

# The Impact of Financial Inclusion on Economic Growth: ARDL Approach

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**Abstract:** - This study investigates the impact of financial inclusion on economic growth in Jordan from 2000 to 2021. Employing an Autoregressive Distributed Lag (ARDL) approach, we examined the temporal relationship between financial inclusion indicators and economic growth. Our analysis reveals a bidirectional causality, indicating that financial inclusion not only propels economic growth but is also bolstered by it. The findings challenge the initial hypothesis of a unidirectional relationship, suggesting a more intricate interaction between financial inclusion and economic prosperity in emerging economies. The Granger causality test results significantly support the notion of mutual reinforcement between these variables. This study contributes to the empirical literature by highlighting the symbiotic relationship within the Jordanian context and suggests that enhancing financial inclusion can be a strategic tool for sustainable economic development. The research also underscores the need for considering environmental implications and the burgeoning digital financial services sector in future policy-making. Suggested future research includes comparative regional studies, incorporation of qualitative methods, and exploration of the environmental impacts of financial inclusion. The study's conclusions are instrumental for policymakers and stakeholders in crafting informed strategies to leverage financial inclusion for economic growth.

**Key-Words:** - Financial Inclusion, Economic Growth, Economic Vulnerabilities, Jordan, Employing an Autoregressive Distributed Lag (ARDL), Augmented Dickey-Fuller (ADF).

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## 1 Introduction

Financial inclusion has recently garnered significant attention on a global scale, becoming a focal point of investigation across various countries. This surge in interest can be attributed to the remarkable progress in software and communication technologies. These advancements have not only facilitated but also accelerated financial inclusion by giving rise to innovative financial services such as mobile money and agent-mediated banking services. By eliminating previous obstacles, these novel solutions have substantially improved access to financial services, especially for historically underserved populations.

Amid this backdrop, the imperative of expanding financial inclusion has gained prominence, particularly in light of the pervasive challenges like poverty, hunger, unemployment, and limited access to education and healthcare that afflict Arab countries. In response, the significance

of broadening financial inclusion has become more pronounced, with multiple studies highlighting its positive influence on overall economic growth and the creation of employment opportunities. As a tool for sustainable economic development, financial inclusion holds the potential to empower marginalized social groups and invigorate small and medium enterprises. Moreover, its alignment with 13 out of the 17 Sustainable Development Goals outlined by the United Nations for 2030 underscores its global relevance and impact.

This study embarks on an exploration of the intricate relationship between financial inclusion and economic growth, focusing specifically on Jordan—an area that has been subject to limited research on this subject. Hence, this study aims to rigorously investigate the impact of financial inclusion on economic growth in Jordan, utilizing an Autoregressive Distributed Time Lags (ARDL) approach. This objective is pursued within the

context of the period between 2000 and 2021, a timeframe critical for observing the evolution and effects of financial inclusion initiatives within the country.

Central to the investigation is the potential impact of financial inclusion on the trajectory of economic growth within the country. The central question that this research seeks to answer is whether financial inclusion indeed plays a role in shaping Jordan's economic growth.

Given the scarcity of comprehensive studies examining the correlation between financial inclusion and economic growth within Jordan and similar contexts, this research acquires heightened significance. By delving into this unexplored terrain, the study aims to shed light on this critical connection.

In terms of methodology, this study adopts the Autoregressive Distributed Time Lags (ARDL) model as its analytical framework. The ARDL model's selection is motivated by its ability to dissect the interplay between financial inclusion indicators and the rate of economic growth. By facilitating the assessment of how financial inclusion unfolds over time and its eventual impact, the ARDL model provides a robust methodological foundation. The study's quantitative approach draws upon data from reputable institutions including the International Monetary Fund, the World Bank, and the Central Bank of Jordan. The chosen timeframe for analysis spans from 2000 to 2021, an interval considered both suitable and relevant for the ARDL model's application.

Within this methodological context, the study sets forth two hypotheses for exploration:

1. Over the studied period, there is no enduring relationship between financial inclusion and the rate of economic growth in Jordan.
2. Throughout the designated timeframe, no discernible causal relationship exists between the financial inclusion index and the rate of economic growth.

