DEVELOPMENT, FINANCE AND SOCIOECONOMIC DYNAMICS

Editor
Prof. Dr. Salih OZTURK

İKSAD
Publishing House

DEVELOPMENT, FINANCE AND SOCIOECONOMIC DYNAMICS

Editor

Prof. Dr. Salih OZTURK

Authors

Prof. Dr. Salih ÖZTURK

Asst. Prof. Harun DEMİR

Lecturer Dr. Eda OZOVACI

Lecturer Gorkem GUNGOR

Lecturer Baris POLAT

İKSAD Publishing House

(The Licence Number of Publicator: 2014/31220)
TÜRKİYE TR: +90 342 606 06 75
USA: +1 631 685 0 853
E mail: iksadyayinevi@gmail.com
www.iksadyayinevi.com

ISBN: 978-625-367-953-8
Cover Design: İbrahim KAYA
December / 2024
Ankara / Türkiye
Size: 16x24cm

Contents

Preface

It is of great importance to follow developments in the field of economics, which deals with many issues for individuals and countries. Therefore, socioeconomic parameters that are directly or indirectly related to welfare levels for economic agents and countries should be carefully investigated. This book is compiled from studies prepared by researchers from several different universities and institutions on various topics that can guide socioeconomic developments. In this context, this book titled *Development, Finance and Socioeconomic Dynamics* consists of four chapters.

In the first chapter of the book, the authors Harun Demir and Salih Ozturk discuss the study titled "Does Social Globalization Contribute to Poverty Reduction? Empirical Evidence from Türkiye". In this chapter, the main purpose of the authors is to investigate the relationship between social globalization and income inequality for Türkiye in the period 1987-2017. The limited number of studies examining the social globalization - income inequality relationship reveals the importance of this chapter. The analysis results of the study indicate that social globalization decreases income inequality in Türkiye. In other words, the authors of this study conclude that social globalization has a statistically significant and negative impact on income inequality in the long run. Moreover, the estimates prove the existence of a unidirectional causality from social globalization to income inequality. All these estimation results of the authors show that social globalization should be carefully considered in ensuring fair income distribution, which is of great importance for economic agents. In addition, Demir and Ozturk offer several recommendations for policymakers to reduce income inequality in Türkiye at the end of this chapter.

The second chapter, titled "Investigating the Determinants of Students' Smart Phone Purchasing Behavior" and written by Gorkem Gungor, aims to determine the smartphone preferences and the factors that are effective on this issue by applying a survey to 128 volunteer vocational school students. In this context, the demographic characteristics, incomes, smartphone brands used and the importance levels of the factors affecting the preferences of the students participating in the survey are analyzed using Kruskal-Wallis and Mann-Whitney tests. The analysis results of this study reveal that the features of the smartphone, brand image and guarantee conditions are effective on the

purchasing behavior of vocational school students. Therefore, this chapter of the book provides various guiding information to researchers and individuals in terms of consumer behavior.

The third chapter contains the study titled "The Relationship between Public Expenditure, Financial Development and Economic Growth: Empirical Evidence from BRICS-T Countries" written by the author Eda Ozovaci. Ozovacı aims to determine the impact of public expenditures and financial development on economic growth by using the Driscoll and Kraay estimator for BRICS countries and Türkiye in the period 1995-2021. In this context, the results of the analysis applied by the author show that public expenditures do not trigger economic growth for these countries, while financial development has a positive effect on economic growth. Consequently, this chapter presents several suggestions for policymakers in terms of the determinants of economic growth.

The fourth chapter of the book includes a study titled "Testing Monte Carlo Simulation Analysis with Power Functions: An Application on BIST-100" prepared by the author Baris Polat. In this study, Polat aims to analyze the performance of the Borsa Istanbul 100 (BIST-100) index using Monte Carlo Simulation and integration of power functions. Monte Carlo Simulation is a method often used to better understand complex and uncertain financial processes. This method allows to evaluate risks and returns by simulating possible scenarios with the help of random numbers and probability distributions. In this study, the author tests the effectiveness of this method on BIST-100. Here, the author aims to provide a new perspective by integrating Monte Carlo simulation with power functions to produce more robust results of existing models and to deepen the application of these methods, especially in Türkiye, which is among the emerging markets. In addition, the limited number of studies using these two methods together in terms of modeling and managing uncertainties in financial markets further increases the importance of this research. In this respect, this chapter of the book provides information that helps to contribute to the formulation of more effective risk management strategies for investors.

My main purpose is that this book titled "*Development, Finance and Socioeconomic Dynamics*" makes an important contribution to the literature. Finally, I would like to state that all academic and legal responsibility regarding

the chapters in the book belongs entirely to the author(s). Other technical and editorial responsibilities for this book are the responsibility of the editor.

Editor

Prof. Dr. Salih OZTURK

Tekirdag/Türkiye-2024

CHAPTER I

Does Social Globalization Contribute to Poverty Reduction? Empirical Evidence from Türkiye

Asst. Prof. Harun DEMİR[1], Prof. Dr. Salih ÖZTURK[2]

DOI: https://dx.doi.org/10.5281/zenodo.14391253

[1] Department of Foreign Trade, Vocational School, Dogus University, Istanbul, Türkiye. ORCID: https://orcid.org/0000-0001-7778-2897
e-mail: hdemir@dogus.edu.tr
[2] Department of Economics, Faculty of Economics and Administrative Sciences, Tekirdag Namik Kemal University, Tekirdag, Türkiye. ORCID: https://orcid.org/0000-0001-6851-951X e-mail: salihozturk@nku.edu.tr

1. Introduction

Income inequality undoubtedly causes many socioeconomic problems in societies. Therefore, steps to ensure fair income distribution among individuals can positively affect their welfare levels. In recent years, it has been noteworthy that many studies in the literature have focused on the determinants of income inequality. For example, empirical studies investigate the impact of many variables such as trade openness (Nam et al., 2024), economic growth (Ali, 2023), foreign direct investment (Wang et al., 2023), financial development (Bolarinwa and Akinlo, 2021), technological innovation (Cetin et al., 2021), institutional quality (Kouadio and Gakpa, 2022), inflation (Kim and Lin, 2023), energy security (Lee et al., 2022), geopolitical risk (Sweidan, 2023) and tourism (Jiaqun et al., 2024) on income inequality. Income inequality not only directly affects the economic welfare of individuals, but is also an issue that countries need to carefully address in terms of economic stability. In this context, it is seen that studies in the literature have made great efforts to reveal the effects of various parameters on income inequality. Furthermore, ensuring fair income distribution is a crucial issue in terms of the Sustainable Development Goals (SDGs).

Within the scope of this study, another important parameter for both individuals and the SDGs is the globalization level of countries and the international integration of economic agents. Tsai (2007) stated that globalization has led to an increase in the welfare levels of individuals. On the other hand, social globalization connects people in different societies as it improves the flow of information and cultural proximity. In other words, social globalization enables countries to access information more easily (Shahbaz et al., 2018). Although the existing literature generally examines globalization in terms of economic indicators, it can be argued that it has important social and political dimensions. Because the closer the cultures of open countries are to each other, the easier it is to transfer knowledge between societies. In this case, the host country may be more likely to competitively lower taxes or provide subsidies to attract investment. Therefore, this implies that the social dimension of globalization may be important for income inequality (Dreher and Gaston, 2008). Tabash et al. (2024) empirically prove that social globalization improves income distribution for 18 developing countries.

In line with the above explanations, this study aims both to contribute to the literature on income distribution from various perspectives and to develop policies by analyzing Türkiye's case in terms of income inequality. In this context, it is thought that investigating the impact of social globalization as a determinant of income inequality for Türkiye will add an important perspective to the literature. Empirical studies widely use the Gini index as a measure of income inequality. The Gini index is expressed by a value between 0 and 100. A Gini index value close to 0 indicates that income is fairly distributed in a country, while a value close to 100 indicates that income distribution is unfair (Ozturk et al., 2022). According to Solt (2019) data, Türkiye's Gini index was approximately 43 in 1990 and 40 in 2017. Based on these data, it is possible to state that Türkiye's income inequality is not at a low level and therefore there is not a fair distribution. However, it should be underlined that there was a slight decline in Türkiye's Gini index from 1990 to 2017. On the other hand, according to KOF Swiss Economic Institute (2019) data, Türkiye's globalization index was approximately 51.8 in 1990, while it was approximately 71.6 in 2017. This situation indicates that the level of globalization in Türkiye has shown a positive development in the period from 1990 to 2017. Therefore, it is possible to conclude that Türkiye's level of globalization tended to increase during this period, while income inequality decreased. For these reasons, the relationship between globalization dimensions and income inequality is an important research topic for Türkiye.

This study contributes to the literature in many ways by aiming to investigate the social globalization – income inequality relationship for Türkiye. First, most of the studies in the literature focus on the relationship between overall globalization and income inequality (see Section 2). In this respect, the main difference of this study from the literature is that it examines the impact of social globalization on income inequality. Moreover, this is the first study to investigate the relationship between social globalization and income inequality for Türkiye. Therefore, this research may lead to future studies that will examine this relationship. Second, this study addresses various gaps in the literature examining the relationship between other indicators of globalization and income inequality. For example, there are very few studies in the literature that analyze the impact of various indicators of globalization on income inequality using time series methods. Furthermore, it is noteworthy that

empirical studies examining causality relationships are limited in the literature. Third, the empirical analysis of this study has several methodological advantages. The stationarity of all variables in the estimation models is investigated by utilizing the Narayan and Popp (2010) unit root test with two structural breaks. The cointegration relationship between the variables is analyzed with the ARDL bounds test proposed by Pesaran et al. (2001) by taking structural breaks into account. Moreover, long-run coefficient estimates are determined by two different estimators such as ARDL and DOLS. Finally, another important methodological contribution is the use of the Toda and Yamamoto (1995) technique and the Hacker and Hatemi-J (2006) bootstrap method as causality tests in the empirical analysis. The empirical findings obtained from the estimation methods used in the study enable the presentation of important policy implications for a more equitable income distribution in the Turkish economy.

Other sections of this study are discussed as follows: The second section covers the literature examining the relationship between globalization indicators and income inequality. The third section includes the dataset, models and empirical methods used in the estimation. The fourth section evaluates and discusses the estimation results. Finally, the study is completed with the conclusion and policy recommendations section.

2. Literature Review

The first literature examining the globalization-income inequality relationship generally focuses on globalization from an economic perspective. This literature is based on trade openness and foreign direct investment as indicators of globalization (Mah, 2003; Adams, 2008; Asteriou et al., 2014). On the other hand, there are various studies in the empirical literature analyzing the long-run relationship between the dimensions of globalization (overall, economic, social, political) and income inequality. However, it is noteworthy that there is not a consensus in these studies and their findings differ according to countries. Therefore, it is not possible to state that there is a definitive link between globalization and income inequality.

Bergh and Nilsson (2010) analyzed the relationship between economic, political and social globalization indicators and income inequality for 80 countries. In general, their results indicate that social globalization led to an

increase in income inequality during the period 1970-2005. Shahbaz et al. (2015) investigate the financial Kuznets curve hypothesis with ARDL test from time series analysis methods using data covering the period 1965-2011 for Iran. The globalization variable is also included in the estimation models of this study. The results obtained prove that globalization reduces income inequality in the long run. Moreover, the authors reveal that there is a U-shaped relationship between globalization and income inequality. Shahbaz et al. (2015) find the existence of a unidirectional causality from globalization to income inequality using the VECM Granger causality test. Destek (2018) examines the impact of economic, social and political globalization on income inequality for 11 countries in the period 1991-2013. The estimation results show that social globalization causes an increase in income inequality in Russia and Kazakhstan, while it causes a decrease in Belarus and Poland. In the other countries considered by the authors, it is found that there is no statistically significant effect between the variables. Destek (2018) also analyzes the causality relationships between variables. The findings suggest that there is a bidirectional causality between social globalization and income inequality for Belarus, Kazakhstan and Poland. While social globalization is the cause of income inequality in Hungary, there is a unidirectional causality from income inequality to social globalization in Armenia, Moldova and Romania. Lee et al. (2020) show that globalization has boosted income inequality for 121 countries in the period 1984-2014. However, Lee et al. (2020) argue that this negative impact of globalization on income distribution can be reduced by ensuring economic and financial stability. Akbakay and Barak (2020) find that trade and financial globalization increases income inequality by applying the PMG method for 13 emerging market economies over the period 1994-2014. In addition, the authors conclude that there is a one-way causality relationship from trade globalization to income inequality by using the panel Granger causality test. Munir and Bukhari (2020) prove that technological globalization reduces income inequality but financial globalization increases income inequality for 11 countries. Villanthenkodath et al. (2024) test the impact of economic globalization on income inequality for 19 low-income, 64 middle-income and 16 high-income countries using data covering the period 1991-2020. The PMG-ARDL findings of this study show that economic globalization has a positive long-run effect on income inequality for low-income countries,

while it has a negative coefficient for middle-income and high-income countries. Tabash et al. (2024) analyze the impact of overall, economic, social and political globalization on income inequality in 18 developing countries for the period 1991-2021 by employing two-stage least squares (2SLS) and Pooled OLS methods. The findings of the two estimators used in this study suggest that overall, economic and social globalization indicators reduce income inequality. On the other hand, Pooled OLS results show that political globalization triggers income inequality, while 2SLS findings reveal that political globalization mitigates income inequality. In addition to these estimation findings, Tabash et al. (2024) determine that FDI and trade openness have a negative impact on income inequality.

2.1. Literature Gap

The literature reviewed above reveals that there are limited empirical studies testing the impact of the social dimension of globalization on income inequality. Additionally, there are very few studies estimating this relationship using time series analysis techniques. Furthermore, there are almost no studies investigating the relationship between the social dimension of globalization and income inequality for Türkiye. Hence, this study aims to fill the gap in the literature and contribute to the empirical literature investigating poverty.

3. Data, Model and Empirical Methodology

3.1. Data and Estimation Models

The main focus of this study is to explore the social globalization – income inequality nexus for Türkiye in the period 1987-2017. For this purpose, the estimation process is carried out by constructing two different models in the empirical analysis of the study. The income inequality functions include real income per capita, financial development and household consumption expenditures as explanatory variables in addition to social globalization. The log-linear models used in the estimations are as follows:

$$lnGINI_t = \delta_0 + \delta_1 lnGDP_t + \delta_2 lnSGI_t + \delta_3 lnFD_t + \varepsilon_{1t} \quad (1)$$

$$lnGINI_t = \delta_0 + \delta_1 lnGDP_t + \delta_2 lnSGI_t + \delta_3 lnFD_t + \delta_4 lnCON_t + \varepsilon_{2t} \quad (2)$$

In Models (1) and (2), *lnGINI* denotes the natural logarithmic form of the Gini index. *lnGDP*, *lnSGI*, *lnFD* and *lnCON* represent the natural logarithmic forms of real income per capita, social globalization index, financial

development and household consumption expenditure, respectively. In the equations, δ_0 and ε_t symbolize the constant and error terms, respectively. Here, δ_1, δ_2, δ_3 and δ_4 are the coefficients showing the effects of real income per capita, social globalization, financial development and household consumption expenditure on income inequality, respectively. There is no consensus in the literature regarding the impact of GDP per capita on income inequality. The inverted-U shaped hypothesis put forward by Kuznets (1955) on the relationship between real income per capita and income inequality indicates that this effect may differ according to the welfare or development levels of countries. Therefore, the GDP per capita coefficient is expected to be $\delta_1 > 0$ or $\delta_1 < 0$. Moreover, the impact of social globalization on income inequality differs across countries and therefore the coefficient value is expected to be negative ($\delta_2 < 0$) or positive ($\delta_2 > 0$) (Destek, 2018). The impact of financial development on income inequality can be positive (Rajan and Zingales, 2003; Koh et al., 2020) or negative (Galor and Zeira, 1993; Thornton and Tommaso, 2020). In this respect, the coefficient of financial development can be $\delta_3 > 0$ or $\delta_3 < 0$. In the estimations, the coefficient of household consumption expenditures is expected to be positive ($\delta_4 > 0$).

The Gini index, one of the indicators of income inequality, is obtained from the SWIID 8.2 dataset prepared by Solt (2019). The GDP per capita (constant 2010 US$) series used to represent economic growth is collected from the World Bank (2020) database. Economic, social, political and overall globalization indices were introduced to the literature by Dreher (2006) and the current version was prepared by Gygli et al. (2019). The social globalization index considered in this study is taken from KOF Swiss Economic Institute (2019). On the other hand, there are various indicators used to represent financial development by empirical studies in the literature. The financial development indicators generally preferred in the literature include the financial development index (Kavya and Shijin, 2020), broad money (Younsi and Bechtini, 2020), domestic credit to private sector by banks (Inoue, 2018), domestic credit provided by financial sector (Canh et al., 2020) and domestic credit to private sector (Swamy and Dharani, 2020). Accordingly, broad money (% of GDP) obtained from the World Bank (2020) database is utilized to represent financial development in the empirical analysis of the study. In addition, the empirical analysis uses the household spending (% of GDP) series

collected from the OECD (2020) database as a measure of household consumption expenditure. Descriptive statistics for the series explained here and included in the estimation models are presented in Table 1.

Table 1: Descriptive Statistics (1987-2017)

	lnGINI	*lnGDP*	*lnSGI*	*lnFD*	*lnCON*
Mean	3.737	9.106	3.935	3.637	4.148
Median	3.750	9.020	3.910	3.640	4.150
Maximum	3.770	9.610	4.210	4.020	4.210
Minimum	3.690	8.750	3.640	3.170	4.080
Std. Dev.	0.031	0.262	0.210	0.264	0.034
Skewness	-0.474	0.398	0.036	-0.076	-0.355
Kurtosis	1.577	1.940	1.476	1.694	2.384
Jarque-Bera	3.775	2.271	3.005	2.233	1.141
Probability	0.151	0.321	0.223	0.327	0.565
Observations	31	31	31	31	31

3.2. Empirical Methodology

The empirical strategy utilized in the study consists of four stages. In the first stage, the stationarity of the series is investigated using Phillips-Perron and Ng-Perron unit root tests. In addition, the stationarity of the series is examined by employing the Narayan-Popp unit root test with two structural breaks to obtain robust empirical evidence. In the second stage, the cointegration relationship between variables is analyzed with the ARDL bounds test. In the third stage of the estimation process, long-run coefficients are determined using ARDL and DOLS estimators. In the last stage of the estimates, the relationships between the series are tested with the Hacker and Hatemi-J bootstrap causality method. Here, Toda-Yamamoto test is also included to provide additional evidence for the causality analysis.

3.2.1. Unit Root Tests

In this study, the conventional unit root tests proposed by Phillips and Perron (1988) and Ng and Perron (2001) are used to determine the stationarity properties of the variables. The Ng-Perron unit root test has

several advantages compared to other conventional tests. For example, Ng and Perron (2001) argue that ADF and PP tests exhibit scale distortions when the error terms have a negative moving average. The Ng-Perron method aims to correct the skewness in the size of the error term that arises in the PP unit root test. Moreover, the Ng-Perron technique provides more robust findings as it modifies the PP test and information criteria. While the H_0 hypothesis for the *MZa* and *MZt* test statistics in the Ng-Perron method indicates the existence of a unit root, the H_0 hypothesis for the *MSB* and *MPT* test statistics indicates that the series do not contain a unit root (Ng and Perron, 2001).

Conventional unit root tests may lead to biased results since they do not take into account structural breaks in the series. Therefore, in the analysis process of this study, Narayan and Popp (2010) unit root test with two structural breaks is applied in order to provide more robust evidence for the stationarity results of the series. In this test, two different models are proposed to determine whether the series contain unit roots. Here, *Model M1* indicates two structural breaks in the constant, while *Model M2* indicates two structural breaks in the constant and trend. The test equations for Models M1 and M2 are expressed as follows:

$$\text{Model M1: } y_t = \kappa + \alpha y_{t-1} + \beta t + \varphi_1 D(T_B)_{1,t} + \varphi_2 D(T_B)_{2,t} + \omega_1 DU_{1,t-1} + \omega_2 DU_{2,t-1} + \sum_{j=1}^{\rho} \theta_j \Delta y_{t-j} + e_{1t} \quad (3)$$

$$\text{Model M2: } y_t = \kappa + \alpha y_{t-1} + \beta t + \varphi_1 D(T_B)_{1,t} + \varphi_2 D(T_B)_{2,t} + \omega_1 DU_{1,t-1} + \omega_2 DU_{2,t-1} + \delta_1 DT_{1,t-1} + \delta_2 DT_{2,t-1} + \sum_{j=1}^{\rho} \theta_j \Delta y_{t-j} + e_{2t} \quad (4)$$

In Equations (3) and (4), Δ and ρ denote the first difference operator and the optimal lag length, respectively. e_{1t} and e_{2t} represent the error terms assumed to be normally distributed. In the equations, $DU_{i,t} = 1(t > T_{B,i})$ and $DT_{i,t} = 1(t > T_{B,i})(t - T_{B,i}), i = 1,2$ indicate the dummy variables used to

identify "potential structural breaks in the constant" and "slope in the trend function" occurring at times T_{B1} and T_{B2}, respectively. Here, the *t*-statistic of y_{t-1} is used to check the null hypothesis indicating the existence of a unit root against the alternative hypothesis showing stationarity. Finally, in this test put forward by Narayan and Popp (2010), the structural break dates (T_{B1} and T_{B2}) are chosen based on the sequential procedure.

3.2.2. Cointegration Test and Long-Run Coefficient Estimators

In the empirical analysis of this study, the cointegration relationship is detected using the ARDL bounds test proposed by Pesaran et al. (2001). The ARDL test can be used when the series are at level, first difference or different degrees of stationarity. Additionally, the ARDL technique can produce robust findings in small sample groups (Pesaran et al., 2001). The F-statistic value obtained from the ARDL method is compared with the asymptotic lower *I*(0) and upper *I*(1) bound values suggested by Pesaran et al. (2001) and Narayan (2005) to determine whether there is cointegration between the variables. The ARDL technique allows the estimation of long-run coefficients as well as cointegration relationship. The stability of the estimated long-run coefficients can be determined through the CUSUM and CUSUM^2 tests proposed by Brown et al. (1975). As a result of these explanations, the unrestricted error correction models (UECMs) for the ARDL bounds test utilized in this study are defined as follows:

$$\Delta lnGINI_t = \theta_0 + \sum_{i=1}^{p} \theta_{1i}\, \Delta lnGINI_{t-i} + \sum_{i=0}^{q} \theta_{2i}\, \Delta lnGDP_{t-i} + \sum_{i=0}^{q} \theta_{3i}\, \Delta lnSGI_{t-i} + \sum_{i=0}^{q} \theta_{4i}\, \Delta lnFD_{t-i} + \gamma_1 lnGINI_{t-1} + \gamma_2 lnGDP_{t-1} + \gamma_3 lnSGI_{t-1} + \gamma_4 lnFD_{t-1} + \gamma_5 D_{1997} + \gamma_6 D_{2008} + \varepsilon_{1t} \quad (6)$$

$$\Delta lnGINI_t = \theta_0 + \sum_{i=1}^{p} \theta_{1i}\, \Delta lnGINI_{t-i} + \sum_{i=0}^{q} \theta_{2i}\, \Delta lnGDP_{t-i} + \sum_{i=0}^{q} \theta_{3i}\, \Delta lnSGI_{t-i} + \sum_{i=0}^{q} \theta_{4i}\, \Delta lnFD_{t-i} + \sum_{i=0}^{q} \theta_{5i}\, \Delta lnCON_{t-i} + \gamma_1 lnGINI_{t-1} + \gamma_2 lnGDP_{t-1} + \gamma_3 lnSGI_{t-1} + \gamma_4 lnFD_{t-1} + \gamma_5 lnCON_{t-1} + \gamma_6 D_{1997} + \gamma_7 D_{2008} + \varepsilon_{2t} \quad (7)$$

In Equations (6) and (7), θ_0, Δ, ε_t, D_{1997} and D_{2008} stand for the constant term, first difference operator, error term and dummy variables related to structural breaks determined in 1997 and 2008, respectively. For Model (1), the null hypothesis is $H_0: \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = 0$ while the alternative hypothesis can be expressed as $H_1: \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq 0$. For Model (2), the null hypothesis is $H_0: \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = 0$ while the alternative hypothesis is $H_1: \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq 0$. Moreover, the short-run parameters of the ARDL model are determined by the error correction model (ECM). Here, the error correction term (ECT_{t-1}) can be estimated by ECM. The error correction models constructed within the ARDL framework are presented in Eqs. (8) and (9).

$$\Delta lnGINI_t = \alpha_0 + \sum_{i=1}^{j} \alpha_{1i} \Delta lnGINI_{t-i} + \sum_{i=0}^{k} \alpha_{2i} \Delta lnGDP_{t-i} + \sum_{i=0}^{m} \alpha_{3i} \Delta lnSGI_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta lnFD_{t-i} + \vartheta_1 D_{1997} + \vartheta_2 D_{2008} + \vartheta_3 ECT_{t-1} + \varepsilon_{1t} \quad (8)$$

$$\Delta lnGINI_t = \alpha_0 + \sum_{i=1}^{j} \alpha_{1i} \Delta lnGINI_{t-i} + \sum_{i=0}^{k} \alpha_{2i} \Delta lnGDP_{t-i} + \sum_{i=0}^{m} \alpha_{3i} \Delta lnSGI_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta lnFD_{t-i} + \sum_{i=0}^{r} \alpha_{5i} \Delta lnCON_{t-i} + \vartheta_1 D_{1997} + \vartheta_2 D_{2008} + \vartheta_3 ECT_{t-1} + \varepsilon_{2t} \quad (9)$$

The error correction term shows how quickly equilibrium can be restored in the event of a deviation from long-run equilibrium. Here, the error correction terms (ECT_{t-1}) are expected to have a statistically significant negative coefficient ($\vartheta_3 < 0$). A result estimated in this manner provides additional evidence for the existence of a cointegration relationship between the series. Finally, the robustness and validity of the results obtained for the analyzed ARDL models can be checked through various diagnostic tests (such as autocorrelation, normal distribution, heteroskedasticity and functional form).

