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THE RELATIONSHIP BETWEEN FINANCIAL INCLUSION AND INCOME INEQUALITY; EVIDENCE FROM TÜRKİYE

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ABSTRACT

The purpose of this study is to assess the impact of financial inclusion on income inequality in Türkiye *using the VAR approach from 2010 to 2021. The principal component anaysis technique is employed to create our own indicator representing financial inclusion, which contains the number of POS devices, the number of bank accounts, and the number of ATMs. The findings indicate that there is a reverse link between financial inclusion and income inequality. In other words, financial inclusion associated with more equitable distribution of income in* Türkiye. *Furthermore, the Granger causality test is used to establish the direction of causality between variables. It has been observed that financial inclusion granger causes lower income inequality. However, gini index, which measures income inequality does not granger causes financial inclusion. As a results, a unidirectional causality is found from financial inclusion to income inequality in* Türkiye.

Keywords: *Financial Inclusion, Income Inequality, Vector Autoregression Method and Granger Causality Test.*

Jel Classification: *G23, F40, O50.*

1. INTRODUCTION

Financial inclusion is defined by the availability of reasonably priced, high-quality financial services; access to these financial services includes not only gains (savings and interest or credit), but also costs (bank fees and commissions). In addition, financial inclusion is also defined as the process of providing access to financial services and providing timely and adequate credit when needed by vulnerable groups such as the low-income groups. In this context, it can be concluded that financial inclusion should mainly focus on vulnerable people in society, such as the lower-income group, in order to reduce inequalities (Quechtati, 2020: 1051).

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It has been assumed that financial inclusion is a crucial factor in reducing income inequality. Since the 1970s, numerous studies have analysed the effect of financial inclusion on economic growth and income equality. At that time, financial inclusion was expressed as a single segment rather than types of financial services or access. Later, the notion of financial inclusion became popular and was described as the condition in which all members of society have easy and voluntary access to fundamental financial services (savings accounts, types of deposits, credit, and money advice) at a reasonable cost. Speaking of which, it is worth noting that more than 70 percent of the global population suffers from access to basic banking services (Lan and Thuong, 2019: 24).

There are various research on the impact of financial inclusion on income inequality (e.g. Chandrarin et al., 2018; Kling et al., 2022; Sani Ibrahim et al., 2018; Menyelim et al., 2021; Chinoda and Mashamba, 2021; Ratnawati, 2020). As the relationship between financial growth and income inequality has been revealed by numerous researchers from numerous nations, financial inclusion as a means to reduce income inequality has become highly concentrated. According to the World Bank (2018), financial inclusion is crucial for eliminating poverty and reducing income inequality. As a result, it is anticipated that financial inclusion will assist in reducing poverty and income inequality. However, it is observed that the gap between the poor and the wealthy does not close as some countries are getting more wealthy. This brings up the question of whether financial inclusion can really aid in the reduction of income inequality by increasing access to financing for various populations.

According to income and living conditions research conducted in Türkiyein 2021, the top 20 percent of income account for 46.7 percent of the total income. The Gini coefficient, which is expressed as a measure of income inequality, was calculated as 0.401 in 2021. As the Gini coefficient approaches one, it indicates economic inequality, and as it approaches zero, it implies income equality (Tüik, 2022).

The aim of this study is to assess the effect of financial inclusion on income inequality in Türkiye over the period 2010-2021. The mixed findings on the role of financial inclusion in the income inequality in the literature prompted us to investigate this subject. We expect to find a reducing effect of financial inclusion on income inequality because of the following factor: Low-income individuals with access to financial services can make a profit by depositing their savings in a commercial bank. Additionally, having financial contacts in the community makes it easier to create a bank account or obtain a loan from a commercial bank, which facilitates the investment endeavours of prospective entrepreneurs. As a results, it is anticipated that these mentioned facilities enable low-income population to earn more, which in turn reducing the income inequality.

The impact of financial inclusion on income disparity in Türkiye is investigated in this study. For this reason, the study is divided into four sections. While the introduction is included in the first section of the study, the literature review is presented in the second section. In the third section, information

about the study's methodology and findings is provided. In the final section, the study's results, recommendations, and conclusion are presented.

