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Direction of Causality between Financial Development and Economic Growth in Turkey

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

This paper has investigated the causality relationship between financial development and economic growth in Turkey, using data from 2005:04 to 2020:03. We construct a time-series model to explore causality relationships between the variables. In the study, two indicators were used as financial development indicators: banking loans to the private sector and money supply to GDP (Gross Domestic Product). The empirical results have represented a bi-directional relationship between financial development and economic growth in the short run. On the other hand, we have not found a causality relationship in the long term.

Keywords: Financial development; economic growth; cointegration; Turkey.

JEL Classification: O16; O40; O43.

1. INTRODUCTION

Decision-makers: governments', bureaucrats' and economists', one of the most important goals and duty is to grow the economy. Economic growth is an issue that concerns almost all layers of the economy. Economic growth affects employment, unemployment, the income level of workers, and even unemployed people's welfare [1-8]. While economic growth increases the companies' profit, it also increases the taxes collected by the nations. At this stage, one of the main questions can be, "what are the main drivers of economic growth?" Very different answers can be given to this question, such as scientific and technological development or financial development would be the answers. In the past, economists have scrutinized the essential elements of economic growth. Perhaps Joseph A. Schumpeter was the first academician who investigated the question. Schumpeter [9] analyzed developments in the financial system, especially the banking system's development in economic growth and development. According to the author, the banking system is critical to economic growth; banks distinguish productive and productive investments from unproductive ones and choose efficient (right) investments. Banks constantly encourage innovation (technological development) and future economic growth. Gurley and Shaw [10] implied that financial factors: financial development, were ignored (financial development is not considered as a factor in economic development) while variables such as labor and wealth were prime considerations in the studies.

The assumption that financial development affects economic growth is called "supply-driven growth". These "demand-driven" and "supply-push" themes are developed from two models that examine financial development and economic growth developed by Patrick [11]. The basic assumption in supply-driven growth is that the increase in financial products' supply creates its demand and grows the economy. In other words, if there are enough or more financing opportunities in the market and there is enough financing supply, investors who are reluctant to invest more may change their minds and invest more. Therefore, (stimulated) financial supply will push and increase economic growth: "supply-driven growth".

The opposite of supply-pushed growth is the "demand-push" approach. In the demand-push approach, it is claimed that economic growth will

increase the demand for financial instruments; in other words, economic growth will stimulate and attract financial products, which will cause an increase in economic growth: "demand pulled" growth. At this point, a question comes to mind. Does financial development affect economic growth? Or does economic growth affect financial development? This question also became an article title for a study by Shan et al. [12] "Financial Development and Economic Growth: An Egg-and-Chicken Problem?".

So why is this easy question so important? and why scientists are searching for the same question over and over again. The answer to this question is the starting point of the decision-makers and policymakers. Policymakers have to decide at which point they have to start for sustainable economic growth. The correct answer; correct starting point can be a better starting point for policy successes. In their study, King and Levine [13] argued that using leading data on financial development, policies for future economic growth, capital accumulation, and efficient use of this accumulation could be determined and implemented. In 1969 Goldsmith initiated the debate whether the financial structure is influencing the economic growth or not. That is why he compared Britain's and Germany's financial structures.

2. FUNCTIONS OF THE FINANCIAL SYSTEM

Financial development is the positive changes in a financial market by establishing new financial institutions, increasing the number of existing financial institutions in an economy, increasing the range of money and information-based products provided, and increasing financial instruments' quality and quantity. The factors to be considered in this definition are as follows: (1) There should be an improvement in the financial structure to support the economy over time, (2) There should be an increase in the number of financial institutions, (3) There should be an improvement in the quality of the services provided by the institutions, (4) There should be a decrease in the costs of financial products, (5) There should be an increase in the number of financial instruments, (6) There should be an increase in the number of financial instruments. The financial development level represents the level reached as a result of development. For instance: Twenty banks in the banking system and fifty different types of banking products. According to Fitzgerald [14], financial institutions

and intermediaries contribute to the country's financial development. They are helping their investors by providing the capital they need and providing timely capital with appropriate conditions. That is why he suggests that evaluating and measuring financial institutions and intermediaries on different bases are essential criteria in measuring financial development.

Fisher [15], who paid attention to the effects of financial markets on economies primarily, suggested that one of the reasons for the worsening of the economic recession is financial markets that are not working well, instead of saying that the level of financial development affects the growth of the economy. Whereas, Marcellin and Mathur [16] argued that brokerage firms' financial transaction quality is more important than numerical measurements in financial development. Despite the researchers who examine financial development based on quantity and variety, Japelli and Pagano [17] listed financial development features as reliable regulations, advanced financial technologies, and minimized asymmetric information problems. They are features of developed financial markets. Regulations are the indicators that show how fast and fair the decision mechanism can work. Usage of advanced financial technologies is an indicator of how effectively the system can benefit from time and money. In an asymmetric information environment, investors compete in an unfair environment. Minimizing the asymmetric information problem is very important in terms of trust.

According to Greenwood and Jovanovic [18], who investigated the financial system's benefits to the economy, a developed financial structure has two essential functions. The first is to inform entrepreneurs which investment opportunities (can) have higher returns with the information they provide with the financial information. The second is to provide financial information that can aid in making a balanced risk distribution. Sometimes it is more beneficial to provide accurate, relevant information for the decision-making process than providing finance.

