Journal of Economics, Business & Organization Research

Year: 2025, Vol: 7, Issue: 1, pp. 40-57

Article Type: *Research*

Citation: Kömürcüoğlu, E. D. (2025). Does financial innovation boost economic growth in BRICST countries?. *Journal of Economics, Business and Organization Research, 7*(1), 40-57. https://doi.org/10.66414/ebor.100347

DOES FINANCIAL INNOVATION BOOST ECONOMIC GROWTH IN BRICST COUNTRIES?

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Received / Başvuru: 25.06.2025 **Accepted / Kabul:** 18.11.2025 **Published / Yayın:** 27.12.2025

Abstract

Financial innovations are expected to stimulate economic activity by improving the efficiency of resource allocation through new products, services, and institutions. The study aims to analyse the impact of financial innovation on economic growth for BRICST countries over the period 2008–2022. The results derived using the Driscoll–Kraay indicate that advancements in financial innovation have a positive impact on economic growth. In this framework, strengthening financial systems with innovative structures and implementing policies that encourage financial innovation in BRICST countries can be considered as a crucial component for the sustainability of economic growth.

Keywords: *Financial Innovation, Economic Growth, Panel Data Analysis*

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FİNANSAL YENİLİK BRICST ÜLKELERİNDE EKONOMİK BÜYÜMEYİ ARTIRIYOR MU?

Öz

Finansal yeniliklerin sunduğu yeni ürün, hizmet ve kurumsal düzenlemeler aracılığıyla kaynak tahsisi etkinliğini artırarak ekonomik faaliyeti canlandırması beklenmektedir. Bu çalışmanın amacı, 2008–2022 döneminde finansal yeniliğin ekonomik büyüme üzerindeki etkisini BRICST ülkeleri için analiz etmektir. Driscoll–Kraay standart hata tahmincisiyle elde edilen bulgular, finansal yenilikteki gelişmelerin ekonomik büyümeyi olumlu yönde etkilediğini ortaya koymaktadır. Bu çerçevede, BRICST ülkelerinde finansal sistemlerin yenilikçi yapılarla güçlendirilmesi ve finansal yeniliği teşvik edici politikaların hayata geçirilmesi ekonomik büyümenin sürdürülebilirliği açısından kritik bir unsur olarak değerlendirilebilir.

Anahtar Kelimeler: *Finansal Yenilik, Ekonomik Büyüme, Panel Veri Analizi*

1. INTRODUCTION

Financial innovation (FINNOV) is considered a strategic element that both facilitates cross–sector integration and triggers economic growth (EG) within the rapidly changing global economic structure (Abbas et al., 2024). The concept of "innovation", which etymologically derives from the Latin word "novus", generally refers to something new, but also includes the restructuring of what already exists. In economic literature, this concept is mostly used to explain shocks in the economy and the responses to these shocks (Tufano, 2003). In this context, Schumpeter (1934) defined innovation as the creation of new combinations in the economic system and addressed it systematically (Fikirli and Çetin, 2017). Accordingly, innovation refers to developing a novel product, employing a new method of production, entering a new market, utilising new sources of raw materials, and adopting a new organisational structure (Kesbiç and Şimşek, 2020). However, the concept of innovation has not been limited to technology and production processes; over time, it has also created a unique area of transformation in financial markets. Advances in information and communication technologies, especially since the late 20th century, have reshaped the organisation of financial markets, facilitating quicker capital flows and the creation of innovative financial instruments. In this context, FINNOV has become a phenomenon of global significance and have begun to play a decisive role in the functioning of the financial system (Oktayer, 2011).

FINNOV is approached from different perspectives to encompass various developments affecting financial markets. In this context, it is not limited to the launch of a completely new financial product or instrument; the reintroduction of a previously known product that could not be used for legal reasons is also considered within this scope. Furthermore, it also covers changes in the structure and depth of financial markets, transformations in the functioning of financial institutions, and developments in the way services are delivered (Van Horne, 1985; O'Sullivan, 2002).