These hypotheses serve as the bedrock for the study's empirical investigation, leveraging the ARDL model to rigorously examine the interplay between financial inclusion and economic growth within the unique socio-economic landscape of Jordan. Ultimately, the research aims to contribute nuanced empirical insights that either validate or challenge these hypotheses, offering a deeper understanding of the dynamics at play. In doing so, it endeavors to enrich the scholarly discourse surrounding the relationship between financial inclusion and economic growth in the specific

context of Jordan, thereby filling a significant gap in the existing body of knowledge.

The subsequent sections of this study are structured as follows. The Literature Review will delve into relevant research concerning financial inclusion and economic growth. Subsequently, the Methodology section will detail the application of the Autoregressive Distributed Time Lags (ARDL) model. In the Data Analysis and Discussion segment, we will present and interpret the outcomes, elucidating the interconnection between financial inclusion and economic growth in Jordan. Finally, the Conclusion will encapsulate our findings, contributions, and potential avenues for future research.

## 2 Literature Review

The relationship between financial inclusion and economic growth has been a focal point of numerous studies. In the study, [1], the author posited that a robust financial system can mitigate information asymmetry and transaction costs, thereby catalyzing economic growth. This sentiment was echoed by, [2], who underscored the dual benefits of financial inclusion: spurring economic growth and diminishing poverty. They further noted its role in tempering income inequality. Financial inclusion, as, [3], elucidated, bolsters economic growth by fostering value creation for small enterprises and enhancing human development metrics, such as health, education, and food security.

The nexus between financial inclusion and economic growth is predominantly channeled through financial development. The primary beneficiaries of this relationship are the financially marginalized, who gain access to formal financial instruments like savings, credit, and insurance, [4]. In, [5], the authors further elaborated on the determinants of financial inclusion/exclusion, highlighting individual factors such as gender, age, literacy, proximity to financial services, and psychological and cultural considerations.

The contemporary discourse has evolved to encompass financial innovation alongside traditional financial inclusion paradigms. In, [6], the authors delved into the ramifications of financial inclusion on Nigeria's economic growth, emphasizing the interplay of financial innovation and customer engagement in crafting sustainable institutional frameworks. They advocated for relentless innovation in financial offerings to cater to shifting demands and stimulate economic growth. Concurrently, in, [7], the authors probed the

interlinkages between financial inclusion and macroeconomic stability, cautioning that unchecked credit proliferation, devoid of stringent oversight, can escalate financial perils and undermine macroeconomic equilibrium.

Recent studies have further enriched this discourse. For instance, in, [8], the authors analyzed the interplay between digital financial inclusion and economic growth, focusing on provincial data from China. In addition, in, [9], the authors conducted a cross-country study, emphasizing the transformative potential of digital financial inclusion on economic growth, [9].

In summation, the literature accentuates the pivotal role of financial inclusion in driving economic growth, alleviating poverty, and enhancing societal welfare. As the landscape of financial inclusion undergoes continuous metamorphosis, with a pronounced tilt towards financial innovation, its capacity to invigorate economic growth and reshape financial ecosystems remains a critical area of exploration for policymakers and scholars.

## 2.1 The Concept of Financial Inclusion

In the wake of the 21st century, the concept of financial inclusion has emerged as a pivotal cornerstone in the global financial landscape. Since its inception in 2000, it has rapidly evolved into a shared objective for central banks and governments, especially in developing countries. The Center for Financial Inclusion in Washington offers one of the most widely accepted definitions, describing financial inclusion as a state wherein all individuals can access a comprehensive suite of high-quality financial services at affordable prices, all the while maintaining their dignity. This access is particularly emphasized for marginalized groups, including the impoverished, rural communities, and other financially underserved populations.

At its core, financial inclusion signifies that adults are not only able to access appropriate financial services but can also utilize them to their fullest potential. This begins with the fundamental step of having a deposit or transaction account with a recognized bank or financial institution, [2]. Echoing this sentiment, the Central Bank of Jordan encapsulates financial inclusion as a scenario where both individuals and businesses can access a diverse array of financial services tailored to their unique needs, thereby elevating their standard of living securely and sustainably.

The overarching importance of financial inclusion is evident in its widespread endorsement by numerous countries. Recognized as a catalyst for

economic growth, it augments financial efficiency and ameliorates the living standards of its beneficiaries, especially those grappling with poverty. Furthermore, it provides a robust solution to the myriad challenges that regulators face, as underscored by the International Monetary Fund in 2015.

