THE LONG-RUN EFFECT OF FINANCIAL DEVELOPMENT ON ECONOMIC GROWTH IN THE TURKISH ECONOMY: A JOHANSEN COINTEGRATION TESTING APPROACH

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ABSTRACT

This study differs from the frequently used multi-country, short-horizon designs in the literature by covering the period 1990-2021 for Türkiye. More importantly, instead of reducing financial development to a single proxy, it enhances the robustness of the results by employing a composite financial development index that jointly captures the banking and market dimensions, thereby mitigating proxy-sensitivity problems. Econometrically, testing the long-run common relationship through the multivariate Johansen cointegration approach and triangulating it with three different parametric long-run estimators FMOLS, DOLS, and CCR provides a stronger robustness architecture than evidence based on a single method, and confirms the reliability of the elasticities. The research seeks to assess the impact of financial development on economic growth by taking into account critical macroeconomic factors. A rigorous methodological framework is adopted through the use of the Johansen Cointegration model. To provide a comprehensive economic assessment, the study incorporates control variables such as capital formation, labor force, and public expenditures. The empirical results reveal a significant and negative long-run relationship between financial development and economic growth in Türkiye. On the other hand, capital formation, labor force, and public expenditures positively affect economic growth in the long run. The findings highlight the critical role of skilled labor, capital accumulation, and public spending in Türkiye's growth process, while also unveiling the adverse effects of the financial sector. By offering a comprehensive and up-to-date analysis of Türkiye's economic outlook, this study contributes to the ongoing discussion on financial development and economic growth.

1. INTRODUCTION

The relationship between financial development and economic growth remains one of the most debated and dynamic research areas in development economics. Schumpeter and Swedberg's (2021) early view, which emphasized that the credit channel is of critical importance for innovative investments, brought forward the idea that the financial system can act as the engine of economic progress. This perspective was supported by McKinnon (1973), who argued that removing financial repression and deepening the financial system would accelerate growth. In contrast, Robinson (1952) contended that finance follows growth, while Lucas (1988) suggested that the importance of financial development has been overstated. These debates indicate that no theoretical consensus has been reached regarding the direction and strength of the finance-growth nexus.

The empirical literature likewise exhibits considerable diversity. Khan and Senhadji's (2003) large-sample analyses report that financial depth has a positive effect on growth, but that the magnitude of this effect varies depending on the indicators and methods employed. Meta-analytic evidence also confirms this heterogeneity. For example, Valickova et al. (2015), in a meta-analysis based on 1334 estimates, showed that financial development has a generally positive but weakening effect on growth,

and that methodological choices and regional factors influence the results. Similarly, Arestis et al. (2015) drew attention to the presence of publication bias in the finance–growth literature and found that studies failing to address endogeneity tend to overstate the size of the effect. Bijlsma et al. (2018), in a meta-analysis of 68 studies examining the relationship between private sector credit and growth, found that the relationship is weak in linear models but positive with diminishing marginal effects in log-linear models. These findings support the view, put forward by Arcand et al. (2015) in the "Too Much Finance" hypothesis and by Ductor and Grechyna (2015), that financial deepening beyond a certain threshold may actually slow down growth.

The mechanisms through which the financial system supports growth are explained in the literature through several channels: mobilization of savings and efficient allocation of capital King and Levine (1993), reduction of information asymmetries and strengthening of corporate control Levine (1997), and risk diversification and provision of liquidity Diamond and Dybvig (1983). However, events such as the 1997 Asian crisis and the 2008 global financial crisis have shown that financial deepening does not promote growth under all conditions and that the risk of financial instability should not be overlooked Rousseau and Wachtel (2011).
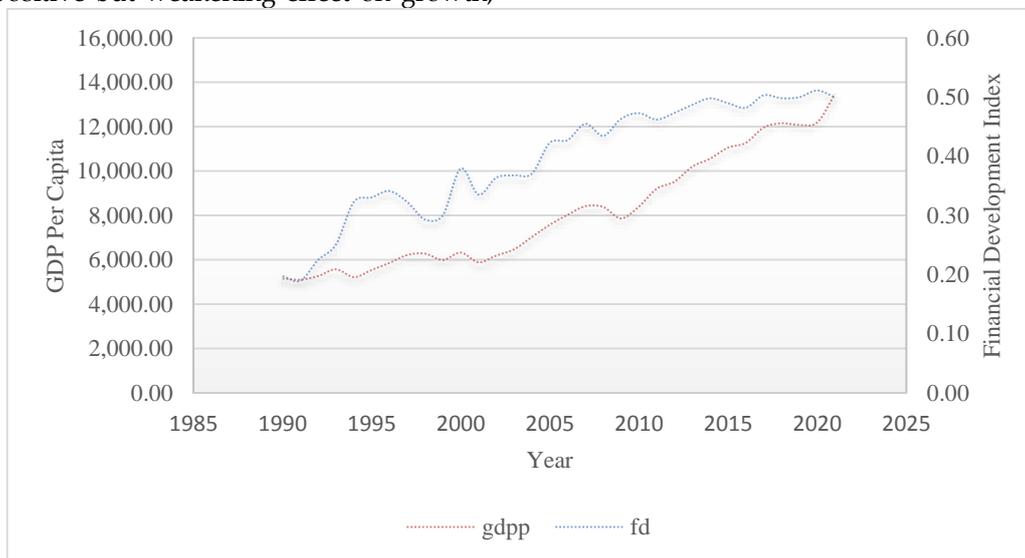

Figure 1: Trend Analysis of Per Capita GDP And Financial Development Over Time.