Although the literature offers various definitions of the FINNOV concept, no agreement has been reached on a single definition. Tufano (2003) defines FINNOV as the creation and dissemination of financial instruments, technologies, institutions, and markets. In contrast, Frame and White (2004) characterize FINNOV as something new that emerges in the form of advanced products, services, or tools that reduce costs, lower risks, and more effectively meet the needs of participants in the financial system. Similarly, Solans (2003) approaches FINNOV

as technological developments and new organisational structures that facilitate access to information, trade, and payment systems. Błach (2011: 18–19), on his part, addresses these definitions in a narrow and broad sense, referring to any development in financial instruments (such as the exchange of existing financial instruments or a completely new financial instrument) as FINNOV in the narrow sense and FINNOV encompasses any advancement within any component of the financial system (regulations concerning financial markets, financial institutions, financial instruments and transactions) in the broad sense.

This diversity in definitions has also given rise to differing views on how FINNOV arises and evolves. Therefore, the emergence of FINNOV reflects a multidimensional and dynamic process that cannot be reduced to a single cause. In the literature, regulatory constraints, tax policies, fluctuations in interest rates, increased competition in financial markets, and technological developments are highlighted as the primary driving forces behind these innovations. Miller (1986) notes that FINNOV is often developed to overcome certain constraints, while Finnerty (1988) emphasises that interest rate volatility, deregulation, and increased competition also shape this process. On the other hand, Van Horne (1985) argues that variable economic conditions and increasing liberalisation encourage FINNOV. Tufano (2003), on a different note, argues that market imperfections such as inefficient market structures, information gaps, and high transaction costs are the primary drivers of FINNOV. Additionally, his study reveals that increasing risks, globalisation, and taxation also contribute to FINNOV.

The classification of FINNOV is also addressed from different perspectives in the literature. These classifications are generally grouped under three main headings in the literature according to their types, functions and motivations. Frame and White (2004) classify FINNOV comprises four main types: the creation of new products, the delivery of new services, the adoption of new production methods, and the emergence of new organisational structures. For example, exchange–traded index funds represent new products, internet banking represents new services, credit scoring systems represent new production processes, and electronic platforms developed for securities trading represent new organisational forms. Meanwhile, FINNOV based on functional foundations are categorised by the Bank for International Settlements (1986: 172) according to their functions of credit or debt creation, risk transfer, liquidity enhancement, and capital creation. FINNOV based on motivation are addressed in Llewellyn's (2009: 8) study as defensive, aggressive, responsive, and protective. Accordingly, innovations developed in response to regulatory or political changes are considered defensive;

initiatives aimed at creating and marketing new products and tools are considered aggressive; innovations developed in response to customer demands are considered responsive; and techniques developed by institutions as solutions to their own portfolio constraints are considered protective innovations.

FINNOV, which is often highlighted in the literature as a catalyst for financial development, contribute significantly to the sustainability of EG (Laeven et al., 2015). Accordingly, FINNOV enables the emergence of diversified assets and services in the financial system, strengthen the infrastructure of financial institutions, make financial intermediation processes more efficient, and improve financial services. Each of these factors promotes EG (Qamruzzaman and Jianguo, 2018; Qamruzzaman et al., 2021). In addition, new financial instruments, services, intermediaries, and institutions arising from FINNOV increase capital accumulation by directing savings to more efficient areas, thereby supporting EG. New financial technologies developed during this process, such as Automated Teller Machines (ATMs) and credit cards, increase capital efficiency, reduce transaction costs, and enable the optimal allocation of financial resources (Kömürcüoğlu, 2024). Thus, financial resources directed towards investments that offer optimal returns accelerate capital accumulation and increase EG (Mishra, 2008).

Many studies (Adu-Asare Idun and Aboagye, 2014; Ajide, 2016; Nazir et al., 2021; Yinusa et al., 2021) conducted in recent years have shown that developments in FINNOV increase EG. However, it is noteworthy that this relationship may vary depending on the variable used to represent FINNOV or the country considered. The present study aims to assess the effect of FINNOV on EG within the BRICST countries. The BRICST countries, selected due to their weight in the global economy and accelerating integration, provide a suitable framework for researching the FINNOV–growth relationship at the macro level. Furthermore, differences in institutional structure, financial deepening and digitalisation levels allow the effect to be investigated under different market and policy conditions. In this regard, the study considers annual data from 2008 to 2022 and employs the Driscoll–Kraay method, which produces robust estimates in the presence of cross-sectional dependence, autocorrelation, and heteroskedasticity. The study is expected to contribute to the literature in two main ways. First, in existing studies on the subject, variables such as loans and the M2/M1 ratio are mostly used to represent FINNOV. In this study, the M3/M1 ratio, which has been underutilised in the literature, is examined. The M3/M1 ratio used in the study is an indicator that summarises the