With similar logic, Krishnan [19] also argued that financial development helps distribute and prevent risks. Yılmaz [20] claimed that financial performance can be measured with TOPSIS and is important for the economy. Federici ve Caprioli [21] has examined financial development from a different perspective and concluded that financial

development is related to production capacity and domestic price stability. According to them, if a country's production capacity is high and its domestic prices are stable, the financial development level is high. Lynch [22] argued that financial development indicators could be categorized according to the system's structural features, product variety, and product costs. According to Shaw [23], financial development is the qualitative and quantitative change of the financial market's instruments. It is better to add "positive-sided improvement" to this definition instead of change.

Financial system: is a system where the savings of individuals and organizations are utilized efficiently, the savings (supply) and fund requests (demand) are met, the fair value is formed, the trade of these transactions are secured and regulated within the legal and economic framework, the savings are directed into real investments through financial intermediaries. These financial system elements make it work like leverage leads the economy through the realization of economic growth. Components of the financial system are:

Savings: The financial system is based on savings; the savings accumulated by individuals and institutions within the system are like the system's blood. The savings (liquidation) circulate within the financial system like blood circulating in the body. Enough and healthy circulating savings leads the economic system to work healthily. Deficiencies in savings and problems in circulation can destruct the health of the economy.

Matching of supply and demand of funds: The financial system is the meeting and matching place of the fund; it can be a physical marketplace or a cyber market. While the physical environment can be stock exchange halls, bank branches, customers' offices, at the same time, a financial system can be created in the cyber environment such as websites and networks, etc.

Efficiency: is essential for both parties. A sound financial system offers profitable options to both suppliers and customers. If, only both parties, can estimate a decent return (efficient usage of funds) from the result of the financial transaction, they can go for it.

Fair value: A fair price must be determined to satisfy both the supplier's and customers'

requests in a financial system. It should not be too high to restrict or exterminate customer earnings: in that case, customers prefer not to use the fund and prefer not to invest in new investment, or the other way around: price should not be too low that money supplier cannot earn enough or any real earnings: this time money supplier may not lend his/her money. So, price and cost of capital are the two sides of the same coin, like heads and tails. Their prices and benefits should be fair or otherwise, financial market efficiency can be reduced, and market players stay away from investing, which can negatively affect economic growth.

Legal and economic security: Fund providers want their funds to be legally and economically secure. While legal security can be considered as the primary element, economic guarantees may follow it. But we can suggest that legal and financial security are complementary elements: equally important. Legal assurances about investments, economic policies, exchange rate policies, policies regarding banking transactions, tax rates, and competition laws may enormously relieve investors.

Channeling savings into real investments: The financial system channels idle or inefficiently used funds into productive investments through risk-return evaluations and financial analysis.

Leveraging: or financial funding of risky investments; can provide leveraged high returns.

Financial intermediaries, Brokerage houses: are perhaps the most critical elements in the financial system. Banks, bankers, or other financial institutions play important roles in financial markets, such as price determination. Determination of fair price can directly affect the health of the entire market. Fair price is an indication of agreement, compromise, tolerance, fairness in the marketplace. Fair prices are determined mainly by experts, professionals, intermediaries. During the fair price calculation, buyers and sellers' credibility should be measured, the risks of projects should be calculated, projects should be priced, venture capitals should be selected, analysis and pricing of forward-looking derivative transactions should be made. In addition to making these calculations, Institutional Intermediaries provide routine services in financial transactions such as daily routine, money order, EFT (Electronic Funds Transfer), Etc...

According to Ross Levine [24], the Functions of the Financial System can be listed as follows: A.

Functional Approach, Facilitating Risk Amelioration, C. Acquiring Information About Investments and Allocating Resources, D. Monitoring Managers and Exerting Corporate Control, E. Mobilizing Savings, F. Facilitating Exchange, G. A Parable, H. The Theory of Finance and Economic Growth: Agenda.

Many researchers have studied the impact of financial development on other different variables. For instance, Jalilian and Kirkpatrick [25] investigated the effect of financial development on poverty reduction. The result of their study reveals that up to a certain level of economic development, financial sector growth contributes to poverty reduction through its growth-enhancing effect. Additionally, it is also concluded that the impact of financial development on poverty reduction is affected by income inequality. Besides, Merton and Bodie [26] examined the financial system in terms of competition. According to the authors, competition enables the financial system to perform its functions more efficiently. They also claim that the financial system's functions can be listed as; facilitating risk trading, facilitating finding and selling capital, contributing managers' supervision, easy transferring of savings to investments, and facilitating the trade of goods, services, and financial contracts. According to Berger et al. [27] more efficient institutions in the financial market increase their profitability and start to serve with better prices. They ensure their customers' financial security and become more efficient. In other words, the improvement of financial markets ensures the advancement of all institutions and services generally.

3. THEORETICAL FRAMEWORK

In his work published in German in 1912 and translated into English in 1934, Joseph Schumpeter claimed that the banking system was critical to economic growth. The banks that constantly stimulate innovation (technological development) stimulate future economic growth. Additionally, Bagehot [28], and Levine [24] have claimed that financial markets play critical roles in mobilizing capital. Yılmaz and Ozgur [20] investigated Factors Affecting the Asset Profitability of Private Capital Deposit Banks. Robinson [29] explored the relationship between financial development and economic growth. Studies concerning financial development and economic growth can be classified under two headings. The first of these; "supply-driven growth" and the second one is "demand pulled

growth". However, in some studies, the relationship between financial development and economic growth has been neglected or ignored.