In addition, the DOLS estimator developed by Stock and Watson (1993) is used in the estimation process of this study to provide additional evidence for the long-run coefficients determined by the ARDL model. The DOLS method produces robust results for small samples and provides an asymptotically

efficient estimator that eliminates feedback effects in the cointegration equations. Thus, autocorrelation, simultaneity and endogeneity problems are avoided in cointegration equations.

3.2.3. Causality Tests

In the empirical analysis, the Hacker and Hatemi-J (2006) causality test including the bootstrap procedure is applied to examine the relationships between variables. In the estimation process, Toda and Yamamoto (1995) test is also applied to provide additional evidence on the causality between the series. The main features and application of the Toda-Yamamoto causality test are as follows: i) The variables are not required to be stationary in difference and this method considers the series at their level values. ii) In this test, an augmented VAR model is established with $k + d_{max}$ lags. Here, k is the optimal lag length obtained from the VAR model and d_{max} is the maximal order of integration for the series. iii) In the next step, the causality relationship is determined by applying the modified Wald (MWALD) test statistic expressed by Toda and Yamamoto (1995) to the k-lagged VAR parameters. This procedure can also be implemented using the semingly unrelated regression (SUR) technique suggested by Rambaldi and Doran (1996). Based on the Toda-Yamamoto causality test, the models considered in the study are presented as follows:

$$lnGINI_t = \delta_1 + \sum_{i=1}^{k} \theta_{1i} lnGINI_{t-i} + \sum_{i=k+1}^{k+d_{max}} \theta_{2i} lnGINI_{t-i} + \sum_{i=1}^{k} \alpha_{1i} lnGDP_{t-i} + \sum_{i=k+1}^{k+d_{max}} \alpha_{2i} lnGDP_{t-i} + \sum_{i=1}^{k} \beta_{1i} lnSGI_{t-i} + \sum_{i=k+1}^{k+d_{max}} \beta_{2i} lnSGI_{t-i} + \sum_{i=1}^{k} \omega_{1i} lnFD_{t-i} + \sum_{i=k+1}^{k+d_{max}} \omega_{2i} lnFD_{t-i} + \varepsilon_{1t} \quad (10)$$

$$lnGINI_t = \delta_1 + \sum_{i=1}^{k} \rho_{1i} lnGINI_{t-i} + \sum_{i=k+1}^{k+d_{max}} \rho_{2i} lnGINI_{t-i} + \sum_{i=1}^{k} \sigma_{1i} lnGDP_{t-i} + \sum_{i=k+1}^{k+d_{max}} \sigma_{2i} lnGDP_{t-i} + \sum_{i=1}^{k} \gamma_{1i} lnSGI_{t-i} + \sum_{i=k+1}^{k+d_{max}} \gamma_{2i} lnSGI_{t-i} + \sum_{i=1}^{k} \pi_{1i} lnFD_{t-i} + \sum_{i=k+1}^{k+d_{max}} \pi_{2i} lnFD_{t-i} + \sum_{i=1}^{k} \tau_{1i} lnCON_{t-i} + \sum_{i=k+1}^{k+d_{max}} \tau_{2i} lnCON_{t-i} + \varepsilon_{2t} \quad (11)$$

The causality relationships are estimated by considering the series in Eqs. (10) and (11) separately as dependent variables. Here, the null hypotheses that social globalization is not the cause of income inequality are $H_0: \beta_{1i} = 0, i = 1, \dots, k$ and $H_0: \gamma_{1i} = 0, i = 1, \dots, k$, respectively. The MWALD test, which has an asymptotic χ^2 distribution with k degrees of freedom, is applied to test these null hypotheses.

In addition, the analysis process of this study includes the bootstrap causality test introduced by Hacker and Hatemi-J (2006), which is an improved version of the Toda and Yamamoto (1995) procedure. This method reveals that the null hypothesis of no causality can be tested with the bootstrap approach of the MWALD test statistic. Hacker and Hatemi-J (2006), in addition to many important features of the Toda and Yamamoto (1995) causality test, recommend the use of a leveraged bootstrap distribution to reduce distortions in small sample sizes. Additionally, Hacker and Hatemi-J (2006) argue that the MWALD test based on a bootstrap distribution provides more robust results compared to the asymptotic distribution. That is, it can be inferred that the critical values of the Hacker and Hatemi-J bootstrap approach are stronger than the asymptotic tests. For these reasons, the Toda and Yamamoto method as well as the Hacker and Hatemi-J technique are applied to detect causality relationships in the empirical analysis of the study.

4. Empirical Findings and Discussion

In this section of the study, an empirical analysis is conducted to statistically examine the social globalization – income inequality relationship. In the first step of the empirical analysis, Phillips-Perron and Ng-Perron conventional unit root tests are applied and the findings are reported in Table

2. The empirical findings indicate that all variables contain unit root at their level values, that is, they are non-stationary. The variables used in the estimation models are found to be stationary in the first difference. Therefore, the integration level of these variables is determined as *I*(1) according to conventional unit root tests. It should be noted that conventional unit root tests may generate biased results compared to tests with structural breaks. Because conventional unit root tests do not take into account crises and/or shocks resulting from volatilities in economies during the time period in which the variables are used. For this reason, the stationarity properties of the series used in the estimations are analyzed with the Narayan and Popp (2010) two structural break unit root test to obtain stronger results.

Table 2: Unit Root Test Results

Variables	PP	Ng-Perron				Result
	Adj. *t*-statistic	MZa	MZt	MSB	MPT	
lnGINI	0.361(3)	-1.464(7)	-0.628(7)	0.429(7)	12.144(7)	-
lnGDP	2.073(6)	2.002(0)	1.792(0)*	0.895(0)	67.769(0)	-
lnSGI	-0.649(1)	0.346(1)	0.259(1)	0.749(1)	36.889(1)	-
lnFD	-0.712(6)	-2.093(0)	-0.812(0)	0.388(0)	9.882(0)	-
lnCON	-1.746(4)	-6.796(0)*	-1.601(0)	0.236(0)*	4.384(0)*	-
Δ*lnGINI*	-5.325(2)***	-12.656(6)**	-2.512(6)**	0.199(6)**	1.948(6)**	*I*(1)
Δ*lnGDP*	-5.978(4)***	-14.235(0)***	-2.635(0)***	0.185(0)**	1.845(0)**	*I*(1)
Δ*lnSGI*	-4.621(0)***	-14.242(0)***	-2.657(0)***	0.187(0)**	1.764(0)***	*I*(1)
Δ*lnFD*	-16.966(23)***	-12.556(0)**	-2.503(0)**	0.199(0)**	1.959(0)**	*I*(1)
Δ*lnCON*	-6.768(3)***	-10.518(0)**	-2.282(0)**	0.217(0)**	2.373(0)**	*I*(1)

Note: The values in parentheses indicate the optimal lag length. In the PP test, the bandwidth is determined automatically using the Newey and West (1994) method. In the Ng-Perron test, the optimal lag length is automatically estimated using SIC. ***, ** and * denote significance at 1%, 5% and 10% levels, respectively.

The empirical findings on the stationarity of the variables obtained from the Narayan Popp unit root test with two structural breaks are shown in Table 3. The results indicate that all variables included in the models are stationary in the first difference. The dependent variable, income inequality, is found to contain structural breaks in 1997 and 2008. The break date determined for 1997 may be due to the economic crises experienced in the Turkish economy in the 1990s. Moreover, the 2008 break date can be interpreted as a consequence of

the 2008 global crisis. On the other hand, the structural break dates for social globalization are 2002 and 2006, respectively. These structural break dates refer to the periods after the 2001 crisis in Türkiye. In addition, the acceleration of technological developments on a global scale in the post-2000 period and the socioeconomic structural changes in Türkiye have had an impact on social globalization. The break dates obtained for the other variables in the models generally coincide with the period of crises and shocks experienced in the Turkish economy (see Table 3). For these reasons, it can be concluded that the estimation findings of Narayan and Popp test are consistent.

Table 3: Narayan and Popp Structural Break Unit Root Test Results

Variables	M2 test results			Result
	t-statistic	TB_1	TB_2	
lnGINI	-2.738(0)	1997	2008	-
lnGDP	-3.718(0)	2000	2008	-
lnSGI	-3.956(0)	2002	2006	-
lnFD	-4.044(0)	1997	2000	-
lnCON	-3.781(0)	1995	2000	-
Δ*lnGINI*	-6.029(2)***	1997	2010	*I*(1)
Δ*lnGDP*	-6.862(0)***	2000	2008	*I*(1)
Δ*lnSGI*	-8.247(1)***	2001	2006	*I*(1)
Δ*lnFD*	-11.490(0)***	1997	2004	*I*(1)
Δ*lnCON*	-6.063(2)***	1995	2000	*I*(1)

Note: M2 results imply a model with two structural breaks in the constant and trend. TB1 and TB2 symbolize the first and second structural break dates, respectively. The M2 critical table values are -5.949, -5.181 and -4.789 at 1%, 5% and 10% significance levels, respectively. *** denotes significance at 1% level.

After determining the stationarity properties of the variables, the next step of the empirical analysis is to select the optimal lag length from the VAR for the models. Table 4 presents the appropriate lag results for the estimation models used in this study. In the following stages of the empirical analysis, cointegration and causality relationships are tested by considering the lag length indicated by Schwarz information criteria (SIC).

Table 4: Optimal Lag Length

Panel A: Lag length for Model (1)						
Lag	LogL	LR	FPE	AIC	SIC	HQ
0	161.980	NA	1.48e-10	-11.284	-11.094	-11.226
1	269.329	176.359*	2.20e-13*	-17.809	-16.858*	-17.518*
2	279.123	13.293	3.71e-13	-17.366	-15.653	-16.842
3	303.298	25.901	2.56e-13	-17.950*	-15.476	-17.193
Panel B: Lag length for Model (2)						
Lag	LogL	LR	FPE	AIC	SIC	HQ
0	241.576	NA	3.15e-14	-16.898	-16.660	-16.826
1	357.166	181.641*	5.05e-17*	-23.369	-21.942*	-22.933*
2	380.227	28.003	7.01e-17	-23.231	-20.614	-22.431
3	415.635	30.349	5.83e-17	-23.974*	-20.168	-22.810

Note: * indicates the optimal lag length.

ARDL bounds test is applied to reveal the cointegration relationship between the series by taking structural breaks into account. The cointegration results for both models tested empirically are provided in Table 5. Here, the *F*-statistic values calculated for Models (1) and (2) are determined as 4.359 and 6.346, respectively. These results for Models (1) and (2) exceed the upper bounds of the Pesaran et al. (2001) and Narayan (2005) critical table values at the 5% and 1% significance levels, respectively. Therefore, the findings prove the existence of a cointegration relationship between the variables considered in the models. Moreover, the error correction term (ECT_{t-1}) coefficients are estimated as -0.338 and -0.488 for Models (1) and (2), respectively. These coefficients are negative and statistically significant at the 1% level. Hence, the error correction terms estimated for the models provide additional evidence for the long-run linkages between the series.

Table 5: ARDL Cointegration Test Results

Panel A: Bounds test results					
Estimated models	Lag Length	TB_1	TB_2	*F*-statistic	ECT_{t-1}
Model (1)					
$lnGINI_t = f(lnGDP_t, lnSGI_t, lnFD_t)$	1, 0, 0, 0	1997	2008	4.359**	-0.338***
Model (2)					
$lnGINI_t = f(lnGDP_t, lnSGI_t, lnFD_t, lnCON_t)$	1, 0, 1, 0, 0	1997	2008	6.346***	-0.488***

Panel B: Critical table values: Case II				
	Pesaran et al. (2001)		Narayan (2005)	
Model (1)	*I*(0)	*I*(1)	*I*(0)	*I*(1)
1%	3.65	4.66	4.614	5.966
5%	2.79	3.67	3.272	4.306
10%	2.37	3.20	2.676	3.586
Model (2)	*I*(0)	*I*(1)	*I*(0)	*I*(1)
1%	3.29	4.37	4.280	5.840
5%	2.56	3.49	3.058	4.223
10%	2.20	3.09	2.525	3.560

Note: TB_1 and TB_2 symbolize the first and second structural break dates, respectively. *** and ** denote significance at 1% and 5% levels, respectively.

After determining the cointegration relationship for the models, long-run coefficient estimation is performed at this stage of the empirical analysis. The long-run coefficients of the series in Models (1) and (2) are determined by utilizing ARDL and DOLS estimators and the results are reported in Table 6. Firstly, the results of the ARDL and DOLS estimators show that the long-run coefficients in Model (1) indicating the impact of social globalization on income inequality are negative and statistically significant at the 1% level. Similarly, ARDL and DOLS results for Model (2) reveal that the long-run coefficient of social globalization statistically reduces income inequality at the 1% significance level. Therefore, these results indicate that social globalization improves Türkiye's income distribution in the long run for both models. In this context, the development of social globalization in Türkiye leads to a more fair income distribution. This estimation finding is compatible with the results of Tabash et al. (2024), which found that social globalization reduces income inequality for 18 developing countries. Moreover, the estimation results of this study are consistent with the findings of Destek (2018) for Belarus and Poland, but not for Russia and Kazakhstan. On the other hand, the results of this study differ from the findings of Bergh and Nilsson (2010), which show that social globalization has a positive effect on income inequality. The findings obtained do not coincide with the results of Lee et al. (2020), which indicate that globalization triggers income inequality. Asteriou et al. (2014), considering

different globalization indicators, determine that trade globalization diminishes income inequality and this finding is similar to the results obtained. However, the estimation results are not congruent with the authors' findings that financial globalization has a distortive effect on income distribution. Munir and Bukhari (2020) argue that financial globalization boosts income inequality, and therefore, their result does not overlap with the findings of this study. However, the estimation findings are in line with the authors' results that technological globalization reduces income inequality.

Secondly, ARDL results show that the long-run coefficient of economic growth is statistically insignificant in both models. This result indicates that economic growth has no effect on income inequality in Türkiye. According to the findings obtained from the DOLS estimation technique, the coefficient of economic growth is insignificant for Model (1), while it is positive and statistically significant at the 10% level for Model (2). Generally, the findings reveal that economic growth does not have a significant effect on income inequality in Türkiye. This finding is inconsistent with the estimation results of Shahbaz (2010) which analyzed the nexus between economic growth and income inequality for Pakistan in the period 1975-2001. Ifeakachukwu (2020) investigates the relationship between globalization, economic growth and income inequality using ARDL and VECM methods for Nigeria. In this study, the author reveals that economic growth reduces income inequality in the long run. Therefore, the estimation findings of this study are not similar to the results found by Ifeakachukwu (2020). Similarly, the estimation findings differ from the results of studies such as Risso et al. (2013) and Shahbaz et al. (2017), which show that economic growth decreases income inequality.

Thirdly, another explanatory variable included in both models is financial development. The ARDL long-run coefficient estimates for Models (1) and (2) show that the impact of financial development on income inequality is statistically positive at 5% and 1% significance levels, respectively. Similarly, DOLS results reveal that the long-run effect of financial development on income inequality is positive and significant at the 1% level in both estimation models. In short, improvements in Türkiye's financial development increase income inequality and thus distort income distribution. The finding of a positive correlation between financial development and income inequality for Türkiye confirms the hypothesis of Rajan and Zingales

(2003). In addition, this positive relationship is consistent with the findings of studies in the literature such as Chiu and Lee (2019) and Koh et al. (2020). On the other hand, the findings are not in line with the hypothesis of Galor and Zeira (1993) and Banerjee and Newman (1993), which argue for the existence of a negative linear association between financial development and income inequality. Furthermore, the findings are not similar to the results of Zhang and Naceur (2019) and Thornton and Tommaso (2020), which find a negative relationship between the variables in the long run.

Finally, in this part of the empirical analysis, the long-run coefficients showing the effect of household consumption expenditures on income inequality in Model (2) are examined. ARDL and DOLS findings indicate that the elasticity of household consumption expenditures on income inequality is positive at the 1% significance level. This result reveals that increases in household consumption trigger income inequality in Türkiye. In other words, the increase of household consumption leads to a more unfair income distribution in Türkiye. This may imply that taxes applied to consumption expenditures in Türkiye are not aimed at ensuring a fair income distribution. Therefore, revisions should be made to reduce income inequality through a comprehensive tax reform in the Turkish economy.

The diagnostic tests presented in Table 6 indicate that there is no error for both estimation models. In other words, the R^2 values obtained for the models show that the independent series have a high explanatory power for the changes in income inequality. The *F*-statistic, which reveals the combined significance of all independent variables, is found to be significant at the 1% level. Moreover, other diagnostic tests confirm the absence of heteroskedasticity and autocorrelation problems in the models. The Ramsey RESET and Jarque-Bera test results indicate that there is no error in the model specification and the error terms are normally distributed, respectively. In addition, the stability of the long-run coefficients determined for Models (1) and (2) is demonstrated by the *CUSUM* and $CUSUM^2$ test results in Figures (1) and (2). The fact that the relevant values in Figs. (1) and (2) remain within the 5% band proves that the long-run coefficients are stable in both models.

Table 6: Long-Run Coefficient Estimation Results

Panel A: Long-run coefficient estimates				
Dependent variable: *lnGINI*				
	Model (1)		Model (2)	
Explanatory Variables	ARDL	DOLS	ARDL	DOLS
C	4.421***	4.531***	3.695***	3.203***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
lnGDP	-0.005	-0.022	0.010	0.023*
	(0.8667)	(0.2886)	(0.6304)	(0.0771)
lnSGI	-0.216***	-0.214***	-0.226***	-0.214***
	(0.0069)	(0.0002)	(0.0001)	(0.0000)
lnFD	0.058**	0.066***	0.056***	0.054***
	(0.0471)	(0.0077)	(0.0031)	(0.0025)
lnCON	-	-	0.152***	0.233***
			(0.0088)	(0.0001)
D_{1997}	0.002	0.019**	0.003	0.005
	(0.6329)	(0.0115)	(0.3403)	(0.1888)
D_{2008}	-0.004	-0.012	-0.002	-0.008*
	(0.3647)	(0.1113)	(0.5702)	(0.0754)
Panel B: ARDL diagnostic tests				
	Model (1)		Model (2)	
R^2	0.988		0.992	
$\bar{R}^2$	0.985		0.989	
CUSUM	Stable		Stable	
$CUSUM^2$	Stable		Stable	
	F-statistic	Probability value	*F*-statistic	Probability value
F-statistic	318.406	0.0000	316.119	0.0000
Breusch-Godfrey LM Test	1.501	0.2459	1.735	0.2032
Heteroskedasticity Test: ARCH	0.036	0.8510	0.033	0.8572
Jarque-Bera Normality Test	0.194	0.9075	0.104	0.9495
Ramsey RESET	1.289	0.2684	0.042	0.8403

Note: Values in parentheses indicate probability values. D_{1997} and D_{2008} represent structural breaks in 1997 and 2008, respectively. ***, ** and * denote significance at 1%, 5% and 10% levels, respectively.

Figure 1: *CUSUM* and $CUSUM^2$ Results for Model (1)

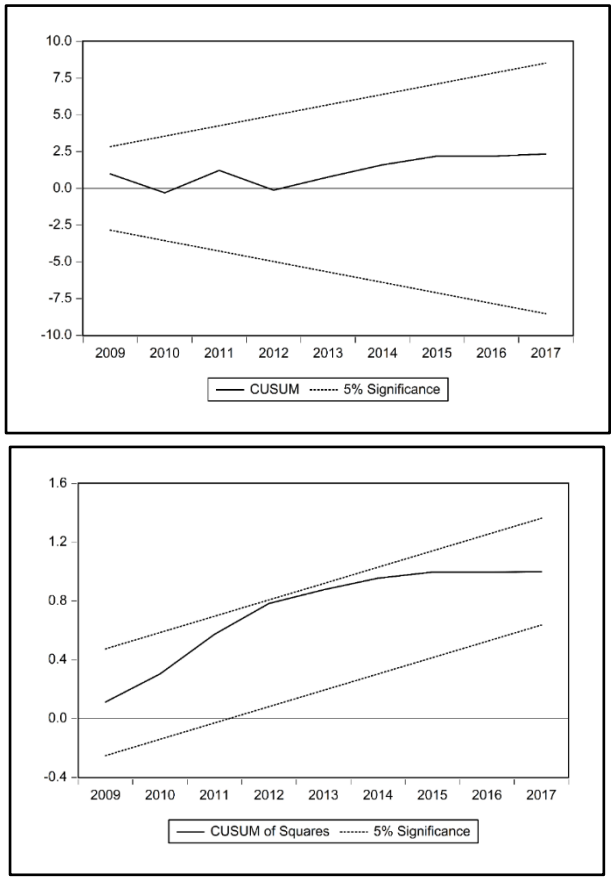
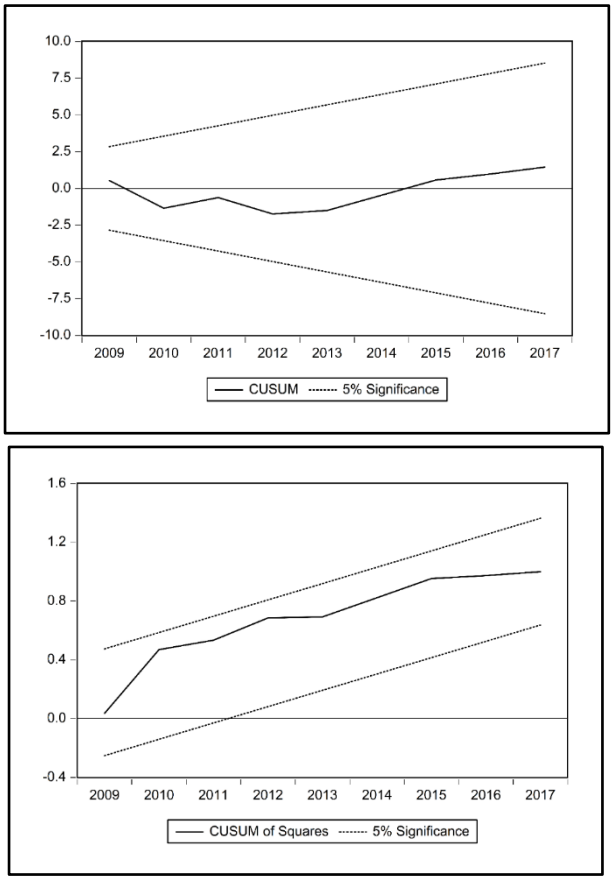


Figure 2: *CUSUM* and $CUSUM^2$ Results for Model (2)



In the last stage of the empirical strategy, the causality relationships between the series included in the models are first analyzed with the Hacker and Hatemi-J bootstrap method. The results presented in Table 7 prove a unidirectional causality from social globalization to income inequality. This finding is in line with the results of Shahbaz et al. (2015), which indicate the existence of a unidirectional relationship from globalization to income inequality using the VECM Granger causality test. Moreover, the results are consistent with Destek (2018)'s findings that social globalization causes income inequality for Hungary, Belarus, Kazakhstan and Poland by applying the panel bootstrap causality test. However, the results of this study are not similar to the findings of Destek (2018) that income inequality causes social globalization for Armenia, Belarus, Kazakhstan, Moldova, Poland and Romania. On the other

hand, Hacker and Hatemi-J test results reveal the existence of a one-way causality relationship from financial development to income inequality. This finding is compatible with the results of the studies in the literature such as Sehrawat and Giri (2015) for India, Azam and Raza (2018) for ASEAN-5 countries and Younsi and Bechtini (2020) for BRICS countries. In short, all these causality results provide evidence that social globalization and financial development have an impact on income distribution in the long run.