financial deepening created by FINNOV, showing the share of broad money components (time deposits, savings deposits, repo transactions and money market fund shares) relative to narrow money (cash and demand deposits). The ratio captures, at the macro level, the portfolio substitution that FINNOV has directed from transaction-oriented money to interest-bearing assets and the accompanying financial deepening. Product and market innovations (time deposits, money market instruments, repo, etc.) and the expansion of liquidity management opportunities increase the weight of M3, while developing payment infrastructures reduce the need to hold transaction money, accelerating this shift. Second, to the best of our knowledge, this research constitutes the earliest effort to investigate how FINNOV affects EG in the context of the BRICST countries and fills an important gap in the literature on this group of countries. Although Turkey is not a member of BRICS, it is a suitable reference economy for comparative analysis due to its deepening commercial and financial ties with the group countries and their institutional similarities. Compared to BRICS countries, FINNOV in terms of FAST and widespread QR/contactless payments, open banking, digital identity (e-government gateway) integration offers strong potential for contribution.

The rest of the paper is organised as follows: the second section surveys the empirical studies investigating the link between FINNOV and EG. The third section outlines the data set and econometric approach. After the fourth section, which reports the results of the analysis, the paper closes with a discussion of the conclusions and their policy relevance.

2. LITERATURE REVIEW

Research in the field on the relationship between finance and growth indicates that most studies focus on how financial development interacts with EG. The positive impact of developments in the financial sector on EG is supported by numerous empirical studies (King and Levine, 1993; Beck et al., 2000; Jalil and Feridun, 2011; Masoud and Hardaker, 2012). However, it is noteworthy that the number of studies focusing on the relationship between FINNOV and EG is limited. Empirical studies in this context are summarised in Table 1 in terms of the country and period under consideration, the FINNOV indicator used, the method applied, and the findings obtained.

Table 1. Empirical Insights from the Literature

Author(s)	Country & Period	FINNOV Proxy	Method	Findings
Adu-Asare Idun and Aboagye, 2014	Ghana 1990–2009	Bank credit to the private sector (BCPS)	ARDL, Granger causality	(+) Bidrictional causality
Bara and Mudzingiri, 2016	Zimbabwe 1980–2013	M2/M1 ratio and BCPS	ARDL	Only M2/M1 affects positively.
Ajide, 2016	Selected countries from West Africa 2000–2013	M3/M1 ratio	Panel data analysis	(+)
Bara et al., 2016	15 SADC countries	BCPS, M2/M1 ratio and mobile penetration rate	Panel ARDL, PMG, and Panel Granger causality	Only mobile money affects positively. No causality.
Qamruzzaman and Jianguo, 2017	Bangladesh 1980–2016	BCPS and M2/M1 ratio	ARDL	(+)
Qamruzzaman and Jianguo, 2018	4 Selected South Asian Countries 1975:Q1–2016:Q4	M2/M1 ratio	ARDL, NARDL and Granger causality	(+) Bidrictional causality
Bernier and Plouffe, 2019	23 selected countries 1996–2014	R&D spendings from the financial services sector	Panel data analysis	No
Mollaahmetoğlu and Yaşar Akçalı, 2019	15 high–income and upper–income countries 2003–2016	FINNOV expenditures	Driscoll–Kraay standard errors	(+)
Nazir et al., 2021	China, India and Pakistan 1970–2016	BCPS and M2/M1 ratio	ARDL, DOLS and FMOLS	(+)
Qamruzzaman et al., 2021	6 Selected South Asian Countries 1981:Q1–2016:Q4	M2/M1 ratio	ARDL and Granger causality	(+) Bidrictional causality
Yinusa et al., 2021	Selected African countries 2004–2018	ATM	GMM	(+)

Notes: ARDL: Autoregressive Distributed Lag, NARDL: Nonlinear ARDL, PMG: Pooled Mean Group, DOLS: Dynamic Ordinary Least Squares, FMOLS: Fully Modified Ordinary Least Squares, GMM: Generalized Method of Moments.