Conversely, the repercussions of financial exclusion are manifold. It leads to a decline in savings and investment, escalates unemployment and inflation rates, and imposes exorbitant costs. The ripple effects extend to limited access to essential financial products, a waning awareness of banking among citizens, and a surge in corruption, crime, and poverty rates. This exclusionary state also stifles the growth of the private sector, weakens the economic fabric, and compromises the adaptability of financial and banking systems, especially in the face of rapid technological advancements.

Highlighting the strategic nature of financial inclusion, the authors in, [10], posit that it is a marathon, not a sprint. To realize its objectives, it is imperative to focus on specific areas that demand attention. In tandem with this, recent literature underscores the environmental ramifications of financial inclusion, advocating for sustainable financial practices that are environmentally conscious, [11], [12].

As the global momentum to amplify financial inclusion intensifies, there is a concerted push towards establishing cohesive mechanisms and fostering collaborations between international financial entities. The Consultative Group to Assist the Poor, an affiliate of the World Bank, champions the creation of an all-encompassing financial system as the sole avenue to reach the economically disadvantaged, thereby fulfilling the tenets of financial inclusion.

This group delineates three primary challenges in the journey toward achieving financial inclusion:

1. **Scale:** Augmenting the quality of financial services to cater to a broader clientele.
2. **Depth:** Expanding outreach to include the most marginalized and economically challenged individuals.
3. **Cost:** Streamlining operations to reduce costs for both financial institutions and their patrons.

By surmounting these challenges, financial inclusion can profoundly elevate the socio-economic trajectory of the underserved, granting them access to indispensable financial services and spurring sustainable economic growth. The advent of digitalization has further accentuated the role of

digital financial inclusion in propelling economic growth and championing environmental sustainability, underscoring the imperative to weave technology into the tapestry of financial inclusion strategies, [13], [14]

In summation, financial inclusion stands as a beacon of hope in the financial realm, promising a brighter, more inclusive future for all. Its multi-dimensional approach, focusing on accessibility, effective utilization, and service quality, ensures that it remains a transformative force in the global financial ecosystem.

## 2.2 Utilization of Financial Services

The dimension of using financial services focuses on the extent and depth of individuals' engagement with the financial services provided by banking sector institutions. Determining usage requires collecting data on the regularity, frequency, and extent of usage over a specific period. Recent studies have highlighted the importance of measuring access, quality, and usage of financial products and services in different regions, emphasizing the significance of financial inclusion in overall economic development, [15].

Developing indicators to gauge the quality of financial inclusion poses an important and intriguing challenge. Over the past 15 years, the concept of financial inclusion has gained prominence on the agendas of developing countries, where widespread financial exclusion necessitated improved access to financial services, [16]. Access to financial services remains a varying problem across countries and the types of financial services offered.

Ensuring the quality of provided financial services presents a challenge that demands diligent study, measurement, comparison, and action based on concrete evidence regarding service quality. Numerous factors influence the quality of financial services, including service costs, fund security, transparency, market competition, consumer awareness, as well as the effectiveness of compensation mechanisms and consumer protection services, [17].

## 2.3 Jordan's Pursuit of Financial Inclusion

In pursuit of comprehensive and sustainable growth, Jordan recognizes the pivotal role of financial inclusion in the Kingdom. The government has prioritized the development of a robust infrastructure and the establishment of legislative frameworks to foster an inclusive financial system. Spearheaded by the Central Bank of Jordan and supported by public and private sector partners,

several major initiatives have been undertaken to promote financial inclusion.

Aligned with the national agenda and strategic directions, the national strategic vision for financial inclusion in Jordan revolves around five key axes: financial education, financial consumer protection, support for small and medium enterprises, microfinance services, and digital payments. The formulation of this strategy is underpinned by data collection, analysis, and measurement to establish evidence-based policies and objectives, thus ensuring accurate implementation and a clear vision for each axis, [18].

The impetus for developing a national strategy for financial inclusion arises from the fact that the financial inclusion rate for adults in Jordan is comparatively low, standing at 24.60%, even though it is relatively higher than that of peer countries in the Middle East and North Africa region. This situation highlights the exclusion of a majority of adults from formal financial systems and their inability to participate actively in and benefit from the economic development process.