Table 7: Hacker and Hatemi-J Bootstrap Causality Test Results

Null hypothesis	MWALD test statistic	Bootstrap critical values			Result
		1%	5%	10%	
lnGDP ≠> *lnGINI*	0.002	8.318	4.702	3.209	H_0 accepted.
lnGINI ≠> *lnGDP*	0.076	7.851	4.367	3.046	H_0 accepted.
lnSGI ≠> *lnGINI*	6.457**	9.232	5.163	3.521	H_0 rejected.
lnGINI ≠> *lnSGI*	0.584	7.874	4.415	2.945	H_0 accepted.
lnFD ≠> *lnGINI*	5.453**	7.729	4.292	2.959	H_0 rejected.
lnGINI ≠> *lnFD*	2.763	7.842	4.281	2.933	H_0 accepted.
lnCON ≠> *lnGINI*	0.092	7.926	4.445	3.039	H_0 accepted.
lnGINI ≠> *lnCON*	2.384	7.895	4.285	2.899	H_0 accepted.

Note: ** denotes significance at 5% level.

At this stage of the empirical analysis, the Hacker and Hatemi-J bootstrap technique as well as the Toda and Yamamoto method are used to determine the causality relationship between the variables. The findings of the Toda-Yamamoto technique confirm the existence of a unidirectional causality relationship from social globalization to income inequality in both models. This result coincides with the findings of the Hacker and Hatemi-J bootstrap causality test. Moreover, Toda-Yamamoto test findings reveal the existence of one-way causality from income inequality, financial development and household consumption expenditures to real income per capita.

Table 8: Toda and Yamamoto Causality Test Results

Panel A: Estimation results for Model (1)				
Dependent variables	Independent variables			
	lnGINI	*lnGDP*	*lnSGI*	*lnFD*
lnGINI	-	0.391	8.155***	0.042
		(0.5319)	(0.0043)	(0.8368)
lnGDP	3.361*	-	1.055	15.394***
	(0.0668)		(0.3044)	(0.0001)
lnSGI	1.437	1.133	-	0.545
	(0.2306)	(0.2871)		(0.4606)
lnFD	0.906	0.170	0.636	-
	(0.3412)	(0.6805)	(0.4251)	

Panel B: Estimation results for Model (2)					
Dependent variables	Independent variables				
	lnGINI	*lnGDP*	*lnSGI*	*lnFD*	*lnCON*
lnGINI	-	0.008	9.826***	0.008	1.812
		(0.9287)	(0.0017)	(0.9302)	(0.1782)
lnGDP	8.044***	-	2.209	22.559***	5.729**
	(0.0046)		(0.1372)	(0.0000)	(0.0167)
lnSGI	2.170	0.295	-	0.175	0.003
	(0.1407)	(0.5870)		(0.6757)	(0.9590)
lnFD	0.161	0.018	0.733	-	0.009
	(0.6881)	(0.8924)	(0.3920)		(0.9239)
lnCON	2.375	2.321	1.684	0.055	-
	(0.1233)	(0.1276)	(0.1944)	(0.8140)	

Note: Values in parentheses indicate χ^2 probability values. Estimates are generated using the SUR (Seemingly Unrelated Regression) technique. ***, ** and * denote significance at 1%, 5% and 10% levels, respectively.

6. Conclusion and Recommendations

This study examines the relationship between social globalization and income inequality for Türkiye in the period 1987-2017. This relationship is analyzed with two estimation models using time series methods. The estimation models include per capita real income, financial development and household consumption expenditures as explanatory variables in addition to social globalization. As a result of the empirical analysis, a long-run relationship between the series used is determined by proving the existence of cointegration

in both models. Furthermore, ARDL and DOLS long-run coefficient estimates suggest that social globalization diminishes income inequality. On the other hand, it is evidenced that financial development and household consumption expenditures increase income inequality in the long run. Finally, causality findings show that there is a unidirectional causal relationship from social globalization to income inequality. These empirical findings prove the existence of a correlation between social globalization and income inequality in Türkiye. Based on the estimation results, various recommendations are offered to policymakers to ensure fair income distribution in Türkiye.

6.1. Policy Recommendations

The fact that social globalization reduces income inequality in the long run (i.e. leads to a fairer income distribution) provides important insights for policymakers. For example, since economic indicators alone may be insufficient to reduce income inequality, policy makers need to give importance to social globalization as well as economic globalization. Many socioeconomic factors such as labor wages and employment, environmental pollution, financial development, migration decisions, technological innovation, education, quality health services, science and arts activities can directly and/or indirectly affect income inequality among individuals. Considering all these factors, the development of social globalization in Türkiye can play a corrective role on income distribution. Therefore, Türkiye's policymakers should attach great importance to social integration with other countries. Because ensuring cultural and social integration between countries can strongly affect many parameters such as foreign direct investment, international trade, tourism and health revenues, technology transfers and human capital mobility. Moreover, in order to ensure a fair income distribution for Türkiye, policy recommendations can be listed such as reducing the share of high-income groups in GDP, achieving price stability, and organizing tax policies to increase the share of direct taxes instead of indirect taxes.

Finally, this study can provide information to inspire future studies that will examine the relationship between social globalization and income inequality. In particular, future studies could comprehensively analyze income inequality models by including economic, political, cultural, trade, technological and financial globalization in addition to social globalization.

Moreover, future studies can contribute to the literature investigating this relationship by including different countries in the analysis to make a comparison of countries.

References

Adams, S. (2008). Globalization and income inequality: Implications for intellectual property rights. *Journal of Policy Modeling*, 30(5), 725-735. https://doi.org/10.1016/j.jpolmod.2007.10.005.

Akbakay, Z. & Barak, D. (2020). Yükselen Piyasalarda Ekonomik Küreselleşme ve Gelir Eşitsizliği İlişkisi. *Uluslararası Yönetim İktisat ve İşletme Dergisi*, 16(1), 17-34. https://doi.org/10.17130/ijmeb.700812.

Ali, I.M.A. (2023). Income inequality, economic growth, and structural changes in Egypt: new insights from quantile cointegration approach. *Economic Change and Restructuring*, 56, 379-407. https://doi.org/10.1007/s10644-022-09429-w.

Asteriou, D., Dimelis, S. & Moudatsou, A. (2014). Globalization and income inequality: A panel data econometric approach for the EU27 countries, *Economic Modelling*, 36, 592-599. https://doi.org/10.1016/j.econmod.2013.09.051.

Azam, M. & Raza, S.A. (2018). Financial sector development and income inequality in ASEAN-5 countries: does financial Kuznets curve exists? *Global Business and Economics Review*, 20(1), 88-114. https://doi.org/10.1504/GBER.2018.088482.

Banerjee, A.V. & Newman, A.F. (1993). Occupational choice and the process of development. *Journal of Political Economy*, 101(2), 274-298. https://www.jstor.org/stable/2138820.

Bergh, A. & Nilsson, T. (2010). Do liberalization and globalization increase income inequality? *European Journal of Political Economy*, 26(4), 488-505. https://doi.org/10.1016/j.ejpoleco.2010.03.002.

Bolarinwa, S.T. & Akinlo, A.E. (2021). Is there a nonlinear relationship between financial development and income inequality in Africa? Evidence from dynamic panel threshold. *The Journal of Economic Asymmetries*, 24, e00226. https://doi.org/10.1016/j.jeca.2021.e00226.

Brown, R. L., Durbin, J. & Evans, J.M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society: Series B (Methodological)*, 37(2), 149-192. www.jstor.org/stable/2984889.

Canh, N.P., Binh, N.T., Thanh, S.D. & Schinckus, C. (2020). Determinants of foreign direct investment inflows: The role of economic policy uncertainty. *International Economics*, 161, 159-172. https://doi.org/10.1016/j.inteco.2019.11.012.

Cetin, M., Demir, H. & Saygin, S. (2021). Financial Development, Technological Innovation and Income Inequality: Time Series Evidence from Turkey. *Social Indicators Research*, 156, 47-69. https://doi.org/10.1007/s11205-021-02641-7.

Chiu, Y.-B. & Lee, C.-C. (2019). Financial development, income inequality, and country risk. *Journal of International Money and Finance*, 93, 1-18. https://doi.org/10.1016/j.jimonfin.2019.01.001.

Destek, M.A. (2018). Dimensions of globalization and income inequality in transition economies: taking into account cross-sectional dependence. *Eastern Journal of European Studies*, 9(2), 5-25.

Dreher, A. & Gaston, N. (2008). Has Globalization Increased Inequality?, *Review of International Economics*, 16(3), 516-536. https://doi.org/10.1111/j.1467-9396.2008.00743.x.

Dreher, A. (2006). Does globalization affect growth? Evidence from a new index of globalization. *Applied Economics*, 38(10), 1091-1110. https://doi.org/10.1080/00036840500392078.

Galor, O. & Zeira, J. (1993). Income distribution and macroeconomics. *The Review of Economic Studies*, 60(1), 35-52. https://doi.org/10.2307/2297811.

Gygli, S., Haelg, F., Potrafke, N. & Sturm, J.-E. (2019). The KOF Globalisation Index-revisited. *The Review of International Organizations*, 14, 543-574. https://doi.org/10.1007/s11558-019-09344-2.

Hacker, R.S. & Hatemi-J, A. (2006). Tests for causality between integrated variables using asymptotic and bootstrap distributions: theory and application. *Applied Economics*, 38(13), 1489-1500. https://doi.org/10.1080/00036840500405763.

Ifeakachukwu, N.P. (2020). Globalisation, Economic Growth and Income Inequality in Nigeria. *Indian Journal of Human Development*, 14(2), 202-212. https://doi.org/10.1177/0973703020948484.

Inoue, T. (2018). Financial development, remittances, and poverty reduction: Empirical evidence from a macroeconomic viewpoint. *Journal of*

Economics and Business, 96, 59-68. https://doi.org/10.1016/j.jeconbus.2017.12.001.

Jiaqun, W., Jotham, K., Dossou, T.A.M., Alinsato, A.S. & Asongu, S.A. (2024). Tourism and income inequality in sub-Saharan African countries: the role of democracy. *Current Issues in Tourism*, 27(18), 2878-2898. https://doi.org/10.1080/13683500.2024.2321336.

Kavya, T.B. & Shijin, S. (2020). Economic development, financial development, and income inequality nexus. *Borsa Istanbul Review*, 20(1), 80-93. https://doi.org/10.1016/j.bir.2019.12.002.

Kim, D.-H. & Lin, S.-C. (2023). Income inequality, inflation and financial development. *Journal of Empirical Finance*, 72, 468-487. https://doi.org/10.1016/j.jempfin.2023.04.008.

KOF Swiss Economic Institute (2019). KOF Globalisation Index. Accessed March 27, 2020. Retrieved from https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html.

Koh, S.G.M., Lee, G.H.Y. & Bomhoff, E.J. (2020). The income inequality, financial depth and economic growth nexus in China. *The World Economy*, 43(2), 412-427. https://doi.org/10.1111/twec.12825.

Kouadio, H.K. & Gakpa, L.-L. (2022). Do economic growth and institutional quality reduce poverty and inequality in West Africa? *Journal of Policy Modeling*, 44(1), 41-63. https://doi.org/10.1016/j.jpolmod.2021.09.010.

Kuznets, S. (1955). Economic growth and income inequality. *The Economic Review*, 45(1), 1-28. https://www.jstor.org/stable/1811581.

Lee, C.-C., Lee, C.-C. & Lien, D. (2020). Income inequality, globalization, and country risk: a cross-country analysis, *Technological and Economic Development of Economy*, 26(2), 379-404. https://doi.org/10.3846/tede.2019.11414.

Lee, C.-C., Xing, W. & Lee, C.-C. (2022). The impact of energy security on income inequality: The key role of economic development. *Energy*, 248, 123564. https://doi.org/10.1016/j.energy.2022.123564.

Mah, J.S. (2003). A note on globalization and income distribution-the case of Korea, 1975-1995. *Journal of Asian Economics*, 14(1), 157-164. https://doi.org/10.1016/S1049-0078(02)00244-0.

Munir, K. & Bukhari, M. (2020). Impact of globalization on income inequality in Asian emerging economies. *International Journal of Sociology and*

Social Policy, 40(1/2), 44-57. https://doi.org/10.1108/IJSSP-08-2019-0167.

Nam, H.-J., Frijns, B. & Ryu, D. (2024). Trade openness and income inequality: The moderating role of institutional quality. *Global Finance Journal*, 60, 100959. https://doi.org/10.1016/j.gfj.2024.100959.

Narayan, P.K. & Popp, S. (2010). A new unit root test with two structural breaks in level and slope at unknown time. *Journal of Applied Statistics*, 37(9), 1425-1438. https://doi.org/10.1080/02664760903039883.

Narayan, P.K. (2005). The saving and investment nexus for China: evidence from cointegration tests. *Applied Economics*, 37(17), 1979-1990. https://doi.org/10.1080/00036840500278103.

Newey, W.K. & West, K.D. (1994). Automatic Lag Selection in Covariance Matrix Estimation. *The Review of Economic Studies*, 61(4), 631-653. https://doi.org/10.2307/2297912.

Ng, S. & Perron, P. (2001). Lag lenght selection and the construction of unit root tests with good size and power. *Econometrica*, 69(6), 1519-1554. https://doi.org/10.1111/1468-0262.00256.

OECD (2020). Household spending (indicator). Accessed May 2, 2020. Retrieved from https://data.oecd.org.

Ozturk, S., Cetin, M. & Demir, H. (2022). Income inequality and CO_2 emissions: nonlinear evidence from Turkey. *Environment, Development and Sustainability*, 24, 11911-11928. https://doi.org/10.1007/s10668-021-01922-y.

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

Phillips, P.C.B. & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, 75(2), 335-346. https://doi.org/10.2307/2336182.

Rajan, R.G. & Zingales, L. (2003). The great reversals: the politics of financial development in the twentieth century. *Journal of Financial Economics*, 69(1), 5-50. https://doi.org/10.1016/S0304-405X(03)00125-9.

Rambaldi, A.N. & Doran, H.E. (1996). Testing for Granger non-causality in cointegrated systems made easy. *Working Paper in Econometrics and Applied Statistics*, 88, 1-22.

Risso, W.A., Punzo, L.F. & Carrera, E.J.S. (2013). Economic growth and income distribution in Mexico: A cointegration exercise. *Economic Modelling*, 35, 708-714. https://doi.org/10.1016/j.econmod.2013.08.036.

Sehrawat, M. & Giri, A.K. (2015). Financial development and income inequality in India: an application of ARDL approach. *International Journal of Social Economics*, 42(1), 64-81. https://doi.org/10.1108/IJSE-09-2013-0208.

Shahbaz, M. (2010). Income inequality-economic growth and non-linearity: a case of Pakistan. *International Journal of Social Economics*, 37(8), 613-636. https://doi.org/10.1108/03068291011060652.

Shahbaz, M., Bhattacharya, M. & Mahalik, M.K. (2017). Finance and income inequality in Kazakhstan: evidence since transition with policy suggestions. *Applied Economics*, 49(52), 5337-5351. https://doi.org/10.1080/00036846.2017.1305095.

Shahbaz, M., Loganathan, N., Tiwari, A.K. & Sherafatian-Jahromi, R. (2015). Financial development and income inequality: is there any financial Kuznets curve in Iran? *Social Indicators Research*, 124, 357-382. https://doi.org/10.1007/s11205-014-0801-9.

Shahbaz, M., Shahzad, S.J.H., Mahalik, M.K. & Hammoudeh, S. (2018). Does Globalisation Worsen Environmental Quality in Developed Economies? *Environmental Modeling & Assessment*, 23, 141-156. https://doi.org/10.1007/s10666-017-9574-2.

Solt, F. (2019). Measuring income inequality across countries and over time: the standardized world income inequality database, SWIID version 8.2. Accessed March 27, 2020. Retrieved from https://fsolt.org.

Stock, J.H. & Watson, M.W. (1993). A simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica*, 61(4), 783-820. https://doi.org/10.2307/2951763.

Swamy, V. & Dharani, M. (2020). Thresholds of financial development in the Euro area. *The World Economy*, 43(6), 1730-1774. https://doi.org/10.1111/twec.12902.

Sweidan, O.D. (2023). The Effect of Geopolitical Risk on Income Inequality: Evidence from a Panel Analysis. *Social Indicators Research*, 167, 47-66. https://doi.org/10.1007/s11205-023-03093-x.

Tabash, M.I., Elsantil, Y., Hamadi, A. & Drachal, K. (2024). Globalization and Income Inequality in Developing Economies: A Comprehensive Analysis. *Economies*, 12(1), 23. https://doi.org/10.3390/economies12010023.

Thornton, J. & Tommaso, C.D. (2020). The long-run relationship between finance and income inequality: evidence from panel data. *Finance Research Letters*, 32, 101180. https://doi.org/10.1016/j.frl.2019.04.036.

Toda, H.Y. & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics*, 66(1-2), 225-250. https://doi.org/10.1016/0304-4076(94)01616-8.

Tsai, M.-C. (2007). Does globalization affect human well-being? *Social Indicators Research*, 81, 103-126. https://doi.org/10.1007/s11205-006-0017-8.

Villanthenkodath, M.A., Pal, S. & Mahalik, M.K. (2024). Income Inequality in Globalization Context: Evidence from Global Data. *Journal of the Knowledge Economy*, 15, 3872-3902. https://doi.org/10.1007/s13132-023-01342-5.

Wang, W., Xu, T., Liu, X. & Sun, Y. (2023). FDI inflows and income inequality: A Schumpeterian economic growth. *International Review of Economics & Finance*, 83, 805-820. https://doi.org/10.1016/j.iref.2022.10.023.

World Bank (2020). World development indicators database. Accessed March 27, 2020. Retrieved from https://data.worldbank.org.

Younsi, M. & Bechtini, M. (2020). Economic Growth, Financial Development, and Income Inequality in BRICS Countries: Does Kuznets' Inverted U-Shaped Curve Exist? *Journal of the Knowledge Economy*, 11, 721-742. https://doi.org/10.1007/s13132-018-0569-2.

Zhang, R. & Naceur, S.M. (2019). Financial development, inequality, and poverty: some international evidence. *International Review of Economics & Finance*, 61, 1-16. https://doi.org/10.1016/j.iref.2018.12.015.

CHAPTER II

Investigating the Determinants of Students' Smart Phone Purchasing Behavior

Lecturer Gorkem GUNGOR[1]

DOI: https://dx.doi.org/10.5281/zenodo.14391608

[1] Department of Banking and Insurance, Vocational School, Dogus University, Istanbul, Türkiye.ORCID: https://orcid.org/0000-0003-2210-1286
e-mail: ggungor@dogus.edu.tr

1. Introduction

Behavioral economics is a branch of science that allows us to understand economic behavior. It examines the purchasing decisions of individuals from an economic perspective. In this sense, it has an important place in economics. Significant contributions have been made with studies conducted since the 1960s (Cartwright, 2018). Day by day, as in every field, there are developments in the field of information technology. Our lives have become easier thanks to smart phones in this field (Gadeyne et al., 2018). According to MOBİSAD (2023) data, smartphone usage in the world has reached approximately 86%. This rate exceeds 95% for Türkiye. According to the data published by TÜİK (2021), the smartphone usage rate of children aged 6-15 is 64.4% and the internet usage rate is 82.7%. It is known that young people, especially university students, use smartphones effectively. Many features and applications of smartphones, especially social media, are used by students. According to the report published by Meltwater (2024), approximately 67% of the population in Türkiye use social media and approximately 95% of this population consists of young people over the age of 18.

In the studies conducted, the main factors affecting the purchasing behavior of consumers for products and services come to the fore. These are demographic, economic, socio-cultural and psychological factors. i) Demographic factors consist of factors that affect the purchasing behavior of consumers, such as age, gender, income, education, etc. and are important because they are more measurable than other factors. ii) Economic factors; Although it is included as a sub-factor of demographic factors in most studies, it is also considered as a separate factor. When considered in this way, it is necessary to examine the utility, purchasing power and expenditure structure in addition to income. iii) Socio-cultural factors are the other factor affecting consumer behavior. It is considered as social roles and statuses, culture, reference groups and family. iv) Psychological factors; It is another factor that affects the purchasing of consumers and affects the purpose for which they will purchase. It is divided into belief, motivation, perception and attitude (Dewi et al., 2022; Gedik, 2020; Şahin and Akballı, 2017; Gajjar, 2013; Kirchler and Hoelzl, 2011).

In this study, it is aimed to reveal which brands are preferred by students who use smartphones more in terms of use in the competitive environment that

has increased with the development of technology and what are the factors affecting their preferences. A survey is administered to students studying in two different programs of a university in Istanbul with high and low financial literacy levels. It is observed that there are few studies in the literature on university students in Istanbul and financial literacy. It is aimed that the study will contribute to the literature in this respect.

The second part of the study includes a literature review. The third part includes the analysis of the study. This section covers the findings and discussion topics. Finally, the fourth part is the conclusion. This section includes content such as the benefits, shortcomings and policy recommendations of the study.

2. Literature Review

As a result of the literature review, various consumer behavior research studies were discussed. In the study, especially studies on mobile phones, smartphones and students' purchasing behavior and preferences were included, as well as studies on closely related topics.

Wu (2002), Rambi (2015) and Dewi et al. (2022) similarly reveal that there is a robust relationship between consumer behavior and purchasing decisions. Wu (2002), affect the degree of participation that studied on consumers states that demographic factors, social factors and psychological factors. These factors affect the participation of internet consumers in marketing as well as their purchasing decisions. Rambi (2015) examines the relationship of consumer behavior on the purchasing decision for the Xiaomi smartphone with 80 people residing in Manado. It concludes that there is a robust relationship between the factors affecting consumer behavior and the purchasing decision. It is revealed that cultural, demographic and psychological factors do not have an effect on the consumer purchasing decision for the brand used in the research, but social factors do. Dewi et al. (2022), surveyed 120 randomly selected respondents residing in Indonesia. It revealed that there is a positive and significant relationship between consumer behavior and product purchase decision.

Yaylalı et al. (2011), administered a survey to 564 students studying at Selçuk University Vocational School. The income and expenditure relationship was examined. The results of the study show that food and accommodation

expenses constitute 59% of the budget. Communication expenses have a rate of 8%.

Çakır and Demir (2014) aimed to reveal the smartphone purchase preference with university students. For this purpose, a questionnaire is conducted to 387 students and it was concluded that the factors affecting the preference of students in their purchase are advertising and features, and price has no effect.

Büyükdoğan et al. (2015) administered by a survey to 582 students studying at KTO Karatay University. According to the results of the study, the ratio of food, clothing, entertainment and social activity expenses to the budget is quite high. On the other hand, the ratio of stationery, accommodation and communication expenses to the budget is low. While male students spend more on entertainment and social activities, female students spend their budgets on stationery and clothing.

Pehlivanoğlu and Narman (2018) aim to examine the consumption behavior of university students based on various factors. For this purpose, they conduct a survey on 580 students studying at Kocaeli University. Among 10 different expenditure groups, the two groups with the largest share are food and shelter expenses, while the share of communication expenses in the budget is quite low. Communication expenses are at the last place in the list, after health expenses.

Koç and Aydın (2018), the effect of gender factor among demographic characteristics on purchasing is examined and 400 people are surveyed. In their study, they reveal that women make sudden decisions in purchasing, can buy products out of necessity, and are higher in purchasing than men because they follow fashion and innovation. However, they explain that there is no difference in electronic product purchases.

Başaran Alagöz and Güler (2018) and Sürücü et al. (2020) emphasize the importance of the brand in their study and authors examine the relationship between product placement in computer games and purchase intention by surveying 350 university students. They determine that there is a positive relationship. According to the results of the study, participants prefer to buy the brands they see while playing computer games and the brands used by other players. Sürücü et al. (2020) conduct a survey to 749 people between the ages of 20-30 to determine the factors affecting purchase intention. As a result of the

research, they concluded that reference group and brand trust have an effect on purchase intention.

Zaware et al. (2020) conduct a survey to 971 people between the ages of 18-55 living in India. In this study, they conclude that online and offline holistic sources are used simultaneously in the purchase decision.

