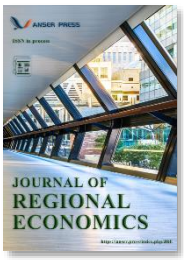
Journal of Regional Economics

Homepage: https://www.anserpress.org/journal/jre



Effects of Financial Inclusion on Economic Growth: Evidence from MENA Countries

A. Talha Yalta [a] , A. Yasemin Yalta [b,*]

[a] *Department of Economics, TOBB University of Economics and Technology, Ankara, Turkey*

[b] *Department of Economics, Hacettepe University, Ankara, Turkey*

ABSTRACT

In recent years, financial inclusion has taken center stage in policy discussions regarding achieving higher growth rates and reducing poverty levels. The existing literature analyzing the relationship between financial inclusion and GDP growth mostly assumes a one-way relation from financial inclusion to GDP, often ignoring potential reverse causality. Furthermore, the literature commonly adopts a financial inclusion index, or focuses on specific indicators such as the number of bank branches, ATMs or the share of people having an account. Because financial inclusion encompasses multiple dimensions, it is important to analyze the causal linkages between different financial inclusion indicators and GDP. In this paper, we analyze the nature and the direction of the causality between GDP and a large number of financial inclusion indicators for MENA (Middle East and North Africa) countries by adopting the recently developed nonlinear and nonparametric Kernel causality approach. Our analysis suggests that financial inclusion increases as the share of women having bank accounts increases. It also increases with the share of adults with primary education having an account and the share of adults having a mobile account. We also identify the relationship between main barriers to financial inclusion and GDP, and find that affordability and having insufficient funds are associated with GDP.

KEYWORDS

Financial Inclusion; Economic Growth; Kernel Causality; Middle East and North Africa

* Corresponding author: A. Yasemin Yalta
E-mail address: yyalta@hacettepe.edu.tr

ISSN 2972-3434
doi: 10.58567/jre03010004

Received 26 June 2024; Accepted 22 October 2024; Available online 10 January 2025; Version of Record 15 March 2024

1. Introduction

Financial inclusion refers to the "access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way" (World Bank, 2021). Improving financial inclusion to achieve higher growth rates and eradicate poverty has gained considerable attention as a policy agenda in recent years. The World Bank emphasizes the importance of financial inclusion as an important tool to reduce poverty (World Bank, 2021). Furthermore, G20 Finance Ministers and Central Bank Governors committed to facilitating financial inclusion worldwide in the G20 meeting held in Germany in 2017 (Global Partnership for Financial Inclusion (GPFI), 2021). The literature highlights the potential benefits of financial inclusion by enabling households to obtain the necessary funds to undertake new investment projects, providing funds for emergency situations, and facilitating the pooling of financial resources in financial markets. Moreover, financial inclusion is found to positively affect economic growth (Demirgüç-Kunt and Levine 2009; Demirgüç-Kunt et al., 2017; Sharma, 2016; Lenka and Sharma, 2017; Sethi and Sethy, 2018; Gul et al., 2018) and reduce income inequality (Lan and Thuong, 2019; Ouechtati, 2020). As a result, it is important both theoretically and practically to understand the relationship between financial inclusion and GDP.

In theory, the causal relationship between financial inclusion and GDP can run in either direction. On the one hand, according to the "finance-led growth hypothesis", financial inclusion can stimulate growth by increasing capital accumulation. On the other hand, an increase in GDP can increase access to financial services and thereby lead to higher financial inclusion. A two-way relationship between these variables is also possible. Furthermore, it is also possible that a causal relationship between financial inclusion and economic growth does not exist, supporting the so-called "neutrality hypothesis". Although the relationship between financial inclusion and economic growth has been a subject of various studies, most assume a one-way causal relationship from financial inclusion to economic growth, ignoring possible reverse causality.

Applying a Granger Causality analysis, Sharma (2016) finds that the number of deposits and loan accounts increase economic growth in India. Sethi and Acharya (2018) examine the relationship between financial inclusion and economic growth for 31 countries for the period between 2004-2010 and using a panel causality analysis, they document that there is a bidirectional causality between financial inclusion and economic growth. Using annual data between 2004-2017 for SAARC (South Asian Association for Regional Cooperation) countries, Singh and Stakic (2021) suggest that there is bidirectional causality between financial inclusion and economic growth in the sample countries. Van et al. (2021) use three indicators of financial inclusion, namely the number of commercial bank branches per 100,000 adults, the number of ATMs per 100,000 adults, and the ratio of bank credit for private sector to GDP for the measurement of financial inclusion and apply fixed effect regression with a robust error of heteroscedasticity and provide evidence for the positive relation between financial inclusion and economic growth. Boukhatem and Moussa (2023) examine the impact of financial inclusion and institutional quality on economic growth for MENA countries for the 1997-2018 period and conclude that financial inclusion does not affect economic growth. Nizam et al. (2020) and Karim et al. (2022) consider the nonlinear relationship between financial inclusion and economic growth and reveal that financial inclusion exhibits a nonlinear relation with economic growth. Afonso and Arana (2024) analyze the effect of different dimensions of financial inclusion namely usability, accessibility, concentration of banks, and availability and argue that not all dimensions affect economic growth similarly.