3.1 Supply-Pushed Growth

The basic logic of the supply-driven growth model is that developments in financial markets (increases in the number of financial instruments and volume instruments) provide more opportunities for enlarging existing investments and/or new investments, leading to economic growth. According to this assumption, firstly, financial development should be realized then economic growth will be actualized by itself. So policy makers' priority should be financial development. Patrick [11] was one of the first authors to examine the relationship between financial development and economic growth by using time series data. According to Goldsmith [30], the rapid development of a country's financial structure will further increase the normal potential economic development. Of course, this will increase national income and welfare. Levine [31] argued that low brokerage and trading costs in developed stock markets attract more long-term and more profitable investments. In addition, she suggested that sufficient liquidity (one of the development criteria) in improved stock markets enables buyers to make long-term investments with this comfort and confidence. It is easier and less costly to get out of a market with high liquidity. The author emphasized that financial development and liquidity can both increase long-term returns and increase economic growth. Whereas, King and Levine [13] in their study conducted in 80 countries between 1960 and 1989 in 1993, emphasized that the level of financial development was strongly related to GDP per capita, physical capital: accumulation and efficient use of capital. So they emphasized that by using leading data on financial development; future economic growth, capital accumulation, and efficient usage of this accumulation can be predicted.

Obstfeld [32] claimed that global investors diversify their investments, reduce their risks, and divert investment options from safe but low-return investments to high-return but risky investments. Since they minimize the risk by diversifying their high-risk investments, it is a kind of financial development. This development enabled the financing of high-risk and more profitable projects that support economic growth in the long term. In their study, Levine and Zervos [33] argued that the increase in stock

market liquidity and development positively and strongly affects economic growth. Similarly, Agu and Chukwu [34] found a causality relationship between bank-based financial development and economic growth in their studies conducted for the Nigerian economy in the 1970-2005 period with the Toda-Yamamoto Causality Test. According to Levine [24], sectors and firms need external financing to grow faster in countries with well-developed banks and securities markets than countries with poorly developed financial systems. Unlike other studies, Yang and Yi [35] discussed financial reforms as an element of financial development. As a result of this study, it is found that financial reforms (financial development) cause economic growth. Annual data belonging to Korea between 1971-2002 were used in the study. These studies assume that primarily increase in financial development (supply) will push the nation's economic development. As a consequence of this relation, financial markets should be stimulated first to improve economic growth.

3.2 Demand Pulled Growth

The "demand pulled" growth model's basic logic is the opposite of the "supply-pushed growth" model's logic. In this model, economic growth leads the growth, with economic growth, the need for financial instruments in terms of quality and quantity, and type of instruments. Hence, demand, since the economic growth, will pull the financial development afterward. According to this assumption, economic growth can be realized first then financial development will be realized next by itself. So in this assumption, policymakers' priority should be economic growth rather than financial development. In this assumption, economic growth occurs first. Economic growth causes companies and industries to become more prosperous, which increases society's welfare and consequently increases demand for financial transactions such as money transfers, deposits, loans, risk valuation, etc., which results in financial development. Simultaneously, economic growth also increases the demand for credit rating analysis, financial reports, and credibility evaluation of buyers and sellers. Besides, the need for derivative transactions can also increase. In this framework, Stiglitz [36] emphasized that economic development creates additional demand for financial services, creating a more developed financial sector. Such a similar economic growth to the financial development cycle is represented in Fig. 2.