Hanaysa et al. (2021) conduct a survey to consumers of stores operating in the retail sector in Malaysia. They explain that product price and store image have a positive relationship with purchase decision. Kanapathipillai et al. (2024) examine the relationship between marketing mix and consumer behavior for mobile phones in Malaysia. They emphasize the importance of product specifications in consumer purchase decisions. Moreover, in this study, as in Hanaysa et al (2021), there is a robust relationship between price and consumer behavior. Finally, they state that distribution channels, accessibility, promotions and campaigns are also important on consumer behavior.

3. Analysis

3.1. Sample and Research Method

The data for the study are obtained from university students studying in two different programs of a university in Istanbul. The data collected from 128 participants on a voluntary basis are analyzed. The analysis of the data was made with the SPSS 22 program and 95% confidence level is used.

The difference in the degree of importance of issues in smartphone purchase according to categorical variables is analyzed with the Kruskal-Wallis test proposed by Kruskal and Wallis (1952) and the Mann-Whitney test proposed by Mann and Whitney (1947). The Mann-Whitney test is a test technique used to compare two independent groups in terms of a quantitative variable, while the Kruskal-Wallis test is a test technique used to compare k independent group ($k > 2$) in terms of a quantitative variable.

In the study, Cronbach Alpha reliability test developed by Cronbach (1951) was applied. However, since there was no normal distribution, the reliability was not at the desired level according to the 2, 3 and 4 dimensions. Therefore, nonparametric tests were applied.

3.2. Findings and Discussion

3.2.1. Findings

In the study, the first seven questions include questions on the demographic characteristics of the participants. Through these questions, demographic characteristics were analyzed.

Table 1: Personal Findings

		n	%
Gender?	Female	45	35,2
	Male	83	64,8
Age?	20 years and under	73	57,0
	Over 20 years	55	43,0
Department?	Banking and Insurance	62	48,4
	Computer Programming	66	51,6
Grade?	1st grade	67	52,3
	2nd grade	61	47,7
Do you work?	Yes	29	22,7
	No	99	77,3
Monthly net income?	0-2500TL	44	41,5
	2501-5000TL	12	11,3
	5001-7500TL	13	12,3
	7501-10000TL	12	11,3
	10001 TL and above	25	23,6
Monthly net income of your family?	0-20000TL	9	7,7
	20001-30000TL	24	20,5
	30001-40000TL	30	25,6
	40001-50000TL	21	17,9
	50001 TL and above	33	28,2

Among the participants who responded to the survey; the rate of males is 64.8%; the rate of those aged 20 years and under is 57.0%; the rate of those whose department is Computer Programming is 51.6%; the rate of those who are in the first grader is 52.3%; the rate of those who are employed is 22.7%; the rate of those whose monthly net income is between 0-2500 TL is 41.5%; the rate of those whose monthly net income of family is 50001 TL and above is 28.2%.

Table 2: Findings Related to Smartphone

		n	%
Is brand a reason for preference in your smartphone purchases?	Yes	95	74,2
	No	33	25,8
What is the first smartphone brand that comes to your mind?	Apple	76	59,4
	Samsung	35	27,3
	Xaomi	8	6,3
	Huawei	4	3,1
	LG	2	1,6
	Motorola	1	,8
	Sony	2	1,6
Which of the smartphone brands on the list do you use?	Apple	59	46,5
	Asus	3	2,4
	Sony	3	2,4
	General Mobile	0	0,0
	HTC	1	,8
	Xiaomi	10	7,9
	LG	6	4,7
	Lenovo	0	0,0
	Motorola	0	0,0
	Samsung	35	27,6
	Nokia	0	0,0
	Huawei	10	7,9
How long have you been using your current smartphone?	Less than 6 months	32	25,0
	7 months - 18 months	55	43,0
	19 months - 30 months	17	13,3
	more than 31 months	24	18,8
Have you planned how much budget you will use before you buy your smartphone?	Yes	88	68,8
	No	40	31,3
How did the budget match up with the purchase price of your smartphone?	I exceeded the budget	15	16,0
	Equal	35	37,2
	I didn't exceed the budget	44	46,8
Would you like to change the brand of your smartphone at the next purchase?	I will definitely change it	18	14,1
	I definitely won't change it	55	43,0
	Maybe	55	43,0

Which of the listed promotional methods was most effective for you when you get your smartphone?	News in the press and on television	13	10,2
	Advice from store salespeople selling smartphones	17	13,3
	Friend / Family / Acquaintance Recommendation	45	35,2
	Internet forums / Blogs	53	41,4
How did you get your smartphone?	Online	15	11,7
	Gift	8	6,3
	Abroad	5	3,9
	Store	93	72,7
	Second hand	3	2,3
	Others	4	3,1

Among the participants who responded to the survey; the rate of those who have a brand preference for their smartphone purchases is 74.2%; the rate of those who have Apple as the first smartphone brand that comes to mind is 59.4%; the rate of those who use Apple brand phones is 46.5%; the rate of those who have been using their current phone for 7 months - 18 months is 43.0%; the rate of those who plan how much budget they will use before purchasing their smartphone is 68.8%; the rate of those who did not exceed the budget when they matched the amount they purchased their smartphone with the budget is 46.8%; the rate of those who would not like to change their smartphone brand in the next purchase and maybe will change it is 43.0%; the rate of those who were influenced by Internet forums / Blogs when purchasing their smartphone is 41.4%; the rate of those who bought their smartphone from a sales store is 72.7%.

Table 3: Importance Degrees of Topics in Smartphone Purchasing

	1		2		3		4		5		Mean
	n	%	n	%	n	%	n	%	n	%	
1. Affordable price	4	3,1	5	3,9	24	18,8	29	22,7	66	51,6	4,16
2. Having attractive campaigns	17	13,3	7	5,5	29	22,7	17	13,3	58	45,3	3,72
3. Having design aesthetics	10	7,8	4	3,1	24	18,8	29	22,7	61	47,7	3,99
4. Having different color alternatives	26	20,3	16	12,5	37	28,9	21	16,4	28	21,9	3,07
5. Good features	4	3,1	0	0,0	4	3,1	12	9,4	108	84,4	4,72
6. Having a robust and reliable brand image	5	3,9	4	3,1	11	8,6	19	14,8	89	69,5	4,43
7. Having a good warranty period and conditions	7	5,5	3	2,3	14	10,9	22	17,2	82	64,1	4,32
8. Being flashy and eye-catching	26	20,3	16	12,5	39	30,5	18	14,1	29	22,7	3,06
9. Used by well-known and famous people	95	74,2	9	7,0	11	8,6	6	4,7	7	5,5	1,60
10. Used by people whose opinions I value	38	29,7	17	13,3	29	22,7	24	18,8	20	15,6	2,77

The most important topics when buying a smartphone are having good features, having a robust and reliable brand image, and having a good warranty period and conditions. On the other hand, the least important topics are that it is used by well-known and famous people, that it is used by people whose opinions I value, and that it is flashy and eye-catching.

Table 4: Examining the Importance Degrees of the Topics Considered While Purchasing a Smartphone in Terms of Gender

	Gender?				U	p
	Female		Male			
	Mean	sd	Mean	sd		
1. Affordable price	4,20	1,04	4,13	1,08	1809,500	,753
2. Having attractive campaigns	3,93	1,40	3,60	1,43	1605,000	,165
3. Having design aesthetics	4,16	1,13	3,90	1,27	1666,500	,283
4. Having different color alternatives	3,51	1,36	2,83	1,39	1360,500	,009*
5. Good features	4,69	0,90	4,73	0,75	1865,500	,987
6. Having a robust and reliable brand image	4,53	0,92	4,37	1,10	1747,500	,461
7. Having a good warranty period and conditions	4,69	0,63	4,12	1,26	1424,500	,010*
8. Being flashy and eye-catching	3,22	1,40	2,98	1,42	1678,000	,331
9. Used by well-known and famous people	1,71	1,14	1,54	1,18	1631,000	,124
10. Used by people whose opinions I value	3,11	1,50	2,59	1,40	1491,000	,054

* $p < 0.05$

The results of the Mann-Whitney test proposed by Mann and Whitney (1947) to examine the importance degrees of the topics considered when buying a smartphone in terms of gender are presented in Table 4. There is a statistically significant difference between females and males with regard to the importance degree of "Having different color alternatives" when purchasing a smartphone ($p<0.05$). Accordingly, females attach more importance to this topic. There is a statistically significant difference between females and males regarding the importance degree of "Having a good warranty period and conditions" in the purchase of smartphones ($p<0.05$). Accordingly, females attach more importance to this topic.

Table 5: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of Age

	Age?				U	p
	20 years and under		Over 20 years			
	Mean	sd	Mean	sd		
1. Affordable price	4,18	1,10	4,13	1,02	1901,500	,579
2. Having attractive campaigns	3,52	1,46	3,98	1,34	1638,000	,059
3. Having design aesthetics	3,85	1,30	4,18	1,11	1724,000	,144
4. Having different color alternatives	3,00	1,41	3,16	1,41	1872,000	,504
5. Good features	4,73	0,85	4,71	0,74	1921,500	,512
6. Having a robust and reliable brand image	4,37	1,12	4,51	0,92	1899,500	,522
7. Having a good warranty period and conditions	4,27	1,20	4,38	0,99	1959,000	,785
8. Being flashy and eye-catching	3,03	1,40	3,11	1,44	1944,500	,755
9. Used by well-known and famous people	1,66	1,27	1,53	1,02	1968,500	,807
10. Used by people whose opinions I value	2,86	1,54	2,65	1,32	1848,500	,432

* $p < 0.05$

The results of the Mann-Whitney test proposed by Mann and Whitney (1947) to examine importance degrees of the topics considered when purchasing a smartphone in terms of age are presented in Table 5. There is no statistically significant difference between age groups regarding the importance degrees of topics in purchasing a smartphone (p>0,05).

Table 6: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of Department

	Department?				U	p
	Banking and Insurance		Computer Programming			
	Mean	sd	Mean	sd		
1. Affordable price	4,11	1,16	4,20	,96	2041,500	,981
2. Having attractive campaigns	3,87	1,48	3,58	1,37	1729,500	,110
3. Having design aesthetics	3,95	1,35	4,03	1,11	1998,500	,808
4. Having different color alternatives	3,32	1,36	2,83	1,42	1660,000	,059
5. Good features	4,74	0,81	4,70	,80	1946,000	,450
6. Having a robust and reliable brand image	4,73	0,81	4,15	1,15	1407,000	,000*
7. Having a good warranty period and conditions	4,63	0,83	4,03	1,26	1444,000	,001*
8. Being flashy and eye-catching	3,48	1,40	2,67	1,32	1370,500	,001*
9. Used by well-known and famous people	1,77	1,30	1,44	1,01	1778,500	,097
10. Used by people whose opinions I value	3,00	1,47	2,56	1,40	1698,000	,089

* $p < 0.05$

The results of the Mann-Whitney test proposed by Mann and Whitney (1947) to examine importance degrees of the topics considered when purchasing a smartphone in terms of department are presented in Table 6. There is a statistically significant difference between departments regard to the importance degree of “Having a robust and reliable brand image” when purchasing a smartphone ($p<0,05$). Accordingly, those whose department is Banking and Insurance attach more importance to this issue. There is a statistically significant difference between departments regard to the importance degree of “Having a good warranty period and conditions” when purchasing a smartphone ($p<0,05$). Accordingly, those whose department is Banking and Insurance attach more importance to this issue. There is a statistically significant difference between departments regard to the

importance degree of "Being flashy and eye-catching" when purchasing a smartphone (p<0,05). Accordingly, those whose department is Banking and Insurance attach more importance to this issue.

Table 7: **Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of Grade**

	Grade?				U	p
	1st grade		2nd grade			
	Mean	sd	Mean	sd		
1. Affordable price	4,21	1,04	4,10	1,09	1930,000	,556
2. Having attractive campaigns	3,37	1,48	4,10	1,27	1460,500	,003*
3. Having design aesthetics	3,78	1,30	4,23	1,10	1618,000	,030*
4. Having different color alternatives	2,85	1,45	3,31	1,34	1666,500	,065
5. Good features	4,67	0,91	4,77	0,67	2001,500	,751
6. Having a robust and reliable brand image	4,28	1,14	4,59	0,90	1703,000	,046*
7. Having a good warranty period and conditions	4,27	1,16	4,38	1,07	1906,500	,444
8. Being flashy and eye-catching	2,81	1,41	3,34	1,38	1605,500	,032*
9. Used by well-known and famous people	1,54	1,23	1,67	1,09	1812,500	,151
10. Used by people whose opinions I value	2,67	1,46	2,89	1,44	1870,500	,397

* $p < 0.05$

The results of the Mann-Whitney test proposed by Mann and Whitney (1947) to examine importance degrees of the topics considered when purchasing a smartphone in terms of grade are presented in Table 7. There is a statistically significant difference between grades regard to the importance degree of "Having attractive campaigns" when purchasing a smartphone (p<0.05). Accordingly, 2nd graders attach more importance to this issue. There is a statistically significant difference between grades regard to the importance degree of "Having design aesthetics" when purchasing a smartphone (p<0.05). 2nd graders attach more importance to this issue. There is a statistically

significant difference between grades regard to the importance degree of "Having a robust and reliable brand image" when purchasing a smartphone ($p<0.05$). Accordingly, 2nd graders attach more importance to this issue. There is a statistically significant difference between grades regard to the importance degree of "Being flashy and eye-catching" when purchasing a smartphone ($p<0.05$). Accordingly, 2nd graders attach more importance to this issue.

Table 8: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of Grade and Department

	1st Grade?						2nd Grade?					
	Department				U	p	Department				U	p
	Banking and Insurance		Computer Programming				Banking and Insurance		Computer Programming			
	Mean	sd	Mean	sd			Mean	sd	Mean	sd		
1. Affordable price	4,20	1,19	4,21	,95	496,500	,685	4,05	1,15	4,17	1,01	433,000	,861
2. Having attractive campaigns	3,36	1,68	3,38	1,36	514,500	,888	4,22	1,23	3,92	1,35	375,000	,256
3. Having design aesthetics	3,68	1,55	3,83	1,15	518,000	,924	4,14	1,18	4,38	0,97	407,500	,547
4. Having different color alternatives	2,92	1,55	2,81	1,40	507,000	,811	3,59	1,17	2,88	1,48	324,500	,069
5. Good features	4,56	1,12	4,74	,77	494,500	,540	4,86	0,48	4,63	0,88	372,500	,087
6. Having a robust and reliable brand image	4,44	1,16	4,19	1,13	436,500	,188	4,92	0,36	4,08	1,21	261,500	,000*
7. Having a good warranty period and conditions	4,64	0,91	4,05	1,25	354,500	,012*	4,62	0,79	4,00	1,32	327,500	,036*
8. Being flashy and	3,24	1,61	2,55	1,21	390,500	,070	3,65	1,23	2,88	1,48	307,500	,039*

eye-catching												
9. Used by well-known and famous people	2,04	1,67	1,24	,76	409,000	,029*	1,59	0,96	1,79	1,28	425,000	,736
10. Used by people whose opinions I value	3,20	1,58	2,36	1,30	362,000	,030*	2,86	1,40	2,92	1,53	436,000	,904

* $p < 0.05$

The results of the Mann-Whitney test proposed by Mann and Whitney (1947) to examine importance degrees of the topics considered when purchasing a smartphone in terms of grade and department are presented in Table 8. There is a statistically significant difference between 1st graders of different departments regard to the importance degree of "Having a good warranty period and conditions" when purchasing a smartphone (p<0,05). Accordingly, those whose department is Banking and Insurance attach more importance to this issue. There is a statistically significant difference between 1st graders of different departments regard to the importance degree of "Used by well-known and famous people" when purchasing a smartphone (p<0,05). Accordingly, those whose department is Banking and Insurance attach more importance to this issue. There is a statistically significant difference between 1st graders of different departments regard to the importance degree of "Used by people whose opinions I value" when purchasing a smartphone (p<0,05). Accordingly, those whose department is Banking and Insurance attach more importance to this issue. There is a statistically significant difference between 2nd graders of different departments regard to the importance degree of "Having a robust and reliable brand image" when purchasing a smartphone (p<0,05). Accordingly, those whose department is Banking and Insurance attach more importance to this issue. There is a statistically significant difference between 2nd graders of different departments regard to the importance degree of "Having a good warranty period and conditions" when purchasing a smartphone (p<0,05). Accordingly, those whose department is Banking and Insurance attach more importance to this issue. There is a statistically significant difference between 2nd graders of different departments

regard to the importance degree of "Being flashy and eye-catching" when purchasing a smartphone (p<0,05). Accordingly, those whose department is Banking and Insurance attach more importance to this issue.

Table 9: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of Employment Status

	Do you work?				U	p
	Yes		No			
	Mean	sd	Mean	sd		
1. Affordable price	4,03	1,30	4,19	,99	1411,500	,882
2. Having attractive campaigns	4,03	1,09	3,63	1,50	1267,000	,309
3. Having design aesthetics	3,93	1,22	4,01	1,23	1372,000	,699
4. Having different color alternatives	3,03	1,48	3,08	1,40	1410,000	,882
5. Good features	4,66	0,90	4,74	,78	1397,500	,732
6. Having a robust and reliable brand image	4,45	1,18	4,42	1,00	1339,500	,501
7. Having a good warranty period and conditions	4,52	0,87	4,26	1,17	1283,000	,310
8. Being flashy and eye-catching	3,48	1,48	2,94	1,38	1120,500	,065
9. Used by well-known and famous people	1,66	1,29	1,59	1,13	1403,000	,810
10. Used by people whose opinions I value	2,66	1,67	2,81	1,38	1339,000	,573

* $p < 0.05$

The results of the Mann-Whitney test proposed by Mann and Whitney (1947) to examine importance degrees of the topics considered when purchasing a smartphone in terms of working are presented in Table 9. There is no statistically significant difference between the employment statuses regard to the importance degree when purchasing a smartphone (p>0,05).

Table 10: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of Monthly Net Income

	Monthly net income?										X2	p
	0-2500TL		2501-5000TL		5001-7500TL		7501-10000TL		10001 TL and above			
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd		
1. Affordable price	4,27	1,02	4,00	,85	3,92	1,26	4,58	,67	3,84	1,31	4,916	,296
2. Having attractive campaigns	3,57	1,47	3,50	1,31	3,15	1,95	3,75	1,36	4,28	0,94	4,969	,290
3. Having design aesthetics	3,61	1,38	3,83	1,03	4,00	1,22	4,00	1,21	4,40	1,08	7,885	,096
4. Having different color alternatives	3,00	1,48	2,50	1,17	3,00	1,63	2,25	1,29	3,64	1,32	9,228	,056
5. Good features	4,64	1,04	4,75	,45	4,54	0,78	4,83	,39	4,92	0,40	5,159	,271
6. Having a robust and reliable brand image	4,18	1,13	4,42	1,08	4,77	0,44	4,00	1,21	4,56	1,23	9,713	,046*
7. Having a good warranty period and conditions	4,23	1,22	3,42	1,44	4,38	0,96	4,00	1,21	4,56	0,92	8,427	,077
8. Being flashy and eye-catching	2,68	1,34	2,83	1,47	3,15	1,41	2,42	1,38	3,72	1,46	10,229	,037*
9. Used by well-known and famous people	1,34	0,86	2,17	1,40	1,38	0,65	1,08	,29	1,96	1,57	9,377	,052
10. Used by people whose opinions I value	2,84	1,43	2,42	1,24	2,46	1,39	2,92	1,56	2,56	1,66	1,611	,807

* $p < 0.05$

The results of the Kruskal-Wallis test proposed by Kruskal and Wallis (1952) to examine importance degrees of the topics considered when purchasing a smartphone in terms of monthly net income are presented in Table 10. There is a statistically significant difference between different monthly incomes regards to the importance degree of "Having a robust and reliable brand image" when purchasing a smartphone ($p<0,05$). Accordingly, those with

an income of TL 5001-7500 attach the most importance to this issue, while those with an income of TL 7501-10000 attach the least importance to it. There is a statistically significant difference between different monthly income regards to the importance degree of "Being flashy and eye-catching" when purchasing a smartphone ($p<0,05$). Accordingly, those with an income of 10,001 TL and above attach the most importance to this issue, while those with an income of 7,501-10,000 TL attach the least importance to it.

Table 11: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of Families' Monthly Net Income

	Monthly net income of your family?										X2	p
	0-20000TL		20001-30000TL		30001-40000TL		40001-50000TL		50001 TL and above			
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd		
1. Affordable price	4,00	1,32	4,21	,98	4,60	,72	4,38	,86	3,61	1,25	14,464	,006*
2. Having attractive campaigns	3,00	1,66	4,13	1,08	3,83	1,34	3,86	1,35	3,55	1,54	4,212	,378
3. Having design aesthetics	3,56	1,74	4,08	1,10	3,63	1,30	4,19	1,03	4,36	0,86	6,123	,190
4. Having different color alternatives	2,22	0,97	3,13	1,36	2,53	1,28	3,48	1,44	3,45	1,37	12,278	,015*
5. Good features	5,00	0,00	4,71	,55	4,73	,58	4,57	1,21	4,79	0,78	4,248	,374
6. Having a robust and reliable brand image	4,33	1,32	4,54	,72	4,23	1,19	4,38	1,02	4,67	0,85	3,757	,440
7. Having a good warranty period and conditions	3,89	1,69	4,54	,78	4,37	1,03	3,52	1,60	4,52	0,71	7,198	,126
8. Being flashy and eye-catching	2,67	1,32	2,88	1,26	2,80	1,24	2,81	1,36	3,70	1,49	10,062	,039*
9. Used by well-known and famous people	1,33	1,00	1,67	1,24	1,33	,96	1,57	1,03	1,64	1,17	3,447	,486
10. Used by people whose opinions I value	2,56	1,59	2,96	1,55	2,80	1,24	2,29	1,31	2,76	1,56	2,863	,581

* $p < 0.05$

The results of the Kruskal-Wallis test proposed by Kruskal and Wallis (1952) to examine importance degrees of the topics considered when purchasing a smartphone in terms of families' monthly net income are presented in Table 11. There is a statistically significant difference between families' different monthly incomes regards to the importance degree of "Affordable price" when purchasing a smartphone (p<0,05). Accordingly, those whose family income is 30,001-40,000 TL attach the most importance to this issue, while those whose family income is 50,001 TL and above attach the least importance to it. There is a statistically significant difference between families' different monthly income regards to the importance degree of "Having different color alternatives" when purchasing a smartphone (p<0,05). Accordingly, those whose family income is 40001-50000TL attach the most importance to this issue, while those whose family income is 0-20000TL attach the least importance to it. There is a statistically significant difference between families' different monthly income regards to the importance degree of "Being flashy and eye-catching" when purchasing a smartphone (p<0,05). Accordingly, those whose family income is 50001 TL and above attach the most importance to this issue, while those whose family income is 0-20000TL attach the least importance to it.

Table 12: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone Regarding Brand is Being a Reason for Preference in Smartphone Purchases

	Is brand a reason for preference in your smartphone purchases?				U	p
	Yes		No			
	Mean	sd	Mean	sd		
1. Affordable price	4,14	1,10	4,21	,96	1556,500	,948
2. Having attractive campaigns	3,75	1,41	3,64	1,50	1508,000	,731
3. Having design aesthetics	4,08	1,17	3,73	1,35	1330,500	,167
4. Having different color alternatives	3,23	1,39	2,61	1,37	1191,500	,036*
5. Good features	4,71	0,82	4,76	,75	1549,500	,877

6. Having a robust and reliable brand image	4,56	0,88	4,06	1,34	1269,000	,045*
7. Having a good warranty period and conditions	4,41	1,01	4,06	1,37	1358,000	,182
8. Being flashy and eye-catching	3,22	1,43	2,61	1,27	1175,500	,028*
9. Used by well-known and famous people	1,71	1,25	1,30	,81	1330,000	,092
10. Used by people whose opinions I value	2,85	1,45	2,55	1,44	1377,500	,288

* $p < 0.05$

The results of the Mann-Whitney test proposed by Mann and Whitney (1947) to examine importance degrees of the topics considered when purchasing a smartphone regarding brand is being a reason for preference in smartphone purchases are presented in table 12. There is a statistically significant difference between the groups in which the brand is a reason for preference in the purchase of a smartphone regarding importance degree of "Having different color alternatives" when purchasing a smartphone ($p<0,05$). Accordingly, those for whom brand is a reason for preference attach more importance to this issue. There is a statistically significant difference between the groups in which the brand is a reason for preference in the purchase of a smartphone regarding importance degree of "Having a robust and reliable brand image" when purchasing a smartphone ($p<0,05$). Accordingly, those for whom brand is a reason for preference attach more importance to this issue. There is a statistically significant difference between the groups in which the brand is a reason for preference in the purchase of a smartphone regarding importance degree of "Being flashy and eye-catching" when purchasing a smartphone ($p<0,05$). Accordingly, those for whom brand is a reason for preference attach more importance to this issue.