It is especially crucial to analyze the relation between economic growth and financial inclusion in MENA countries.

The MENA region has distinct socio-economic characteristics, financial structures, and policy environments that influence financial inclusion as well as economic growth differently compared to other regions. By concentrating on MENA countries, our study aims to provide tailored insights and policy recommendations that address the region's specific challenges and opportunities, thus adding significant value to the existing literature.

However, despite the efforts to adopt various policies towards financial inclusion (Cama et al., 2022), financial inclusion in this region lags behind other regions. Surprisingly, there are only a few papers examining the link between financial inclusion and economic growth in MENA countries. Yones (2018) assesses the relationship between financial inclusion and growth for MENA countries and finds that financial inclusion as measured by the number of ATMs, number of depositors, number of borrowers, number of accounts and credit as a percentage of GDP has a positive effect on GDP. Emara and El Said (2020) also explores the relation between financial inclusion and economic growth for MENA countries employing a GMM analysis. By using the number of bank accounts (per 1000 adult population), bank accounts for corporates/enterprises, and the number of bank branches and ATMS (per 100,000 people) and the percentage of firms using banks to measure financial inclusion, they find that financial inclusion is positively associated with GDP growth rate in the sample countries. Cama et al. (2022) find that financial inclusion in MENA region is positively associated with the size of gross capital formation in industries with low R&D expenditures. In a recent study, Boukhatem and Moussa (2023) examine the impact of financial inclusion and institutional quality on economic growth for 16 MENA countries for 1997-2018 period and conclude that financial inclusion does not have any effect on economic growth in MENA countries because of the low level of financial inclusion.

Reviewing the existing literature, two observations can be made. First, it is seen that most of the earlier studies on the financial inclusion and economic growth nexus assume a one-way causal relationship from financial inclusion to economic growth, ignoring any possible reverse causality between these two variables. Second, the majority of the studies consider only a few indicators of financial inclusion. This is because data on financial inclusion was limited to country-specific survey evidence on some financial access indicators such as the number of bank branches, ATMs and account penetration (Beck, 2016). However, financial inclusion is a broad concept with multitude of dimensions and the construction of Global Financial Index has made it feasible to undertake a more detailed analysis. According to Global Financial Inclusion Index (Demirgüç-Kunt et al., 2018), financial inclusion is composed of seven categories each of which has several other sub-sections. These indicators are related with account information, saving at a financial institution, debit card ownership, borrowing as well as credit card ownership. The subcategories are also divided on the basis of gender, age, education and the income level. Examining the relationship between these subcategories and GDP growth can potentially provide a wealth of information useful to policy makers. However, such analysis has not been undertaken until today due to data limitations.

In this paper, we analyze the nature and the direction of the causality between economic growth and a large number of financial inclusion indicators for MENA countries by adopting the recently developed nonlinear and nonparametric Kernel causality approach. In order to address the aforementioned gaps in the literature, we offer two novel contributions to extend our current understanding of financial inclusion and economic growth nexus. First, we analyze the causal relationship between multiple indicators of financial inclusion and GDP growth to assess which aspects matter the most for economic growth, so that policy makers can design policies accordingly. We especially focus on the causal effects of the number of bank accounts, digital financial inclusion as well as barriers to financial inclusion because these dimensions are highlighted as the most important dimensions in the MENA countries.

Our second contribution is methodological. In our study, we adopt a recently developed nonlinear and nonparametric kernel causality approach. To our knowledge, this is the first empirical research to utilize kernel causality in this field. This advanced approach makes it possible to avoid the data limitations that normally encumber analysis for MENA countries and provides a comprehensive and robust framework to establish causal linkages. Its main advantage over the traditional Granger causality is the ability to perform causality analysis using cross-sectional data with a relatively limited number of observations. Consequently, this approach makes it possible

to explore the causal effects between many different dimensions of financial inclusion with GDP, which could not be studied in the previous literature.[1]

The rest of the paper is organized as follows: Section 2 describes our methodology and data, section 3 presents empirical results and section 4 concludes.

2. Data and Empirical Methodology

2.1. Data

To measure financial inclusion, we rely on Global Findex database (Demirgüç-Kunt et. al., 2017), which is the most comprehensive data set providing information on the use of financial services based on national surveys. This unique database has been published every three years since 2011, providing financial inclusion data for 2011, 2014, and 2017. While most of the previous indicators of financial inclusion focus on the access to financial services by considering only supply-side indicators, the Global Findex data measures the use of financial services, which includes both demand and supply factors (Demirgüç-Kunt et al., 2018). The data consists of three broad categories namely formal accounts, borrowing behavior, and saving behavior. Indicators on account numbers provide information on the mode of access, barriers to account use, and alternatives to formal accounts (Demirgüç-Kunt et al., 2018). These are also provided in the subcategories of gender, age and income levels. In order to analyze these features in a systematic way, we focus on three main categories namely: account numbers, digital financial inclusion and barriers to financial inclusion.

Our analysis involves conducting a kernel causality analysis of a large group of indicators of financial inclusion for 19 MENA countries including Türkiye and Iran[2]. The primary variable of concern is GDP. We use purchasing power parity adjusted GDP in constant 2017 dollars, obtained from the World Bank (2021).