During the period 1991-2021, the financial development indicator and per capita income in Türkiye exhibit two series that generally move in the same direction but occasionally diverge. In the early years, both variables followed a fragile path due to macroeconomic instability and exchange rate–interest rate shocks. Following the 2001 crisis,

however, monetary-fiscal discipline, the restructuring of the banking sector, and increased openness to the outside world accelerated financial deepening, which in turn supported growth dynamics and strengthened the comovement between the series. During the global crisis years (2008-2009), the tightening of financial conditions

and the contraction in external demand caused a simultaneous weakening, whereas the subsequent period witnessed a recovery through credit expansion and the revival of domestic demand. In the post-2018 period, exchange rate volatility, inflationary pressures, and policy uncertainty led to a loss of momentum in per capita income, while on the financial development side a tendency toward plateauing or lagged adjustment became evident. During the COVID-19 pandemic, both series entered a recovery trend again through public credit support and normalization measures. Overall, increases in financial development have supported per capita income through channels such as facilitating resource allocation, expanding access to finance, and lengthening the investment horizon, while income growth has in turn created a feedback mechanism that nourishes financial deepening. Nevertheless, since cyclical shocks, regulatory changes, and capital flows can lead to episodic divergences, the relationship between financial development and economic growth can be described not as a linear and uninterrupted process but as one that evolves over time and is sensitive to regimes, policy frameworks, and external conditions.

Investigating the impact of financial development on growth in Türkiye is of strategic importance due to its capacity to improve resource allocation and make productivity gains permanent. In the Turkish context, the finance–growth nexus has gained prominence with the financial liberalization policies implemented since the 1980s, banking reforms, and the deepening of capital markets. In particular, the expansion of credit extended to the private sector, the increase in stock market capitalization, and the liberalization of international capital movements have emerged as key factors shaping growth dynamics. However, the 2001 banking crisis and the 2008 global crisis demonstrated that, in cases where financial regulation and supervision are inadequate, financial development may destabilize growth. Therefore, examining the financial development-growth link is critical for sustainable growth strategies, especially for emerging markets such as Türkiye. In this study, it is aimed to comprehensively analyze the relationship between the financial transformation of the Turkish economy in the post-1980 period and its growth dynamics. In doing so, the study seeks to provide an evidence-based framework for both financial sector regulatory policies and long-term growth strategies.

This study makes several original contributions to the existing literature. First, it provides policy-relevant insights by identifying the channels through which an increase in the level of financial liberalization is transmitted to a country's social welfare. Second, although there is a large body of empirical research on financial development, the use of a composite financial development index is a relatively recent approach; in this respect, the study adds methodological richness to the measurement dimension. Third, the study discusses, through the case of Türkiye, why financial deepening does not always translate into an immediate and strong increase in the economic growth process; it is particularly important that the rise in the financial development index is reflected more in the diversification of financial markets, which may not generate an instant increase but can provide valuable information that paves the way for significant long-run improvements in social welfare. Finally, and most importantly, the study is one of the few to address jointly the effects of financial development and public expenditures on social welfare in Türkiye, and it fills a gap in the literature by disentangling the contributions of capital accumulation, skilled labor, and public spending to welfare.

2. LITERATURE REVIEW

Despite the diversity of methods and samples, the economics literature examining the relationship between financial development and growth presents findings along three main axes. The first is the "supply-leading" view, which argues that finance supports growth; the second is the "demand-following" view, which posits that growth deepens finance; and the third axis consists of two-way feedback effects and threshold/nonlinear impacts.

To begin with, panel studies covering a large number of countries show that financial development boosts growth, particularly in developing economies (Bist, 2018; Nguyen et al., 2022). Hasan et al. (2011), using panel regressions and variance decompositions for low- and middle-income countries, highlight a statistically significant long-run relationship between financial development and per capita GDP. Estrada et al. (2010) confirm the contribution of post-1990 financial deepening to growth in Asia but note that this contribution weakened after the Asian crisis. Similarly, for 26 EU countries over the period 1990-2016, it has been shown that financial development supported growth before the crisis, whereas it constrained economic activity in the post-crisis period Asteriou and Spanos (2019).

In the relevant literature, different findings have been obtained regarding the direction of causality between economic growth and financial

development, clearly demonstrating the decisive role of country-specific conditions and regime changes. Many country-specific studies support the existence of bidirectional causality. Examining the finance–innovation-growth dynamics in 18 Euro Area countries for the period 1961-2013 using a panel VAR model, Pradhan et al. (2016) found that financial development (and rising innovation capacity) significantly supports economic growth in the long run, while the direction of causality may display bidirectional, unidirectional, or neutral patterns across countries. For Egypt, within a VECM framework, it has been shown that finance feeds growth through both the investment and productivity channels, and that growth in turn deepens finance (Abu-Bader and Abu-Qarn, 2008). ARDL results for Tunisia indicate that finance supports growth in the long run, and that there is a bidirectional relationship between credit and growth (Jedidia et al., 2014). By contrast, in the case of Korea, superexogeneity tests showed that finance causes growth, but there is no causality running from growth to finance Yang and Yi (2008). VAR results for Russia, which vary across subperiods, identified causality running from growth to monetary variables for 1999-2008 and from growth to bank credit for 2009-2014 (Ono, 2017). In an African panel using the frequency-domain approach, the neutrality hypothesis dominates at most frequencies; in other words, finance and growth evolve largely independently Opoku et al. (2019).