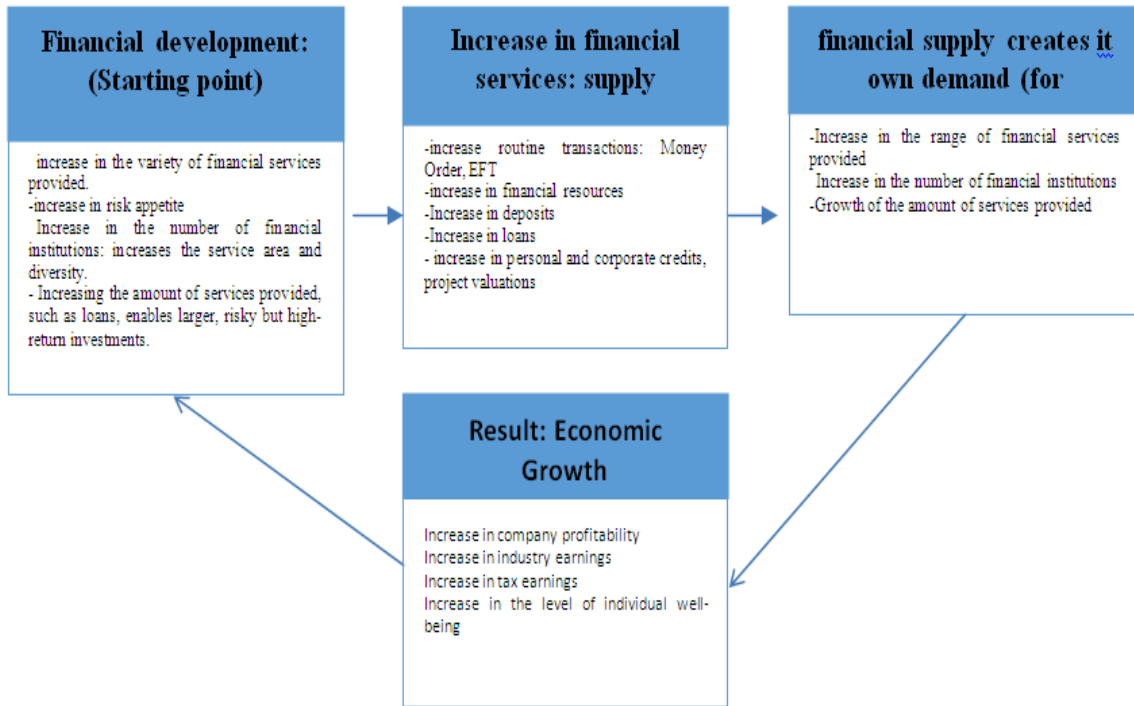


Fig. 1. Financial development to economic growth cycle (supply pushed growth)

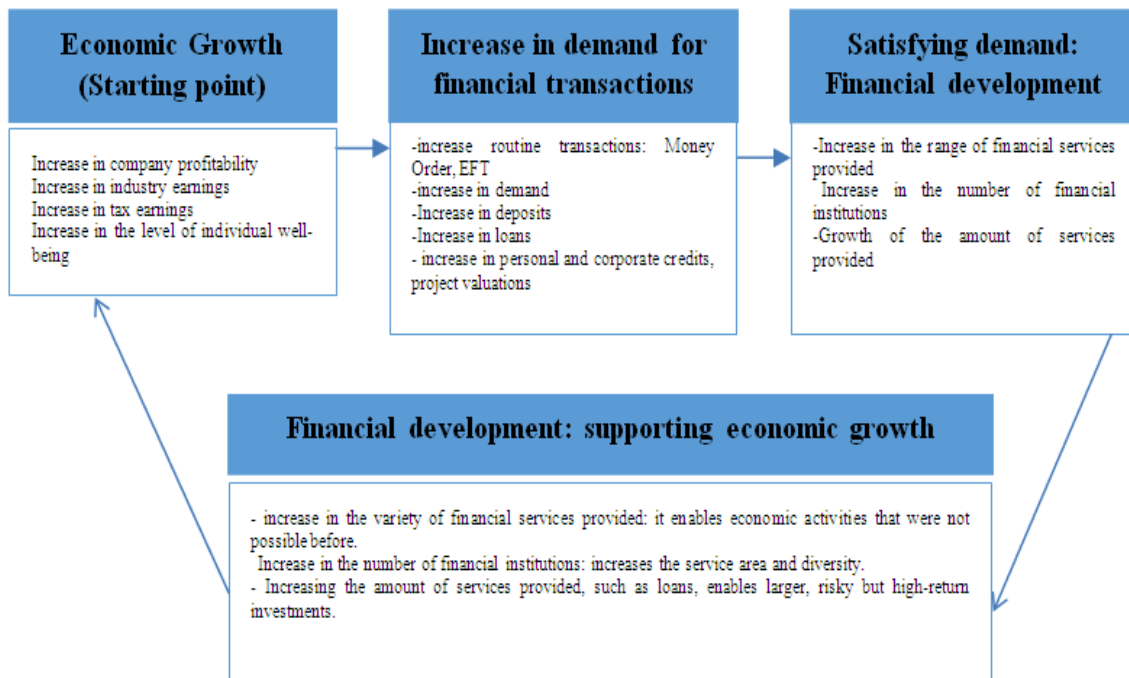


Fig. 2. Economic growth to financial development cycle (demand pulled growth)

The relationship between economic growth and financial development was argued by Joan Robinson [29] Joan Robinson in 1952, who argued that entrepreneurship leads to finance

development. According to this assumption, economic development creates demand for finance, and financial institutions respond to this demand. The author also claims that banks also

affect economic growth, but this effect was not too much; it was passive. In 2006 Liu and Hsu found that significant investments accelerated the Japanese economy. Still, the growth in Taiwan was stimulated by the Stock Exchange, which clarifies that policies in different countries give different results.

3.3 Studies that Neglect or Deny the Relationship

In addition to these two basic assumptions, the third assumption suggests no or a minimal relationship between financial development and economic growth. Even if there is, it should be neglected. For instance: In his article, Chandavarkar [37] argued that economists often neglect and ignore or could not resolve the relationship between finance and development. Besides, Arestis and Panicos [38] emphasized that the view "financial development leads to economic growth" is not clear. Lucas [39] never addressed financial development while dealing with economic growth; he simply neglected and denied the role of financial development. Güney [40], in his study; examined five countries from 1998 to 2015 with annual data, found that economic growth and financial development go hand in hand and he suggests that there is no cause and effect relationship.

3.4 Assumptions that Claim there is a Negative Relationship

Some researchers and authors argue that there is a relationship between financial development and economic growth, but they claim that this relationship's direction is negative. For instance, Lucas [39] suggests that economists overestimate the financial system's role. Overestimating the system causes overestimation of predictions, resulting in a highly tensed, stressed market, i.e., negatively affecting the economy. Morck and Nakamura [41] suggest that banks, with their audits, with their surveillance, and with their policies that are avoiding risks, are distancing themselves and their potential investors from risky and at the same time profitable investments. They suggest that banks negatively influence the investment environment.