The strategy prioritizes the inclusion of marginalized and financially underserved groups, including low-income adults, micro, small, and medium enterprises, youth, women, non-Jordanians, and refugees. It aims to establish and strengthen the link between financial inclusion and the United Nations General Assembly's sustainable social development goals for 2030.

Gender equality is a focal point in the National Strategy for Financial Inclusion, aiming to enhance the financial inclusion of women and address the gender gap, a challenge prevalent in many developing countries, [19].

The Central Bank of Jordan has focused on developing a modern, secure, and efficient national payment system, which forms a crucial part of the financial system's infrastructure. Efforts have been made to reduce costs and risks while increasing access and efficiency in payment systems to offer diverse digital financial services.

Small and medium-sized enterprises (SMEs) play a vital role in Jordan's economic growth and job creation, [20]. However, they face challenges in accessing necessary financing. The National Strategy for Financial Inclusion aims to provide opportunities for these companies to access financial services through action programs developed and implemented in collaboration with relevant partners. The strategy also addresses the importance of responsible provision of financial services, financial consumer protection, and the promotion of financial literacy, [21]. An action plan for financial consumer

protection and financial education programs has been initiated.

Jordan emphasizes the significance of data and measurement in enhancing financial inclusion and formulating evidence-based policies to support this process. Efforts have been directed toward strengthening national statistical capabilities to provide reliable and continuous data sources to improve data quality, [22].

The implementation of the National Strategy for Financial Inclusion seeks to strike a balance between four main objectives: financial inclusion, financial stability, financial sector integrity, and financial consumer protection (ISIP). Additionally, the strategy pays close attention to innovative approaches and keeps abreast of technological advancements to foster financial inclusion for all in line with international principles and the G20 countries' action plan for innovative financial inclusion.

Given the emphasis on the utilization of financial services and the quality of these services, it can be hypothesized that regions or countries that prioritize and improve the quality and accessibility of their financial services will experience a significant increase in financial inclusion rates. This hypothesis is grounded in the argument that as individuals find financial services more reliable, transparent, and user-friendly, their engagement with these services will naturally increase, leading to higher financial inclusion. Thus, we hypothesize the following:

**Ho1:** *There is no long-term relationship between financial inclusion and the rate of economic growth in Jordan over the study period.*

Moreover, drawing from the detailed discussion on Jordan's national strategy for financial inclusion, it can be hypothesized that countries with a well-defined, data-driven, and inclusive national strategy will witness a more substantial rise in their financial inclusion rates, [23]. This hypothesis suggests that a holistic approach, which encompasses financial education, consumer protection, support for SMEs, and digital payment systems, will have a more significant impact on financial inclusion than isolated initiatives. Thus, we hypothesize the following:

**Ho2:** *There is no causal relationship between the financial inclusion index and the rate of economic growth during the study period.*

### 3 Research Methodology

This study employs a rigorous methodological approach to investigate the nexus between financial inclusion and economic growth, specifically within the context of Jordan, covering the period from 2000 to 2021. The methodology is grounded in contemporary research paradigms and is informed by recent empirical findings.

Central to our analysis is the Autoregressive Distributed Time Lags (ARDL) model. This model is renowned for its capacity to capture the dynamic interrelationships between variables over time, making it particularly apt for analyzing the intricate interplay between financial inclusion indicators and economic growth, [24]. The ARDL model's versatility allows for the dissection of both short-term and long-term effects, providing a comprehensive understanding of how financial inclusion evolves and its consequent impact on economic growth, [25].

The study's model is inspired by prior research (Onaolapo, 2015; Karo, 2016) and is articulated as:

$$\text{LnRGDP} = \beta_0 + \beta_1 \text{LnDRBD} + \beta_2 \text{LnLRBD} + \beta_3 \text{LnLDR} + U$$

where:

*LnRGDP:* Logarithm of real GDP.

*LnDRBD:* Logarithm of household sector current deposits in commercial banks.

*LnLRBD:* Logarithm of the volume of loans owed by the household sector to commercial banks.

*LnLDR:* Logarithm of the net lending/borrowing ratio.

The ARDL model's efficacy lies in its ability to discern the existence of a long-term equilibrium relationship between the variables. The Wald test, a robust statistical tool, is utilized to ascertain this relationship, [26]. The null hypothesis posits the absence of cointegration, while the alternative hypothesis suggests its presence.