Table 13: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of the First Smartphone Brand that Comes to Your Mind

	What is the first smartphone brand that comes to your mind?								X2	p
	Apple		Samsung		Xaomi		Others			
	Mean	sd	Mean	sd	Mean	sd	Mean	sd		
1. Affordable price	4,03	1,15	4,23	,97	4,88	,35	4,33	,71	5,175	,159
2. Having attractive campaigns	3,74	1,49	3,77	1,29	3,13	1,46	3,89	1,45	2,127	,546
3. Having design aesthetics	4,07	1,27	3,94	1,21	3,88	,83	3,67	1,32	2,378	,498
4. Having different color alternatives	3,12	1,41	3,06	1,37	2,25	1,58	3,44	1,33	3,257	,354
5. Good features	4,67	0,89	4,83	,45	4,88	,35	4,56	1,33	0,402	,940
6. Having a robust and reliable brand image	4,54	1,01	4,57	,65	3,25	1,75	4,00	1,12	10,371	,016*
7. Having a good warranty period and conditions	4,38	1,03	4,54	,95	4,25	1,39	3,00	1,41	14,165	,003*
8. Being flashy and eye-catching	3,14	1,48	3,17	1,27	2,25	1,39	2,67	1,32	3,963	,266
9. Used by well-known and famous people	1,76	1,29	1,46	,98	1,00	,00	1,33	1,00	5,228	,156
10. Used by people whose opinions I value	2,79	1,45	2,71	1,45	2,50	1,69	3,11	1,36	0,877	,831

* $p < 0.05$

The results of the Kruskal-Wallis test proposed by Kruskal and Wallis (1952) to examine importance degrees of the topics considered when purchasing a smartphone in terms of the first smartphone brand that comes to

your mind are presented in Table 13. There is a statistically significant difference between the groups with comes to mind different first smartphone brands in terms of the importance degree of "Having a robust and reliable brand image" in purchasing a smartphone (p<0,05). Accordingly, those whose first smartphone brand comes to mind is Samsung attach the most importance to this issue, while those whose first smartphone brand comes to mind is Xiaomi attach the least importance to it. There is a statistically significant difference between the groups with comes to mind different first smartphone brands in terms of the importance degree of "Having a good warranty period and conditions" in purchasing a smartphone (p<0,05). Accordingly, those whose first smartphone brand comes to mind is Samsung attach the most importance to this issue, while those whose first smartphone brand comes to mind is the others attach the least importance to it.

Table 14: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of Using the Smarthphone Brands

	Which of the smartphone brands on the list do you use?										X2	p
	Apple		Xiaomi		Samsung		Huawei		Others			
	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd		
1. Affordable price	3,83	1,16	4,60	,97	4,46	,95	4,20	,79	4,46	,78	12,793	,012*
2. Having attractive campaigns	3,73	1,47	2,90	1,45	4,06	1,33	3,50	,85	3,46	1,66	7,402	,116
3. Having design aesthetics	4,02	1,29	3,60	1,17	4,11	1,23	4,30	,82	3,62	1,26	4,630	,327
4. Having different color alternatives	3,12	1,40	2,90	1,52	3,17	1,50	2,80	1,40	3,08	1,19	0,802	,938
5. Good features	4,68	0,75	4,50	1,27	4,91	,28	4,90	,32	4,38	1,50	2,930	,570
6. Having a robust and reliable brand image	4,53	1,09	3,60	1,51	4,60	,65	4,30	1,34	4,31	,85	8,399	,078
7. Having a good warranty period and conditions	4,41	1,00	3,50	1,84	4,51	,98	4,20	1,03	4,08	1,19	5,506	,239

8. Being flashy and eye-catching	2,98	1,50	2,70	1,42	3,43	1,31	2,60	1,35	3,15	1,28	4,509	,342
9. Used by well-known and famous people	1,69	1,21	1,30	,67	1,51	1,12	1,70	1,16	1,62	1,50	1,564	,815
10. Used by people whose opinions I value	2,75	1,49	2,30	1,64	2,89	1,45	3,00	1,15	2,69	1,44	1,743	,783

* $p < 0.05$

The results of the Kruskal-Wallis test proposed by Kruskal and Wallis (1952) to examine importance degrees of the topics considered when purchasing a smartphone in terms of using the smarthphone brands are presented in Table 14. There is a statistically significant difference between using smartphone brands regards to the importance degree of "Affordable price" when purchasing a smartphone (p<0,05). Accordingly, Xiaomi users attach the most importance to this issue, while Apple users attach the least importance to it.

Table 15: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of How Long the Current Smartphone Has Been Used

	How long have you been using your current smartphone?								X2	p
	Less than 6 months		7 months - 18 months		19 months - 30 months		more than 31 months			
	Mean	sd	Mean	sd	Mean	sd	Mean	sd		
1. Affordable price	3,94	1,29	4,25	,95	4,06	1,14	4,29	,91	1,090	,779
2. Having attractive campaigns	3,53	1,50	3,64	1,50	3,76	1,39	4,13	1,15	2,232	,526
3. Having design aesthetics	3,97	1,31	3,95	1,25	4,35	0,70	3,88	1,36	0,785	,853
4. Having different color alternatives	2,72	1,44	3,04	1,40	3,47	1,12	3,33	1,52	4,137	,247
5. Good features	4,81	0,78	4,71	,71	4,88	0,33	4,50	1,18	3,390	,335

6. Having a robust and reliable brand image	4,41	1,10	4,38	1,15	4,76	0,44	4,33	1,01	1,408	,704
7. Having a good warranty period and conditions	4,13	1,41	4,40	,95	4,53	1,07	4,25	1,07	1,685	,640
8. Being flashy and eye-catching	2,94	1,46	3,15	1,42	3,41	1,28	2,79	1,44	2,362	,501
9. Used by well-known and famous people	1,56	1,11	1,60	1,18	2,00	1,46	1,38	,97	3,211	,360
10. Used by people whose opinions I value	3,03	1,45	2,75	1,46	2,35	1,41	2,79	1,47	2,374	,498

* $p < 0.05$

The results of the Kruskal-Wallis test proposed by Kruskal and Wallis (1952) to examine importance degrees of the topics considered when purchasing a smartphone in terms of how long the current smartphone has been used are presented in table 15. There is no statistically significant difference between different durations of current smartphone use regarding importance degree of the issues when purchasing a smartphone. (p>0,05).

Table 16: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of Planning How Much Budget to Use Before Buying a Smartphone

	Have you planned how much budget you will use before you buy your smartphone?				U	p
	Yes		No			
	Mean	sd	Mean	sd		
1. Affordable price	4,25	1,02	3,95	1,13	1484,000	,123
2. Having attractive campaigns	3,70	1,47	3,75	1,33	1750,500	,959
3. Having design aesthetics	3,99	1,25	4,00	1,20	1759,000	,996

4. Having different color alternatives	3,13	1,42	2,95	1,40	1637,500	,518
5. Good features	4,77	0,71	4,60	0,98	1640,000	,328
6. Having a robust and reliable brand image	4,35	1,11	4,60	0,84	1556,000	,197
7. Having a good warranty period and conditions	4,26	1,17	4,45	0,99	1636,500	,458
8. Being flashy and eye-catching	2,99	1,43	3,23	1,37	1592,000	,375
9. Used by well-known and famous people	1,61	1,16	1,58	1,20	1693,500	,656
10. Used by people whose opinions I value	2,80	1,50	2,73	1,34	1715,500	,814

* $p < 0.05$

The results of the Mann-Whitney test proposed by Mann and Whitney (1947) to examine importance degrees of the topics considered when purchasing a smartphone in terms of planning how much budget to use before buying a smartphone are presented in Table 16. There is no statistically significant difference between planning budget to use before buying regarding importance degree of the issues when purchasing a smartphone (p>0,05).

Table 17: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone Regarding the Matching up with the price of the Smartphone Purchased and the Budget

	How did the budget match up with the purchase price of your smartphone?						X2	p
	I exceeded the budget		Equal		I didn't exceed the budget			
	Mean	sd	Mean	sd	Mean	sd		
1. Affordable price	4,07	1,10	4,29	,83	4,36	1,10	2,279	,320
2. Having attractive campaigns	3,87	1,73	3,80	1,43	3,61	1,51	0,836	,658
3. Having design aesthetics	4,20	1,42	4,20	,90	3,80	1,37	2,234	,327
4. Having different color alternatives	3,07	1,28	3,34	1,43	3,00	1,38	1,383	,501

5. Good features	4,60	1,06	4,80	,72	4,82	0,50	0,678	,712
6. Having a robust and reliable brand image	4,47	0,83	4,63	,69	4,05	1,38	2,919	,232
7. Having a good warranty period and conditions	4,07	1,22	4,54	,92	4,16	1,29	2,520	,284
8. Being flashy and eye-catching	3,00	1,41	3,37	1,19	2,80	1,56	3,106	,212
9. Used by well-known and famous people	1,87	1,55	1,71	1,10	1,52	1,17	1,878	,391
10. Used by people whose opinions I value	2,60	1,40	2,74	1,54	2,89	1,43	0,433	,805

* $p < 0.05$

The results of the Kruskal-Wallis test proposed by Kruskal and Wallis (1952) to examine importance degrees of the topics considered when purchasing a smartphone regarding the matching up with the price of the smartphone purchased and the budget are presented in table 17. There is no statistically significant difference between planning budget and purchasing price regarding importance degree of the issues when purchasing a smartphone (p>0,05).

Table 18: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of Would Like to Change the Brand of the Smartphone in the Next Purchase

	Would you like to change the brand of your smartphone at the next purchase?						X2	p
	I will definitely change it		I definitely won't change it		Maybe			
	Mean	sd	Mean	sd	Mean	sd		
1. Affordable price	4,56	,70	3,84	1,20	4,35	,93	8,317	,016*
2. Having attractive campaigns	3,67	1,37	3,78	1,46	3,67	1,43	0,415	,813
3. Having design aesthetics	4,22	1,06	3,91	1,43	4,00	1,05	0,714	,700
4. Having different color alternatives	2,72	1,53	3,24	1,41	3,02	1,37	1,869	,393

5. Good features	4,89	,32	4,60	1,01	4,78	,66	0,849	,654
6. Having a robust and reliable brand image	4,39	,78	4,62	0,95	4,25	1,17	5,980	,050*
7. Having a good warranty period and conditions	4,33	,77	4,13	1,28	4,51	1,02	4,294	,117
8. Being flashy and eye-catching	2,94	1,35	3,18	1,54	2,98	1,31	0,830	,660
9. Used by well-known and famous people	1,50	1,20	1,65	1,14	1,58	1,20	1,120	,571
10. Used by people whose opinions I value	2,67	1,41	2,73	1,55	2,85	1,38	0,368	,832

* $p < 0.05$

The results of the Kruskal-Wallis test proposed by Kruskal and Wallis (1952) to examine importance degrees of the topics considered when purchasing a smartphone in terms of would like to change the brand of the smartphone in the next purchase are presented in table 18. There is a statistically significant difference between groups with different desire to change the brand of their smartphones in the next purchase regarding importance degree of "Affordable price" in the purchase of smartphones ($p<0,05$). Accordingly, those who will definitely change attach the most importance to this issue, while those who will definitely not change attach the least importance to it. There is a statistically significant difference between groups with different desire to change the brand of their smartphones in the next purchase regarding importance degree of "Having a robust and reliable brand image" in the purchase of smartphones ($p<0,05$). Accordingly, those who will definitely not change attach the most importance to this issue, while those who may change attach the least importance to it.

Table 19: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of the Most Effective Promotional Methods to Buy a Smartphone

	Which of the listed promotional methods was most effective for you when you get your smartphone?								X2	p
	News in the press and on television		Advice from store salespeople selling smartphones		Friend / Family / Acquaintance Recommendation		Internet forums / Blogs			
	Mean	sd	Mean	sd	Mean	sd	Mean	sd		
1. Affordable price	4,15	1,21	3,88	1,32	4,33	,88	4,09	1,08	1,814	,612
2. Having attractive campaigns	3,77	1,36	3,59	1,33	3,93	1,37	3,57	1,53	1,988	,575
3. Having design aesthetics	4,46	0,78	3,88	1,54	3,96	1,35	3,94	1,10	2,322	,508
4. Having different color alternatives	3,77	1,64	3,12	1,27	3,16	1,38	2,81	1,39	5,544	,136
5. Good features	4,85	0,55	4,65	1,00	4,73	,75	4,70	0,85	0,652	,884
6. Having a robust and reliable brand image	4,77	0,44	4,71	0,77	4,62	,83	4,09	1,27	8,614	,035*
7. Having a good warranty period and conditions	4,15	1,21	4,29	1,10	4,62	,78	4,11	1,30	4,885	,180
8. Being flashy and eye-catching	3,31	1,44	3,18	1,38	3,38	1,40	2,70	1,38	6,437	,092
9. Used by well-known and famous people	1,92	1,12	1,76	1,25	1,78	1,35	1,32	0,94	7,900	,048*
10. Used by people whose opinions I value	2,92	1,50	3,47	1,50	3,16	1,35	2,19	1,32	15,897	,001*

* $p < 0.05$

The results of the Kruskal-Wallis test proposed by Kruskal and Wallis (1952) to examine importance degrees of the topics considered when purchasing a smartphone in terms of the most effective promotional methods to buy a smartphone are presented in table 19. There is a statistically significant difference between groups with different the most affected promotion methods regarding the importance degree of "Having a robust and reliable brand image" when purchasing a smartphone. ($p<0,05$). Accordingly, those who are

influenced by the news in the press and on television attach the most importance to this issue, while those who are influenced by internet forums / blogs attach the least importance to it. There is a statistically significant difference between groups with different the most affected promotion methods regarding the importance degree of "Used by well-known and famous people" when purchasing a smartphone (p<0,05). Accordingly, those who are influenced by the news in the press and on television attach the most importance to this issue, while those who are influenced by internet forums / blogs attach the least importance to it. There is a statistically significant difference between groups with different the most affected promotion methods regarding the importance degree of "Used by people whose opinions I value" when purchasing a smartphone (p<0,05). Accordingly, those who are influenced by the advice from store salespeople selling smartphones attach the most importance to this issue, while those who are influenced by internet forums / blogs attach the least importance to it.

Table 20: Examining the Importance Degrees of the Topics Considered While Buying a Smartphone in Terms of the Way of Getting a Smartphone

	How did you get your smartphone?								X2	p
	Online		Gift		Store		Others			
	Mean	sd	Mean	sd	Mean	sd	Mean	sd		
1. Affordable price	4,73	,59	4,00	1,20	4,04	1,11	4,42	,79	6,720	,081
2. Having attractive campaigns	3,27	1,49	4,00	1,51	3,76	1,41	3,75	1,48	2,331	,507
3. Having design aesthetics	3,87	1,36	4,13	1,46	4,03	1,18	3,75	1,36	1,000	,801
4. Having different color alternatives	3,27	1,67	2,88	1,73	3,09	1,37	2,83	1,27	0,859	,835
5. Good features	4,47	1,06	4,88	0,35	4,81	0,61	4,25	1,54	5,356	,147
6. Having a robust and reliable brand image	4,60	,83	4,13	1,64	4,56	0,84	3,42	1,62	7,630	,054
7. Having a good warranty period and conditions	4,13	1,46	4,00	1,60	4,43	0,95	3,92	1,44	2,422	,490
8. Being flashy and eye-catching	3,20	1,32	2,13	1,46	3,12	1,43	3,08	1,31	3,727	,292
9. Used by well-known and famous people	1,40	,74	1,00	0,00	1,67	1,23	1,75	1,42	2,987	,394
10. Used by people whose opinions I value	2,47	1,41	2,00	1,60	2,95	1,42	2,33	1,50	5,562	,135

* $p < 0.05$

The results of the Kruskal-Wallis test proposed by Kruskal and Wallis (1952) to examine importance degrees of the topics considered when purchasing a smartphone in terms of the way of getting a smartphone are presented in table 20. There is no statistically significant difference between ways of getting a smartphone regarding importance degree of the issues when purchasing a smartphone (p>0,05).

3.2.2. Discussion

According to the results of the study, there is a robust relationship between consumer behavior and purchase decision. These findings are consistent with the results of the studies by Wu (2002), Rambi (2015) and Dewi et al. (2022).

Smartphone features, brand image and warranty conditions are the most important for students. This is explained by the results of Çakır and Demir (2014), Sürücü et al. (2020), Hanaysa et al. (2021) and Kanapathipillai et al. (2024). Brand image and warranty conditions are important for those who first think of Samsung as a smartphone. While it is important for a smartphone to be flashy for those with both their own and family higher income groups, this is not important for lower-income groups. In addition, while it is important for Samsung and Xiaomi users to have a affordable price, it is not so important for Apple users. This situation varies according to the diversity of the product, brand and participant group, as seen in the studies of Çakır and Demir (2014), Hanaysa et al. (2021) and Kanapathipillai et al. (2024), which found different results. The relationship between income and expenditure is also very important in this study. In the studies conducted, there are differences in the students' expenditure groups. This situation is important for students, especially since accommodation expenses have an important place in the budget. According to the results of the study by Büyükdoğan et al. (2015), accommodation expenses do not have an effective place in the budget due to the fact that most of the students live in their hometowns or in cities close to their hometowns. Thus, students transfer the advantage they gain from this to their other expenses. In the studies of Yaylalı et al. (2011) and Pehlivanoğlu and Narman (2018), students spend a large share of their budget on accommodation and food expenses.

For those affected by news in the press and on television, brand image and the fact that smartphones are used by famous people are important. This reveals that advertisements are effective, as seen in the studies of Wu (2002), Başaran Alagöz and Güler (2018), Koç and Aydın (2018), Zaware et al. (2020) and Kanapathipillai et al. (2024).

4. Conclusion

Today, with the advancement of technology, consumer preferences are changing. People from all walks of life and all ages follow technology closely. Especially the young generation and therefore students have more interest and need for technological products. Since students follow technology closely, they also come to the forefront in purchasing technological products. Therefore, this study aims to reveal which brands are preferred by students who use smartphones more in terms of usage in an increasingly competitive environment with the development of technology and what factors affect their preferences. The data used in the study was obtained by applying a survey to 128 students from two different programs in terms of financial literacy.

According to the results obtained, there is not much difference between the programs with the effect of financial literacy on students' preferences. For this reason, the results were evaluated by considering the subject as a general student group, except for financial literacy. Although some of the students work to earn their own budgets, the majority of them do not. They obtain their budgets from their families or through different channels such as scholarships. In general, smartphone features, brand image and warranty conditions are the most important for students. While it is important for those with both high personal and family incomes to have a flashy smartphone, this is not important for groups with lower incomes. For those who think of Samsung as the first brand for a smartphone, brand image and warranty conditions are important. In addition, while affordable price is important for Samsung and Xiaomi users, it is not so important for Apple users. For those who are influenced by the news in the press and on television, brand image and the fact that the smartphone is used by famous people are important. This also shows that advertisements are effective.

Based on the results obtained from this study, various policy recommendations can be presented. Producers should improve their product

features to be preferable in a competitive environment and give the necessary importance to advertising campaigns and budgets. They should also avoid situations that will damage the brand image. They should not cause problems to consumers in warranty conditions and they should never victimized them. The high price of technological products in our country is a negative situation for consumers. This situation is even more difficult for students with low budgets. For this reason, the economic conditions that affect students' smartphone preferences should be improved and students should be provided with a tax reduction or tax-free purchasing opportunity for students. In addition, students should not have to worry about income during their education and this situation should be provided by the state with scholarship opportunities.

This study is a source of information for producers, suppliers and consumers in the smartphone market. In future studies, a new study can be conducted by surveying parents in case the smartphone purchased for students is covered by the family budget. This study may be a source of inspiration for future studies from different perspectives. On the other hand, this study has various limitations. Participants were selected from two associate degree programs at a university in Istanbul. In new studies to be based on this study, undergraduate, graduate and doctoral students can also be included. In addition, according to the results, whether the province where students study and the province where their families reside are the same or different has a significant impact on the results. For this reason, it is important to learn this information in future studies.

References

Başaran, Alagöz, S. & Güler, B. (2018). Bilgisayar Oyunlarında Ürün Yerleştirmeye Yönelik Tüketici Tutumu ve Satın Alma Niyeti Arasındaki İlişki. *Kahramanmaraş Sütçü İmam Üniversitesi Sosyal Bilimler Dergisi (KSÜSBD)*, 15(2), 479-500.

Büyükdoğan, B., Afşar, B. & Gedik, H. (2015). Üniversite Öğrencilerinin Öğrenim Gördükleri Şehire Ekonomik Katkıları: KTO Karatay Üniversitesi Örneği. *The Journal of Academic Social Science*, 15, 161-174.

Cartwright, E. (2018). *Behavioral Economics*. 3rd Edition, Routledge, Abingdon. https://doi.org/10.4324/9781315105079.

Cronbach, L.J. (1951). Coefficient Alpha and the Internal Structure of Tests. *Psychometrika*, 16, 297-334. https://doi.org/10.1007/BF02310555.

Çakır, F. & Demir, N. (2014). Üniversite Öğrencilerinin Akıllı Telefon Satın Alma Tercihlerini Belirlemeye Yönelik Bir Araştırma. *Dokuz Eylül Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 1(29), 213-243.

Dewi, F.M., Sulivyo, L. & Listiawati (2022). Influence of Consumer Behavior and Marketing Mix on Product Purchasing Decisions. *APTISI Transactions on Management (ATM)*, 6(2), 151-157. https://doi.org/10.33050/atm.v6i2.1737.

Gadeyne, N., Verbruggen, M., Delanoeije, J. & Reini, C. (2018). All wired, all tired? Work-Related ICT-Use Outside Work Hours and Work-To-Home Conflict: The Role of Integration Preference, Integration Norms and Work Demands. *Journal of Vocational Behavior*, 107, 86-99. https://doi.org/10.1016/j.jvb.2018.03.008.

Gajjar, N.B. (2013). Factors Affecting Consumer Behavior. *International Journal of Research in Humanities and Social Sciences*, 1(2), 10-15.

Gedik, A. (2020). Davranış Ekonomisi ve Tüketici Davranışları Açısından Bir Uygulama. *Sosyal Araştırmalar ve Yönetim Dergisi*, 1, 23-40.

Hanaysa, J.R., Al-Shaikh, M.E. & Alzoubi, H.M. (2021). Importance of Marketing Mix Elements in Determining Consumer Purchase Decision in the Retail Market. *International Journal of Service Science Management Engineering and Technology*, 12(6), 56-72. https://doi.org/10.4018/ıjssmet.2021110104.

Kanapathipillai, K., Ling, N.S., Chian, C.B.P. & Ng, K. (2024). Mixing Brands and Behaviour: Unveiling the Power of Marketing Mix and Brand Affinity in Mobile Phone Choices in Klang Valley, Malaysia. *European Journal of Management and Marketing Studies*, 9(1), 200-232. https://doi.org/10.46827/ejmms.v9i1.1759.

Kirchler, E. & Hoelzl, E. (2011). Economic and Psychological Determinants of Consumer Behavior. *Journal of Psychology*, 219(4), 195-197. https://doi.org/10.1027/2151-2604/a000072.

Koç, E. & Aydın, F.F. (2018). Cinsiyetin Satın Alma Kararları Üzerindeki Etkisinin Davranışsal İktisat Perspektifinden Değerlendirilmesi. *Social Mentality and Researcher Thinkers Journal*, 4(10), 298-306.

Kruskal, W.H. & Wallis, W.A. (1952). Use of Ranks in One-Criterion Variance Analysis. *Journal of the American Statistical Association*, 47(260), 583-621. https://doi.org/10.1080/01621459.1952.10483441.

Mann, H.B. & Whitney, D.R. (1947). On a Test of Whether one of Two Random Variables is Stochastically Larger than the Other. *The Annals of Mathematical Statistics*, 18(1), 50-60.

Melwater (2024). Digital 2024 Global Overview Report, The Essential Guide to the World's Connected Behaviours. Access: https://www.meltwater.com/en/global-digital-trends, Access Date: 15.07.2024.

Mobisad (2023). Mobil İletişim Sektörü Raporu 2023 Türkiye'nin ve Dünya'nın Dijital Karnesi. Access: https://mobisad.org/wp-content/uploads/rapor-2023.pdf, Access Date: 15.07.2024.

Pehlivanoğlu, F. & Narman, Z. (2018). Kocaeli Üniversitesi Öğrencilerinin Fakülteler Bazında Gelir-Tüketim İlişkisinin Analizi. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 40, 103-115.