The literature examining the relationship between FINNOV and EG in Table 1 shows that panel data and time series analyses are commonly used in studies. Although the majority of findings reveal that FINNOV increases EG, the statistical power of the effect varies substantially depending on the FINNOV indicator. For example, in their study, Bara and Mudzingiri (2016) represented FINNOV using two different indicators and found that the M2/M1 ratio had a statistically positive effect on EG. By contrast, they found that the effect of credit expansion on EG was statistically insignificant. Bara et al. (2016) used three different FINNOV indicators in their study: credit expansion, the M2/M1 ratio, and mobile money. While the effect of mobile money on EG was found to be positive, the effects of the other indicators were statistically insignificant. Moreover, Bernier and Plouffe (2019) used the variable of R&D spendings in the financial services sector in their study and found no relationship between FINNOV and EG. Therefore, this diversity in FINNOV indicators limits the generalisability of the results and necessitates examining the relationship in different economic contexts. In this study, the M3/M1 ratio is used to represent FINNOV in the BRICST countries, and its effect on EG is analysed; thus, the study clearly distinguishes itself from the existing literature in terms of both the country group and the FINNOV indicator.

3. ECONOMETRIC ANALYSIS

3.1. Data

In this study, the impact of FINNOV on EG in BRICST[2] countries were investigated for the period 2008–2022 using panel data analysis. The model created for this purpose is shown in equation (1).

$$LGDP_{it} = \alpha_i + \beta_1 LGFC_{it} + \beta_2 LLAB_{it} + \beta_3 LGOV_{it} + \beta_4 URB_{it} + \beta_4 LFINNOV_{it} + \varepsilon_{it} \qquad (1)$$

In Equation (1), i and t represent country and time, respectively, α_i represents the countries' constant, β represents the estimated coefficients, and ε represents the error terms. "L" denotes that the variables are expressed in their logarithmic form. Table 2 presents the definitions of the variables used in the analysis and their corresponding data sources.

[2] Brazil, Russia, India, China, South Africa, and Turkey.

Table 2. Descriptions of Variables and Sources

Variables	Descriptions	Sources
GDP	Gross domestic product (constant 2015 US$)	World Development Indicators–World Bank
GFC	Gross fixed capital formation (% of GDP)	
LAB	Labor force, total	
GOV	General government final consumption expenditure (% of GDP)	
URB	Urban population growth (annual %)	
M1	Seasonally adjusted narrow money	Fred–Federal Reserve Banks of St. Louis
M3	Seasonally adjusted broad money	
FINNOV	Ratio of broad money to narrow money supply (M3/M1)	Calculated by author

GDP in US dollars at 2015 prices was employed as the dependent variable in the model to represent EG. FINNOV, the main explanatory variable of the study, was represented by the ratio of broad money supply (M3) to narrow money supply (M1), following the work of Ajide (2016), Artan and Kullukçu (2020), Chishti and Sinha (2022), and Jamshidi et al. (2023). Additionally, to eliminate omitted variable bias and obtain more reliable results, gross fixed capital (Sore et al., 2024; Žarković et al., 2025), labour force (Sarsar and Echaoui, 2024; Mudayen et al., 2025), government expenditure (Thaddeus et al., 2024; Nguyen, 2025), and urbanisation (Nguyen and Nguyen, 2018) were included in the model as control variables.

Descriptive statistics for the model's variables are displayed in Table 3.

Table 3. Descriptive Statistics

Variables	Mean	Std. Dev.	Min	Max
GDP	2.94e+12	3.98e+12	3.02e+11	1.63e+13
GFC	26.264	9.101	13.05	44.519
LAB	2.51e+08	2.89e+08	2.00e+07	7.81e+0
GOV	16.214	3.150	10.295	20.786
URB	1.769	0.925	−0.103	3.434
FINNOV	5.240	3.567	1.879	15.425

Upon reviewing Table 3, it becomes apparent that the lowest value of the FIN variable used to represent FINNOV was 1.879 in South Africa in 2021, while the highest value was 15.425 in Brazil in 2018.