4. LITERATURE REVIEW

4.1 Time Series Studies

One of the most frequently used methods in "financial development - Economic growth"

studies is the time series method. It is popular because it is a comparatively easy and reliable method. For instance, Gupta [42], used time series to examine the relationship between financial development and economic growth in developing countries. Later on, Jung [43] again used the time series method to analyze the relationship between financial development and economic growth based on economic results and cultural change. Arestis and Demetriades [38] used time series in their studies. The time-series method is used for different purposes. For instance: Rajan ve Zingales [44] used the time-series method to test whether an improved financial system provides an advantage over the others in the industries dependent on external finance. This study was conducted for 55 countries with data for the years 1980-1990. But, Ghali [45] used the time series to analyze the relationship between the ratio of bank deposit debts to nominal GDP and the ratio of private sector loans to nominal GDP for Tunisia's annual series the years 1963-1993. Arestis et al. [46] have used the time series method to test whether banks and capital markets support economic growth in Germany, United States, Japan, Britain, and France. Federici and Caprioli [21] have used the time series method to investigate the relationship between the crises and financial development level macroeconomic fluctuations within 39 countries. The relationship between financial development and economic growth was a popular subject for researchers. This subject is trendy today as well. Some of the recent studies are given below:

Küçüksakarya [47] used panel data from 16 OECD countries. The period for her search was 2008 to 2019. According to the study, financial development is a pre-condition for economic growth for these nations. Mehmood and Bilal [48] examined financial development in bringing the economic well-being for the period 1991 – 2017. they used 10 developing country's data in the study. The result of the survey indicates that developing countries can utilize their financial development for economic development. Abeka et al. [49] used the General Method of Moment estimation technique in their study. Results indicated that the Level of telecommunication infrastructure is a crucial factor Affecting financial development and economic growth. So, sub-Saharan African economies should take appropriate policies to improve their telecommunication infrastructure, resulting in financial development and economic growth. Policy implications of this study suggest;

investing in telecommunication infrastructure will reduce transaction costs, enhance flexibility, create favorable conditions for banks to develop new products, and, consequently, consistent and reliable economic growth. In their analysis, Albert et al. [50] Used time series data on the annual growth rate of gross domestic product, real interest rate, gross domestic savings to GDP, the ratio of domestic credit to the private sector to GDP for 1980 - 2019. Results of their study indicated a need to improve the financial system through innovations, for effective regulation and supervision, for more funds available for productive investments to propel economic growth. Ustarz and Fanta [51] examined the effect of financial development in sub-Saharan Africa using the Generalized Method of Moments (GMM). Their findings show that while financial development positively impacts the service and agricultural sectors, policymakers need to continue promoting financial development to enhance economic growth.

4.2 The Studies Related to Turkey

One of the most popular subjects of academics in the world is "Is financial development causes economic growth? Or is economic growth causes financial development?" which is also a very popular subject in Turkey. It has been and has to be discussed and researched so much. Because Turkey is a developing country, it has to accelerate its economic growth and financial development process to catch up with developed countries. Determining the starting point for the development relies on this egg and chicken problem that we are and other researchers have been investigating, or they have already been investigated. Correct measuring the starting point in designing and implementing policies supporting both financial development and economic growth; is fundamental to maximizing social welfare. This study aims to try to provide necessary, appropriate, and correct information for decision-policy makers in Turkey. Indeed, there are several studies carried out in Turkey until today. In Turkey, there are several studies concerning financial development levels. For instance, Saldanlı and Şeker [52] investigated Turkey's financial development under five main groups, with 76 variables, and developed a financial development index. According to this index, financial development in Istanbul, Ankara, Izmir, and Kocaeli had the highest index values. In their time-series study, Kar and Pentecost [53] used money supply, deposits, loans to the private sector, and the ratio of total loans to

income as financial development measures concerning the period between 1963-1995, which took place in Turkey. The study results showed that the power of causality between financial development and economic growth is much weaker than the power of causality between economic growth and financial development. Aslan and Küçükaksoy [54] have used the annual data between 1970 and 2004, have used the time-series causality analysis method, have accepted the size of private sector credit volume as the financial development variable. The result of his study shows that there is a relationship between financial development to economic growth. Akkay [55] claimed that: (1) the relationship between financial development and economic growth will yield healthier results by using time series, (2) correct selection of variables representing financial development and economic growth is very important (3) studies only based on data are incomplete and insufficient. Ceylan and Durkaya [56], in their analysis with three-month time series, for the period 1998-2008, They found a one-way causal relationship between the growth in loan volume and the ratio of gross domestic product. Türedi and Berber [57] studied and analyzed the financial development, trade openness and the relationship between economic growth in Turkey. The study was carried out with annual data covering the period 1970-2007. The results of the study showed that the financial developments in Turkey unidirectional causal relationship to economic growth. In other words, the reason for economic growth is the development in the financial sector. In contrast, commercial openness and economic growth mutually reinforce each other's growth; they have a bidirectional causality relationship. Özcan and Arı [58], in their study, they used the VAR (Vector Autoregression) model for the period 1998-2009, which, found that the direction of growth in Turkey is 'from economic growth to financial development'. Öztürk et al. [59], in their studies about Emerging Markets, found that there is a causal relationship from economic growth to financial development. In this study, Holtz-Eakin, Newey, and Rosen panel causality Tests were applied to the data for the period 1992-2009. In this study, the money supply/GDP ratio and bank loans / GDP ratio are used as indicators of financial development. Türkoğlu [60] used the data of 1960-2013 in his study using the Granger causality test. Results of the study revealed that there is bidirectional causality between economic growth and financial development. Demirhan et al. [61] analyzed the causal relationship between

financial development and economic growth for the period of 1987:1 to 2006:04. They found that there is bidirectional causality relationship between financial development and economic growth.