Rambi, W. (2015). The Influence of Consumer Behavior on Purchase Decision Xiaomi Cellphone in Manado. *Jurnal EMBA*, 3(2), 917-927.

Sürücü, L., Yesilada, F. & Maslakcı, A. (2020). Purchasing Intention: A Research on Mobile Phone Usage by Young Adults. *Journal of Asian Finance, Economics and Business*, 7(8), 353-360. https://doi.org/10.13106/jafeb.2020.vol7.no8.353.

Şahin, B.G. & Akballı, E.E. (2017). Tüketici Davranışlarını Etkileyen Faktörler ve Yöntem Analizi. *International Journal of Social and Educational Sciences*, 1(1), 43-85.

TÜİK (2021). Çocuklarda Bilişim Teknolojileri Kullanım Araştırması. Access: https://data.tuik.gov.tr/Bulten/Index?p=Cocuklarda-Bilisim-Teknolojileri-Kullanim-Arastirmasi-2021-41132, Access Date: 15.07.2024.

Wu, S. (2002). Internet Marketing Involvement and Consumer Behavior. *Asia Pacific Journal of Marketing and Logistics*, 14(4), 36-53. https://doi.org/10.1108/13555850210764945.

Yaylalı, M., Özer, H. & Dilek, Ö. (2011). Selçuk Üniversitesi Seydişehir Meslek Yüksekokulu Öğrencilerinin Gelir-Harcama İlişkisi ve Meslek Yüksekokulunun İlçe Ekonomisine Katkısı. *ZKU Journal of Social Sciences*, 7(13), 1-13.

Zaware, N., Pawar, A., Samudre, H. & Kale, S. (2020). Omnichannel Consumer Buying Behavior: Apprehending the Purchasing Pattern for Mobile Buyers in India. *International Journal of Advanced Science and Technology*, 29, 1086-1101.

CHAPTER III

The Relationship between Public Expenditure, Financial Development and Economic Growth: Empirical Evidence from BRICS-T Countries

Lecturer Dr. Eda OZOVACI[1]

DOI: https://dx.doi.org/10.5281/zenodo.14392532

[1] Department of Foreign Trade, Vocational School, Dogus University, Istanbul, Türkiye.
ORCID: https://orcid.org/0000-0003-4482-6763 e-mail: eozovaci@dogus.edu.tr

1. Introduction

The focus of fiscal policy, which is a tool of economic policy, is to influence the level of economic activity by using public expenditures and revenues and to ensure stability in macroeconomic issues such as economic growth, inflation and income distribution. In this context, it is seen that the political power and the economic management use the fiscal policy tools at different levels and combinations in the reduction of poverty, ensuring economic development and growth, and combating inflation, although the degree varies according to the requirements of the political and economic conjuncture or the influence of the dominant view (Dinova and Slavinskaitė, 2015).

The use of fiscal policy as an effective tool began with Keynes' proposal to solve the crisis, which he diagnosed as insufficient aggregate demand, after the great world crisis of 1929. Accordingly, an increase in autonomous expenditures, including public expenditures, or a reduction in tax rates will stimulate aggregate demand by increasing disposable income, which will increase the level of production and bring the economy back into balance at full employment level. This approach later led to the use of fiscal policy as an economic policy tool that would provide full employment or reduce cyclical fluctuations by increasing the actual production level to the potential production level. In this context, the quality of fiscal policy is also linked to its ability to reduce cyclical fluctuations (Zagler and Dürnecker, 2003). However, the effectiveness of fiscal policies has led to debates and different opinions, especially with the global energy crisis of the 1970s. Accordingly, it has been argued that state intervention in the economy harms the functioning of the economy, reduces the level of production and decreases productivity (Hassan and Abdullah, 2017).

The first scholar to propose a positive correlation between the level of economic growth and the scope of government was Adolph Wagner (1893). Wagner has explained in detail the law of progressive expansion of public activities. It is one of the rarely questioned issues in economics that the public sector tends to grow in the long run relative to national income (Atkinson and Stiglitz, 1980). Wagner's Law has been extensively tested empirically, and with some exceptions, the law has strong support. The relationship between government spending and economic growth is an ongoing topic in economic

development discussions. According to the view put forward by Adolph Wagner between 1883 and 1890 and later known as "Wagner's Law", it is argued that government expenditures are income elastic and that the margin of government expenditures in total economic activities increases with economic development (Wu et al., 2010). Societies perceive economic growth as evidence of improved quality of life as a result of supportive efforts such as increased consumption, improved quality of goods and services, reduced unemployment, increased welfare, and reduced poverty. In this context, the impact of fiscal policies on economic growth gains great importance and guides many studies.

While classical economists argue that the state should not intervene in the economy under free market conditions, Keynesians argue that public expenditures should be increased when production in the economy is below full employment level, and public expenditures should be reduced when production in the economy is above full employment level. Monetarists, on the other hand, advocate that public expenditures should be determined according to the requirements of economic efficiency rather than macroeconomic stability. According to monetarists, government expenditures should be determined in such a way that the marginal benefit from one unit of public expenditure equals the marginal benefit from one unit of private expenditure. If the marginal benefit of a unit spent on private goods is less than the marginal benefit of a unit spent on public goods, it can be said that public expenditures are too low and private sector expenditures are too high, and resources need to be rearranged from the private sector to the public sector, that is, public expenditures should be increased. In the opposite case, public expenditures should be reduced. Therefore, monetarists decide whether to increase or decrease expenditures by looking at the marginal benefit of each dollar spent on public expenditures such as national defense, law and order, education, and health services (Parasız, 2006).

Public expenditures can directly or indirectly increase the output of countries through interaction with the private sector and the provision of social services. Public expenditure can be classified as development and recurrent expenditure. Recurrent expenditures consist of expenditures on ongoing programs or activities, namely, expenditures on salaries and wages, administrative benefits, and welfare services. Recurrent expenditures can

impact economic growth by affecting people's ability to work, save and invest. Development expenditures generally include spending on new projects and activities. They invest in national plans, such as infrastructure projects, the creation of communication systems, and support for community benefit activities. The implementation of these projects will increase economic growth both directly and indirectly with the participation of private investments (Hassan and Abdullah, 2017).

On the other hand, Goldsmith (1969) drew attention to the relationship between financial development and investment efficiency, and McKinnon (1973) and Shaw (1973) drew attention to the relationship between financial development and economic growth by examining the role played by financial liberalization in increasing savings and hence investment. The policy implication of the McKinnon-Shaw model is that government regulatory policies (interest rate interventions, reserve levels and credit control) towards financial markets delay financial development and economic growth. Financial development positively affects economic growth as it increases investment and productivity. The McKinnon-Shaw model has contributed to financial sector policies in countries since 1973 (Huang, 2010). Financial development calculations include measures of the depth, reach, efficiency and stability of financial systems. The development of the financial sector occurs when financial instruments, markets and institutions reduce the costs of applying information and transactions, thereby improving how well the financial sector performs its core economic activities (IMF, 2024). Financial development is the creation and growth of financial institutions, instruments and markets that support major investments, growth and enable the development of financial sector. Financial development provides information on the most efficient use of cash and the investments that can be successful (Mlambo, 2024). The development of financial institutions facilitates access to information, enabling contracts and transactions to be carried out more effectively. Financial development supports economic growth through access to information, pooling of savings, capital accumulation and more efficient capital allocation (IMF, 2024).

BRICS countries are among the fastest growing and emerging market economies in the world, and they are very close to each other in terms of financial development. As BRICS countries become institutionalized within

themselves, they seek to gain greater influence on international markets through cooperation and to create an alternative to the global financial system (Zhongying and Ruiping, 2013). A large part of the world's foreign trade volume consists of these countries. The foreign trade volumes of these countries are increasing every year. Türkiye was added to the study because it has been approaching these countries in terms of macroeconomic indicators in recent years. Nowadays, a large literature has emerged on the relationship between public expenditures and economic growth, financial development and economic growth. Since there are limited studies investigating the effects of both financial development and public expenditures on economic growth, this study was conducted to contribute to the literature.

2. Literature

In order to have an overview of the recent discussions and to create a starting point for future research, it is necessary to first include the studies that have been done on this subject within the scope of this study. It is necessary to separate these studies into the relationship between public expenditures and economic growth and the contribution of financial development to economic growth and to evaluate the studies on these subjects in the literature.

2.1. Relationship between Public Expenditures and Economic Growth

Wu et al. (2010) applied the Granger causality test for the years 1950-2004 and 182 countries. When countries are disaggregated by income levels and degrees of corruption, the results confirm the bidirectional causality between public activities and economic growth for different subsamples of countries, except for low-income countries.

Abdiyeva and Çetintaş (2017) tested the long-term causality relationship between economic growth and public expenditures in Kyrgyzstan during the period 1995-2014 with ARDL and concluded that there is a one-way causality relationship between economic growth and public expenditures in the long run.

Akinlo (2013) applied Granger causality test for the relationship between public expenditure and economic growth in Nigeria during the period 1961-2009. A one-way causality relationship was found from both real GDP and GDP per capita to public expenditure.

Odhiambo (2015) shows that economic growth in South Africa is caused by government expenditure in both the short and long term with the ARDL test.

Laboure and Taugourdeau (2018) concluded that public expenditures have an impact on economic growth using the GMM estimator in 147 countries during the period 1970-2008. They also stated that productive expenditures have a greater impact on growth in poor countries.

Menyah and Wolde-Rufael (2013) applied Granger causality test to investigate the long-run and causal relationship between public expenditure and national income in Ethiopia for the period 1950-2007. They found that there is a one-way causality running from GDP to public expenditure. Since no causality running from public expenditure to income was found in the study, they concluded that public expenditure is not an effective policy tool to promote economic growth in Ethiopia.

Chen et al. (2020) concluded that government expenditure in Vanuatu during the period 1981-2016 negatively affected long-term economic growth when financed by tax revenues, but positively affected long-term economic growth when financed by other sources such as non-tax revenues and budget surplus/deficit.

Ono (2014) applied ADL and Granger causality tests for the years 1960-2010 and Japan to reveal the relationship between public expenditures and economic growth. He concluded that there is a cointegration relationship between real public expenditures per capita and real GDP per capita and that there is a two-way causality between the variables.

Hassan and Abdullah (2017) applied the ARDL test for Sudan in the period 1960-2013. They concluded that public expenditures on agriculture and industry positively affected economic growth in the long run, but expenditures on services did not have a long-term effect on economic growth.

Cooray (2009) applied GMM test to reveal the relationship between public expenditure and economic growth in 71 countries. They concluded that both the size and quality of public expenditure increase economic growth. They suggested that investing in improved governance capacity is a priority for the economic growth performance of countries.

Nurudeen and Usman (2010) state that increased public expenditure on transportation, communication and health in Nigeria during the period 1970-2008 caused an increase in economic growth, however, they reveal that total

capital expenditure, total recurrent expenditure and government expenditure on education had a negative impact on economic growth.

Saad and Kalakech (2009) conducted a cointegration analysis on the relationship between public expenditure and economic growth in Lebanon during the period 1962-2007. The results show that public expenditure on education has a positive effect on growth in the long run and a negative effect in the short run. They emphasized that defense spending has a negative effect on economic growth in the long run and an insignificant effect in the short run. As for health spending, it has been found that it has no effect in the short run, although it has a negative correlation with growth in the long run. Finally, they stated that spending on agriculture has no effect in either the short or long run.

2.2. Relationship between Financial Development and Economic Growth

Hassan, Sanchez and Yu (2011) concluded in their panel data analysis that there is a positive relationship between financial development and economic growth in developing countries.

Durusu-Ciftci et al. (2017). AMG test was applied for 40 countries for the period 1989-2011. They concluded that credit markets have a positive and long-term effect on economic growth.

Calderon and Liu (2003) reached some conclusions by using the Geweke decomposition test on the combined data of 109 developing and industrialized countries between 1960 and 1994 to examine the direction of causality between financial development and economic growth. They have shown that financial development generally leads to economic growth and that there is a bidirectional causality.

Abu-Bader and Abu-Qarn (2007) tested the causal relationship between financial development and economic growth in Egypt during the period 1960-2001 with Granger causality. They concluded that financial development and economic growth are mutually causal, that is, causality is bidirectional. They say that financial development causes economic growth by both increasing investment resources and improving productivity.

Anwar and Nguyen (2011) use a panel dataset in Vietnam for the period 1997-2006 to conclude that financial development contributes to economic growth.

Samargandi et al. (2015) conducted a panel test of 52 middle-income countries over the period 1980-2008. They concluded that financial development may have a negative impact on growth in middle-income countries.

Atil et al. (2020) concluded in their study for Pakistan for the period 1972-2017 that economic growth has a positive and significant impact on financial development.

Ahmed and Mmolainyane (2014) found no direct, robust and statistically significant relationship between financial integration and economic growth in Botswana during the period 1974-2009.

Al-Yousi (2002) found both time series and panel data from 30 developing countries for the period 1970-1999 to conclude that financial development and economic growth are mutually causal, that is, causality is bidirectional.

Chang and Caudill (2005) applied Granger causality test for Taiwan in the period 1962-1998. They concluded that there is a one-way causality running from financial development to economic growth.

3. Dataset, Model and Methodology

3.1. Dataset and Model

The model used to estimate the relationships between public expenditure, financial development and economic growth can be explained with the help of Equation (1) and Equation (2).

$$lngdp_{i,t} = \beta_0 + \beta_1 lngovex_{i,t} + \beta_2\, lntrade_{i,t} + \beta_3 lnfd_{i,t} + \beta_4 lnurpop_{i,t} \quad (1)$$

$$lngdp_{i,t} = \beta_0 + \beta_1 lngovex_{i,t} + \beta_2\, lntrade_{i,t} + \beta_3 lnfd_{i,t} + \beta_4 lnurpop_{i,t} + \beta_5 lncap_{i,t} \quad (2)$$

In addition, the economic indicators used in this study, their abbreviations and the databases from which these economic indicators were obtained are given in Table 1. For growth; gdp (constant 2015 US$), for public expenditures; general government final consumption expenditure (% of GDP), for trade openess; trade (% of GDP), for capital formation; gross fixed capital formation (% of GDP), and for urbanization; urban Population was used.

Table 1. Variables and Data Sources

Abbreviations	Variables	Data Sources
lngdp	GDP (constant 2015 US$)	World Bank
lngovex	General Government Final Consumption Expenditure (% of GDP)	World Bank
lnfd	Financial Development Index	IMF
lntrade	Trade (% of GDP)	World Bank
lnfcap	Gross fixed capital formation (% of GDP)	World Bank
lnurpop	Urban Population	World Bank

3.2. Estimation Method

The empirical analysis of this study is carried out with a panel consisting of BRICS and Türkiye for the years 1995-2021. In this context, the Driscoll-Kraay estimator put forward by Driscoll and Kraay (1998) was used as the estimation technique. In this study, the models were estimated with fixed effects model and Driscoll-Kray. In the fixed effects model, it is assumed that the slope coefficients indicated by β do not change, but the fixed coefficients change only among the cross-sectional data or only among the time data or within both data. If the differentiation occurs only depending on time, such models are called one-way time-dependent fixed effects models. f there is a difference in panel data both in time and cross-section, these models are called two-way fixed effects models (Özer and Çiftçi, 2009). The reason we use this estimator is to eliminate autocorrelation and heteroscedasticity encountered in panel data analysis and to obtain robust results against cross-sectional dependence. In addition, Driscoll and Kray (1998) is a powerful estimator that allows analysis even if there are deficiencies in the data sets (Avcı et al., 2024).

4. Findings

In this study, the impact of public expenditures and financial development on economic growth is analyzed for the period 1995-2021. Our empirical estimation consists of two stages. First, descriptive statistics and correlation matrix of the series are presented. In the next stage, the estimation models are analyzed and coefficient interpretation is made. Table 2 and Table 3 show the descriptive statistics and correlation matrix, respectively.

Table 2. Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
lngdp	162	8.488429	0.7799262	6.426714	9.506729
lngovex	162	2.738705	0.2142075	2.282634	3.047713
lntrade	162	3.732318	0.3297149	2.74955	4.26384
lnfd	162	-.7560876	0.1893522	-1.22857	-.3940808
lnfcap	162	3.158663	0.3228688	2.578982	3.795911
lnurpop	162	4.050555	0.3586563	3.281174	4.469545

Table 3. Correlation Matrix

	lngdp	lngovex	lntrade	lnfd	lnfcap	lnurpop
lngdp	1.000					
lngovex	-0.0350	1.000				
lntrade	-0.1634	-0.1398	1.000			
lnfd	0.4237	0.3530	0.0251	1.000		
lnfcap	0.6986	-0.5734	0.1620	0.0365	1.000	
lnurpop	-0.1680	0.7524	0.0147	0.2851	-0.5801	1.000

In Table 4, two models were constructed and estimated for the general panel covering BRICS countries and Türkiye, taking economic growth as the dependent variable. In both of our models, it is observed that public expenditures do not produce a significant result on economic growth for these countries. It can be inferred that the reason for this is that public expenditures in these countries are not used efficiently enough to trigger economic growth. It is thought that public expenditures are not in a way that will increase investment and production or that public expenditures are not at a sufficient level. Although it is known that public expenditures have a positive effect on economic growth according to the Wagner law (1893), the study found that public expenditures for the BRICS countries and Türkiye are not at a level that will affect economic growth. Many studies in the literature provide evidence

that public expenditures increase economic growth. Wu et al. (2010), Abdiyeva and Çetintaş (2017), Akinlo (2013), Odhiambo (2015), Laboure and Taugourdeau (2018), Menyah and Wolde-Rufael (2013), Chen et al. (2020), Ono (2014) and Hassan and Abdullah (2017) mentioned the relationship between these two variables in their studies. The reason why no relationship was found between these two variables in this study is thought to be due to the selected country group.

As seen in our estimation models, financial development appears to have a significant and positive impact on economic growth. The results presented are parallel to the results of Hassan, Sanchez, and Yu (2011), Calderon and Liu (2003), Abu-Bader and Abu-Qarn (2007), Anwar and Nguyen (2011), Samargandi et al. (2015), Atil et al. (2020), Al-Yousi (2002), Chang and Caudill (2005). As financial development enables the resources provided for investments to increase trust in financial institutions, it affects the economic growth of countries. It enables countries to be more stable and financial institutions to be used more effectively during periods of financial crisis. Moreover, since access to financial information is easier, investment decisions are more effective. As financial institutions become more efficient in terms of quantity and quality, this creates an environment for markets to become more efficient.

As seen in Table 4, there is a significant and positive relationship between trade openness and economic growth. This result is consistent with the results found in the literature by Makki and Somwaru (2004), Silberberger and Königer (2016), Were (2015), Kalı, Mendez and Reyes (2007), Abendin and Duan (2021). The increase in foreign trade contributes to the economic growth of countries. Technology transfer between countries and globalization of foreign trade will accelerate economic growth by triggering production in countries. Since GDP per capita will increase with the increase in foreign trade in countries, it is an expected result that the relationship between these two variables will be positive.

In the estimated models, it is seen that there is a significant and positive relationship between urbanization and economic growth. The increase in production with urbanization affects economic growth. The results of the analysis are similar to those of Henderson (2003), Frick and Rodriguez-Pose (2018), Bertinelli and Strobl (2007), Castells-Quintana and Royuela (2014),

Leitao (2013). Although it is possible to find many studies in the literature that show parallelism with these results, there are also studies that show that increasing urbanization has no effect on economic growth. Bloom, Canning and Fink (2008), BRülhart and SberGami (2009) have shown that increasing urbanization supports economic growth up to a certain level of development, after which negative economies prevail.

As seen in Model 2, there is a significant and positive relationship between fixed capital formation and economic growth. The results found in the study are consistent with the results of the studies conducted by Akinola and Omolade (2013), Kong et al. (2020), Zahir et al. (2020). Capital formation refers to the capital stock, which is one of the basic components of the economy's ability to generate profits. The increase in capital in countries will lead to an increase in production, which will contribute positively to economic growth. The increase in production, together with the transfer of capital to the right sectors, will have a positive impact on the economic development of countries as it will increase GDP.

Table 4. Driscoll-Kray Estimator Results

Dependent Variable: *lngdp*		
	Model 1	Model 2
lngovex	-0.0561522 (0. 2175355)	-0.1005261 (0. 1934459)
lnfd	0.4794784 *** (0.0714546)	0.4439949 *** (0.0784576)
lntrade	0.1196024 *** (0.040121)	0.0782585* (0.0447415)
lnurpop	3.000982*** (0.1390077)	2.821201*** (0.2112617)
lnfcap		0.5083674 *** (0.1259885)
constant	15.66818*** (0.7719551)	15.03964*** (0.8716663)
R^2	0.9838	0.9010
Number of observations	162	162
Number of Groups	6	6

Notes: Standard errors are given in parentheses.

*** $p < 0.01$

** $p < 0.05$

* $p < 0.10$

5. Conclusion and Recommendations

An empirical analysis of the impact of public expenditures and financial development on economic growth is conducted with the Driscoll-Kray estimator for BRICS and Türkiye during the period 1995-2021. It is observed that public expenditures have no impact on economic growth for these countries. It can be said that public expenditures in these countries are not capable of triggering economic growth. It should be noted that for the BRICS countries and Türkiye, public expenditures are not made in sufficient amounts for the right resources, and as a result, they do not trigger sufficient GDP growth. It can be said that the fiscal policies implemented in these countries, especially regarding public expenditures, are not at a level that will affect economic growth and public expenditures are not used efficiently.

In our estimation models regarding the relationship between financial development and economic growth, it is seen that financial development affects economic growth significantly and positively. With the increase in financial development, the increase in investments in countries and the increase in credit opportunities create effects that increase both production and GDP. In particular, trust in financial institutions and easy access to financial information make it easier for people to make investment and production decisions. The increase in technology transfers to countries along with financial development leads to more advanced levels of production and investment. As financial development makes it easier for individuals to access retirement funds and loans, per capita GDP will also increase and contribute to economic growth.

It has been revealed that there is a significant and positive relationship between trade openness and economic growth. With globalization, countries have gained freedom in trade and their trade openness has increased. Increasing the foreign trade volume of countries will have a positive effect on economic growth as it will also increase the gross national product. It can increase economic growth as it will enable an increase in investments made to countries and an inflow of capital and technology with the increase in foreign trade. Especially with the increase in exports, the production in the country and the amount of foreign currency entering the country will increase, and the increase in GDP will also contribute to economic growth.

In this empirical analysis, it is seen that there is a significant positive relationship between urbanization and economic growth. It is concluded that

the increase in urbanization in the countries participating in the analysis triggers economic growth and this increase makes a positive contribution to the gross national product.

In the models testing the relationship between fixed capital stock and economic growth, it was observed that there was a significant and positive relationship between these two variables. The increase in capital stock will positively affect production in countries. This increase in production will also have positive effects on the economy, and since it will increase both the gross national product per capita and the total gross national product, it will also positively affect economic growth. Fixed capital stock will increase the amount of capital and therefore will cause an increase in investments. These results are parallel to the literature.

It can be recommended that policy makers, especially for the BRICS countries and Türkiye, implement fiscal policies to increase public expenditures and increase these expenditures. Since many studies have shown that the effective use of public expenditures will have a positive impact on economic growth, it is necessary for these countries to reconsider their public expenditure decisions. Transferring these expenditures to the right resources will contribute to economic development and will also be effective in individual development. Financial development is an issue that should be supported by countries as it will provide technology transfer, capital inflow, increased investment, credit opportunities and better funds for individuals. In line with the reasons listed above, it has been demonstrated both in empirical analysis and in many studies in the literature that financial development contributes to the economic growth of countries. For this reason, it is important for policy makers to develop policies that increase the financial development levels of their countries. Another important issue for countries is the concept of trade openness. With globalization, many countries have increased their trade openness and made positive contributions to their economic growth. While ensuring trade openness is an important issue for countries, it is important for policy makers to make decisions that ensure this increase and to implement practices that encourage individuals in this regard in terms of economic growth. Although increasing urbanization has a positive effect on economic growth, this population growth and urbanization need to be done in a controlled manner. In many studies, in addition to this positive relationship, the negative effects of urbanization have

also been mentioned. Therefore, countries need to manage urbanization and population correctly and make decisions in this direction. The study has shown that increasing the fixed capital stock in countries has a positive effect on economic growth. Policy makers need to implement correct policies in this regard. Since the increase in capital stock will also increase production and investment, it will make positive contributions to countries. It should also be noted that there are some limitations to this analysis. This analysis was conducted to include only the BRICS countries and Türkiye. This number can be increased by adding different countries or country groups to the sample group. In addition, for other studies, the number of explanatory variables can be increased and different perspectives can be presented by using different estimation models.