2.2. Methodology

To examine the relationship between financial inclusion and GDP growth, we adopt a kernel causality analysis. Kernel causality, or instantaneous causality, states that a variable *X* instantaneously causes another variable *Y* if the present value of *Y* is *better predicted* when the present value of *X* is included in the prediction than if it is not. This powerful concept has so far received limited attention due to the difficulty of its implementation with the traditional regression methods. However, thanks to advances in econometric theory and increased computational capacity, it has recently become viable to implement kernel causality using computer-intensive nonparametric and nonnormal conditional densities. Recently, Vinod (2017) proposed a method to implement kernel causality by adopting the concept of generalized measure of correlation (GMC) developed by Zheng et al. (2012). This analytical framework depends on the comparison of the coefficient of determinations obtained from two-way non-parametric "kernel regressions" (Fousekis, 2020). The advantage of using kernel regressions is their ability to provide a superior fit measured by the squared Pearson correlation coefficient between the observed and the kernel-fitted values (Vinod, 2019). The approach has been already adopted by Allen and Hooper (2018), Lister and Garcia (2018), Vinod (2019), and Fousekis (2020) for different applications in economics and finance. Furthermore, Lister and Garcia (2018) discuss that this method of generalized meausure of correlation is the most accurate to date in terms of correctly identifying causality in the CauseEffectPairs benchmark database with a success rate of 70–75 per cent.

[1] It is important to note that, like the other statistical methods used in the existing literature, such as the Granger causality tests, our kernel causality approach can only demonstrate correlations and suggest predictive relationships, but it cannot certify underlying causal mechanisms. For further information, the reader is referred to Vinod (2017).

[2] The countries included in the analysis are as follows:Algeria, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Liberia, Libya, Morocco, Oman, Qatar, Saudi Arabia, Syrian Arab republic, Tunisia, Turkey, Yemen, United Arab Emirates.

Following Fousekis (2020) and Vinod (2017), our framework for kernel causality approach is based on the following two regressions:

$$Y = g(X) + \mathcal{E} = E_{YX} + \mathcal{E} \tag{1}$$

$$X = g'(Y) + \mathcal{E}_i' = E_{XY} + \mathcal{E}' \tag{2}$$

Where $g(X)$ and $g'(Y)$ are nonparametric and unspecified nonlinear functions. Computations of (1) and (2) can be done using the Nadaraya-Watson kernel regression method (Nadaraya,1965; Watson, 1964). For the nonparametric Nadaraya-Watson regressions, the coefficient of determination R^2 is calculated following Hayfield and Racine (2008):

$$R_{YX}^2 = \frac{\left[\sum_{t=1}^{T}(Y_t - \bar{Y})(Y_t - \overline{Y})\right]^2}{\sum_{t=1}^{T}(Y_t - \bar{Y})^2 \sum_{t=1}^{T}(Y_t - \overline{Y})^2} \tag{3}$$

R_{YX}^2 lies in the range of (0,1) and it is similar to the standard coefficient of determination for linear regression models fitted with least squares and includes an intercept term (Fousekis, 2020). The signed square root of R_{YX}^2 gives the generalized measure of correlation between the variables and can be represented as follows:

$$GMC_{YX} = sign\,(_{YX})(R_{YX}) \tag{4}$$

$$GMC_{YX} = sign\,(_{XY})(R_{XY}) \tag{5}$$

The difference between two population R^2 values is denoted by δ:

$$\delta = GMC_{XY} - GMC_{YX} \tag{6}$$

Based on Equation (6), kernel causality is formally defined as follows:

$$\begin{array}{llll} If\ \delta > 0, & GMC_{YX} > GMC_{XY}, & Y\ kernel\ causes\ X, Y\ better\ predicts\ X\ than\ vice\ versa \\ If\ \delta = 0, & GMC_{YX} = GMC_{XY}, & kernel\ cause\ is\ bidirectional \\ If\ \delta > 0, & GMC_{YX} < GMC_{XY}, & X\ kernel\ causes\ Y, X\ better\ predicts\ Y\ than\ vice\ versa \end{array} \tag{7}$$

To test the statistical significance of $\hat{\delta}$, we employ the modified *t* test proposed by Vinod (2017). If the test result is significant, H_0: δ = 0 is rejected, implying a one way causality from X to Y or Y to X depending on the value of δ.

3. Empirical Findings

We analyze the causal path between different dimensions of financial inclusion and GDP growth, presenting our results in a set of three tables. The preliminary analysis begins with using Pearson's correlation analysis to look for the existence of a relationship between the two variables. The Pearson coefficient of correlation varies between -1 and +1, in which higher values represent stronger correlation. If the correlation is equal to zero, this means that there is no connection between the variables, suggesting no causality. A statistically significant Pearson correlation implies that there is a connection between the variables. However, because Pearson's correlation does not reveal the direction of causality, in the subsequent step we utilize the nonparametric kernel causality approach in order to capture the asymmetric responses and identify the direction of causality as per (7). The nonparametric kernel regressions are undertaken using the "np" R library provided by Racine and Hayfield (2018), while the test statistics are computed with the "generalCorr" R library by Vinod (2017b).