2.LİTERATURE REVİEW

Financial inclusion has garnered the interest of numerous authors and has been the focus of numerous research in the last decade. Although financial inclusion has been mostly found to reduce income disparity in the literature (e.g., Kim, 2016; Zhang and Posso, 2019), while in some studies, it has been found to increase income inequality or insignificant link between them (e.g., Tita and Aziakpono, 2017; Zia and Prasetyo, 2018). Even more, some research conclude that link between them is not linear (Demir et al., 2020). Selections of countries at various stages of development, different econometric techniques and time periods, and a variety of variables used to measure financial inclusion may account for the contradictory results. Considering the potential factor leading to mixed findings in the literature, we attempted to deal with the impact of financial inclusion on income inequality by employing the VAR method and Granger causlity test based on Türkiye. This study contributes to the literature by adopting the variables most commonly used to measure financial inclusion in the literature and focusing on Türkiye. According to our knowledge, there is no paper exploring this topic from the perspective of Türkiye.

Table 1 summarises some of the studies on the relationship between financial inclusion and income disparity to indicate that there is no consensus in the literature regarding this subject.

Table 1. Summary of the Studies on the Link between Financial Inclusion and Income Inequality

Author(s)	Sample and Period	Estimation Method	Variables Measuring Financial Inclusion	Findings on the Effect of Financial Inclusion on Income Inequality
Kim (2016)	2004-2011, OECD and EU Countries	Cross-Sectional Analysis/OLS Fixed effect	Number of Branches, Bank Loans, Bank Deposit Rates, Number of Branches and Account in Bank.	Negative
Tita and Aziakpono (2017)	2011, Sub-Saharan African Countries	Cross-sectional regression technique	Health Insurance, Account Holder, Electronic Payment Services, Government savings, Loans from Banking Institutions, Loans to Pay for School, Banking Account for Business,	Positive effect of Banking Account for Business, Electronic Payment Services and government savings. No significant impact of other variables.

Zia and Prasetyo (2018)	2014-2016, Indonesia	Panel data regression and correlation	Financial inclusion index	Insignificant
Agyemang-Badu et al. (2018)	2004-2015, African Countries	Panel data regression	ATM, Number of branches, bank credit and bank deposits	Negative
Zhang and Posso (2019)	2011, 6200 households in China	Ordinary Least Square (OLS) technique and Quantile Regressions (QR)	Check account, deposit account or bond, investment account, credit, credit cards and business insurance	Negaive
Le et al. (2019)	2005-2015, Transition Countries	Panel data regression and 2SLS	ATM, Number of branches, bank credit and bank deposits	Negative
Ouechtati (2020)	2004-2017, 53 Developing Countries.	Panel GMM	ATM, Number of branches, bank credit and bank deposits	Negative
Bkwayep et al. (2020)	2004-2014, 47 Sub-Saharan Afrian countries	Panel GMM	ATM, Number of branches, bank credit and bank deposits and insurance	Negative
Demir et al. (2020)	2011-2017, 106 Developed and Developing Countries	Panel threshold regression models	The proportion of the adult population with a bank account and the proportion of the adults who borrow from a government institution.	Non-linear relationship.
Omar and İnaba (2020)	2004-2016, 116 Developing Countries	Dynamic Panel Regression,	Financial inclusion index	Negative
Ali et al. (2021)	1997-2017, 18 Asian Countries	GMM	Financial inclusion index	Negative but weak.
Sawadogo ve Semedo (2021)	2004-2016/ Sahra Altı Afrika bölgesinde bulunan 28 ülke seçilmiş	A finite mixture model (FMM)	Financial inclusion index	Negative

Khan et al. (2022)	2001–2019, 54 African Countries	Panel data regression	ATM and commercial deposit	Negative
Tsouli (2022)	2004-2019, 54 European Countries	Fixed Effect, random effect, and GMM	Branchs, ATMs, Deposit ve Loan	Negative

3.DATA AND METHODOLOGY

To investigate the relationship between financial inclusion and gini index, we applied annual values for the period 2010–2021 using the VAR method and granger causality test. The selection of the period is based on the data availability as the data on the number of point of sale (POS) devices, the number of bank accounts, and the number of ATMs is available as of 2010. We also use the data on the number of students enrolled in high school as a proxy for the human capital and financial development index as these two variables are considered as potentially determinants of gini index.