The measurement of financial development plays a critical role in the sensitivity of empirical findings. For Ghana, while domestic credit to the private sector as a share of GDP and total domestic credit promote growth, monetary expansion to GDP does not; index constructions based on PCA confirm this sensitivity (Adu et al., 2013). In Sri Lanka, domestic credit to the private sector and gross fixed capital formation were found to have positive effects, whereas labor force and trade variables were found to have negative effects Fathima Rinosha and Mohamed Mustafa (2021).

The debate on nonlinearity and "too much finance" presents a complex picture. In transition economies, similar inverted U-shaped thresholds have been reported for both banking and stock market indicators Nguyen and Pham (2021). By contrast, Botev et al. (2019), using a broad sample covering advanced, emerging, and developing economies, did not confirm the widely cited "too much finance is harmful" thesis in the literature and did not identify a level of financial depth that systematically turns growth negative. On the other hand, it has been found that bank-based and market-based finance are complementary; as stock markets deepen, the contribution of bank credit to growth increases markedly, and this complementarity becomes operative even at relatively low thresholds. In the study by Shahbaz et al. (2022), TARDL results pointing to asymmetric regimes at higher levels of financialization show that both positive and negative effects are possible, depending on country–regime thresholds. Adeniyi et al. (2015) likewise found that, in Nigeria, while financial development negatively affects growth in a linear model, the sign of the relationship turns positive once threshold effects are incorporated, revealing turning points. Mlambo (2024), using DCCE estimations for a low-income SADC panel over 2000-2022, obtained evidence that financial development positively affects economic growth; however, another study found that financial development weakens growth Wen et al. (2022).

In terms of channels and complementarities, not only the volume of investment but also its efficient allocation and gains in total factor productivity (TFP) come to the fore. For example, in Malaysia, finance promotes savings and private investment, thereby raising output growth, while at the same time contributing to economic growth through the productivity channel Ang (2008). Studies on BRICS and the Euro Area similarly show that banking and stock market channels complement rather than substitute for each other Guru and Yadav (2019). The interaction between foreign direct investment and financial development has been documented through strong long-run cointegrating relationships and causal linkages. Lee and Chang (2009), in their analysis of 37 countries, concluded that financial development indicators are more influential than foreign direct investment in explaining growth. The literature also reports that human capital and finance jointly affect growth positively Sarwar et al. (2021), that the diffusion of ICT can, in interaction with finance, mitigate adverse financial effects in high-income groups Cheng et al. (2021), and that remittances support growth in a manner substitutable with financial development Olayungbo and Quadri (2019). In natural resource-dependent economies, the effects diverge across sectors. Samargandi et al. (2014) found that in Saudi Arabia, finance supports non-oil growth, but exhibits weak or negative effects on aggregate GDP. Links to renewable energy and environmental sustainability in the Indian case show that finance and growth have positive effects on green transformation, yet financial development and growth can erode environmental quality in the short run Eren et al. 2019; Sethi et al.

2020). In the inequality–growth nexus, the level of financial development is decisive. Madsen et al. (2018) stated that at low to moderate levels of financial depth, inequality constrains growth, whereas at higher levels the effect weakens.

Anwar and Nguyen (2011), in their analysis of a provincial panel for Vietnam, found that the credit-to-GDP ratio and alternative financial indicators accelerated growth, and that as resource allocation to financial markets increased, the growth effect of FDI was strengthened. Using panel cointegration and GMM methods for Sub-Saharan Africa, Acaravci et al. (2009) identified bidirectional causality between bank credit and growth. Uddin et al. (2013) showed for Kenya that, under structural breaks, financial sector development positively affects economic growth in the long run and strengthens growth dynamics by channeling savings into productive investments. On the other hand, in Australia, causality was found to run from growth to financial development for financial intermediaries, and from financial markets to growth for market-based indicators

covering both bank-based and market-based indicators was found to have a positive long-run effect on economic growth, thereby confirming the supply-leading hypothesis Sehrawat and Giri (2015). Finally, in Chinese provinces over the period 1995-2014, financial development was found to have a negative effect on GDP, whereas energy consumption had a positive effect Hao et al. (2021).