4.3 Variables Used in Previous Studies

In the literature, a wide variety of variables (could be) have been used in economic studies where reliable logic relies on each assumption. Knowing these variables and the rationale behind selecting variables and analyzing these choices is vital for the researchers and their studies.

Some authors, like Gupta [42] used monetary quantities such as (M1: Narrow Money, Include Coins; Easily Convertible into Cash) (M2: M1 Plus Short-Term Time Deposits in Banks) (M3: M2 Plus Long-Term Time Deposits + Money Market Funds.) as an indicator of financial development. Calderón and Liu [62] conducted a study for 1960-1994 and used the ratio of money supply [M2] and loans to the private sector to the gross domestic product as financial development indicators. The study shows that the increase in money supply [M2] and private sector loans in all 109 developed and developing countries accelerate economic development. The "demand-push" hypothesis in developed countries and the "supply-pull" hypothesis for "developing" countries are more prominent. In his study, Ergeç [63] conducted a study in Turkey with the data belong to 1988-2001. In this study several variables are used such as: • M2 / GDP, • M3 / GDP, • (M2-M1) / GDP, • (M3Y-M1) / GDP, • Private sector loans / GDP, • Loans to private sector / Total loan volume. The study results indicated that in the long term, all financial development indicators represented causality relationship, whereas in the short term, only some did. On the other hand, Akkay [55] used (y) the change in real GDP and (k) the difference in the formation of gross fixed capital to describe economic growth. Ilıkkan and Demirtaş [64] investigated investment decisions, for the time period of 1992:1-2013:3, on the basis of financial development, Economic Growth and Foreign Direct Investment relations in Turkey. The study's results indicated that financial development and Foreign Direct Investments in Turkey could not support the economic growth as much as they should. Similarly, Demirhan and Yılmaz [65] investigated the foreign direct investments determinans with panel data. Manga et al. [66], in their studies covering the period 1960-2013, used three different financial development indicators: domestic loans to the

private sector, loans provided to the private sector by banks, and M2 money supply. Karamelikli [67] studied the impact of financial development components on economic growth in Turkey, where growth Rate, loans, market value and money supply are used as variables. Pata and Ağca [68] used "GDP: 'Gross domestic product (million USD) in 2010 at constant prices', 'FD1: Share of domestic loans to the private sector in GDP (%)', 'FD2: The share of domestic loans provided by the finance sector within the GDP (%)', and finally 'FD3: The share of domestic loans provided to the private sector by banks within the GDP (%)' as variables.

5. EMPIRICAL FINDINGS

5.1 Data and Methodology

In this study, two different financial development indicators are used to estimate the relationship between financial development and economic growth in order to determine whether the relationship between financial development and economic growth changes in according to the financial development indicator. The first indicator is the ratio of private sector bank loans to GDP. The second is the ratio of the broad money supply to the GDP. Economic growth refers to the increase in GDP compared to the previous period. In this study industrial production index is used to measure economic growth because monthly data is used in the econometric estimations monthly data. The sum of exports and imports as a percentage of GDP is used to measure openness in trade and included in the model as a control variable. In the econometric estimations data is used from 2005:04 to 2020:03 and extracted from the Central Bank of the Turkish Republic. Initially, unit root tests were applied to determine whether the series has a unit root or not. The results obtained from unit root tests are essential in determining the methods used in empirical estimations. For this reason, we have implemented several unit root tests such as Augmented Dickey-Fuller (ADF) [69], Phillips-Perron (PP), [70,71], and Kwiatkowski, Phillips, Schmidt, Shin [72] unit root tests. ADF unit root tests are applied for the intercept model by estimating the following regressions.

$$\Delta y_t = \beta_1 + \beta_2 y_{t-1} + \sum_{i=1}^p \varphi_i \Delta y_{t-i} + \varepsilon_t$$

Where Δ is the first difference operator; y_t shows series used in the study, i.e., ipi , $m2$, cre , and

open; $t=1, \dots, T$ is an index of time; p represents the number of lags, which is determined based on the Schwarz Criterion (SC); ε_t is a stationary random error term. Trend variables are included in the ADF equation to estimate the trend and intercept model.

The PP method estimates the ADF equation in the non-augmented form ($\Delta y_{t-1}, i=1,2, \dots$ are not included in the ADF equation). To apply ADF and PP tests, the null hypothesis of non-stationary ($\beta_2 = 0$) is tested against the alternative hypothesis of stationary ($\beta_2 < 0$). If the calculated test statistics are smaller than the critical values, the null hypothesis of non-stationary is rejected, meaning that unit root does not exist in the series, ie. $I(0)$. Since ADF and PP tests are thought to have lower power to test the series's stationarity, the KPSS test was also applied in the study. KPSS test requires testing the null hypothesis of

stationary contrary to ADF and PP tests. If the calculated test statistics exceed the critical values, stationarity's null hypothesis is rejected against the non-stationary alternative.

In case variables have unit roots, we have applied the Johansen cointegration test proposed by Johansen [73] and Johansen and Juselius [74] to detect the variables' long-run relationship. The long-run relationship between variables is decided by taking into consideration trace and maximum eigenvalue statistics. If the long-run relationship exists, a causality test should be performed following Engle and Granger [1] and Granger [2]. They remarked that there is at least one-directional Granger causal relationship if two time-series are cointegrated.