The data for the Gini index is taken from the Turkish Statistical Institute and the variable ranges from 0 to 1. The lower numbers indicate a more equal distribution of income.

Financial inclusion consists of three variables, namely the number of POS devices, the number of bank accounts, and the number of ATMs. All the components of financial inclusion are gathered by The Banks Association of Türkiye. We apply principal component analysis (PCA) to create a single variable as a proxy for financial inclusion. As stated by Samargandi et al. (2015: 70), PCA has two advantages. Firstly, there is a high correlation between those variables, which results in a multicollinearity problem. PCA enables us to deal with this issue. Secondly, there is no consensus about the best way to measure financial inclusion. As a consequence, utilising a summary indication appears to be more effective than using a single variable. Table 2 shows the results of the principal component analysis. The first accounts for 75% of the variation. We, therefore, prefer to use the first component as our financial inclusion.

Table 2. Results of PCA For Financial Inclusion

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.222	1.558	0.75	0.74
Comp2	0.664	0.550	0.22	0.96
Comp3	0.113		0.03	1.00

Human capital is represented by the number of students enrolled high school. The data is gathered from World Bank Indicator Databe.

Financial development index is developed by considering financial depth, access, and efficiency and obtained from International Money Fund (IMF). Its value ranges from 1 to 0.

Descriptive statistics for variables used in the regressions have been reported in Table 3 for Türkiyeover the period 2010-2021. It is worth noting that the gini index ranges from 0.391 to 0.41, which shows that there is a limited variation throughout this time span. The largest changes are observed in human capital, ranging from a low value of 26.24 to a high value of 35.15.

Table 3. Data Descriptive

Variable	Observation	Mean	Std. Dev.	Min	Max
Gini_index	11	0.401	0.00563	0.391	0.41
Financial_inclusion	11	-0.359	0.763	-1.707	0.944
Human_capital	11	36.697	4.382	29.986	43.444
Financial_development	11	0.511	0.0189	0.478	0.539

We employed the VAR method to investigate the relationship between the gini index and financial inclusion as well as human capital and financial development. Because all variables are considered endogenous, no exogenous variables are incorporated in the VAR model. All regressors are used as either dependent or independent variables in the model. Furthermore, the dependent variable is a function of its lagged values and the lagged values of other regressors in the system. The relationship among those variables is estimated by the following equations:

$$GI_t = \alpha + \sum_{i=1}^{k} \beta_i GI_{t-i} + \sum_{i=1}^{k} \lambda_i FI_{t-i} + \sum_{i=1}^{k} \gamma_i HCt_{-i} + \sum_{i=1}^{k} \theta_i FD_{t-i} + u_{1t} \quad (1)$$

$$FI_t = \alpha + \sum_{i=1}^{k} \beta_i FI_{t-i} + \sum_{i=1}^{k} \lambda_i GI_{t-i} + \sum_{i=1}^{k} \gamma_i HC_{t-i} + \sum_{i=1}^{k} \theta_i FD_{t-i} + u_{2t} \quad (2)$$

$$HC_t = \alpha + \sum_{i=1}^{k} \beta_i HC_{t-i} + \sum_{i=1}^{k} \lambda_i GI_{t-i} + \sum_{i=1}^{k} \gamma_i FI_{t-i} + \sum_{i=1}^{k} \theta_i FD_{t-i} + u_{3t} \quad (3)$$

$$FD_t = \alpha + \sum_{i=1}^{k} \beta_i FD_{t-i} + \sum_{i=1}^{k} \lambda_i GI_{t-i} + \sum_{i=1}^{k} \gamma_i HC_{t-i} + \sum_{i=1}^{k} \theta_i FI_{t-i} + u_{4t} \quad (4)$$

Where gini index, financial inclusion, human capital, and financial development are used as dependent variables respectively. We also applied the dianostic tests reported in the next section.