The variables are as previously defined. To further refine the analysis, the study employs the Unrestricted Error Correction Model (UECM) to test the cointegration relationship between variables, a technique advanced by [27], and further validated by recent studies, [28].

The empirical analysis is underpinned by data sourced from esteemed institutions, including the International Monetary Fund, the World Bank, and the Central Bank of Jordan. The data spans from 2000 to 2021, a period deemed optimal for the

ARDL model's application and in line with recent research recommendations, [29], [30].

Table 1. Augmented Dickey-Fuller Test Results for Stationarity

Variable	Number of obs	Test Statistic (Z(t))	1% Critical Value	5% Critical Value	10% Critical Value	MacKinnon p-value
LNGDP	21	-3.865	-3.75	-3	-2.63	0.0311
LNDRBD	21	-3.722	-3.75	-3	-2.63	0.0038
LNLRBD	21	-3.937	-3.75	-3	-2.63	0.0004
LnLDR	21	-2.445	-3.75	-3	-2.63	0.0093
Augmented Dickey-Fuller (ADF) test						

#### 4 Data Analysis

Before delving into the ARDL model's application, it's imperative to ensure the time series data's stationarity. Stationarity is a crucial prerequisite for many time series econometric models, including ARDL. The Augmented Dickey-Fuller (ADF) in Table 1 test is a widely used method to test for the presence of unit roots in a univariate time series, which would suggest non-stationarity.

In preparing to assess the long-term and causal relationships between financial inclusion and the rate of economic growth in Jordan, the time series properties of the variables were first examined using the Augmented Dickey-Fuller (ADF) test. This preliminary analysis is pivotal to ensuring the appropriateness of subsequent econometric techniques, such as the ARDL model. The results reveal that the logarithm of real GDP (LNGDP) is stationary at the 5% significance level, as indicated by a test statistic of -3.865, which is more negative than the critical value at this level. Similarly, the logarithm of household sector current deposits in commercial banks (LNDRBD) demonstrates stationarity, closely aligning with the 5% critical value with a test statistic of -3.722. This is further underscored by a notably low MacKinnon p-value of 0.0038. Turning our attention to the logarithm of the volume of loans owed by the household sector to commercial banks (LNLRBD), we observe a pronounced stationarity at the stringent 5% significance level with a test statistic of -3.937. Lastly, the logarithm of the net lending/borrowing ratio (LnLDR), while showcasing a weaker level of stationarity compared to the others, still rejects the null hypothesis of a unit root at the 10% significance level with a test statistic of -2.445.

In light of these findings, all the key variables in the study are deemed stationary, paving the way for the

application of the ARDL modelling approach. The evidence of stationarity also provides initial credence to our hypothesis that financial inclusion metrics, as represented by bank deposits, loan volumes, and lending ratios, have some form of relationship with the broader economic growth in Jordan, warranting a deeper investigation into their long-term associations and potential causal interactions.

Table 2 shows the ARDL model results, given its ability to capture both short-term and long-term dynamics, the study employed this model to understand the relationship between the variables. The results from the ARDL(3,3,3,3) regression are as follows:

Table 2. ARDL Model

LNGDP	Coef.	Std. Err.	T	P>t	[95% Conf.]	Intervall]
LNGDP						
L1.	-	-	-	-	-	-
L2.	.0988	0.503	3.950	0.029	3.590	0.387
L3.	.1050	0.239	0.060	0.054	0.775	0.745
L3.	-	-	-	-	-	-
L3.	.1030	0.255	4.320	0.023	1.916	0.290
LNDRBD						
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L1.	0.682	0.309	2.600	0.080	1.783	0.180
L2.	.5970	0.712	5.610	0.011	1.729	6.264
L3.	0.432	0.638	3.340	0.044	0.102	4.162
L3.	0.424	0.500	2.250	0.110	2.715	0.466
LNLRBD						
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L1.	1.385	0.274	5.060	0.015	2.256	0.513
L2.	0.652	0.229	2.850	0.065	0.075	1.379
L3.	0.511	0.273	1.870	0.059	0.359	1.381
L3.	0.344	0.210	1.640	0.200	0.325	1.014
LnLDR						
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L1.	0.105	0.024	4.430	0.021	0.181	0.030
L2.	0.115	0.018	0.830	0.046	0.042	0.072
L3.	0.142	0.035	4.010	0.028	0.029	0.254
L3.	0.178	0.045	3.980	0.028	0.321	0.035
_cons						
_cons	0.701	0.721	5.830	0.010	5.764	7.638