3.2. Methodology

In this study, static panel data analysis was performed to examine the effect of FINNOV on EG. Panel data consists of N units and T observations corresponding to each unit. It is

defined as the aggregation of cross-sectional observations belonging to units such as individuals, countries, and firms over a specific period (Tatoğlu, 2013). In this regard, it is primarily necessary to choose between the fixed effects model (FEM) and the random effects model (REM), which are static panel data estimators. Therefore, the Hausman test, which was developed by Hausman (1978) and is frequently preferred in analyses, was used in this study. According to the Hausman test's null hypothesis, the random effects model is considered valid, whereas the alternative hypothesis suggests that the fixed effects model provides a better fit (Bangura and Saibu, 2024). After determining the appropriate estimator, it is important to test for deviations from the assumptions in order to maintain the validity of the model and obtain reliable results. The relevant assumptions are heteroskedasticity, autocorrelation, and inter–unit correlation. In this study, since the Hausman test determined that the fixed effects model was the appropriate estimator, the Modified Wald (Greene, 2000) test was used to test for the presence of heteroskedasticity. Additionally, the Durbin–Watson (DW) (Bhargava et al., 1982) and Locally Best Invariant (LBI) (Baltagi and Wu, 1999) tests were applied to detect autocorrelation. The presence of inter–unit correlation in the model was tested using the test proposed by Friedman (1937). In the final stage of the analysis, robust standard errors estimator developed by Driscoll and Kraay (1998) was used to obtain consistent estimates in case of potential issues arising from deviations from the basic assumptions (Sultana and Rahman, 2024).

4. FINDINGS

In the analysis, a choice was first made between FEM and REM, and the Hausman test was used for this purpose. Table 5 reports that the Hausman test is statistically significant at the 1% level and it was decided that fixed effects were valid. Subsequently, deviations from the assumptions were tested in order to obtain effective estimators in FEM, and the results are presented in Table 4.

Table 4. Diagnostic Tests

Tests	Statistics
Modified Wald Test	502.30***
Friedman's Test	11.200**
DW Test	0.502
LBI Test	0.733

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

As shown in Table 4, the Modified Wald test statistic was found to be significant at the 1% level, rejecting the null hypothesis that assumes homoscedasticity in the model. Accordingly, there is heteroscedasticity in the model. The result of Friedman's test shows that the test statistic is significant at the 5% level and that there is correlation between units. In addition, the DW and LBI tests were used to investigate whether autocorrelation was present in the model. The fact that the DW and LBI test statistics are significantly less than 2 indicates the presence of an autocorrelation issue in the model. As a result, since deviations from the basic assumptions were detected in the model, the analysis was performed using the Driscoll–Kraay standard errors method, which provides more robust estimates. The analysis findings related to the model are presented in Table 5.

Table 5. Driscoll–Kraay with Fixed Effects Test Results

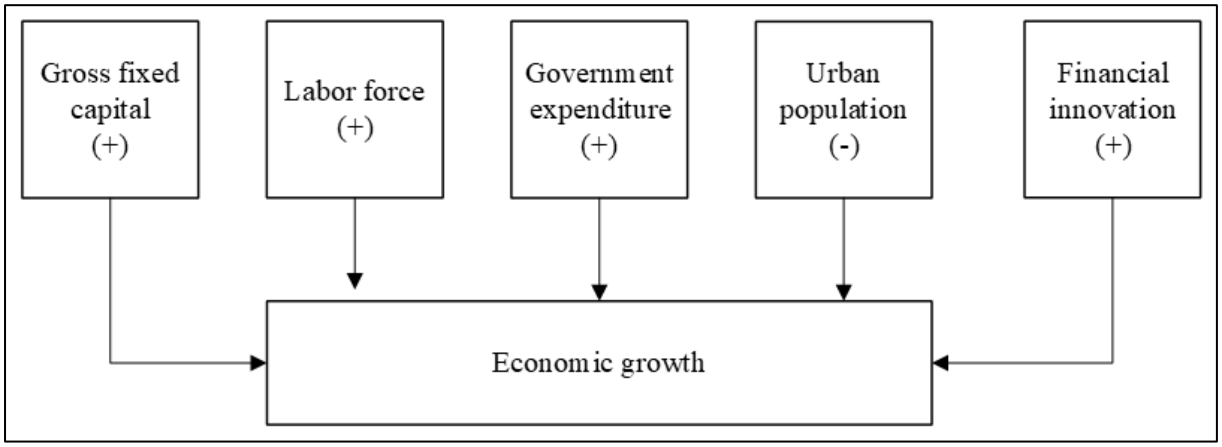
Dependent Variable: LGDP	**Coefficient**	**Driscoll–Kraay Standard Error**	**t–statistic**
LGFC	0.353^{***}	0.119	2.96
LLAB	1.832^{***}	0.129	14.19
LGOV	0.343^{*}	0.178	1.92
URB	-0.328^{***}	0.064	−5.13
LFINNOV	0.242^{***}	0.087	2.79
Constant	-7.748^{***}	2.737	−2.83
Hausman Test		69.06^{***}	
F–Statistic		124.29^{***}	
R^2		0.71	