In the first two columns of Table 1 to Table 3, we provide the Pearson correlation coefficients along with their p-values. In columns 3-7, kernel causality estimations are presented. The final column shows the direction of the causality, if it exists.

3.1. Causal Paths between Account Numbers and GDP

In the first part of our empirical analysis, we explore the causal paths between account numbers and GDP. More specifically, we examine whether the subcategories provided on the basis of gender, age, education and income level are positively related with GDP. Table 1 illustrates the results of Kernel causality tests for the various indicators of account information and gross domestic product. The first two columns indicate that there is a correlation between most of the financial inclusion variables and GDP. Therefore, we can proceed with testing the existence of kernel causality. Columns 3 and 4 present generalized measures of correlation between X and Y GMC_{XY}, and Y and X and GMC_{YX} respectively. The next column shows the difference between these values. We check whether the sign of δ is positive or negative to identify kernel causality. The last column provides p value. If the value in the column entitled `p-value' exceeds 0.05, we fail to reject the null hypothesis: X;Y = 0 at the 5% level.

Table 1. Kernel causality between use of accounts and GDP.

	PEARSON CORR		KERNEL CORR						
GDP per capita, PPP, constant 2017 int. 1000USD	t-stat1	p-value1	GMCyx	GMCxy	δ	t-stat2	p-value2		Cause
Account (% age 15+)	1,872	0,034	0,767	0,726	0,041	-0,582	0,564		Bidirectional
Account, male (% age 15+)	1,828	0,037	0,272	0,728	-0,456	3,376	0,002	**	Y → X
Account, in labor force (% age 15+)	2,006	0,026	0,570	0,491	0,080	-0,626	0,535		Bidirectional
Account, out of labor force (% age 15+)	0,762	0,225	0,304	0,626	-0,322	2,174	0,036	**	No causality
Account, female (% age 15+)	1,418	0,082	0,950	0,680	0,271	-6,406	0,000	***	X → Y
Account, young adults (% ages 15-24)	0,885	0,191	0,248	0,676	-0,428	2,928	0,006	**	No causality
Account, older adults (% ages 25+)	2,066	0,022	0,788	0,724	0,064	-0,942	0,352		Bidirectional
Account, primary education or less (% ages 15+)	1,723	0,046	0,880	0,648	0,231	-3,633	0,001	***	X → Y
Account, secondary education or more (% ages 15+)	1,637	0,055	0,578	0,591	-0,013	0,122	0,904		Bidirectional
Account, income, poorest 40% (% ages 15+)	2,024	0,025	0,771	0,682	0,089	-1,150	0,257		Bidirectional
Account, income, richest 60% (% ages 15+)	1,598	0,059	0,592	0,715	-0,123	1,264	0,214		Bidirectional
Account, rural (% age 15+)	2,243	0,015	0,349	0,713	-0,364	2,757	0,009	**	Y → X
Financial institution account (% age 15+)	1,868	0,034	0,810	0,733	0,077	-1,201	0,237		Bidirectional
Financial institution account,male(% age 15+)	1,833	0,037	0,272	0,733	-0,461	3,435	0,001	**	Y → X
Financial institution account, in labor force(% age 15+)	2,002	0,026	0,604	0,706	-0,102	1,053	0,299		Bidirectional
Financial institution account, out of labor force (% age 15+)	0,747	0,230	0,312	0,639	-0,328	2,249	0,030	**	No causality
Financial institution account,female(% age 15+)	1,402	0,084	0,935	0,661	0,274	-5,616	0,000	***	X → Y
Financial institution account,young adults(% age 15-24)	0,897	0,188	0,264	0,688	-0,424	2,975	0,005	**	No causality
Financial institution account, older adults(% age 25+)	2,068	0,022	0,996	0,709	0,287	-15,069	0,000	***	X → Y
Financial institution account, primary education or less(% age 15+)	1,740	0,045	0,882	0,650	0,231	-3,664	0,001	***	X → Y
Financial institution account, seconday education or more(% age 15+)	1,669	0,051	0,619	0,617	0,002	-0,018	0,986		Bidirectional
Financial institution account,income,poorest 40% (% age 15+)	2,020	0,025	0,805	0,702	0,103	-1,475	0,148		Bidirectional
Financial institution account,income,richest 60% (% age 15+)	1,589	0,060	0,622	0,723	-0,101	1,094	0,280		Bidirectional
Financial institution account, rural(% age 15+)	2,235	0,016	0,547	0,720	-0,173	1,646	0,108		Bidirectional
Withdrawal in the past year (% with a financial institution account, age 15+)	1,339	0,096	0,534	0,219	0,316	-1,501	0,145		Bidirectional
Main mode of withdrawal: ATM (% with a financial institution account, age 15+)	-1,651	0,060	-0,392	-0,764	-0,372	1,895	0,079	*	Y → X
Main mode of withdrawal: bank teller (% with a financial institution account, age 15+)	2,627	0,010	0,575	0,858	-0,284	2,100	0,056	*	Y → X

In Table 1, the null hypothesis that the financial inclusion indicator does not Kernel-cause GDP is rejected for five of the variables. The causal relationship seems to be insignificant for four variables and there exists bidirectional relation for the rest of the variables. There are a few striking observations revealed by the analysis. First of all, the share of women who have an account kernel causes GDP. It is known that women do not have formal accounts in most developing countries (Aterito et al., 2011). This is also true for most of the MENA countries, in which almost 13 percent of females has an account at a financial institution (Demirgüç-Kunt et al., 2018). Therefore, increasing the share of women having access to formal accounts may positively affect GDP in these countries. On the other hand, in terms of the share of male adults having an account, causality runs from GDP to financial inclusion.