This study differs from the frequently used multi-country, short-horizon designs in the literature by covering the period 1990-2021 for Türkiye. More importantly, instead of reducing financial development to a single proxy, it enhances the robustness of the results by employing a composite financial development index that jointly captures the banking and market dimensions, thereby mitigating proxy-sensitivity problems. Econometrically, testing

the long-run common relationship through the multivariate Johansen cointegration approach and triangulating it with three different parametric long-run estimators FMOLS, DOLS, and CCR provides a stronger robustness architecture than evidence based on a single method, and confirms the reliability of the elasticities. The inclusion of gross fixed capital formation, total labor force, and general government final consumption expenditures in the model simultaneously makes it possible to measure the net long-run effects of finance beyond its investment, labor supply, and public demand channels. Consequently, thanks to (i) the use of Turkish data covering a recent and turbulent period, (ii) an index-based measure of finance, and (iii) a robustness set built on multiple long-run estimators, the study generates new policy-oriented evidence that helps close the gap in the literature regarding proxy choice and method sensitivity in the Turkish context.

3. DATA AND METHODOLOGY

The present study investigates the long-run effect of financial development (FD), gross fixed capital formation (GFCF), labor force (LAB), and general government final consumption expenditure (GGFCE) on per capita GDP (GDPP) in Türkiye using an annual data set covering the period 1990-2021. The dataset employed in this study is restricted to the period 1990-2021. The main rationale for this limitation is that data for all variables included in the model are available in the relevant data sources only up to the year 2021. All variables, except financial development, were transformed into their natural logarithms to ensure that the series conform more closely to normality. Table 1 presents the data sources, definitions, and measurement units. In addition, the flow of the analysis is illustrated in Figure 1.

The economic functional form of the study is given in Equation (1):

$$GDPP_t = (FD_t, \ GGFC_t, LAB_t, GGFCE_t) \tag{1}$$

In Equation (1), FD, GFCF, LAB, GGFCE, and GDPP represent financial development, capital formation, labor force, public expenditures, and

economic growth, respectively. The econometric model of the study is specified as follows.

$$lnGDPP_t = \alpha_0 + \alpha_1 FD_t + \alpha_2 lnGFCF_t + \alpha_3 lnLAB_t + \alpha_4 lnGGFCE_t + \varepsilon_t \tag{2}$$

In this empirical analysis, the rationale for using the above-mentioned variables is as follows. For decades, numerous studies have examined these interlinkages (Fengju and Wubishet, 2024; Khan et al., 2021; Kapaya, 2021; Wang et al., 2021; Kirikkaleli et al., 2022; Oroud et al., 2023; Singh et al., 2023; Verma et al., 2023; Saroj et al., 2024; Sethi et al., 2025). However, most of these researchers do not explicitly take social welfare into account in their analyses. The

studies by Nguyen (2022), Mlambo (2024), Mengesha and Berde (2023), and Liu et al. (2025) have shown that capital formation and labor are important not only in the process of economic growth but also because of their close association with financial development. Furthermore, in line with the findings of Nguyen et al. (2022), Radmehr et al. (2022), Ibrahim et al. (2024), and Elfaki et al. (2024), public expenditures are also incorporated into the model.

Table 1: Description And Source of Variables.

Variables	Description	Unit	Source
GDPP	Economic growth	GDP Per Capita Constant $US, 2010	Word Development Indicators
FD	Financial development	Financial Development Index	The Global Economy
GFCF	Capital formation	Gross Fixed Capital Formation	Word Development Indicators
LAB	Labor	Total Labor	Word Development Indicators
GGFCE	Public Expenditures	General Government Final Consumption Expenditure	Word Development Indicators
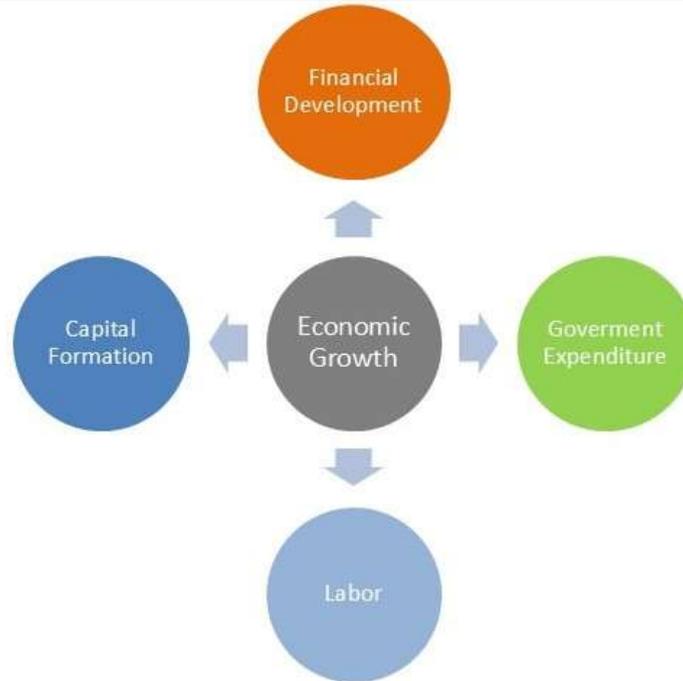
Figure 2: Conceptual Framework of the Model.

3.1. Unit Root Test

Before proceeding to more advanced econometric applications, it is necessary to determine the order of integration of the series. For this purpose, unit root tests were employed to examine the integration properties of the variables. In the first stage, the widely used Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were applied.