References

Abdiyeva, R. & Çetintaş, H. (2017). Kamu harcamaları ve ekonomik büyüme arasındaki ilişki: Kırgızistan örneği. *Optimum Ekonomi ve Yönetim Bilimleri Dergisi*, 4(1), 19-33.

Abendin, S., Duan, P. & Nsiah, C. (2021). International trade and economic growth in Africa: The role of the digital economy. *Cogent Economics & Finance*, 9(1), 191767-191.

Abu-Bader, S. & Abu-Qarn, A.S. (2007). Financial development and economic growth: The Egyptian experience. *Journal of Policy Modeling*, 30(2008), 887-898.

Ahmed, A.D. & Mmolainyane, K.K. (2014). Financial integration, capital market development and economic performance: Empirical evidence from Botswana. *Economic Modelling*, 42, 1-14.

Akinlo, A.E. (2013). Government spending and national income nexus for Nigeria. *Global Journal of Business Research, 7*(1), 33-41.

Akinola, G.W. & Omolade, A. (2013). Savings, gross capital formation and economic growth nexus in Nigeria (1975-2008). *IOSR Journal of Economics and Finance*, 1(2), 19-25.

Al-Yousi, Y.K. (2002). Financial development and economic growth Another look at the evidence from developing countries. *Review of Financial Economics*, 11, 131-150.

Anwar, S. & Nguyen, L.P. (2011). Financial development and economic growth in Vietnam. *J Econ Finan*, 35, 348-360.

Atil, A., Nawaz, K., Lahiani, A. & Roubaud, D. (2020). Are natural resources a blessing or a curse for financial development in Pakistan? The importance of oil prices, economic growth and economic globalization. *Resources Policy*, 67, 101683.

Atkinson, A.B. & Stiglitz, J.E. (1980). Lectures on public economics. New York: McGraw-Hill.

Avcı, P., Sarıgül, S., Karataşer, B., Çetin, M. & Aslan, A. (2024). Analysis of the relationship between tourism, green technological innovation and environmental quality in the top 15 most visited countries: evidence from method of moments quantile regression. *Clean Technologies and Environmental Policy*, 26, 2337-2355.

Bertinelli, L. & Stobly, E. (2007). Urbanisation, urban concentration and economic development. *Urban Studies*, 44(13), 2499-2510.

Bloom, D. E., Canning, D. & Fink, G. (2008). Urbanization and the wealth of nations. *Science*, 319(5864), 772-775.

Brülhart, M. & Sbergami, F. (2009). Agglomeration and growth: cross-country evidence. *Journal of Urban Economics*, 65(1), 48-63.

Calderon, C. & Liu, L. (2003). The direction of causality between financial development and economic growth. *Journal of Development Economics*, 72, 321-334.

Castells-Quintana, D. & Royuela, V. (2014). Agglomeration, inequality and economic growth. *The Annals of Regional Science*, 52, 343-366.

Chang, T. & Caudill, S.B. (2005). Financial development andeconomic growth: The case of Taiwan. *Applied Economics*, 37, 1329-1335.

Chen, H., Sing, B. & Aru, W.S. (2020). Relationship between government expenditure and economic growth: evidence from Vanuatu. *Journal of the Asia Pacific Economy*, 27(4), 640-659.

Cooray, A. (2009). Government expenditure, governance and economic growth. *Comparative Economic Studies*, 51(3), 401-418.

Dinova, T.G. & Slavinskaitė, N. (2015). Impact of fiscal policy on economic growth in the Euro Area. *Current Issues of Business & Law*, 10, 277-288.

Driscoll, J. & Kraay, A.C. (1998). Consistent covariance matrix estimation with spatially dependent data. *The Review of Economics and Statistics*, 80(4), 549-560.

Durusu-Ciftci, D., Ispir, M.S. & Yetkiner, H. (2017). Financial development and economic growth: Some theory and more evidence. *Journal of Policy Modeling*, 39(2), 290-306.

Frick, S.A. & Rodríguez-Pose, A. (2018). Change in urban concentration and economic growth. *World Development*, 105, 156-170.

Goldsmith, R.W. (1969). Financial Structure and Development. New Haven: Yale University Press.

Hassan, K. & Abdullah, A. (2017). The Role of public sector in economic growth evaluation for the impact of government expenditure in sectoral output: The case study of Sudan. *Global Business and Management Research: An International Journal*, 9(1), 370-382.

Hassan, M.K., Sanchez, B. & Yu, J.S. (2011). Financial development and economic growth: New evidence from panel data. *The Quarterly Review of Economics and Finance*, 51, 88-104.

Henderson J.V. (2003). The urbanization process and economic growth: the so-what question. *Journal of Economic Growth*, 8, 47-71.

Huang, Y. (2010). *Determinants of financial development*. Palgrave Macmillan London. https://link.springer.com/book/10.1057/9780230302495.

IMF (2024). Access address: https://www.imf.org/.

Kali, R., Mendez, F. & Reyes, J. (2007). Trade Structure and Economic Growth. *The Journal of International Trade & Economic Development*, 16(2), 245-269.

Kong, Y., Nketia, E.B., Antwi, S.K. & Musah, M. (2020). Scrutinizing the complex relationship between Financial Development Gross Fixed Capital Formation and Economic Growth in Africa by adopting CCEMG and AMG estimation techniques. *International Journal of Science and Business*, 4(11), 160-174.

Laboure, M. & Taugourdeau, E. (2018). Does Government Expenditure Matter for Economic Growth? *Global Policy*, 9(2), 203-215.

Leitao, N.C. (2013). A panel data modelling of agglomeration and growth: cross-country evidence. Theoretical and Empirical Researches in Urban Management Bucharest, 8(1), 67-77.

Makki, S.S. & Somwaru, A. (2004). Impact of foreign direct ınvestment and trade on economic growth: Evidence from developing countries. *American Journal of Agricultural Economics*, 86(3), 795-801.

McKinnon, R.I. (1973). *Money and capital in economic development*. Washington, DC: Brookings Institution.

Menyah, K. & Wolde-Rufael, Y. (2013). government expenditure and economic growth: the Ethiopian experience, 1950-2007. *The Journal of Developing* Areas, 47(1), 263-280.

Mlambo, C. (2024). Financial Development and Economic Growth: Evidence from Low-Income Nations in the SADC Region. *Int. J. Financial Stud*. 12(3), 62. https://doi.org/10.3390/ijfs12030062.

Nurudeen, A. & Usman, A. (2010). Government Expenditure And Economic Growth in Nigeria, 1970-2008: A Disaggregated Analysis. *Business and Economics Journal*, 2010(BEJ-4).

Odhiambo, N.M. (2015). Government Expenditure and Economic Growth in South Africa: an Empirical Investigation. *Atl Econ J*., 43, 393-406.

Ono, H. (2014). The government expenditure–economic growth relation in Japan: An analysis by using the ADL test forthreshold cointegration. *Applied Economics*, 46(28), 3523-3531.

Özer, M. & Çiftçi, N. (2009). Ar-Ge tabanlı içsel büyüme modelleri ve Ar-Ge harcamalarının ekonomik büyüme üzerine etkisi: OECD ülkeleri panel veri analizi. *The Journal of Social Economic Research,* 8(16). 219-240.

Parasız, İ. (2006). *Teori ve politika makro ekonomi*. Bursa: Ezgi Kitabevi.

Saad, W. & Kalakech, K. (2009). The nature of government expenditure and its ımpact on sustainable economic Growth. *Middle Eastern Finance and Economics Issue*, 4, 38-47.

Samargandi, N., Fidrmuc, J. & Ghosh, S. (2015). Is the Relationship Between Financial Development and Economic Growth Monotonic? Evidence from a Sample of Middle-Income Countries. *World Development*, 68, 66-81.

Shaw, E.S. (1973). *Financial deepening in economic development*. New York: Oxford University Press.

Silberbergera, M. & Königer, J. (2016). Regulation, trade and economic growth. *Economic Systems*, 40(2), 308-322.

Wagner A. (1893). *Grundlegung der politischen Ökonomie*. Leipzig.

Were, M. (2015). Differential effects of trade on economic growth and investment: A cross-country empirical investigation. *Journal of African Tradee,* 2(1-2), 71-85.

Wu, S.-Y., Tang, J.-H. & Lin, E.S. (2010). The impact of government expenditure on economic growth: How sensitive to the level of development? *Journal of Policy Modeling*, 32(6), 804-817.

Zagler, M. & Dürnecker, G. (2003). Fiscal policy and economic growth. *Journal of Economıc Surveys*, 17(3), 397-418.

Zahir, S., Hayat, K. & Haider, A. (2020). The causality between gross fixed capital formation, trade deficit, exchange rate, and the economic growth of Pakistan. *International Review of Management and Business Research*, 9(4), 138-147.

Zhongying, P. & Ruiping W. (2013). China's Strategic Response to Global Governance. *China International Studies*, 41, 129-146.

CHAPTER IV

Testing Monte Carlo Simulation Analysis with Power Functions: An Application on BIST-100

Lecturer Baris POLAT[1]

DOI: https://dx.doi.org/10.5281/zenodo.14393304

Note: This study is based on the master's thesis written by Baris Polat.

[1] Department of Banking and Insurance, Vocational School, Dogus University, Istanbul, Türkiye.ORCID: https://orcid.org/0000-0003-4871-6115
e-mail: bpolat@dogus.edu.tr

1. Introduction

In today's conditions, the management of the activities that organizations need to carry out in order to achieve their objective has become a very challenging task for managers. Simulation is the examination of a concrete event or object in real life by imitating it with the help of models. In short, simulation are models created to reflect a system (Erkut, 1992). The concept of simulation is not an optimization technique, but a method used to predict the performance measurements of modeled systems (Hamdy, 1987). The concept of simulation is a scientific process that can be repeated by trial and error in the modeling process. Therefore, it has found an effective use in making investment decisions. (Railsback and Grimm, 2011). First developed in the 1940s by Stanislaw Ulam and John von Neumann during the Manhattan Project and named after the Monte Carlo casinos (Metropolis and Ulam, 1949). This method is widely used to understand and predict the behavior of complex systems and processes (Fishman, 1996).

Monte Carlo Simulation uses random numbers and probability distributions to simulate a system with a large number of possible outcomes. (Rubinstein and Kroese, 2016). The main purpose of simulation is to evaluate the risks and potential rewards of a particular decision or strategy. (Rubinstein and Kroese, 2016). This analysis method is used in a wide range of applications, from financial modeling to engineering, from risk management to game theory (Kroese et al., 2011). Especially in the financial sector, Monte Carlo Simulations are widely applied in areas such as portfolio optimization, option pricing and risk analysis. (Glasserman, 2004).

In Monte Carlo Simulation, firstly random variables and probability distributions are determined. (Fishman, 1996). Subsequently, a large number of simulations are run on the specified model Rubinstein and Kroese, 2016). The data obtained is analyzed and probabilities and risks are evaluated. (Kroese et al., 2011). In this process, thousands or even millions of scenarios can be evaluated quickly by taking advantage of the computational power of computers. This increases the accuracy and reliability of Monte Carlo Simulation. (Glasserman, 2004).

The main objective of this study is to analyze the performance of Borsa Istanbul 100 (BIST-100) index using the integration of Monte Carlo simulation

method with power functions. Monte Carlo simulation is a frequently used method to better understand uncertain and complex financial processes. In the study, the effectiveness of this method in determining the returns and volatility on BIST-100 is tested. The use of power functions together with Monte Carlo simulation has the potential to enable existing models to produce more accurate results. Moreover, this analysis can contribute to better shaping risk management strategies for investors.

This study contributes to the literature on both the analysis of Turkish capital markets and the role of the use of Monte Carlo simulation and power functions in financial analysis. Firstly, by deepening the application of Monte Carlo simulation on BIST-100, a new perspective can be presented on the use of these methods in emerging markets such as Türkiye. Secondly, the combination of power functions with Monte Carlo simulations may provide more accurate results in modeling and managing uncertainties in financial markets. The limited number of studies on the integration of these two methods in the literature shows the importance of this study.

2. General Characteristics of Simulation

Simulation is a technique of creating a model of a situation and conducting experiments on that model (Kazan, 1997). When conducting simulation modeling, the following essential aspects should be considered during the programming phase using computers (Law et al., 2000):

i. To generate random numbers, values between 0 and 1 should be derived from a uniform U(0,1) distribution, and the randomly generated numbers should be generated using a known probability distribution.
ii. The ability to add or remove records from simulation lists must be provided.
iii. Appropriate data analysis methods should be used for the simulation model, and the results should be printed to track any potential errors.

Since the simulation technique has a dynamic structure, its purpose is to prepare the appropriate environment for changes that may occur in variables over time in the fields of economics, business, other social sciences and engineering. (Meier et al., 1969). Simulation studies, which have a very powerful feature of helping in problem solving, provide the practitioner with

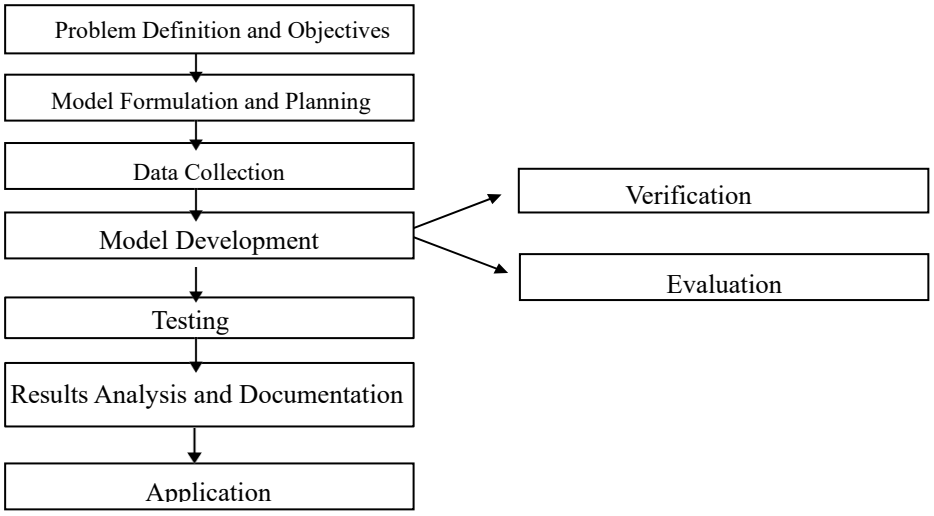
an idea about how the system performance will give results under new conditions. It allows comparison of alternative scenarios and designs with each other. Thus, thanks to the simulation, it becomes possible to consider the system under study in different time periods. Ultimately, the success of a simulation model depends on the success of the model builder. (Banks et al., 1996).

The types of simulations used in studies can be classified in various ways, such as static, deterministic, dynamic, stochastic, discrete, and continuous simulations (Şahin, 1978). If the situation of a system at a certain moment or in a certain period is in question, the model established for this situation will be a static simulation model (Esen, 1994). Models whose behaviors can be predicted in advance and whose future behaviors are known are called "deterministic models". Types of simulations that provide representation of systems developing over time are called "dynamic simulations" (Wayne, 1991). Since stochastic models have a more complex structure than deterministic simulation types, it becomes very difficult to find solutions to stochastic simulation types and for the solutions found to be analytically sufficient. In this respect, the simulation technique has become one of the most widely used basic techniques in the analysis and solution of stochastic simulation types (Sevüktekin, 1992). In this type of simulation, input values and processes are represented by probability distributions. Therefore, stochastic simulation types, whose behavior is unpredictable, can make various predictions about the probability that some events will occur (Pidd, 1990).

If the values of the basic variables of the system change at discrete or countable points in time, such systems are called discrete simulation types. (Hamdy, 1987). In such simulation models, the simulated system is viewed and data is collected only at certain points during the simulation's execution time. There are three specific simulation approaches that facilitate the creation of discrete types of simulation: next-event planning, activity scanning, and the method-adaptation approach. (Hamdy, 1987). These three approaches are based on the collection of statistics on key events as they occur. The ultimate goal of both discrete and continuous types of simulation is to collect appropriate statistics that can be used to explain the behavior of the simulated system. (Hamdy, 1987).

The main steps to be followed when performing a simulation study can be seen in the flow chart below. During the modeling process, the model builder must act according to the order given in the table in the simulation model to be applied.

Table 1. Steps to Follow in a Simulation Study



We can briefly explain the steps to be taken into consideration when determining the steps to be followed in simulation studies as follows: (Öztürk, 2004). After determining the problem and the goals to be achieved for a simulation model, the model builder can begin to create the basic concept of the model. This concept should include the elements and the main event to be examined in the model A system is a set of elements that interact with each other and have relationships aimed at a specific purpose (Erkut, 1992). The accuracy of the collected data is very important for the most effective and accurate preparation of system results. In multi-level simulation studies, it is necessary to indicate with numerical evidence that the behaviors between the model and the outputs are compatible with each other (Dereich and Heidenreich, 2011). After defining the problems, the modeler seeks to obtain the necessary amount of data to estimate the parameter values affecting the constructed model. When using estimated data in the model, sensitivity analysis is employed to determine how and to what extent the variables and parameters

involved in a project affect the project returns. Various values should be used to understand the effects of these data on the system, and the extreme values and tolerances of the data should be thoroughly analyzed. The model created by the model builder is run with the help of simulations and the processes are tested to verify the model. In the evaluation phase, the model builder tries to determine to what extent the model he created for solving the problems accurately reflects the system. Using simulation models alone to solve the problems is not enough. Documentation of the process is also an important issue for the validity of the model (Frederick and Gerald, 1995). During the organization and structuring of each model, the results must be well documented. The final stage in a model is to first implement the developed system on the simulation project. The implementation of the proposals put forward in a project depends on the appropriateness of the steps to be followed in the simulation model. A system that is put into practice must be constantly monitored and updated in order to meet the objectives (Wayne, 1994).

3. Mathematical Analysis and Error Assessment of the Monte Carlo Method

The Monte Carlo Simulation method, when applied to a problem, simulates this problem using random numbers, and the parameter to be calculated is approximately computed based on the results of this simulation (Hancerliogulları, 2006). A random variable is a variable whose value in an experiment or study is not known with certainty. Generally, the rules used to redetermine the sample space (S) are called random variables. To express it more clearly, a result (x,y) that occurs within S, where (x+y) is considered a random variable (Aytaç, 2004). The Monte Carlo Simulation technique, when designed correctly and a sufficiently large sample size is selected, proves to be a reliable method of stochastic simulation processes in many areas (Blanchet et al., 2009). Random number sampling algorithms are algorithms that generate uniformly distributed random numbers based on certain probability distributions. In recent years, these processes have been developed by establishing a relationship between Markov processes and Monte Carlo simulations (Gudmundsson and Hult, 2014). The main purpose of the Monte Carlo method is to imitate an event or experiment with numbers that are uniformly distributed between 0 and 1. These numbers are usually generated by

computer programs. The set of values that can be found in certain experiments and measurements constitutes a random number set. In this random number set, the probability of any number occurring may be different from the others. If the probabilities are equal, this set is called a "uniformly distributed random number set". Each of the random numbers is selected with the same probability and is independent of each other.

Random variables are divided into two groups: discrete and continuous. Discrete random variables are series consisting of elements that can be counted with positive integers in a finite sequence. A random variable X is defined as a function from the sample space S to the set of real numbers. If the domain of this function has a finite or countably infinite number of values, this variable is called a "discrete random variable" (Aytaç, 2004). In the Monte Carlo Method, since a large number of random numbers need to be generated, these numbers are produced through computer programs.

Although the Monte Carlo integral method is not as efficient as other methods for low-dimensional problems, it provides advantages for high-dimensional problems. Studies on six-dimensional empirical models in particular confirm that Monte Carlo path navigation algorithms result in fewer errors (Donner, 2009). Moreover, the independence of the standard deviation from the integration dimension allows the method to yield faster and more accurate results in cases where the dimension exceeds four. This demonstrates that the Monte Carlo method is more advantageous compared to other methods in high-dimensional integral calculations. The concept of high dimensions results in fewer errors in areas such as the measurement and modeling of isotropic and homogeneous materials (Munoz et al., 2011).

4. Transformation of Random Numbers and Theoretical Distributions

Due to the nature of the real systems used, it is not always possible to characterize all qualitative properties of these systems with stochastic processes and uniform distributions. Generally, it is more likely to encounter theoretical distributions (such as Normal, Exponential, Gamma, etc.) that are used more frequently than uniform distributions. The exponential distribution is one of the continuous probability distributions and is often used to model the durations between events. For example, it is used to model the time until a failure occurs

or the response time of customer service (Ross, 2014). The exponential distribution is associated with the Poisson process, which is used to model the number of events occurring in a given time interval (Grimmett and Stirzaker, 2001).

The normal distribution is one of the most common and important continuous distributions in statistics and probability theory. Also known as the Gaussian distribution, it is used to model the distribution of many natural phenomena and measurement errors. (Grimmett and Stirzaker, 2001).

The beta distribution is a continuous probability distribution defined on the interval [0, 1]. It is characterized by two shape parameters (α and β), which determine the shape of the distribution. The beta distribution is used in modeling ratios, percentages, and probabilities, and it plays an important role in Bayesian statistics (Gelman et al., 2013). Particularly, the beta distribution, which is a natural partner to the binomial distribution, is frequently used in modeling success rates. It can also be used to model the success rates of treatment methods or the frequency of diseases (Hull, 2017).

The gamma distribution is one of the continuous probability distributions used to model waiting times. This distribution is suitable for modeling the durations between events in Poisson processes and is a generalization of the exponential distribution. It is defined by two parameters: the shape parameter (α) and the scale parameter (β) (Tijms, 2003). The gamma distribution is widely used, especially in reliability analyses and modeling waiting times in systems. For instance, the failure times of components in a system can be modeled using the gamma distribution (Montgomery and Runger, 2014). Additionally, in Bayesian statistics, the gamma distribution plays an important role as the parametric prior for the Poisson distribution (Gelman et al., 2013).

5. Statisitcal Power Functions

Statistical power functions are used to determine the required sample size for studies on a model or system and to examine the effects on the model as a result of experiments using this size. Power analyses aim to test the hypothesis put forward about the model. In hypothesis tests, claims about the population parameters are initially put forward and whether these claims are true or not is evaluated based on sample data. The put forward claim is expressed with the H_0 hypothesis, while the opposing claim is indicated with the H_1 hypothesis.

When determining the power of a test, a hypothesis is first put forward about the population parameters and the accuracy of this hypothesis is tested on samples. A hypothesis is a statement that states whether a claim put forward about a subject is true or false. (Güler, 2005). Hypothesis tests essentially involve two hypotheses: the null hypothesis (H_0), which represents the current state, and the alternative hypothesis (H_1), which indicates a deviation from the current state (Güler, 2005).

6. Application of Monte Carlo Simulation Analysis on BIST-100

In order to examine the BIST-100 closing values with Monte Carlo Simulation, the closing data of the last nine years obtained from the ISE website will be used to simulate the closing value of 2014 in line with the price data of previous years.

There are some assumptions that need to be taken into consideration during the simulation application. In the applications to be made on BIST-100 data, studies will be carried out by taking these assumptions into account. In order to provide ease of calculation, the data will be grouped according to thousand-unit increases or decreases. In other words, when determining the probabilities, the closing value ranges will be represented by the arithmetic mean. For example, the closing values in the range of 75.000-76.000 will be included as 75.500.

In the simulation application, nine random numbers will be used to estimate the closing values of each month and the arithmetic average of the closing values obtained from these nine numbers will be used to estimate the closing value at the end of 2014. The random numbers will be generated with the help of the Excel program and each number will be used in order starting from the row.

The simulation time will be divided into monthly units, and after the closing estimate for the first month, the other months will be passed. In line with these assumptions, the following procedures will be applied to make a closing value estimate: The probabilities for the closing values between 2005-2013 will be determined, cumulative probabilities will be calculated and random number intervals will be determined accordingly. Estimates will be

made using the random numbers obtained from these intervals and finally the 2014 year-end closing value will be simulated.

The monthly closing values for the BIST-100 index between 2005 and 2013 are presented in Table 2.