In this study, we estimate VECM to apply Granger causality tests as follows:

$$\Delta ipi_t = \alpha_1 + \sum_{i=1}^p \beta_{1i} \Delta ipi_{t-i} + \sum_{i=1}^p \omega_{1i} \Delta fd_{t-i} + \sum_{i=1}^p \delta_{1i} \Delta open_{t-i} + \lambda_1 z_{t-1} + \varepsilon_{1t} \tag{1}$$

$$\Delta fd_t = \alpha_2 + \sum_{i=1}^p \beta_{2i} \Delta ipi_{t-i} + \sum_{i=1}^p \omega_{2i} \Delta fd_{t-i} + \sum_{i=1}^p \delta_{2i} \Delta open_{t-i} + \lambda_2 z_{t-1} + \varepsilon_{2t} \tag{2}$$

$$\Delta open_t = \alpha_3 + \sum_{i=1}^p \beta_{3i} \Delta ipi_{t-i} + \sum_{i=1}^p \omega_{3i} \Delta fd_{t-i} + \sum_{i=1}^p \delta_{3i} \Delta open_{t-i} + \lambda_3 z_{t-1} + \varepsilon_{3t} \tag{3}$$

Table-1. Unit Root Tests

Series	ADF	PP	KPSS
<i>ipi</i>	-0.87(1)	-0.54(20)	0.92(6)***
Δipi	-10.81(0)***	-11.76(7)***	0.50 (58)
<i>cre</i>	-1.19 (1)	-1.25 (2)	0.90 (6)***
Δcre	-5.49 (0)***	-5.44 (1)***	0.14 (3)
<i>m2</i>	053 (0)	0.22 (3)	0.88 (6)***
$\Delta m2$	-6.72 (0)***	-6.77 (2)***	0.18 (3)
<i>open</i>	-2.09 (0)	-1.99 (3)	0.64 (6)**
$\Delta open$	-8.57 (0)***	-8.57 (0)***	0.03 (0)

*PP is the Phillips-Perron, ADF is the Augmented Dickey-Fuller, and KPSS is Kwiatkowski, Phillips, Schmidt, and Shin test; ***, **and* indicate rejection of the null hypothesis of non-stationary at the 1%, 5% and 10% levels, respectively; The proper lag order for ADF test is chosen by considering Schwarz Information Criteria (SIC) and white noise of residuals, representing in parenthesis; For KPSS and PP tests, the bandwidth is chosen using Newey–West method and spectral estimation uses Bartlett kernel, representing in parenthesis; The 1%, 5%, and 10% critical value for the KPSS test is 0,74, 0,46, and 0,35 respectively. (1999:01-2020:03)*

Where *ipi* is industrial production index (*ipi*); *fdi* is financial development indicators, which are the ratio of private sector bank loans to GDP (*cre*) and the ratio of the broad money supply to the GDP (*m2*); *open* is trade openness; Δ is the difference operator; ε_t is zero mean, serially uncorrelated random error terms; p represents the number of lags; z_{t-1} is the error correction term. z_{t-1} is the lagged values of the error term derived from the estimated long-term cointegration relationship and

demonstrates the short-run deviations from the long-run equilibrium. The magnitude of error correction term indicates the speed of adjustment of any disequilibrium towards long-run equilibrium. It is worth noting that equation (1-3) is estimated without error correction terms if there is no long-run relationship. A causality from financial development to economic growth requires rejecting the null hypothesis that all coefficients of $\omega_{1i}=0$ as a group. If the null hypothesis of all coefficients of $\beta_{2i}=0$ is rejected, then it is concluded that there is a causality relationship from economic growth to financial development. Moreover, if the coefficient of error correction term (λ_1) is significant, there is a long-run causality relationship between variables.

5.2 Empirical Results

Table 1 represents the ADF and PP, and KPSS test results for the study variables' levels and first differences. The ADF test results show that *ipi*, *cre*, and *m2* are integrated of order one in first differences; thus, all variables are I(1) or non-stationary. The lag length for the ADF tests is selected to ensure that the residuals are white noise. Besides, the optimal lag is chosen by minimizing Akaike's FPE criterion. Moreover, when investigating stationary properties of series by KPSS test, it is concluded non-stationary of series, confirming ADF and PP test results.

After detecting series are non-stationary, we apply a cointegration test to determine whether series are cointegrated or not. Cointegration test results are used for two sets of the variables. The first panel of Table 2 reports the cointegration test results for *ipi*, *cre*, and *open* variables are used in the cointegration test. The second panel of the Table reports the cointegration test results for *ipi*, *m2*, and *open* variables. The test results show that according to trace and λ -max statistics, the null hypothesis of $r=0$ is not rejected,

implying no long-run relationship between variables.

The causality test results show that there is a bidirectional causality relationship between *ipi* and *cre*. However, there is no causality relationship between *ipi* and *m2*. In Turkey, expansionary monetary policies, which generally lead to an increase in bank loans, are implemented to ensure economic growth. A decrease in interest rates increases consumption and investment expenditures by increasing housing and consumer credits. Moreover developments in economic growth may cause an increase in total demand leading to an increase in bank loans. For determining the robustness of the model, diagnostic tests are implemented in Table-3. Diagnostic tests results show the absence of serial correlation (LM) (except Δcre), the absence of misspecification (RAMSEY) (except Δipi), the absence of heteroskedasticity (except Δcre).