Furthermore, the results confirm that there is unidirectional causality from the share of adults having an account with primary education to GDP. When the causality path is investigated between different income groups and GDP, it is seen that there is a bidirectional relation.

3.2. Causal Paths between Digital Financial Inclusion and GDP

The second set of indicators we use is related to the access to and use of digital technologies. It is argued that digital financial inclusion can enhance the ease of access to and availability of formal financial services (Rekha et al., 2021). With the advancement of digital technologies, people can easily perform financial transactions through mobile phones. The results suggest that having a mobile money account kernel-causes GDP. The data also show that the causality runs from the share of females having a mobile money account to GDP. Thus, it is important to reduce the gender gap in financial inclusion. Similar to the previous analysis, we also observe that share of adults having a mobile account with primary education is also positively related to GDP growth. Because people with primary education may not have sufficient technical knowledge regarding the financial services, improving financial literacy may help these people integrate into the financial system, which would, in turn help increase GDP. Finally, the findings indicate that the share of adults having a mobile money account in rural areas kernel-causes GDP as well.

Table 2. Kernel causality between digital accounts and GDP.

	PEARSON CORR		KERNEL CORR						
GDP per capita, PPP, constant 2017 int. 1000USD	t-stat1	p-value1	GMCyx	GMCxy	δ	t-stat2	p-value2		
Mobile money account (% age 15+)	1,463	0,083	0,815	0,095	0,720	-3,043	0,009	**	X → Y
Mobile money account, male (% age 15+)	1,310	0,106	0,823	0,069	0,754	-3,178	0,007	**	Indeterminite
Mobile money account, in labor force (% age 15+)	1,169	0,131	1,000	0,043	0,957	-7,752	0,000	***	Indeterminite
Mobile money account, out of labor force (% age 15+)	0,674	0,256	0,879	0,174	0,705	-3,632	0,003	**	Indeterminite
Mobile money account, female (% age 15+)	1,537	0,073	0,814	0,284	0,530	-2,572	0,023	**	X → Y
Mobile money account, young adults (% age 15-24)	0,272	0,395	0,992	0,080	0,912	-7,187	0,000	***	Indeterminite
Mobile money account, older adults (% age 25+)	1,800	0,047	0,433	0,183	0,250	-0,777	0,451		Bidirectional
Mobile money account, primary education or less (% age 15+)	1,451	0,084	0,992	0,675	0,318	-7,604	0,000	***	X → Y
Mobile money account, secondary education or less (% age 15+)	0,947	0,180	0,995	0,307	0,688	-7,540	0,000	***	Indeterminite
Mobile money account, income, poorest 40% (% age 15+)	1,303	0,107	0,988	0,325	0,663	-6,938	0,000	***	Indeterminite
Mobile money account, income, richest 60% (% age 15+)	1,645	0,061	0,402	0,127	0,276	-0,815	0,430		Bidirectional
Mobile money account, rural (% age 15+)	1,590	0,067	0,957	0,168	0,789	-5,410	0,000	***	X → Y
Made digital payments in the past year (% age 15+)	2,033	0,026	0,674	0,758	-0,084	0,845	0,406		Bidirectional
Made digital payments in the past year, male (% age 15+)	1,958	0,030	0,764	0,769	-0,005	0,057	0,955		Bidirectional
Made digital payments in the past year, in labor force (% age 15+)	1,779	0,043	0,661	0,756	-0,095	0,935	0,358		Bidirectional
Made digital payments in the past year, out of labor force (% age15+)	1,102	0,140	0,887	0,611	0,276	-3,320	0,003	**	Indeterminite
Made digital payments in the past year, female (% age 15+)	1,641	0,056	0,546	0,745	-0,199	1,598	0,122		Bidirectional
Made digital payments in the past year, young adults (% age 15-24)	1,242	0,112	0,433	0,701	-0,268	1,779	0,087	*	Indeterminite
Made digital payments in the past year, older adults (% age 25+)	2,060	0,025	0,678	0,799	-0,121	1,310	0,202		Bidirectional
Made digital payments in the past year, primary education or less (% age 15+)	2,437	0,011	0,676	0,394	0,281	-1,743	0,093	*	X → Y
Made digital payments in the past year, secondary education or more (% age 15+)	1,735	0,047	0,752	0,746	0,006	-0,074	0,941		Bidirectional
Made digital payments in the past year, income, poorest 40% (% age 15+)	2,158	0,020	0,719	0,742	-0,023	0,252	0,803		Bidirectional
Made digital payments in the past year, income, richest 60% (% age 15+)	1,930	0,032	0,647	0,801	-0,155	1,589	0,124		Bidirectional
Made digital payments in the past year, rural (% age 15+)	2,344	0,013	0,739	0,706	0,032	-0,341	0,736		Bidirectional