Table 2 Monthly closing values of the BIST-100 Index between 2005 and 2013

	2013	*2012*	*2011*	*2010*	*2009*	*2008*	*2007*	*2006*	*2005*
January	78.783	57.171	63.278	54.650	25.934	42.697	41.182	44.590	27.330
February	79.333	60.721	61.283	49.705	24.026	44.776	41.431	47.015	28.396
March	85.899	62.423	64.434	56.538	25.764	39.015	43.661	42.911	25.557
April	86.046	60.010	69.250	58.959	31.651	43.468	44.984	43.880	23.591
May	85.990	55.099	63.046	54.384	35.003	39.969	47.081	38.132	25.236
June	76.294	62.543	63.269	54.839	36.949	35.089	47.093	35.453	26.957
July	73.377	64.259	62.295	59.866	42.641	42.200	52.824	36.067	29.615
August	66.394	67.368	53.946	59.972	46.551	39.844	50.198	37.285	30.908
September	74.486	66.396	59.693	65.774	47.910	36.051	54.044	36.924	33.333
October	77.620	72.529	56.061	68.760	47.184	27.832	57.615	40.582	31.964
November	75.748	73.058	54.517	65.350	45.350	25.715	54.213	38.168	38.088
December	67.801	78.208	51.266	66.004	52.825	26.864	55.538	39.117	39.777

Once Table 2 is prepared, the probabilities related to historical closing values can be calculated, and the estimated closing value for 2014 can be obtained using the Monte Carlo Simulation method. To determine the probability distributions of the closing data in Table 2 the intervals into which the data fall must first be identified. The determination of these intervals will begin with the smallest value of the monthly closing values from the past nine years. This smallest value will serve as our starting point. The smallest monthly closing value recorded in the table is 23.591 which occurred in May 2005. Therefore, the first interval to be established will be the range of 23.000-24.000 and other intervals will be determined incrementally by 1.000 units in hypothetical steps.

The next step, after defining the intervals, is to examine the closing values in the table and count how many values fall into each interval. This will allow us to identify the frequency of monthly closing values corresponding to each interval. According to our assumption prior to the simulation, each value within the 23.000-24.000 range will be treated as 23.500. When adjustments

are made in line with this assumption, the structure presented in Table 3 will be obtained.

Table 3. Ranges of Monthly Closing Values of the BIST-100 Index between 2004-2014

Monthly Closing Value Ranges	*Monthly Closing Value*	*Realized Monthly Closing Values*						*Realization Number*
23000-24000	23500	23591						1
24000-25000	24500	24026						1
25000-26000	25500	25236	25557	25715	25764	25934		5
26000-27000	26500	26864	26957					2
27000-28000	27500	27330	27832					2
28000-29000	28500	28396						1
29000-30000	29500	29615						1
30000-31000	30500	30908						1
31000-32000	31500	31651	31964					2
32000-33000	32500							
33000-34000	33500	33333						1
34000-35000	34500							
35000-36000	35500	35003	35089	35453				3
36000-37000	36500	36051	36067	36924	36949			4
37000-38000	37500	37285						1
38000-39000	38500	38088	38132	38168				3
39000-40000	39500	39015	39117	39777	39844	39969		5
40000-41000	40500	40582						1
41000-42000	41500	41182	41431					2
42000-43000	42500	42200	42641	42697	42911			4
43000-44000	43500	43468	43661	43880				3
44000-45000	44500	44590	44776	44984				3
45000-46000	45500	45350						1
46000-47000	46500	46551						1
47000-48000	47500	47015	47081	47093	47184	47910		5
48000-49000	48500							
49000-50000	49500	49705						1
50000-51000	50500	50198						1
51000-52000	51500	51266						1
52000-53000	52500	52824	52825					2
53000-54000	53500	53946						1
54000-55000	54500	54044	54213	54384	54517	54650	54839	6
55000-56000	55500	55099	55538					2
56000-57000	56500	56061	56538					2
57000-58000	57500	57171	57615					2
58000-59000	58500	58959						1
59000-60000	59500	59693	59866	59972				3

60000-61000	60500	60010	60721					2
61000-62000	61500	61283						1
62000-63000	62500	62295	62423	62543				3
63000-64000	63500	63046	63269	63278				3
64000-65000	64500	64259	64434					2
65000-66000	65500	65350	65774					2
66000-67000	66500	66004	66394	66396				3
67000-68000	67500	67368	67801					2
68000-69000	68500	68760						1
69000-70000	69500	69250						1
70000-71000	70500							
71000-72000	71500							
72000-73000	72500	72529						1
73000-74000	73500	73058	73377					2
74000-75000	74500	74486						1
75000-76000	75500	75748						1
76000-77000	76500	76294						1
77000-78000	77500	77620						1
78000-79000	78500	78208	78783					2
79000-80000	79500	79333						1
80000-81000	80500							
81000-82000	81500							
82000-83000	82500							
83000-84000	83500							
84000-85000	84500							
85000-86000	85500	85899	85990					2
86000-87000	86500	86046						1

The next step after the preparation of Table 3 is to examine the monthly closing figures for 2013. In order to achieve a logical reality due to the assumptions, the smallest value of the monthly closing values of the last two years, 55.099 will constitute our first value. Therefore, our calculations will start with the value 55.500. For example, the number of occurrences of the closing value 23.500 is 1. However, due to our assumption, the value 23.500 will not be included in the calculation. As can be seen when Table 3 is examined, our first closing value, which is greater than 55.500 and has a zero occurrence number, is 70.500. Therefore, the number of occurrences of the closing value 23.500 will be added to the number of occurrences of the closing value 70.500. The occurrence numbers of all values smaller than the closing value 55.500 will be transferred in the same way. However, if there are no

closing values in the table with a zero number of occurrences, but the numbers of occurrences of all the numbers to be included in the calculations are not transferred, new number ranges will be added to the table and the transfer will be made based on these closing values.

For example, in Table 3, 29 of the 32 values smaller than 55.500 have occurrence numbers and these values need to be transferred to the table. However, there are 7 values larger than 55,500 with a occurrence number of zero. Therefore, the occurrence number of the 8th smallest value, 30,500, which needs to be transferred, will be transferred to the new value to be added, 87,500. This process will continue until all occurrence numbers are transferred.

Accordingly, the new image obtained in Table 4 will be as follows. Table 4 is created as follows. After this stage, the probability values of the values found will be found and the estimated closing value to be obtained at the end of 2014 will be calculated.

Table 4. Monthly Closing Values and Occurrences of the BIST-100 Index from 2005 to 2013

Monthly Closing Values	*Realization Number*	*Monthly Closing Values*	*Realization Number*
55500	2	85500	2
56500	2	86500	1
57500	2	87500	1
58500	1	88500	2
59500	3	89500	1
60500	2	90500	3
61500	1	91500	4
62500	3	92500	1
63500	3	93500	3
64500	2	94500	5
65500	2	96500	1
66500	3	97500	2
67500	2	98500	4
68500	1	99500	3
69500	1	100500	3
70500	1	101500	1
71500	1	102500	1
72500	1	103500	5
73500	2	104500	1

74500	1	105500	1
75500	1	106500	1
76500	1	107500	2
77500	1	108500	1
78500	2	109500	6
79500	1		
80500	5		
81500	2		
82500	2		
83500	1		
84500	1		

Now, at this stage, using the data in Table 4, probabilities, cumulative probabilities, and random number ranges will be determined sequentially. These values will be structured as shown in the table we have created below, Table 5.

Table 5. Random Number Ranges for the Monthly Closing Values of the BIST-100 Index for the Years 2005-2013

Monthly Closing Values	*Realization Number*	*Probability*	*Cumulative Probability*	*Random Number Range*
55500	2	0.018519	0.01852	0.00000-0.01851
56500	2	0.018519	0.03704	0.01852-0.03703
57500	2	0.018519	0.05556	0.03704-0.05555
58500	1	0,009259	0.06481	0.05556-0.06480
59500	3	0.027778	0.09259	0.06481-0.09258
60500	2	0.018519	0.11111	0.09259-0.11110
61500	1	0.009259	0.12037	0.11111-0.12036
62500	3	0.027778	0.14815	0.12037-0.14814

63500	3	0.027778	0.17593	0.14815-0.17592
64500	2	0.018519	0.19444	0.17593-0.19443
65500	2	0.018519	0.21296	0.19444-0.21295
66500	3	0.027778	0.24074	0.21296-0.24073
67500	2	0,018519	0.25926	0.24074-0.25925
68500	1	0.009259	0.26852	0.25926-0.26851
69500	1	0.009259	0.27778	0.26852-0.27777
70500	1	0.009259	0.28704	0.27778-0.28703
71500	1	0.009259	0.29630	0.28704-0.29629
72500	1	0.009259	0.30556	0.29630-0.30555
73500	2	0.018519	0.32407	0.30556-0.32406
74500	1	0.009259	0.33333	0.32407-0.33332
75500	1	0.009259	0.34259	0.33333-0.34258
76500	1	0.009259	0.35185	0.34259-0.35184
77500	1	0.009259	0,36111	0.35185-0.36110
78500	2	0.018519	0.37963	0.36111-0.37962
79500	1	0.009259	0.38889	0.37963-0.38888
80500	5	0.046296	0.43519	0.38889-0.43518
81500	2	0.018519	0.45370	0.43519-0.45369
82500	2	0.018519	0.47222	0.45370-0.47221
83500	1	0.009259	0.48148	0.47222-0.48147

84500	1	0.009259	0.49074	0.48148-0.49073
85500	2	0.018519	0.50926	0.49074-0.50925
86500	1	0.009259	0.51852	0.50926-0.51851
87500	1	0.009259	0.52778	0.51852-0.52777
88500	2	0.018519	0.54630	0.52778-0.54629
89500	1	0.009259	0.55556	0.54630-0.55555
90500	3	0.027778	0.58333	0.55556-0.58332
91500	4	0.037037	0.62037	0.58333-0.62036
92500	1	0.009259	0.62963	0.62037-0.62962
93500	3	0.027778	0.65741	0.62963-0.65740
94500	5	0.046296	0.70370	0.65741-0.70369
96500	1	0.009259	0.71296	0.70370-0.71295
97500	2	0.018519	0.73148	0.71296-0.73147
98500	4	0.037037	0.76852	0.73148-0.76851
99500	3	0.027778	0.79630	0.76852-0.79629
100500	3	0.027778	0.82407	0.79630-0.82406
101500	1	0.009259	0.83333	0.82407-0.83332
102500	1	0.009259	0.84259	0.83333-0.84258
103500	5	0.046296	0.88889	0.84259-0.88888
104500	1	0.009259	0.89815	0.88889-0.89814

105500	1	0.009259	0.90741	0.89815-0.90740
106500	1	0.009259	0.91667	0.90741-0.91666
107500	2	0.018519	0.93519	0.91667-0.93518
108500	1	0.009259	0.94444	0.93519-0.94443
109500	6	0.055556	1.00000	0.94444-0.99999

Following the preparation of Table 5, the next step involves generating random numbers, which will then be used to estimate the closing value for the year 2014. As per the assumption, the arithmetic mean of nine randomly generated numbers will be calculated, and this value will represent the estimated closing value for 2014. The random numbers generated for each month and the resulting estimated monthly closing values are presented in Table 6.

As can be seen from Table 6, the estimated closing value for 2014, based on the Monte Carlo Simulation Analysis, is approximately 84.667.

Table 6. Estimation of the 2014 BIST-100 Index Closing Value Using the Monte Carlo Simulation Method

	RS1	RS2	RS3	RS4	RS5	RS6	RS7	RS8	RS9	Sum of the Value of 9 Random Numbers	Arithmetic Mean
January	104500	108500	90500	56500	62500	97500	67500	80500	63500		
	0.89173	0.94221	0.57392	0.02570	0.12649	0.71594	0.25249	0.41200	0.15711	731500	81278
February	107500	83500	73500	97500	65500	85500	57500	56500	94500		
	0.93404	0.47896	0.30910	0.72348	0.20302	0.50049	0.04109	0.02994	0.66335	721500	80167
March	109500	91500	91500	92500	93500	62500	107500	97500	66500		
	0.99271	0.59256	0.59139	0.62349	0.63548	0.13615	0.93490	0.72159	0.21956	812500	90278
April	103500	78500	86500	67500	100500	88500	85500	66500	98500		
	0.84953	0.37170	0.51494	0.24854	0.80195	0.53995	0.49179	0.22430	0.73495	775500	86167
May	98500	73500	96500	77500	103500	83500	91500	61500	105500		
	0.76513	0.31831	0.70880	0.35460	0.88080	0.47760	0.60466	0.11644	0.90538	791500	87944
June	64500	96500	99500	80500	104500	94500	100500	57500	86500		
	0.18581	0.70691	0.77516	0.40877	0.89101	0.69587	0.81081	0.04381	0.51827	784500	87167
July	62500	78500	107500	75500	75500	97500	63500	92500	81500		
	0.13664	0.36892	0.92652	0.35046	0.33724	0.73147	0.16339	0.62605	0.44798	734500	81611
August	59500	61500	63500	67500	73500	82500	80500	73500	66500		
	0.08137	0.11914	0.17395	0.25441	0.31653	0.46419	0.42584	0.31115	0.23747	628500	69833
September	98500	94500	80500	99500	94500	94500	99500	84500	90500		

	0.74229	0.66758	0.40759	0.77009	0.69030	0.65933	0.79037	0.48612	0.56202	836500	92944
October	65500	66500	65500	91500	103500	94500	104500	62500	98500		
	0.21219	0.22066	0.19880	0.60650	0.87794	0.69598	0.89768	0.14495	0.74839	752500	83611
November	106500	88500	103500	82500	59500	80500	84500	94500	73500		
	0.91581	0.53398	0.85977	0.46815	0.08072	0.42864	0.48698	0.70054	0.30640	773500	85944
December	90500	62500	85500	100500	87500	82500	93500	89500	109500		
	0.58295	0.12913	0.50590	0.81475	0.52522	0.46794	0.64555	0.54844	0.97010	801500	89056
										9144000	84667

To assess the validity of the estimation, it is crucial to determine whether the obtained results can be used to predict the closing values in future years. Therefore, the significance of the estimated closing values for 2014, simulated using the Monte Carlo Simulation model, and the actual closing values were examined using the Chi-Square test.

The Chi-Square test and hypothesis concerning the 2014 closing values are formulated as follows:

$H0$= G=B
(There is no significant difference between the observed and expected frequen cies).

$H1$= G=B
(There is a significant difference between the observed and expected frequenc ies).

The hypothesis will be tested at a 1% significance level, with degrees of freedom equal to = k-1= 12-1=11

$\chi 2 = \sum \frac{(Bi-Gi)^2}{Gi} = \sum \frac{(81278-61858)^2}{61858} + \sum \frac{(80617-62553)^2}{62553} + \ldots\ldots + \sum \frac{(89056-85721)^2}{85721}$ = It is found to be 25.252. Since the table value of $\chi 2$ is 24.725 at 1% significance level v = 11 degrees of freedom

Since the $\chi 2$ calculated value is greater than the $\chi 2$ table value, the null hypothesis H_0 is rejected. This indicates that there is a significant difference between the observed monthly closing values and the simulated monthly closing values. Therefore, it is not appropriate to use this model for future predictions.

Öztürk (2004) examined the application of the Monte Carlo Simulation Method in businesses and concluded that the results obtained from computer outputs were closely aligned in all cases. However, the results obtained in this study for the BIST-100 do not align with Öztürk's findings. Eren (2014) concluded that operational risk, a significant type of risk for banks, is crucial for institutions to measure and assess their actual risk levels using real data. Eren suggested that such calculations should not be made for future capital allocations. Additionally, Eren and Çıkrıkçı (2014) emphasized that forward-looking plans should be carefully interpreted. Diker and Aslan (2022) aimed to foresee potential future scenarios businesses may face using Monte Carlo Simulation with time series methods and contribute to taking the necessary precautions. They concluded that predictive methods in modeling should be used to holistically evaluate production processes and make the production process more scientific. Therefore, the findings of Eren and Çıkrıkçı (2014) and Diker and Aslan (2022) are closely aligned. This is because it should be considered that predictive modeling with simulation methods may differ based on the sectoral risk factors inherent in the data being studied.

7. Conclusion

When making investment decisions, one of the most important issues that investors trading in financial markets think about is being prepared for possible future changes in the market they are investing in and the problems that may arise as a result of these changes. The investor, who sets out his goals with a well-prepared planning and control process, determines what he needs to do to achieve these goals and shapes the investment accordingly.

This study aims to calculate the year-end closing value by considering the monthly closing values of the BIST-100 index between January 2014 and December 2014 and to create an estimated model using the Monte Carlo Simulation Method in order to be prepared for possible changes in the future. However, no matter how well the simulation models are prepared, they do not guarantee that we will reach a definite result. For example, they cannot allow us to see today the events such as an economic crisis, a political development, a possible war threat or a natural disaster that may occur during the planned process. They allow us to make estimates on the model or system established

by using past data and to choose the closest probabilities or alternative options to the result or the result.

Borsa Istanbul's 2014 year-end monthly closing value was determined by simulation modeling in September when BIST-100 was at 72.000 points. When the model results and 2014 year-end closing values were compared, the following results were reached. Our model's 2014 closing value was given as a target point of 84.667 points. The realized 2014 closing value was realized at 85.721 with a deviation of approximately one percent. However, when the Chi-Square test results were evaluated, it was seen that there was a significant difference between the realized values and the expected values, in other words, the Monte Carlo Simulation method alone was not sufficient.

Although the Monte Carlo Simulation Method is a powerful tool in predicting future market movements based on past data, using it alone is not enough. Investors should strengthen their predictions by using different modeling methods together. For example, approaches such as econometric models, technical analysis and fundamental analysis should be used in addition to Monte Carlo simulation. Financial markets can always face uncertainties such as economic crises, political events and natural disasters. For this reason, it would be beneficial for investors to use scenario analysis and stress tests in their decision-making processes. With these methods, more durable investment strategies can be developed by predicting the reaction of the markets to possible shocks. Although the simulation results are correct with a certain deviation, it is important for investors to constantly review their risk management policies. Methods such as portfolio diversification, use of derivative products and stop-loss orders can enable investors to be more flexible and protected against uncertainties. The quality of the data used is of great importance in the success of simulation models. Using up-to-date and accurate data ensures that simulation results are more consistent and reliable. In addition, structural changes in the market should be taken into account and modeling processes should be updated accordingly.

As a recommendation for future researchers, it is important to compare Monte Carlo simulation with different modeling techniques. Evaluating which model provides more accurate results by performing a comparative analysis will guide further studies. Working with longer-term data instead of just one

year or short-term data can increase the predictive power of models. Using a data set of 10 years or more allows testing within broader market cycles. The success of Monte Carlo simulation depends on the correct selection of the parameters used. Future studies can try varying parameter sets for different scenarios. For example, performing different simulations on changes in volatility, interest rates or macroeconomic indicators can provide different results. Simulation and modeling technologies are developing rapidly. Researchers who will conduct future studies can increase the predictive power of models by using artificial intelligence and machine learning techniques. These new technologies can help make simulations more dynamic and adaptable.

As a result, it would be useful to remind you that trying to have an idea about the future of BIST-100 with simulation models alone can be misleading. Therefore, even if the result obtained is believed to be correct, one should not rely solely on the simulation model; instead, estimating by using alternative methods together can lead to more accurate results.

References

Aytaç, M (2004). *Matematiksel İstatistik*. Bursa, Ezgi Kitap Yayınları.

Blanchet, J.H., Leder, K., Glynn, P.W. (2009). Efficient Simulation of Light-Tailed Sums: an Old-Folk Song Sung to a Faster New Tune... In: L' Ecuyer, P., Owen, A. (eds) Monte Carlo and Quasi-Monte Carlo Methods 2008. Springer, Berlin, Heidelberg. ss.227-248.

Dereich, S. & Heidenreich. F. (2011). A multilevel Monte Carlo algorithm for L´evy-driven stochastic differential equations. *Stochastic Processes and their Applications*, 121(7), 1565-1587.

Diker, F. & Aslan, E. (2022). Monte Carlo Simülasyonu ve Zaman Serisi Yöntemlerine Göre Bir Üretim Firmasında Tahminleme. *Journal of Academic Value Studies*, 8(1), 26-36.

Donner, C., Lawrence, J., Ramamoorthi, R., Hachisuka, T., Jensen, H.W. & Nayar, S. (2009). An empirical BSSRDF model. *ACM Transaction on Graphics (TOG)*, 28(3), Article No:30.

Eren, Ö. & Çıkrıkçı, M. (2014). Monte Carlo Simülasyonu ile Beklenmeyen Operasyonel Kayıpların Tahmini. *Çankırı Karatekin Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 4(2), 349-361.

Erkut, H (1992). Analiz Tasarım ve Uygulamalı Sistem Yönetimi. Yönetim Bilimleri Dizisi 4. İstanbul, İrfan Yayımcılık.

Erkut, H. (1992). *Yönetimde Simülasyon Yaklaşımı*. İstanbul, İrfan Yayımcılık.

Esen, H.Ö. (1994). *İşletme Yönetiminde Sistem Yaklaşımı*. İstanbul, Avcıol Basım Yayın.

Fishman, G.S. (1996). Monte Carlo: Concepts, Algorithms, and Applications. Springer.

Frederick, S.H. & Gerald, J.L. (1995). *Introduction to Operations Research*. New York, Mc Graw Hill, Inc.

Gelman, A., Carlin, J.B., Stern, H.S., Dunson, D.B., Vehtari, A. & Rubin, D.B. (2013). *Bayesian Data Analysis*. (3rd ed.), CRC Press.

Glasserman, P. (2004). Monte Carlo Methods in Financial Engineering. Springer.

Grimmett, G. & Stirzaker, D. (2001). *Probability and Random Processes*. (3rd ed.), Oxford University Press.

Gudmundsson, T. & Hult, H. (2014). Markov chain monte carlo for computing rare-event probabilities for a heavy-tailed random walk. *Journal of Applied Probability*, 51, 359-376.

Güler, F. (2005). *İstatistik Metodları ve Uygulamaları*, İstanbul, Beta Basım Yayım Dağıtım.

Hamdy A.T. (1987). *Operations Research an Introductions*. New York, Macmillan Publishing.

Hançerlioğulları, A. (2006). Monte Carlo Simülasyon Metotu ve MNCP Kod Sistemi. *Kastamonu Eğitim Dergisi*. 14(2), 545-556.

Hull, J.C. (2017). *Options, Futures, and Other Derivatives*. (10th ed.), Pearson.

Jerry B., John S. Carson & Barry L. Nelson (1996). Discrete-Event System Simülation, New Jersey, Printice Hall.

Kazan, A (2001). Türkiye Ekonomisi İçin Bir Ekonometrik Model ve Simülasyon Çalışması. *Gazi Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*. 1/2001.

Kroese, D.P., Taimre, T. & Botev, Z.I. (2011). Handbook of Monte Carlo Methods. John Wiley & Sons.

Law, A.M., Kelton, D.W (2000). Simülation Modelling and Analysis, McGraw-Hill International Series, Industrial Series. Singapore, ss.367-369

Metropolis, N. & Ulam, S. (1949). The Monte Carlo Method. *Journal of the American Statistical Association*, 44(247), 335-341.

Montgomery, D.C. & Runger, G.C. (2014). *Applied Statistics and Probability for Engineers*. (6th ed.), Wiley.

Munoz, A., Echevarria, J.I., Seron, F.J., Lopez-Moreno, J., Glencross, M. & Gutierrez, D. (2011). BSSRDF estimation from single images. Computer Graphics Forum, 455-464.

Öztürk, A. (2004). *Yöneylem Araştırması*. Bursa, Ekin Yayımcılık.

Öztürk, L. (2004). Monte-Carlo Simülasyon Metodu ve Bir İşletme Uygulaması, Doğu Anadolu Bölgesi Araştırmaları. 3(1), 116-122.

Pidd, M. (1990). Computer Simülation In Management Science. John Wiley&Sons, Chichester.

Railsback S. & Grimm, V. (2011). Agent-based and Individual-based Modeling: A Practical Introduction, Princeton University Press.

Robert C.M. (1969). Simülation in Business and Economics. New Jersey, Printice Hall, s.1.

Ross, S.M. (2014). Introduction to Probability Models. (11th ed.), Academic Press.

Rubinstein, R.Y. & Kroese, D.P. (2016). Simulation and the Monte Carlo Method. John Wiley & Sons.

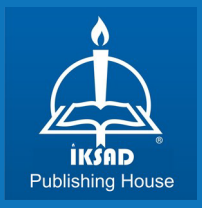
Sevüktekin, M. (1992). Ekonometrik Simülasyon Uygulamaları. *Uludağ Üniversitesi İktisadi ve İdari Bilimler Dergisi*, XIII (2), s.235.

Şahin, M. (1978). Üretim Yönetiminde Simülasyon Analizi ve Uygulaması. Eskişehir İktisadi ve Ticari İlimler Akademisi Yayın No:194/124.

Tijms, H.C. (2003). A First Course in Stochastic Models. Wiley.

Wayne, L.W. (1991). Operation Research Application and Algoritms. Boston, Kent Publishing Company.

Wayne, L.W. (1994). Operations Research Applications and Algorithms. Duxbury Press, Wadsworth Pub. Comp. Belmont, California.



ISBN: 978-625-367-953-8