3.2. Johansen Cointegration Test

The Johansen (1991) cointegration approach is a statistical procedure developed to test for the existence of long-run equilibrium relationships among a group of time-series variables. Cointegration refers to a situation in which two or more nonstationary series move together in the long run along a common equilibrium path despite short-

run fluctuations. As a multivariate generalization of the two-step Engle-Granger method, the Johansen test allows researchers to investigate whether more than one cointegrating vector exists in the system. The method estimates the parameters of the system formulated within a vector error correction model (VECM) framework by using the maximum likelihood technique; in this way, it is possible to determine both the number (rank) of cointegrating relationships and the linear combinations (cointegrating vectors) corresponding to these relationships. The econometric representation used for Johansen cointegration analysis is a system of equations expressed in VECM form, which simultaneously incorporates the short-run dynamics of the series and the long-run restrictions Hu et al. (2023).

$$\Delta y_t = \prod y_{t-1} + \sum_{i=1}^{p-1} \gamma_i \Delta y_{t-i} + B x_t + \epsilon_t \qquad (3)$$

3.3. Fmols-Dols-Ccr Approaches

The first method to be employed is Dynamic Ordinary Least Squares (DOLS), which is an improved version of simple OLS Stock and Watson (1993). This approach is used to estimate the long-run

relationship between the dependent variable and the explanatory variables. As an extension of classical OLS, DOLS augments the cointegrating regression with leads and lags of the first differences of the explanatory variables in order to correct for possible

correlation between the regressors and the error term, thereby mitigating endogeneity-induced biases. In this way, it adjusts for the correlation between the explanatory variables and the

$$H_t = N_t\beta + H_{1t}^{\gamma_1} + \sum_{j=-q}^{\gamma} \Delta_i G_t + j^\delta + F_{1t} \qquad (4)$$

The FMOLS Phillips and Hansen (1990) approach allows the estimation of the long-run effects of the explanatory variables on the dependent variable. Unlike DOLS, FMOLS removes the bias arising from possible contemporaneous correlation between the regressors and the error term and from autocorrelation in the residuals through semi-parametric corrections, thereby yielding long-run coefficients that are consistent and asymptotically normally distributed. The method rests on the assumption that the variables in the model are cointegrated and, within this framework, employs the fully modified least squares estimator. In the present study, in order to secure the long-run cointegrating relationship and to limit distortions

disturbance term and allows the long-run coefficients to be obtained in a consistent and efficient manner. **The dynamic OLS equation can be written as follows Hu et al. (2023):**

stemming from short-run dynamics, Canonical Cointegrating Regression (CCR) Park (1992) is applied alongside FMOLS and DOLS. CCR aims to eliminate endogeneity and serial correlation problems by redefining the variables through appropriate canonical transformations; in this way, it provides efficient and unbiased estimates of the long-run parameters. In addition, to represent the short-run adjustment process, in some applications an error correction term (ECT) is included in the level equation so that the speed of adjustment back to the long-run equilibrium can also be monitored. **The econometric representation of CCR is presented below Hu et al. (2023):**

$$Y_t = \alpha + \beta_1 X_{1t} + \beta_2 X_{2t} + \ldots\ldots\ldots + \beta_n X_{nt} + yD_t + E_t \qquad (5)$$

4. FINDINGS

This article examines, using an annual data set for the period 1990-2021, the long-run impact of financial development (FD) on economic growth (GDPP) in Türkiye while controlling for capital formation (GFCF), labor (LAB), and public expenditures (GGFCE). The descriptive statistics of the series median, mean, maximum, skewness, kurtosis, and minimum values are presented in Table 2.

Table 2: Descriptive Statistics.

	lnGDPP	FD	lnGFCF	lnLAB	lnGGFCE
Mean	3.890	0.395	11.090	7.403	10.887
Median	3.887	0.424	11.112	7.372	10.873
Maximum	4.128	0.510	11.455	7.527	11.201
Minimum	3.707	0.189	10.714	7.305	10.588
Std. Dev.	0.133	0.097	0.261	0.070	0.193
Skewness	0.251	-0.597	0.021	0.513	0.088
Kurtosis	1.687	2.213	1.478	1.886	1.756
Jarque-Bera	2.634	2.728	3.088	3.058	2.104
Probability	0.267	0.255	0.213	0.216	0.349
Observations	32	32	32	32	32

The descriptive statistics indicate that the mean and median values of the variables are close to each other, suggesting that the distributions are generally symmetric. The financial development index is slightly left-skewed, whereas the labor variable is slightly right-skewed. All series exhibit a flatter shape and lighter tails compared with the normal distribution. The Jarque-Bera test results suggest that the normality assumption cannot be rejected. In terms of relative volatility, the financial development