4.EMPİRİCAL RESULTS

In this section, the findings of the VAR technique, the Granger causality test and other diagnostic tests are presented.

4.1.Unit Root Test

We utilised the Augmented-Dickey Fuller test (Dickey and Fuller, 1979) to check the stationarity of the model's variables. The null hypothesis of the ADF test asserts that the time series variable has a unit root, as opposed to the alternative hypothesis, which claims that the model's variables are stationary. The null hypothesis can be rejected if the value of ADF statistics is greater than the critical value (5% level is used for the critical value). As observed in table 4, all variables, including the dependent variable,

are not cointegrated at the level (since none of their ADF statistic values are greater than the stated critical values). However, they are all cointegrated of order 1, allowing us to use the VAR model.

Table 4. The Results of Unit Root Test (ADF)

Variables	At level, I(0)		First Difference, I(1)	
	ADF statistic	Critical value 5%	ADF statistic	Critical value 5%
Gini_index	-2.616	-3.000	-3.821**	-3.000
Financial_inclusion	-0.752	-3.000	-3.276**	-3.000
Human_capital	-0.075	-3.000	-3.330**	-3.000
Financial_development	-1.265	-3.000	-3.211**	-3.000

(**) denotes 5% significant level.

4.2.Lag Order Selection

In the literature, several criterias are used to determine the optimal choice of lags for a model (Liew, 2004: 1). In our analysis, all criteria, including Akaike's Information Criterion (AIC), Schwarz's Information Criterion (SIC), and Hannan and Quinn Information Criterion (HQ), indicate that lag (1) is considered as the optimal selection, as shown in Tablo 5. Consequently, we chose lag (1) according to these criteria in general.

Table 5. Lag Order Selection Based on AIC, HQIC and SBIC

Lag	**LL**	**LR**	**Df**	**AIC**	**HQIC**	**SBIC**
0	29.2568			-10.1027	-10.9413	-10.4152
1	686.061	1313.6*	16	-266.425*	-270.617*	-267.987*
2	678.978	-14.166	16	-263.591	-267.784	-265.154
3	683.213	8.4689	16	-265.285	-269.478	-266.847
4	677.965	-10.496	16	-263.186	-267.379	-264.748
5	675.301	-5.3269	16	-262.12	-266.313	-263.683
6	667.453	-15.697	16	-258.981	-263.174	-260.543

4.3.VAR Model

In this research, the vector autoregressive technique (VAR) is used to analyse how gini index responds to the changes in the three time series (FI, HC and FD). The VAR method uses the lagged values of the dependent variable as the independent variable and also the lagged values of all independent variables. Therefore, all the variables in the model are considered endogenous; there are no exogenous variables. The VAR provides a framework for evaluating the interrelationships between them, as all variables are allowed to impact each other **(**Wijeweera, and Mounter, 2008: 192**).**

Table 6 reports the results estimated by the VAR method. As seen, regression one indicates the effect of financial inclusion, human capital, and financial development on gini index. The first lag of gini index has a negative and significant effect on the current gini index, which means that a lower gini index in the previous year is related to a lower gini index in the current year. Similarly, financial inclusion seems to have a negative and significant effect on gini index. More clearly, a more developed financial inclusion is related to a more equitable distribution of income in Türkiye. This finding is expected, and it may be described as follows: As a result of gaining access to financial services, people in the lower income group might earn money by depositing their savings in a commercial bank. Also, having financial contacts in the community makes it easier to open a bank account or get a loan from a commercial bank, which helps potential entrepreneurs make investments (Ali et al., 2020: 5238). To conclude, those people are able to earn more money than they would if financial services were absent, which leads to a more equitable distribution of income. The coefficient of human capital is positive and significant, indicating that there is a positive relationship between more educated people and more income inequality. The last variable of regression one is financial development which does not enter the regression significantly.