In this category, we also analyze the causality between GDP and digital payments made. The literature documents the importance of structural factors, such as information and communication technology (ICT) and policy related factors in improving financial inclusion (Rekha et. al., 2021). The kernel causality analysis shows that the share of adults made digital payments with primary education kernel-causes GDP. However, causality runs from GDP to the share of adults in rural areas making digital payments. For the rest of the variables, we see a bidirectional relation for most of the time indicating that an increase in GDP will be associated with increases in the use of digital platforms and vice versa. In terms of internet use, it is observed that the share of old people using the internet kernel- causes GDP. Similarly, an increase in the share of poor adults using the internet leads to a rise in GDP. The results also suggest that an increase in GDP leads to a rise in the share of adults using the internet, share

of adults in rural areas using the internet, the share of older adults using the internet, and share of adults using the internet living in rural areas.

3.3. Causal Paths between Barriers to Financial Inclusion and GDP

We now consider whether barriers to financial inclusion kernel-cause GDP. The main barriers to financial inclusion identified in global findex database involve affordability, physical distance, lack of necessary documentation, having insufficient funds, trust in financial institutions and religious reasons. It is evident from the table that there is unidirectional causality running from affordability and having insufficient funds to GDP. Our findings are in line with previous research. The literature suggests that the two most common reasons for not having a formal account are the lack of enough money to use one and the affordability of bank accounts because the account is too expensive (Demirgüç Kunt and Klapper, 2018). Therefore, policies directed at reducing the cost of financial services such as transaction costs and fees may help increase both financial inclusion and GDP.

Table 3. Kernel causality between barriers to financial inclusion and GDP.

	PEARSON CORR		KERNEL CORR						
GDP per capita, PPP, constant 2017 int. 1000USD	t-stat1	p-value1	GMCyx	GMCxy	δ	t-stat2	p-value2		
No account because financial institutions are too far away (% age 15+)	-0,921	0,188	-0,498	-0,539	-0,041	0,167	0,870		Indeterminite
No account because financial institutions are too far away (% without a financial institution account, age 15+)	-0,159	0,438	-0,498	-0,271	0,228	-0,718	0,488		Indeterminite
No account because financial services are too expensive (% age 15+)	-1,473	0,083	-0,983	-0,695	0,288	-5,505	0,000	***	X → Y
No account because financial services are too expensive (% without a financial institution account, age 15+)	-0,655	0,262	-0,320	-0,571	-0,251	0,865	0,405		Indeterminite
No account because of lack of necessary documentation (% age 15+)	-1,196	0,127	-0,326	-0,579	-0,253	0,880	0,398		Indeterminite
No account because of lack of necessary documentation (% without a financial institution account, age 15+)	0,847	0,207	0,238	0,070	0,167	-0,417	0,684		Indeterminite
No account because of lack of trust in financial institutions (% age 15+)	-1,478	0,083	-0,619	-0,673	-0,054	0,291	0,777		Bidirectional
No account because of lack of trust in financial institutions (% without a financial institution account, age 15+)	-1,073	0,152	-0,888	-0,622	0,265	-2,136	0,056	*	Indeterminite
No account because of religious reasons (% age 15+)	-1,720	0,056	-0,632	-0,748	-0,116	0,697	0,500		Bidirectional
No account because of religious reasons (% without a financial institution account, age 15+)	-0,952	0,180	-0,686	-0,476	0,211	-0,940	0,367		Indeterminite
No account because of insufficient funds (% age 15+)	-1,876	0,043	-0,988	-0,921	0,066	-3,491	0,005	**	X → Y
No account because of insufficient funds (% without a financial institution account, age 15+)	-1,305	0,108	-0,677	-0,906	-0,229	2,186	0,051	*	Indeterminite
No account because someone in the family has an account (% age 15+)	-0,697	0,250	-0,567	-0,477	0,090	-0,363	0,724		Indeterminite
No account because someone in the family has an account (% without a financial institution account, age 15+)	1,381	0,096	0,370	0,603	-0,233	0,860	0,408		Bidirectional
No account because of no need for financial services ONLY (% age 15+)	-0,960	0,178	-0,755	-0,688	0,067	-0,449	0,662		Indeterminite
No account because of no need for financial services ONLY (% without a financial institution account, age 15+)	-0,350	0,366	-0,762	-0,678	0,084	-0,557	0,589		Indeterminite

4. Conclusion and Policy Implications

In the MENA region, financial inclusion has been a policy agenda toward achieving higher growth rates and lowering poverty levels. Therefore, a literature has emerged analyzing the relationship between financial inclusion and GDP. However, most of the previous studies either use a financial inclusion index or focus on a small number of indicators for which time series data are available. Financial inclusion is a broader concept and the latest database provided by the World Bank makes it possible to identify many subcategories of financial inclusion. Analyzing the causal relationship between these financial inclusion indicators and GDP can provide a wealth of information useful for designing effective policy solutions. While it is not possible to examine these relationships using the traditional Granger causality tests due to data limitations, a recently developed advanced method, namely Kernel causality, provides a viable approach. Kernel causality, or instantaneous causality, states that a variable X instantaneously

causes another variable Y if the present value of Y is better predicted when the present value of X is included in the prediction than if it is not. In this paper, we perform this analysis by employing a large number of measures of financial inclusion in order to identify the priority areas of improvement and facilitate effective policy making.