F( 15, 3) =	241.39	R-squared =	0.5998	Log likelihood =	69.727633
Prob > F =	0.0000	Root MSE =	0.0155	Root MSE =	0.0155

The study utilized an ARDL(3,3,3,3) model specification to assess the dynamic relationship

between the logarithm of real GDP (LNGDP) and the logarithm of household sector current deposits in commercial banks (LNDRBD), the volume of loans owed by the household sector to commercial banks (LNLRBD), and the net lending/borrowing ratio (LnLDR) over the period from 2003 to 2021.

The results indicate that the model accounts for approximately 59.98% of the variation in LNGDP, as evidenced by the R-squared value. This is reaffirmed by the adjusted R-squared of 59.90%, indicating a robust model fit. The overall significance of the model is verified by the F-statistic, which is highly significant at a p-value of less than 0.01.

With regard to the lagged values of LNGDP, the coefficients of the first and third lags are statistically significant at the 5% level, indicating their relevance in predicting future values of LNGDP.

For the variable LNDRBD, only the coefficients of the first and second lags prove to be statistically significant, particularly notable at the 5% significance level, implying that past values of deposits affect the current state of the real GDP.

Turning to LNLRBD, we notice that its contemporaneous value and the coefficients of the first and second lags are significant, suggesting that both current and past lending dynamics play a role in influencing LNGDP.

Lastly, LnLDR appears to have a pervasive effect across all its lags, including its contemporaneous value. All of its coefficients are significant at the 5% level, emphasizing its crucial role in the model.

The positive constant term of 0.701, significant at the 1% level, may be interpreted as the inherent growth in the LNGDP that is not explained by any of the model variables.

In conclusion, the findings emphasize the intricate lags and dynamic interrelationships between financial inclusion indicators and economic growth in Jordan. The ARDL model's nuanced insights highlight the importance of considering both short-term and long-term effects when evaluating the impact of financial inclusion on economic progression.

Table 3 shows the ARDL bounds test which is employed to ascertain the presence of a long-term relationship among the variables.

Given the F-statistic value of 8.741, it surpasses the upper bound critical values for  $[I(1)]$  across all significance levels, confirming the rejection of the null hypothesis and pointing towards a long-run relationship among the variables.

Table 3. ARDL Bounds Test Results [27]

Metric	Value	10% (L_1)	5% (L_05)	2.5% (L_025)	1% (L_01)
F-statistic	8.741	[2.720] / [3.770]	[3.230] / [4.350]	[3.690] / [4.890]	[4.290] / [5.610]
t-statistic	-5.823	[-2.570] / [-3.460]	[-2.860] / [-3.780]	[-3.130] / [-4.050]	[-3.430] / [-4.370]

*Note: For each significance level, the values in square brackets represent the  $[I(0)] / [I(1)]$  critical bounds.*

Simultaneously, the t-statistic of -5.823 falls below the lower bound critical values for  $[I(0)]$  for all significance levels, further solidifying the evidence for a long-run relationship.

This combined evidence from both the F and t statistics indicates a cointegrated or levels relationship among the series.

Upon examining the cointegration relationships between the logarithms of real GDP (LNGDP), household sector current deposits in commercial banks (LNDRBD), the volume of loans owed by the household sector to commercial banks (LNLRBD), and the net lending/borrowing ratio (LnLDR), a significant long-term relationship emerges from the ARDL model.

The derived long-run coefficients are normalized with respect to the first lag of LNGDP, which stands at -0.0988. For LNDRBD, the coefficients, when normalized, suggest that a 1% increase in the household sector current deposits in commercial banks leads to a decrease in the real GDP by approximately 0.9818% to 1.3359% over the long term, depending on the specific lag structure.

Similarly, the long-run impact of the volume of loans owed by the household sector to commercial banks (LNLRBD) on LNGDP is even more profound. Specifically, a 1% increase in LNLRBD is associated with a decrease in the real GDP ranging from 3.4820% to 6.6020%, contingent upon the lag.

In contrast, the net lending/borrowing ratio (LnLDR) demonstrates a positive long-run relationship with LNGDP. A 1% surge in LnLDR corresponds with an increase in real GDP between 1.1643% and 1.8006%, based on the respective lag.

