgh, UK: Edinburgh University Press.
***g) Chapter in an Edited Book in Turkish***
Erkmen, T. (2012). Örgüt kültürü: Fonksiyonları, öğeleri, işletme yönetimi ve liderlikteki önemi [Organization culture: Its functions, elements and importance in leadership and business management]. In M. Zencirkıran (Ed.), *Örgüt sosyolojisi* [Organization sociology] (pp. 233–263). Bursa, Turkey: Dora Basım Yayın.
***h) Book with the same organization as author and publisher***
American Psychological Association. (2009). *Publication manual of the American psychological association* ($6^{th}$ ed.). Washington, DC: Author.

**Article**

***a) Turkish Article***

Mutlu, B., & Savaşer, S. (2007). Çocuğu ameliyat sonrası yoğun bakımda olan ebeveynlerde stres nedenleri ve azaltma girişimleri [Source and intervention reduction of stress for parents whose children are in intensive care unit after surgery]. *Istanbul University Florence Nightingale Journal of Nursing, 15*(60), 179–182.

***b) English Article***

de Cillia, R., Reisigl, M., & Wodak, R. (1999). The discursive construction of national identity. Discourse and Society, 10(2), 149–173. http://dx.doi.org/10.1177/0957926599010002002

***c) Journal Article with DOI and More Than Seven Authors***

Lal, H., Cunningham, A. L., Godeaux, O., Chlibek, R., Diez-Domingo, J., Hwang, S.-J. Heineman, T. C. (2015). Efficacy of an adjuvanted herpes zoster subunit vaccine in older adults. *New England Journal of Medicine, 372*, 2087–2096. http://dx.doi.org/10.1056/NEJMoa1501184

***d) Journal Article from Web, without DOI***

Sidani, S. (2003). Enhancing the evaluation of nursing care effectiveness. *Canadian Journal of Nursing Research, 35*(3), 26–38. Retrieved from http://cjnr.mcgill.ca

***e) Journal Article wih DOI***

Turner, S. J. (2010). Website statistics 2.0: Using Google Analytics to measure library website effectiveness. Technical Services Quarterly, 27,261–278. http://dx.doi.org/10.1080/07317131003765910

***f) Advance Online Publication***

Smith, J. A. (2010). Citing advance online publication: A review. *Journal of Psychology*. Advance online publication. http://dx.doi.org/10.1037/a45d7867

***g) Article in a Magazine***

Henry, W. A., III. (1990, April 9). Making the grade in today's schools. *Time, 135*, 28–31.

**Doctoral Dissertation, Master's Thesis, Presentation, Proceeding**

***a) Dissertation/Thesis from a Commercial Database***

Van Brunt, D. (1997). *Networked consumer health information systems* (Doctoral dissertation).Available from ProQuest Dissertations and Theses database. (UMI No. 9943436)

***b) Dissertation/Thesis from an Institutional Database***

Yaylalı-Yıldız, B. (2014). *University campuses as places of potential publicness: Exploring the politicals, social and cultural practices in Ege University* (Doctoral dissertation). Retrieved from Retrieved from: http://library.iyte.edu.tr/tr/hizli-erisim/iyte-tez-portali

***c) Dissertation/Thesis from Web***

Tonta, Y. A. (1992). *An analysis of search failures in online library catalogs* (Doctoral dissertation, University of California, Berkeley). Retrieved from http://yunus.hacettepe.edu.tr/ tonta/yayinlar /phd/ ickapak.html

***d) Dissertation/Thesis abstracted in Dissertations Abstracts International***

Appelbaum, L. G. (2005). Three studies of human information processing: Texture amplification, motion representation, and figure-ground segregation. *Dissertation Abstracts International: Section B. Sciences and Engineering, 65*(10), 5428.

***e) Symposium Contribution***

Krinsky-McHale, S. J., Zigman, W. B., & Silverman, W. (2012, August). Are neuropsychiatric symptoms markers of prodromalAlzheimer's disease in adults with Down syndrome? In W. B. Zigman (Chair), *Predictors of mild cognitive impairment, dementia, and mortality in adults with Down syndrome*. Symposium conducted at the meeting of the American Psychological Association, Orlando, FL.