Financial inclusion is a dependent variable in regression two, which allows us to examine whether the gini index and other variables have an effect on it. Financial inclusion is not significantly affected by the gini index or any other variables, as can be demonstrated. Regression three includes human capital as a dependent variable. Except for human capital's lag, no regressors have a significant impact on human capital. This illustrates that having more enrolled high school students in the previos period is linked to having more students attending high school in the current year. Financial development is the dependent variable in regression four, and it is seen that none of the variables has a significant impact on financial development.

Table 6. Estimation Results of the VAR

Dependent variables	**Gini Index**	**Financial Inclusion**	**Human Capital**	**Financial Development**
Gini_index L1.	-0.598** (0.011)	0.848 (0.956)	-4.568 (0.866)	-0.906 (0.140)
Financial_inclusion L.1	-0.0194*** (0.000)	0.122 (0.674)	-0.00716 (0.989)	0.00375 (0.749)
Human_capital L.1	0.00394*** (0.000)	0.0706 (0.225)	0.965*** (0.000)	-0.00263 (0.262)
Financial development L.1	0.0471 (0.729)	-1.528 (-0.74)	-8.337 (0.592)	0.350 (0.322)
Constant	0.4650*** (0.000)	4.7931 (0.80)	8.6926 (0.413)	0.7871*** (0.001)

P-values are represented in parentheses. * $p < 0.1$, ** $p < 0.5$, *** $p < 0.01$

We are required to apply some diagnostic tests to check the reliability of the results estimated by the VAR model. The first test is the lagrange-multiplier autocorrelation reported in Table 7. The null hypothesis is that there is no autocorrelation. We cannot accept the null hypothesis, indicating that The model has no autocorrelation.

Table 7. Lagrange-Multiplier Test Results

Lag	Chi2	Df	Prob>chi2
1	11.6406	9	0.2343

We have also performed the Jarque-Bera test to check the normality of each variable, and Table 8 presents the results. The null hypothesis is that the time series is distributed normally. As shown, the prob values of all variables are higher than 0.05, indicating that we cannot reject the null hypothesis. In other words, we conclude that all variables are distributed normally.

Table 8. Jarque-Bera Normality Test

Equation	Chi2	Df	Prob>chi2
Gini_index	0.547	2	0.7606
Financial inclusion	0.989	2	0.6099
Human_capital	1.431	2	0.4889
Financial_development	0.576	2	0.7498
All	3.544	8	0.8958

The final diagnostic test is the stability test. Table 9 reports the result. The VAR model meets the stability criteria, as can be seen from the table, where all eigenvalues are contained inside the unit circles.

Table 9. Stability Test Results

Eigenvalue	Modulus
0.9949	0.9949
-0.7683	0.7683
0.3064 + 0.532	0.6139
0.3064 + 0.532	0.6139

4.4.Granger Causality Test

The study also utilised the Granger causality test to determine the direction of causality among four time series; gini index, financial inclusion, human capital, and financial development for the Turkish economy. The theory underlying the Granger Causality test, first proposed by Granger (1969)

may be expressed as determining if one time series can be used to predict another. It allows us to examine whether there is a bidirectional, unidirectional, or no causal relationship between the variables included in the model. The null hypothesis claims that X does not cause Y. We will fail the null hypothesis if the probability value is higher than 0.05.

Tablo 10. Estimation Results of the Granger Causality Test

Equation	Excluded	Chi2	Df	Prob>chi2
gini_index	financial_inclusion	18.576	1	0.000
gini_index	human_capital	19.181	1	0.000
gini_index	financial_development	0.12012	1	0.729
gini_index	all	26	3	0.000
financial_inclusion	gini_index	0.00311	1	0.956
financial_inclusion	human_capital	1.473	1	0.225
financial_inclusion	financial_development	3.0283	1	0.082
financial_inclusion	all	9.9491	3	0.019
human_capital	gini_index	0.02868	1	0.866
human_capital	financial_inclusion	0.00019	1	0.989
human_capital	financial_development	0.28688	1	0.592
human_capital	all	0.5216	3	0.914
financial_development	gini_index	2.1817	1	0.140
financial_development	financial_inclusion	0.10274	1	0.749
financial_development	human_capital	1.2571	1	0.262
financial_development	all	8.7649	3	0.033