index stands out as the most variable series; per capita GDP shows low-to-moderate variability; gross fixed capital formation and general government final consumption expenditure display lower variability; and the labor series appears to be the most stable. Overall, there is no pronounced skewness or concentration of extreme values in the series, indicating a reasonable starting point for standard assumptions in the subsequent econometric stages.
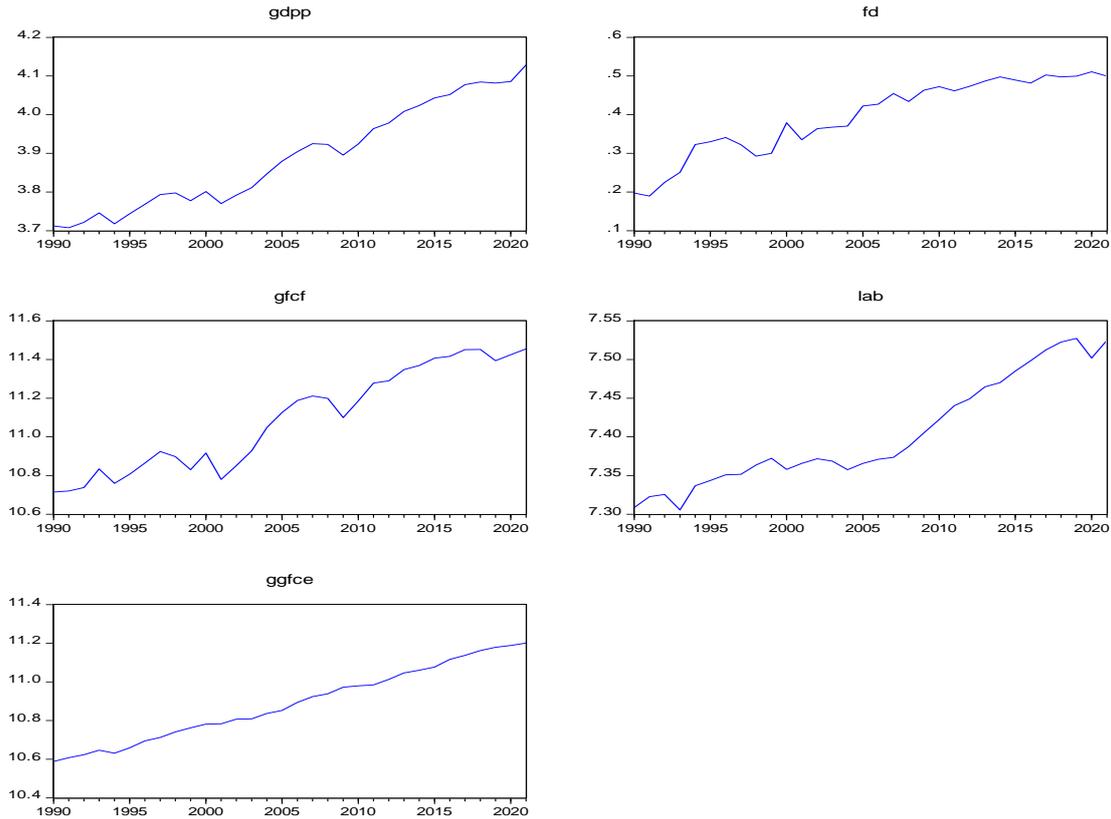
Figure 1: Time Path of the Variables.

As seen in Figure 3, all the series examined for the period 1990-2021 display a clear long-run upward trend in the Turkish economy. The GDPP series, which represents per capita GDP, has risen gradually from the low levels of the early 1990s and, apart from minor breaks corresponding to the 2001 and 2009 crises, has largely maintained its upward trajectory. The financial development indicator (FD) experienced rapid deepening, particularly in the mid-1990s, settled at a higher level in the mid-2000s, and proceeded in a more horizontal but still elevated band after 2010; this implies that the financial system expanded in tandem with the real sector. Gross fixed capital formation (GFCF) exhibits a more volatile pattern, but increased markedly after 2002, showed a brief weakening around the 2008 global crisis, and then rose again suggesting that investment expenditures have been a main channel supporting growth. The LAB series, representing labor supply, expanded almost linearly over the period, with an acceleration toward the 2010s and a slight correction in the years close to 2020. General government final consumption expenditure (GGFCE) displays the smoothest trend, rising steadily and indicating that the level of government spending has grown in line with the real economy. This joint upward movement also shows that the series are likely nonstationary in levels and justifies the search for cointegration and long-run relationships.

Table 3: Unit Root Test.

	At Level	First Differecence	Decision
ADF Unit Root Test			
lnGDPP	-2.576	-5.440**	I(1)
FD	-2.548	-7.095*	I(1)
lnGFCF	-2.649	-5.856**	I(1)
lnLAB	-1.629	-5.946**	I(1)
lnGGFCE	-3.041	-6.007**	I(1)
PP Unit Root Test			
lnGDPP	-2.485	-7.084*	I(1)
FD	-2.237	-8.269*	I(1)
lnGFCF	-2.711	-5.952*	I(1)
lnLAB	-1.565	-5.949*	I(1)
lnGGFCE	-2.988	-6.084*	I(1)

Note: * And ** Denote Statistical Significance at the 1% And 5% Levels, respectively.