***f) Conference Paper Abstract Retrieved Online***

Liu, S. (2005, May). *Defending against business crises with the help of intelligent agent based early warning solutions*. Paper presented at the Seventh International Conference on Enterprise Information Systems, Miami, FL. Abstract retrieved from http://www.iceis.org/iceis2005/abstracts_2005.htm

***g) Conference Paper - In Regularly Published Proceedings and Retrieved Online***
Herculano-Houzel, S., Collins, C. E., Wong, P., Kaas, J. H., & Lent, R. (2008). The basic nonuniformity of the cerebral cortex. *Proceedings of the National Academy of Sciences, 105*, 12593–12598. http:// dx.doi.org/10.1073/pnas.0805417105
***h) Proceeding in Book Form***
Parsons, O. A., Pryzwansky, W. B., Weinstein, D. J., & Wiens, A. N. (1995). Taxonomy for psychology. In J. N. Reich, H. Sands, & A. N. Wiens (Eds.), *Education and training beyond the doctoral degree: Proceedings of the American Psychological Association National Conference on Postdoctoral Education and Training in Psychology* (pp. 45–50). Washington, DC: American Psychological Association.
***i) Paper Presentation***
Nguyen, C. A. (2012, August). *Humor and deception in advertising: When laughter may not be the best medicine*. Paper presented at the meeting of the American Psychological Association, Orlando, FL.

**Other Sources**

***a) Newspaper Article***
Browne, R. (2010, March 21). This brainless patient is no dummy. *Sydney Morning Herald, 45*.
***b) Newspaper Article with no Author***
New drug appears to sharply cut risk of death from heart failure. (1993, July 15). *The Washington Post*, p. A12.
***c) Web Page/Blog Post***
Bordwell, D. (2013, June 18). David Koepp: Making the world movie-sized [Web log post]. Retrieved from http://www.davidbordwell.net/blog/page/27/
***d) Online Encyclopedia/Dictionary***
Ignition. (1989). In *Oxford English online dictionary* ($2^{nd}$ ed.). Retrieved from http://dictionary.oed.com
Marcoux, A. (2008). Business ethics. In E. N. Zalta (Ed.). *The Stanford encyclopedia of philosophy*. Retrieved from http://plato.stanford.edu/entries/ethics-business/
***e) Podcast***
Dunning, B. (Producer). (2011, January 12). *in Fact: Conspiracy theories* [Video podcast]. Retrieved from http://itunes.apple.com/
***f) Single Episode in a Television Series***
Egan, D. (Writer), & Alexander, J. (Director). (2005). Failure to communicate. [Television series episode]. In D. Shore (Executive producer), *House*; New York, NY: Fox Broadcasting.
***g) Music***
Fuchs, G. (2004). Light the menorah. On *Eight nights of Hanukkah* [CD]. Brick, NJ: Kid Kosher.

**SUBMISSION CHECKLIST**

Ensure that the following items are present:

- Cover letter to the editor
  - The category of the manuscript
  - CV(s) of the author(s)
  - Confirming that "the paper is not under consideration for publication in another journal".
  - Including disclosure of any commercial or financial involvement.
  - Confirming that the statistical design of the research article is reviewed.
  - Confirming that last control for fluent English was done.
  - Confirming that journal policies detailed in Information for Authors have been reviewed.
  - Confirming that the references cited in the text and listed in the references section are in line with APA 6.
- Copyright Agreement Form

- Permission of previously published copyrighted material if used in the present manuscript
- Title page
  - The category of the manuscript
  - The title of the manuscript
  - All authors' names and affiliations (institution, faculty/department, city, country), e-mail addresses
  - Corresponding author's email address, full postal address, telephone and fax number
  - ORCIDs of all authors.
- Main Manuscript Document
  - The title of the manuscript
  - Abstract: 200-250 words
  - Key words: 5 words
  - JEL code: 3 JEL codes
  - Extended Summary (600-800 words) in English for the articles which are not in English
  - Main article sections
  - Grant support (if exists)
  - Conflict of interest (if exists)
  - Acknowledgement (if exists)
  - References
  - All tables, illustrations (figures) (including title, description, footnotes)

**CONTACT INFO:**

E-mail : jepr@istanbul.edu.tr
Phone : +90 212 440 00 00 / 11629
Website : http://jepr.istanbul.edu.tr
Address : Istanbul University Center for Practice and
Research in Economic Policy,
Faculty of Economics,
Department of Economic Policy,
34119, Beyazit, Fatih, Istanbul - Turkey

## COPYRIGHT AGREEMENT FORM / TELİF HAKKI ANLAŞMASI FORMU

**İstanbul University**
*İstanbul Üniversitesi*

**Dergi Adı: İktisat Politikası Araştırmaları Dergisi**
*Journal name:* Journal of Economic Policy Researches

**Copyright Agreement Form**
*Telif Hakkı Anlaşması Formu*

| | |
|---|---|
| **Sorumlu Yazar**<br>*Responsible/Corresponding Author* | |
| **Makalenin Başlığı**<br>*Title of Manuscript* | |
| **Kabul Tarihi**<br>*Acceptance Date* | |
| **Yazarların Listesi**<br>*List of Authors* | |

| *Sıra No* | **Adı-Soyadı** *Name - Surname* | **E-Posta** *E-Mail* | **İmza** *Signature* | **Tarih** *Date* |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

| | |
|---|---|
| **Makalenin türü (Araştırma makalesi, Derleme, v.b.)**<br>*Manuscript Type (Research Article, Review, etc.)* | |