Table 10 presents the results of the Granger test. As shown, the first part of the table indicates whether there is a causal effect of financial inclusion, human capital, and financial development on the Gini index. The prob-value of financial inclusion is lower than 0.01, indicating that we are able to reject the null hypothesis and conclude that financial inclusion granger causes the Gini index. Nevertheless, in the second part, we fail to reject the null hypothesis suggesting that Gini index does not cause financial inclusion. To conclude, there exists a unidirectional causality between financial inclusion and Gini index and the causality runs from financial inclusion to financial inclusion but not vice-versa. As for the control variables, it is observed that there is a unidirectional causality running from human capital to Gini index. Regarding the rest of the variables, neither the Gini index nor the control variables appear to granger cause any other variables.

5. CONCLUSION

In recent years, there has been a considerable amount of interest in studies of income inequality. Financial inclusion has been recognised as an important factor in reducing income inequality as it provides access to financial services to people from lower income group. However, there is no consensus about the impact of financial inclusion on income disparity in the literature (Dogan and Guler, 2021: 17). Also, the absence of a study on the relationship between financial inclusion and income disparity in Türkiyemotivated us to investigate this topic.

The goal of this research is to assess the link between financial inclusion and income disparity, along with other control variables, by using the VAR method over the period 2010–2021 in Türkiye. The findings indicate that the impact of financial inclusion on income distribution is negative and significant. More clearly, an improvement in financial inclusion is associated with more equitable distribution of income. These findings are consistent with the studies by Kim (2016); Le et al. (2019); Ouechtati (2020); and Khan et al. (2022). When financial inclusion is used as a dependent variable, gini index does not show a significant effect on financial inclusion, showing that a more equal distribution of income does not play a significant role in improvements of financial inclusion. The granger causality test is also applied to specify the direction of causality among four variables. The findings reveal that financial inclusion granger causes the Gini index, but gini index does not granger cause financial inclusion. To put it more clearly, there is a unidirectional causality that runs from financial inclusion to income distribution.

In light of the findings of this research, it can be stated that, in order to reduce income inequality, financial inclusion should be enhanced, particularly for the lowest-income group. However, our study is limited to Türkiyeas a whole. Further research should shed light on whether the impact of financial inclusion on income distribution differs from city to city in Türkiye. Furthermore, the link between financial inclusion and income inequality in Türkiyecould be compared to that of other developing nations. Finally, this research can be expanded by employing different techniques and control variables.

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KATKI ORANI/ CONTRIBUTION RATE AÇIKLAMA	AÇIKLAMA / EXPLANATION	KATKIDA BULUNANLAR / CONTRIBUTORS
Fikir veya Kavram / Idea or Notion	Araştırma hipotezini veya fikrini oluşturmak / Form the research hypothesis or idea	Asst. Prof. (Ph.D.) Nevzat ÇALIŞ Emre GÖKÇELİ
Tasarım / Design	Yöntemi, ölçeği ve deseni tasarlamak / Designing method, scale and pattern	Asst. Prof. (Ph.D.) Nevzat ÇALIŞ Emre GÖKÇELİ
Veri Toplama ve İşleme / Data Collecting and Processing	Verileri toplamak, düzenlenmek ve raporlamak / Collecting, organizing and reporting data	Asst. Prof. (Ph.D.) Nevzat ÇALIŞ Emre GÖKÇELİ
Tartışma ve Yorum / Discussion and Interpretation	Bulguların değerlendirilmesinde ve sonuçlandırılmasında sorumluluk almak / Taking responsibility in evaluating and finalizing the findings	Asst. Prof. (Ph.D.) Nevzat ÇALIŞ Emre GÖKÇELİ
Literatür Taraması / Literature Review	Çalışma için gerekli literatürü taramak / Review the literature required for the study	Asst. Prof. (Ph.D.) Nevzat ÇALIŞ Emre GÖKÇELİ

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