After examining the basic characteristics of the data, the order of integration of the series was determined in order to specify the method to be followed in the empirical stage. For this purpose, two of the most widely used and empirically validated stationarity tests in the time series literature namely, the ADF and PP tests were employed. The findings reported in Table 3 clearly show that all series contain a unit root in their level form, whereas they become stationary once first-differenced. The fact that all variables are I (1), according to both ADF and PP results, points to the possible existence of a long-run cointegration relationship among them. Therefore, before proceeding to the long-run empirical analysis, it is necessary to test for cointegration using an appropriate procedure.
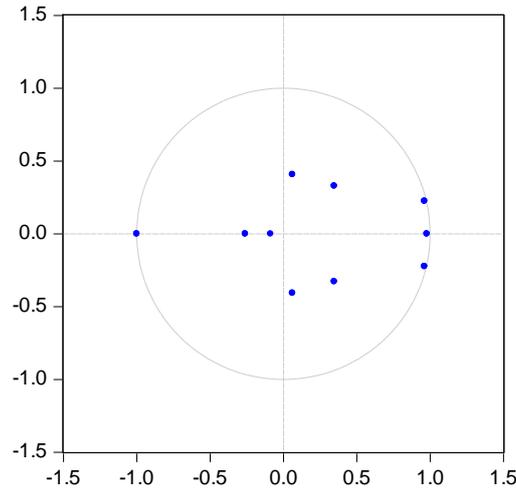
Inverse Roots of AR Characteristic Polynomial

Figure 2: AR Roots Graph.

The AR roots graph shows that all roots lie inside the unit circle. This indicates that the estimated Johansen model satisfies the stability condition and there is no problem regarding stationarity. Therefore, the model can be reliably used to analyze both the short-run dynamics and the long-run relationships. In this regard, it confirms the validity of the econometric framework applied in the study and supports the scientific reliability of the findings.

Table 4: Lag Length Table.

Lag	AIC	SC	HQ
0	-19.564	-19.331	-19.490
1	-26.423*	-25.022*	-25.975*
2	-26.230	-23.661	-25.408

In table 4 examining the results of the lag length selection criteria shows that the Akaike Information Criterion (AIC), the Schwarz Criterion (SC), and the Hannan-Quinn Criterion (HQ) all attain their lowest values at lag 1. The minimum values for AIC, SC, and HQ were obtained at the first lag, and these values were highlighted with an asterisk (*) in the table. This indicates that a lag length of 1 is the most appropriate choice, as it minimizes information loss while preventing autocorrelation among the series. Accordingly, the lag length was set to one for the Johansen cointegration test. The Johansen cointegration test results are presented in Table 5.

Table 5: Johansen Cointegration Test Results.

	Eigenvalue	Trace Statistic	Critical Value	Prob.
None *	0.801	94.715	69.818	0.000
At most 1 *	0.616	47.871	47.856	0.049
At most 2	0.396	20.087	29.797	0.417
At most 3	0.146	5.448	15.494	0.759
At most 4	0.029	0.858	3.841	0.354
	Eigenvalue	Max-Eigen Statistic	Critical Value	Prob.
None *	0.801	46.844	33.876	0.000

At most 1 *	0.616	27.783	27.584	0.047
At most 2	0.396	14.638	21.131	0.315
At most 3	0.146	4.590	14.264	0.792
At most 4	0.029	0.858	3.8414	0.354

Note: * Indicates That the Hypothesis Is Rejected at the 0.05 Level.

To test the existence of a relationship between per capita GDP and the variables included in the model, Johansen cointegration analysis was carried out using the lag order determined previously, and the results of the trace and maximum eigenvalue tests are reported in Table 5. According to the trace test results in Table 5, the null hypothesis of "no cointegration," H_0: r = 0, is rejected because the test statistic exceeds the 5% critical value. Since the subsequent null hypotheses cannot be rejected, it is concluded that there is one cointegrating vector among the variables in the model. Similarly, the max-eigenvalue test also rejects the null hypothesis H_0: r = 0 which states that there is no cointegration among the series because the test statistic is greater than the 5% critical value. Taken together, these findings indicate that there is a single cointegrating relationship among the series.

Table 6: OLS-FMOLS-DOLS-CCR Long-Term Coefficient Results of the Model.

Variable	OLS	FMOLS	DOLS	CCR
FD	-0.187**	-0.214**	-0.108**	-0.219**
lnGFCF	0.303**	0.304**	0.390**	0.304**
lnLAB	0.324**	0.345**	0.337**	0.340**
lnGGFCE	0.260**	0.270**	0.099**	0.275**
C	-4.641**	-4.903**	-3.972**	-4.922**

Note: ** Denotes Statistical Significance at the 5% Level.

In table 6 an examination of the long-run coefficient estimates shows that all estimation methods (OLS, FMOLS, DOLS, and CCR) produce highly consistent results. The financial development (FD) variable is found to be negative and statistically significant, indicating that financial development exerts a negative effect on economic growth in the long run. By contrast, gross fixed capital formation (lnGFCF), labor (lnLAB), and government consumption (lnGGFCE) are positive and statistically significant across all methods. These findings reveal that capital accumulation, labor supply, and public expenditures support economic growth in the long run. The constant term (C) is negative and significant, suggesting that other factors not included in the model have an adverse impact on growth. Overall, the long-run estimates indicate that investment, labor, and public spending are the main drivers of growth, whereas the current structure of financial development operates in a growth-constraining manner.

Table 7: Diagnostic Test Results of the Model.