**Sorumlu Yazar:**
*Responsible/Corresponding Author:*

| | | |
|---|---|---|
| **Çalıştığı kurum** | *University/company/institution* | |
| **Posta adresi** | *Address* | |
| **E-posta** | *E-mail* | |
| **Telefon no; GSM no** | *Phone; mobile phone* | |

**The author(s) agrees that:**
Sunulan makalenin yazar(lar)ın orijinal çalışması olduğunu ve intihal yapmadıklarını,
Tüm yazarların bu çalışmaya asli olarak katılmış olduklarını ve bu çalışma için her türlü sorumluluğu aldıklarını,
Tüm yazarların sunulan makalenin son halini gördüklerini ve onayladıklarını,
Makalenin başka bir yerde basılmadığını veya basılmak için sunulmadığını,
Makalede bulunan metnin, şekillerin ve dokümanların diğer şahıslara ait olan Telif Haklarını ihlal etmediğini kabul ve taahhüt ederler.
İSTANBUL ÜNİVERSİTESİ'nin bu fikri eseri, Creative Commons Atıf-GayrıTicari 4.0 Uluslararası (CC BY-NC 4.0) lisansı ile yayınlamasına izin verirler. Creative Commons Atıf-GayrıTicari 4.0 Uluslararası (CC BY-NC 4.0) lisansı, eserin ticari kullanım dışında her boyut ve formatta paylaşılmasına, kopyalanmasına, çoğaltılmasına ve orijinal esere uygun şekilde atıfta bulunmak kaydıyla yeniden düzenleme, dönüştürme ve eserin üzerine inşa etme dâhil adapte edilmesine izin verir.
Yazar(lar)ın veya varsa yazar(lar)ın işvereninin telif dâhil patent hakları, fikri mülkiyet hakları saklıdır.
Ben/Biz, telif hakkı ihlali nedeniyle üçüncü şahıslarca vuku bulacak hak talebi veya açılacak davalarda İSTANBUL ÜNİVERSİTESİ ve Dergi Editörlerinin hiçbir sorumluluğunun olmadığını, tüm sorumluluğun yazarlara ait olduğunu taahhüt ederim/ederiz.
Ayrıca Ben/Biz makalede hiçbir suç unsuru veya kanuna aykırı ifade bulunmadığını, araştırma yapılırken kanuna aykırı herhangi bir malzeme ve yöntem kullanılmadığını taahhüt ederim/ederiz.
Bu Telif Hakkı Anlaşması Formu tüm yazarlar tarafından imzalanmalıdır/onaylanmalıdır. Form farklı kurumlarda bulunan yazarlar tarafından ayrı kopyalar halinde doldurularak sunulabilir. Ancak, tüm imzaların orijinal veya kanıtlanabilir şekilde onaylı olması gerekir.

**Yazar(lar) aşağıdaki hususları kabul eder**
The manuscript submitted is his/her/their own original work and has not been plagiarized from any prior work,
all authors participated in the work in a substantive way and are prepared to take public responsibility for the work,
all authors have seen and approved the manuscript as submitted,
the manuscript has not been published and is not being submitted or considered for publication elsewhere,
the text, illustrations, and any other materials included in the manuscript do not infringe upon any existing copyright or other rights of anyone.
ISTANBUL UNIVERSITY will publish the content under Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) license that gives permission to copy and redistribute the material in any medium or format other than commercial purposes as well as remix, transform and build upon the material by providing appropriate credit to the original work.
The Contributor(s) or, if applicable the Contributor's Employer, retain(s) all proprietary rights in addition to copyright, patent rights.
I/We indemnify ISTANBUL UNIVERSITY and the Editors of the Journals, and hold them harmless from any loss, expense or damage occasioned by a claim or suit by a third party for copyright infringement, or any suit arising out of any breach of the foregoing warranties as a result of publication of my/our article.
I/We also warrant that the article contains no libelous or unlawful statements and does not contain material or instructions that might cause harm or injury.
This Copyright Agreement Form must be signed/ratified by all authors. Separate copies of the form (completed in full) may be submitted by authors located at different institutions; however, all signatures must be original and authenticated.

| **Sorumlu Yazar;**<br>*Responsible/Corresponding Author* | **İmza** / *Signature* | **Tarih** / *Date* |
|---|---|---|
| | | ……../……../…… |