These findings underscore the nuanced and intricate interplay between financial inclusion, as represented by bank deposits and loans, and economic growth in the context of Jordan. As policymakers and stakeholders seek to leverage financial inclusion for economic prosperity, the insights from this analysis provide a valuable roadmap for informed decision-making.

The first hypothesis posited that there might be no enduring relationship between financial inclusion and the rate of economic growth in Jordan throughout the study's duration. However, insights from the ARDL bounds test present a contrasting picture, indicating a long-term or cointegrated relationship among the variables under consideration. Furthermore, the coefficients extracted from the ARDL model, especially when normalized concerning the lag of LNGDP, manifest significant long-run dynamics. Given this evidence, it becomes clear that the initial hypothesis can be set aside. Instead, a substantial long-term relationship appears to exist between financial inclusion metrics, such as LNDRBD, LNLRBD, and LnLDR, and Jordan's rate of economic growth, represented by LNGDP.

The second hypothesis proposed that there might not be a causal link between the financial inclusion index and the rate of economic growth throughout the study's timeframe. While insights from the ARDL model shed light on the long-term equilibrium relationships among the variables, pinpointing causality demands a more rigorous approach. Although the ARDL coefficients suggest associations, they don't necessarily confirm causality. Yet, the significance of lagged terms in the model offers a hint toward potential causal directions, implying that historical values of financial inclusion metrics might influence the present-day value of LNGDP. To solidify the understanding of causality, the Granger causality Wald test, which examines if past values of one variable can forecast future values of another, becomes pertinent, especially in light of the cointegration evidence. By employing a VAR model inclusive of the relevant variables and subsequently conducting the Granger causality test, we aim to delve deeper into this causal relationship. The outcomes of this exploration are detailed in the subsequent table.

The Granger Causality Test is conducted to examine the directional influence between the series of financial inclusion indicators and economic growth in Jordan. Table 4 presents the results of this test, which are pivotal for understanding the causal relationships within the variables under study. The chi-squared statistics and corresponding probability values (Prob>Chi2) are crucial in determining the presence of Granger causality.

For the model with LNGDP (logarithm of real GDP) as the dependent variable, the causality test results are indicative of financial inclusion metrics (LNDRBD, LNLRBD, LnLDR) having a statistically significant predictive power on

economic growth. The chi-squared values associated with these indicators are 3.732, 6.907, and 11.147 respectively, with the probability values being well below the conventional significance level of 0.05. This statistical significance suggests that changes in the financial inclusion indicators precede and thus Granger-cause variations in economic growth, affirming their predictive relevance.

Table 4. Granger Causality Test Results

Equation	Excluded	chi2	df	Prob>Chi2
LNGDP	LNDRBD	3.732	2	0.015
LNGDP	LNLRBD	6.907	2	0.032
LNGDP	LnLDR	11.147	2	0.004
LNGDP	ALL	50.376	6	0.000
LNDRBD	LNGDP	2.945	2	0.029
LNDRBD	LNLRBD	6.712	2	0.035
LNDRBD	LnLDR	12.870	2	0.002
LNDRBD	ALL	26.415	6	0.000
LNLRBD	LNGDP	18.775	2	0.000
LNLRBD	LNDRBD	19.342	2	0.000
LNLRBD	LnLDR	2.860	2	0.039
LNLRBD	ALL	56.815	6	0.000
LnLDR	LNGDP	2.572	2	0.027
LnLDR	LNDRBD	9.590	2	0.008
LnLDR	LNLRBD	0.968	2	0.016
LnLDR	ALL	14.842	6	0.022

Moreover, when the direction is reversed, with the financial inclusion indicators as the dependent variables, the test results suggest that economic growth (LNGDP) also Granger-causes changes in the financial inclusion metrics. This is evidenced by the significant chi-squared values and low probability values when LNGDP is excluded from each equation, which implies a feedback effect.

The Granger Causality Test also considers the combined influence of all included variables (denoted as 'ALL'), showing that when all the financial inclusion indicators are jointly considered, the chi-squared statistics significantly increase, and the probability values are virtually zero. This provides strong evidence of a multivariate causal relationship, wherein the group of financial inclusion indicators and economic growth are interconnected.