	Autocorrelation LM Test	Jarque-Bera Test	Heterokedasticity Test
Test	.907	9.349	312.252
Prob.	.593	.499	.301

The diagnostic test results for the Johansen model indicate that the model is valid with respect to the key assumptions. Since the probability value obtained from the LM autocorrelation test (p = 0.593) is above the 5% significance level, it is concluded that there is no autocorrelation in the residuals. The Jarque-Bera normality test yields p = 0.499, showing that the residuals do not violate the normality assumption. Finally, the heteroskedasticity test produces a p-value of 0.301, again above the 5% significance level, indicating that there is no problem of heteroskedasticity in the error terms. Overall, the diagnostic tests confirm that the Johansen model is statistically reliable and econometrically valid.

5. DISCUSSION

After testing for long-run cointegration among the parameters, the study estimated the effects of financial development, capital formation, labor, and public expenditures on economic growth in Türkiye over the period 1990-2021 by using the long-run coefficient estimators OLS, FMOLS, DOLS, and CCR. The long-run estimation results obtained from OLS, FMOLS, DOLS, and CCR are reported in Table 6. It is clearly seen that there is a positive relationship between economic growth and capital formation. This implies that, ceteris paribus, a 1% increase in capital formation leads to a 0.30% increase in per capita income. This result shows that capital formation contributes to Türkiye's economic growth. As capital accumulation expands in Türkiye, investment activities rise, which in turn results in higher economic growth. This finding is consistent with the studies of Erdoğan et al. (2020), Kesar et al.

(2023), and Sore et al. (2024). Azam et al. (2023) likewise found that improvements in capital formation trigger economic growth. Table 6 also reports that financial development has a negative effect on economic growth. This means that, holding other indicators constant, a 1% increase in financial development is associated with a 0.18% decline in economic growth. The reason behind this finding may stem from factors such as inefficient credit allocation in the Turkish financial system, high risk/default ratios in the banking sector, the failure of financial-sector expansion to be fully transmitted to the real sector, the vulnerability created by increasing external borrowing, and the implementation of financial liberalization through institutions that were not yet ready for it (Zhu et al., 2020; Taşseven and Yılmaz, 2022; Ekmen, 2024). A higher value of the financial development index reflects a higher degree of financial sophistication. In the case of Türkiye, it may be argued that the expansion of credit to the private sector has not translated into growth as expected, or that, due to the insufficient development of capital markets, the efficiency of financial intermediation has remained limited, which, in turn, has shaped the effect on per capita GDP in a negative direction. These findings are in line with Ductor and Grechyna (2015), Cheng et al. (2021), and Kirikkaleli et al. (2022). As expected, there is a positive relationship between total labor and economic growth. Thus, holding other indicators constant, a 1% increase in the total labor force is associated with a 0.32% rise in economic growth in Türkiye. This result indicates that, alongside qualitative improvements in the labor force particularly in the financial sector total labor constitutes an important pillar for sustaining economic growth in Türkiye. Finally, Table 6 shows that public expenditures create a positive effect on economic growth. This implies that, ceteris paribus, a 1% increase in public expenditures leads to a 0.26% improvement in economic growth. The positive link between public spending and economic growth reveals that public resources in Türkiye finance various components of economic development through expenditure activities directed toward productive areas. According to financial development index rankings, Türkiye is placed 20th among European economies and 38th among 183 countries worldwide (The Global Economy, 2025). Türkiye's level of financial sector development can thus be described as relatively strong among world economies.

In sum, the long-run dynamics in Türkiye indicate that capital formation, total labor, and public

effectiveness of financial intermediation may generate a restraining effect on growth. Within this framework, quality-oriented public spending consistent with fiscal discipline, together with efficient credit allocation, can be regarded as critical levers for strengthening the long-run growth path.

6. CONCLUSION AND POLICY IMPLICATIONS

In the economics literature, the effect of the financial development index on per capita income in Türkiye while controlling for capital formation, labor, and public expenditures has not been examined comprehensively using recently developed empirical approaches. Therefore, the present study aims to fill this gap for the Turkish case. To this end, following the Johansen cointegration test, the long-run coefficients were first estimated using OLS. The robustness of these long-run coefficients was then supported by FMOLS, DOLS, and CCR estimators. We found evidence of significant long-run relationships among per capita income, financial development, capital formation, labor, and public expenditures in Türkiye. The analysis shows that while capital formation, labor, and public spending contribute to per capita income, financial development reduces Türkiye's per capita income level.

Accordingly, policymakers in Türkiye should prioritize the allocation of financial resources to productive sectors and, within credit allocation policies, give precedence to production-oriented R&D, exports, and green investments. Moreover, SMEs are considered one of the main pillars of employment and regional development. The share of SME loans in the banking system should therefore be increased, and programs should be designed to improve interest terms and collateral requirements for these firms. Deepening capital markets can provide an alternative to the bank-based structure of the financial system. Developing financial instruments such as venture capital funds, green bonds, and project-based securities will help channel savings into real investments.

On the other hand, macroprudential policies should be strengthened to preserve financial stability. Regulations on credit growth rates, foreign-exchange positions, and capital flows can prevent financial expansion from generating instability. Taking the positive effect of public expenditures into account, budgetary resources should be directed toward long-term productive areas such as human capital, digital infrastructure, and the energy transition. Finally, vocational training programs and

regional employment strategies that strengthen the education–employment linkage will enhance the contribution of labor to growth. In addition, by expanding financial literacy and inclusion programs, households can be encouraged to use borrowing more productively.

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