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

According to the results in Table 5, the coefficients for the LGFC and LLAB variables are significant and positive at 1%. In addition, the coefficient for the LGOV variable is also positive but significant at 10%. In other words, increases in capital accumulation, labour force size, and government expenditure in BRICST countries have a positive effect on EG. These findings are backed by the studies of Boamah et al. (2018), Cung and Hung (2020), and Al–Fawwaz (2016), respectively. On the other hand, the coefficient of the URB variable was found to be negative and significant at the 1% level, and it was determined that increases in urban population reduce EG. This finding supports the study by Liu et al. (2024). The effect of FINNOV on EG was found to be statistically significant and positive at the 1% level. Accordingly, increases in FINNOV increase EG. The result corroborates with the evidence presented by Ajide (2016), Qamruzzaman and Jianguo (2018), and Nazir et al. (2021).

The findings obtained from the Driscoll–Kraay estimator are summarised in Figure 1.

Figure 1. Summary of Estimation Results



5. CONCLUSION

FINNOV has historically played a decisive role in periods of economic expansion. Developments such as the design of new financial instruments or the emergence of alternative financial institutions have often occurred in parallel with technological advances. These technological advances have brought about the formation of new supporting financial structures (Laeven et al., 2015). Although FINNOV has long been concentrated in developed economies, in recent years this trend has shifted towards developing countries. In this study, the impact of FINNOV on EG was analysed in the BRICST countries. The analysis considers annual data from 2008 to 2022, and the effect is estimated using the Driscoll–Kraay method. In the study, FINNOV is represented by the M3/M1 ratio, and fixed capital, labour, government expenditure, and urban population are included in the model as control variables. The findings reveal that an increase in FINNOV boosts EG. It supports EG by increasing investment and productivity through modern payment infrastructures, open banking/digital finance applications, capital market deepening, mobilisation of savings, reduction of transaction costs, increased financial inclusion, and improved resource allocation. As the quality of the regulatory framework and intermediation capacity strengthen, these effects become more enduring and widespread. Similarly, fixed capital, labour, and government expenditure have positive and statistically significant effects on EG. Conversely, it was found that an increase in urban population reduces EG in BRICST countries.

Based on the findings, creating an ecosystem that encourages FINNOV in BRICST countries is crucial for supporting EG. As is known, the founding purpose of BRICS is to enhance development, economic-financial integration, and representation in global governance

among emerging economies. The findings of the study imply that strengthening a growth-friendly financial architecture (payments, credit and capital markets, regulatory framework) for BRICST is a policy priority. In this context, expanding access to financial services and promoting digital payment systems can be considered priority policy areas for sustainable growth. Activities designed to broaden access to financial services and enhance financial literacy promote financial inclusion by improving access to essential services, including savings, investment, payments, and credit, for both individuals and firms. In this way, it is possible to reduce financial exclusion by integrating low–income individuals, small businesses and households in rural areas into the financial system. Similarly, digital payment systems are an important factor in reducing transaction costs and enabling fast, secure financial transactions. The widespread use of these systems increases the accessibility of financial services while also contributing to the reduction of informal economic activities and increased transparency in the financial system.

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Declaration of Contribution Rate: The entire study has been prepared only by the responsible author.
Declaration of Support and Appreciation: The research did not receive any support from any institution or organisation.
Declaration of Conflict: The author declares that there is no conflict of interest.
In this study, the rules stated in the **"Higher Education Institutions Scientific Research and Publication Ethics Directive"** were followed.
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