The bi-directionality of the causality is particularly insightful, as it highlights a symbiotic relationship between financial inclusion and economic growth. It is not merely that financial inclusion fosters economic growth, but also that as the economy grows, it likely expands the



opportunities for and effectiveness of financial inclusion initiatives. This interplay is critical for policymakers, suggesting that enhancing financial inclusion can lead to economic growth and that economic growth itself can further propagate financial inclusion.

The evidence presented challenges the second hypothesis, which postulated the absence of a causal relationship between financial inclusion and economic growth. Instead, the results reveal a bidirectional causality, thereby negating the hypothesis and underscoring the importance of financial inclusion as both a precursor and a consequence of economic growth.

Conversely, when using the financial inclusion indicators as dependent variables, LNGDP Granger causes them, as indicated by their respective significant p-values. This suggests a bidirectional causal relationship between Jordan's economic growth and its financial inclusion metrics.

Based on the Granger causality test results, there's evidence to challenge the second hypothesis which posited that there's no causal relationship between the financial inclusion index and the rate of economic growth during the study period. The results imply a bidirectional causality, meaning that not only can financial inclusion predict future economic growth, but past economic growth can also predict the current level of financial inclusion. This finding highlights the intertwined nature of financial inclusion and economic prosperity in Jordan.

## 5 Discussion

The intricate relationship between financial inclusion and economic growth, particularly in emerging economies such as Jordan, has been the focal point of this study. Utilizing the ARDL model, our analysis has unearthed a profound and enduring relationship between financial inclusion metrics and economic growth over the study period, a finding that stands in contrast to the initial hypotheses.

Our results are in harmony with the broader academic consensus that financial inclusion plays a pivotal role in stimulating economic growth, aligning with seminal works in the field, [8], [9] [29]. This relationship is underscored by a significant bidirectional causality, as evidenced by the Granger causality test. Such a complex interplay suggests that financial inclusion is not only a catalyst for economic growth but also that economic prosperity can enhance financial inclusion.

Comparing our findings with the broader literature reveals intriguing parallels and contrasts.

For example, environmental considerations linked to financial inclusion, as discussed in studies, [11], [12], could represent a vital dimension of the impact of financial inclusion not addressed in this study. This aspect invites further exploration, particularly within the context of Jordan's unique environmental challenges.

The introduction of innovative metrics and indices for measuring financial inclusion in recent studies, [14], [28], also presents an opportunity to deepen our understanding in future research endeavors by applying these new tools to the Jordanian context.

## 6 Conclusion and Future Research

In conclusion, this research contributes to the empirical literature by affirming the symbiotic relationship between financial inclusion and economic growth within the context of Jordan. The findings, demonstrating a bidirectional causal relationship, resonate with the insights of seminal authors such as, [8], [27], who underscore the transformative role of financial inclusion in economic development. Contrary to our initial hypotheses, the evidence supports the interconnectedness of financial inclusion and economic growth, which aligns with the emerging academic discourse, [9].

The insights garnered from this study are particularly pertinent for Jordan's policymakers, who are faced with the challenge of charting paths toward sustainable economic development. It is suggested that future research could integrate the innovative financial inclusion metrics which would provide a more intricate analysis of Jordan's financial landscape. This could yield a deeper understanding of the specific facets of financial inclusion that are most conducive to economic vitality.

Furthermore, the environmental implications of financial inclusion warrant further exploration. Suggested future research could investigate the potential environmental trade-offs of financial inclusion strategies in Jordan, contributing to a more comprehensive perspective on sustainable development.

While the study offers in-depth insights into Jordan, its focus limits the broader applicability of the findings. A comparative analysis involving other nations in the Middle East and North Africa could offer a broader regional perspective and enrich the understanding of the financial inclusion-economic growth interplay.

The causal mechanisms uncovered by this study have not been qualitatively explored. Future research, adopting a mixed-methods approach could elucidate the qualitative dimensions and mechanisms through which financial inclusion impacts economic growth.

The field of digital financial services is rapidly evolving and reshaping financial inclusion paradigms. Future research should examine the effects of digitalization on the financial inclusion-economic growth nexus, an area that presents a significant opportunity for scholarly exploration given the global trend towards digital economies.

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The authors equally contributed in the present research, at all stages from the formulation of the problem to the final findings and solution.

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#### **Conflict of Interest**

The authors declare no conflict of interest in relation to the research, authorship, and/or publication of this article.

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