Our results offer important insights regarding the financial inclusion and growth nexus in the MENA region. First, we find that not all indicators of financial inclusion have a significant effect on GDP. Specifically, the results show that gender gap is an important factor and share of women having a formal account kernel causes economic growth. Furthermore, the results suggest that share of adults having an account with primary education positively affects GDP as well. Therefore, attempts to reduce gender gap in financial services and improving education level should be a priority for the governments. Also, promoting better education policies, supporting higher degree education and increasing financial literacy can provide important tools to increase financial inclusion as well. For example, in order to increase the number of women having an account, employers may be required to pay wages to the bank accounts of women employees (Sing et al., 2021).

Secondly, when the causality path is investigated between different income groups and GDP, it is seen that there generally exists a bidirectional relationship. Similarly, we observe bidirectional causality between various indicators of digital financial inclusion and GDP growth, indicating that policies aimed at increasing economic growth may contribute to higher levels of financial inclusion.

Our results also unveil that having a mobile money account and the share of adults having a mobile account with primary education are also positively related with GDP. Hence, enhancing access to digital technologies should be center of policies aimed at improving financial inclusion. These can be in the form of developing a free high speed Internet infrastructure, encouraging digital device ownership as well as various incentives towards digital account usage. We also identify the relationship between the main barriers to financial inclusion and GDP, and document that affordability and having insufficient funds are the two main culprits. Reducing the fees on certain financial services and making them more available may help increase financial inclusion. In this sense, policies should be developed to encourage competition in the banking system towards to achieve lower fees.

In conclusion, it is our understanding that implementing policies to enhance specific dimensions of financial inclusion can lead to higher economic growth in MENA countries. Furthermore, the findings of this research can help researchers develop better economic models based on the most relevant determinants of financial inclusion, improving the quality of future empirical results.

Funding Statement

This research received no external funding.

Acknowledgments

This work was sponsored by the Economic Research Forum (ERF) and has benefited from both financial and intellectual support. The contents and recommendations do not necessarily reflect the ERF's views. The authors would like to thank the anonymous reviewers for extremely useful comments and suggestions.

Conflict of interest

All the authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

Author contributions

Conceptualization: Both authors; Investigation: Both authors; Methodology: Both authors; Writing: Both

authors; Review & editing: Both authors.

References

Allen, D., and Hooper, V. (2018). Generalized Correlation Measures of Causality and Forecasts of the VIX Using Non-Linear Models. *Sustainability, 10*(8), 2695. MDPI AG. Retrieved from http://dx.doi.org/10.3390/su10082695

António, A., Blanco-Arana, M. C. (2024). Does financial inclusion enhance per capita income in the least developed countries?. *International Economics, 177*, 100479. https://doi.org/10.1016/j.inteco.2024.100479

Aterido, R., T. Beck, and L. Iacovone. (2011). Gender and Finance in Sub-Saharan Africa: Are Women Disadvantaged? Policy Research Working Paper 5571, World Bank, Washington, DC. https://hdl.handle.net/10986/3338

Beck, T. (2016). Financial Inclusion-measuring progress and progress in measuring. Paper presented at the fourth IMF statistical forum, "Lifting the Small Boats: Statistics for inclusion growth," Washington, DC. https://www.imf.org/external/np/seminars/eng/2016/statsforum/pdf/beck_paper.pdf

Boukhatem, J., and Ben Moussa, F. (2023). Financial inclusion, institutional quality, and economic growth in MENA countries: some evidence from panel cointegration. *Macroeconomics and Finance in Emerging Market Economies,* 1–24. https://doi.org/10.1080/17520843.2023.2284455

Cama, Freddy A., and Rojas, Noha Emara. (2022). Financial inclusion and gross capital formation: A sectoral analysis approach for the MENA region and Ems. *International Review of Financial Analysis*, 79, 101993. https://doi.org/10.1016/j.irfa.2021.101993

Demirgüç-Kunt, A., L. Klapper, and D. Singer. (2017). Financial Inclusion and Inclusive Growth: A Review of Recent Empirical Evidence. Policy Research Working Paper, No. 8040. World Bank, Washington, DC. http://documents.worldbank.org/curated/en/403611493134249446/Financial-inclusion-and-inclusive-growth-a-review-of-recent-empirical-evidence

Demirguc-Kunt, A., Klapper, L., Singer, D., Ansar, S., and Hess, J. (2018). Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution. Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/29510

Demirgüç-Kunt, A., and R. Levine. (2009). Finance and Inequality: Theory and Evidence. *Annual Review of Financial Economics, 1* (1): 287–318. https://www.jstor.org/stable/42939942

Emara, N. and El Said, A. (2020). Financial inclusion and economic growth: The role of governance in selected MENA countries. Munich personal RePEc archive, MPRA Paper No. 99257. https://mpra.ub.uni-muenchen.de/99257/

Global Partnership for Financial Inclusion (GPFI). (2021). https://www.gpfi.org/about-gpfi accessed on 10.10.2021