Besides Granger causality explaining the direction of causality, causal impacts are also substantial. In this context, Impulse Response Functions (IRF) help evaluate the dynamic responses of one variable to another. Impulse response results are showed in Fig. 3 The solid line represents the point estimates of IRFs. Provided that point estimates stand in the confidence bands, impulse responses are significant. Impact response functions are reported only for bank credits and industrial production index. According to the results, the increase in bank credits gives a statistically significant positive response to the industrial production index's increases in the first period. The reaction of the increase in bank loans to the increase in industrial production is negative and statistically significant in the first period.

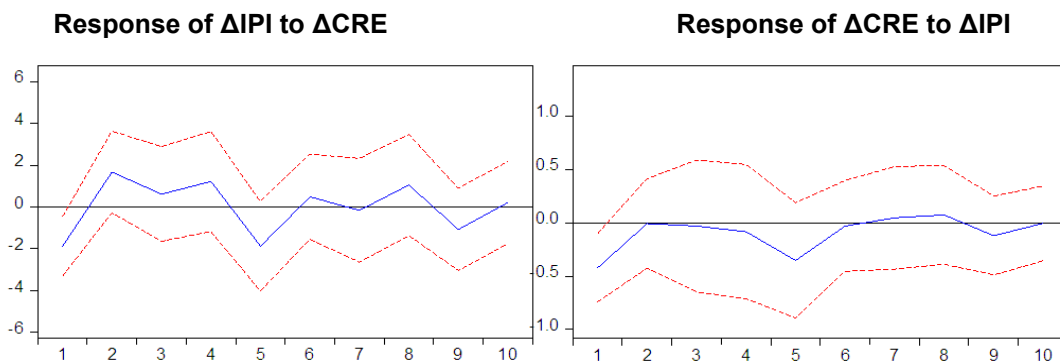


Fig. 3. Impulse response functions

Table 2. Johansen test for cointegration

<i>(ipi, cre, open)</i>							
Null Hypothesis	Alternative Hypothesis	Trace Statistics	%5 Critical Values	Null Hypothesis	Alternative Hypothesis	Max-Eigenvalue Statistics	%5 Critical Values
r=0	r≥1	13.84	29.79	r=0	r=1	7.11	21.13
r≤1	r≥2	6.74	15.49	r≤1	r=2	4.34	14.26
r≤2	r=3	2.39	3.84	r≤2	r=3	2.39	3.84
<i>(ipi, m2, open)</i>							
r=0	r≥1	19.32	29.79	r=0	r=1	13.58	21.13
r≤1	r≥2	5.74	15.49	r≤1	r=2	3.73	14.26
r≤2	r=3	2.01	3.84	r≤2	r=3	2.01	3.84

r indicates the number of cointegrating relationships; *** shows rejection of the hypothesis at the %1 level; The optimal lag structure of the VAR is four for the model, selected by minimizing the Schwarz Bayesian Criterion; The model incorporates intercept and no trend in data.

Table 3. Causality test results

Dependent Variables	Independent Variables				Diagnostic Tests			
	Δipi	Δcre	$\Delta open$	$\Delta m2$	J.B	LM(2)	ARCH(1)	RAMSEY
Δipi	-	8.66**	2.43	-	0.00	0.87	0.65	0.05
Δcre	9.83**	-	20.18***	-	0.03	0.01	0.09	0.50
$\Delta open$	1.52	5.18	-	-	0.00	0.18	0.85	0.51
Δipi	-	-	1.40	0.35	0.00	0.49	0.48	0.01
$\Delta m2$	4.51	-	11.67***	-	0.00	0.15	0.47	0.11
$\Delta open$	0.74	-	-	0.55	0.00	0.32	0.86	0.96

*** and ** indicate significance at the 1% and 5% levels, respectively; The optimal lag structure of models is 3, selecting by minimizing the Akaike's FPE criterion; The numbers in diagnostic tests indicate p values for each test.

6. CONCLUSIONS

Until today, the results of several studies represent very different results about economic growth and financial development relationship. Because countries subjected to the studies and methods used are different, on the other hand, the results may vary according to the time variables. In this study, the short-term and long-term causality relations between financial development and economic growth were examined using the data of Turkey for the period 2005:04 - 2020:03. While investigating the causality VEC method was used in the research. Empirical findings show a bidirectional causality in the short term between economic growth and financial development. Results illustrate that financial development in the short term leads to economic growth, leading to financial development.

The study's findings suggest that bank loans are more associated with economic growth than the expansion in the money supply. According to empirical results, expansionary monetary policies that increase bank loans in Turkey have an impact on economic growth. This finding confirms the importance of bank loans, which is the rationale behind the increased economic growth in recent years. The increase in bank loans increases household consumption expenditures, in particular, leading to an increase in total spending. At this point, the source of economic growth in Turkey is primarily due to internal demand. The causality relationship detected from the growth rate to financial development is negative when the effect response functions are taken into account. This situation shows that during the revival periods of the economy, bank loans decreased in the short term. During the period examined a financial development due to bank loans contributed positively to economic growth. This contribution is only seen in the short term. In the long term, such policies may negatively affect economic growth due to the inflationary effect. Several studies have been used the time series models on financial development and economic growth relationship, and the majority of their results, are consistent with this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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