Gul, F., Usman, M., and Majeed, M. T. (2018). Financial Inclusion and Economic Growth: A Global Perspective. *Journal of Business and Economics, 10*(2), 133-152. https://doi.org/10.62500/jbe.v10i2.113

Hayfield, T. and Racine, J. S. (2008). Nonparametric Econometrics: The np Package. *Journal of Statistical Software, 27*, 1 (32). http://www.jstatsoft.org/v27/i05/

Karim, Z.A., Rosmah Nizam, Siong Hook Law, M., and Kabir Hassan. (2022). Does Financial Inclusiveness Affect Economic Growth? New Evidence Using a Dynamic Panel Threshold Regression, *Finance Research Letters*, 46, Part A, 102364, ISSN 1544-6123. https://doi.org/10.1016/j.frl.2021.102364

Lan, H. H., Thuong, P. T. H. (2019). Financial Inclusion and Income Inequality: Empirical Evidence From Transition Economies. *Journal of Economics and Development, 21*: 23-34. https://vjol.info.vn/index.php/KTQD/article/view/42454

Lenka, S. K., and Sharma, R. (2017). Does financial inclusion spur economic growth in India? *The Journal of Developing Areas, 51*(3), 215–228. https://doi.org/10.1353/jda.2017.0069

Nadaraya, E. A. (1964). On Estimating Regression. Theory of Probability and Its Applications. 9 (1): 141–2. https://doi.org/10.1137/1109020

Nizam, R., Karim, Z. A., Rahman, A. A., and Sarmidi, T. (2020). Financial inclusiveness and economic growth: new evidence using a threshold regression analysis. *Economic Research-Ekonomska Istraživanja, 33*(1), 1465–1484. https://doi.org/10.1080/1331677X.2020.1748508

Rekha, G., Rajamani, K., and G. Resmi. (2021). Digital Financial Inclusion, Economic Freedom, Financial Development, and Growth: Implications from a Panel Data Analysis. ADBI Working Paper 1244. Tokyo: Asian Development Bank Institute. https://www.adb.org/publications/digital-financial-inclusion-economic-freedom-financial-development-growth

Sethi, D., and Acharya, D. (2018). Financial Inclusion and Economic Growth Linkage: Some Cross Country Evidence. *Journal of Financial Economic Policy, 10* (3), 369-385. https://doi.org/10.1108/JFEP-11-2016-0073

Sethi, D., and Sethy, S. K. (2018). Financial inclusion matters for economic growth in India. *International Journal of Social Economics, 46* (1), 132-151. https://doi.org/10.1108/IJSE-10-2017-0444

Sharma, D. (2016). Nexus between Financial Inclusion and Economic Growth. *Journal of Financial Economic Policy, 8*(1), 13–36, https://doi.org/10.1108/JFEP-01-2015-0004

Singh, V. K., and Ghosh, S. (2021). Financial Inclusion and Economic Growth in India amid Demonetization: A Case Study Based on Panel Cointegration and Causality. *Economic Analysis and Policy, 71* (C), 674-693. https://doi.org/10.1016/j.eap.2021.07.005

Singh, D., and Stakic, N. (2021). Financial inclusion and economic growth nexus: Evidence from SAARC countries. *South Asia Research, 41*(2):238-258. doi:10.1177/0262728020964605

Ouechtati, I. (2020). The Contribution of Financial Inclusion in Reducing Poverty and Income Inequality in Developing Countries. *Asian Economic and Financial Review*, 10(9): 1051-1061. https://doi.org/10.18488/journal.aefr.2020.109.1051.1061

Van, L. T. H., Vo, A. T., Nguyen, N. T., and Vo, D. H. (2021). Financial Inclusion and Economic Growth: An International Evidence. *Emerging Markets Finance and Trade, 57*(1), 239–263. https://doi.org/10.1080/1540496X.2019.1697672

Vinod HD. (2017). Generalized correlation and kernel causality with applications in development economics. *Communications in Statistics Simulation Computatiton, 46* (6), 4513–4534. https://doi.org/10.1080/03610918.2015.1122048

Vinod, H. D. (2017b). Generalized correlation and kernel causality using R package generalCorr. Available at https://cran.r-project.org/web/packages/generalCorr/vignettes/generalCorr-vignette.pdf

Vinod, H.D., and Rao, P. M. (2019). Externalities from Intra-Firm Trade by U.S. Multinationals. *International Advances in Economic Research 25*, 389–397. https://doi.org/10.1007/s11294-019-09758-z

Watson, G. S. (1964). Smooth regression analysis. *Sankhyā: The Indian Journal of Statistics*, Series A. 26 (4): 359–372. https://www.jstor.org/stable/25049340

World Bank. (2021). https://www.worldbank.org/en/topic/financialinclusion/overview#1 accessed on 10.10.2021

Yones, R. F. (2018). Financial Inclusion and Economic Growth in Mena Countries. *Scientific Journal for Economics and Commerce*, 48 (4), 799-819. https://doi.org/10.21608/jsec.2018.39515

Zheng, S., Shi, N., and Zhang, Z. (2012). Generalized measures of correlation for asymmetry, nonlinearity and beyond. *Journal of the American Statistical Association*, 107 (499), 1239-1252. https://www.jstor.org/stable/23427428