

THE ROLE OF FINANCIAL INCLUSION IN ENHANCING EGYPTIAN ECONOMIC GROWTH THROUGH DIGITAL FINANCIAL SERVICES AND FINANCIAL TECHNOLOGY

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ABSTRACT

Financial inclusion has been a major driver of economic growth and a primary strategy for achieving it in the majority of economies globally over the past few years. Most nations have regarded it as a modern program aimed at ensuring equitable and sustainable economic expansion. To this extent, the paper sheds light on the causal relationship between economic growth and financial inclusion in Egypt between 2008 and 2023. The paper aims to address the following question: How do indicators of financial inclusion impact economic growth in Egypt?

To address this question, the research aimed to analyse the cause-effect relationship between a set of financial inclusion indicators, including: (the number of bank accounts, the number of bank payment cards, the number of bank branches, the number of ATMs, the volume of individual deposits, and the value of credit provided to individuals), as well as the economic growth of Egypt according to Gross Domestic Product (GDP).

The research employed the Vector Autoregression (VAR) method to investigate the causal relationships among the research variables. The results showed that measures of financial inclusion directly affect Egypt's economic growth rate. Based on these results, the article recommends enhancing the provision of banking services by streamlining the opening requirements for bank accounts and business licenses, and by improving access to these services across all areas of the Arab Republic of Egypt.

Keywords: Financial Inclusion, Economic Growth, VAR Model, Egyptian Economy, GDP, Digital Finance, Banking Services

1. INTRODUCTION

In recent years, financial inclusion has risen to prominence as a key objective in national policy agendas worldwide. Many nations now view it as a pivotal strategy for fostering more equitable and robust economic growth. This perspective aligns with the United Nations' vision, which identifies financial inclusion as a crucial enabler of sustainable development and improved well-being. As a result, awareness of its importance is on the rise, with some countries even ranking it as a priority for building a robust economy with a sophisticated financial infrastructure, which will also positively contribute to economic development.

Financial inclusion gained wider acceptance after the 2008 global financial crisis. The international drive to achieve it has been consolidated through policies undertaken by monetary institutions to bring low-cost financial services to all segments of society. In reality, financial

inclusion is currently a prevalent issue in the banking and economic sectors, attracting increasing policy attention worldwide. Governments are working hard to launch programs to expand access to financial services and empower their citizens. Financial inclusion seeks to expand access to affordable financial products to the broadest possible audience, encompassing institutions, communities, and individuals, particularly those from low-income backgrounds. Expansion of access to the formal financial sector is viewed as a means to achieve development goals, including improved living standards, women's empowerment, equity promotion, financing of small and medium enterprises (SMEs), poverty and inequality reduction, employment creation, and economic growth (Swamy, 2014).

Against this global backdrop, Egypt has gradually moved toward digitalization and a cashless economy, with financial inclusion as a top government priority. Egypt reiterated this commitment by joining the International Alliance for Financial Inclusion in 2013 and hosting its ninth annual conference in Sharm El-Sheikh in 2017, which focused on policy development to further financial inclusion. Therefore, this study addresses the following question: Did financial inclusion achieve its desired effects on Egypt's economic growth rates, both in the short and long term?

This study is valuable as it has tackled financial inclusion, one of the support pillars of Egypt's national strategy and an issue at the center of its financial institutions. The research aims to identify key financial inclusion indicators and delivery channels, with an emphasis on the attendant economic benefits and the challenges that may hinder their overall uptake in Egypt. It will also assess the degree of readiness of Egypt's financial sector to embrace financial inclusion and quantify the attendant development gains.

This will be achieved by scrutinizing the quantitative and causal connections to understand the short- and long-term impacts of financial inclusion on economic growth, ultimately for policy reasons that aim to accelerate growth rates and promote inclusive economic growth. Methodologically, the study relies on official statistics to evaluate the Egyptian economy's readiness for the rapid roll-out of financial inclusion. It will employ descriptive analysis to examine the nexus between financial inclusion applications and their broader economic impact, and an econometric model to quantify the causal impact of financial inclusion indicators on economic growth rates.

The objective is to receive recommendations that enhance the role of financial inclusion in accelerating economic growth.

The paper is structured as follows: Section 2, a Brief theoretical and empirical literature review. Section 3 Methodology: Specifications and Estimates. Section 4 Conclusions and recommendations.

2. BRIEF THEORETICAL AND EMPIRICAL LITERATURE REVIEW

2. 1. THEORETICAL LITERATURE REVIEW

2. 1. 1. OVERVIEW OF FINANCIAL INCLUSION

Drawing on Tariq et al. (2020), it can be said that the theoretical foundations of the relationship between financial development and economic growth are built on several seminal theories. Among those, Schumpeter's theory of innovation (1911, 1912) represents a milestone in this area of research and stresses the proactive role of financial institutions as catalysts of growth. According to Schumpeter, banks do not passively accommodate existing demand but actually anticipate it by identifying and financing innovative entrepreneurs, thereby facilitating the process of "creative destruction" and promoting growth through technological innovation and capital accumulation. This idea lays the theoretical foundation for the "Supply-Leading Hypothesis," later supported by McKinnon and Shaw (1973).

This framework received substantial deepening with the emergence of Endogenous Growth Theory (Romer, 1986; Lucas, 1988). In contrast to neoclassical models, such as the Solow model, which treated technological progress as an exogenous factor, the so-called Endogenous Growth Theory incorporates finance as an internal determinant of long-term growth. From this perspective, the role of the financial sector is explained through the mechanisms of Financial Intermediation Theory, contributing to growth through the following key internal channels: mobilizing savings, improving the efficiency of capital allocation, reducing information and monitoring costs, and diversifying risks. These mechanisms reinforce the growth in capital productivity and accelerate innovation, thereby providing a sound theoretical basis for the “Supply-Leading Hypothesis.”

Also Drawing on Tariq et al. (2020), The “Demand-Following Hypothesis” associated with Robinson (1952), on the other hand, reverses this causal direction, portraying real-sector expansion as creating demand for sophisticated financial services, a notion summarized succinctly by the phrase “where enterprise leads, finance follows.” Meanwhile, the hypothesis denoted “Mutual Causality,” espoused by Patrick (1966) and Greenwood and Jovanovic (1990), synthesizes these two within a stage-based analytical framework, offering theoretical support for a relationship in both directions between economic growth and financial development.

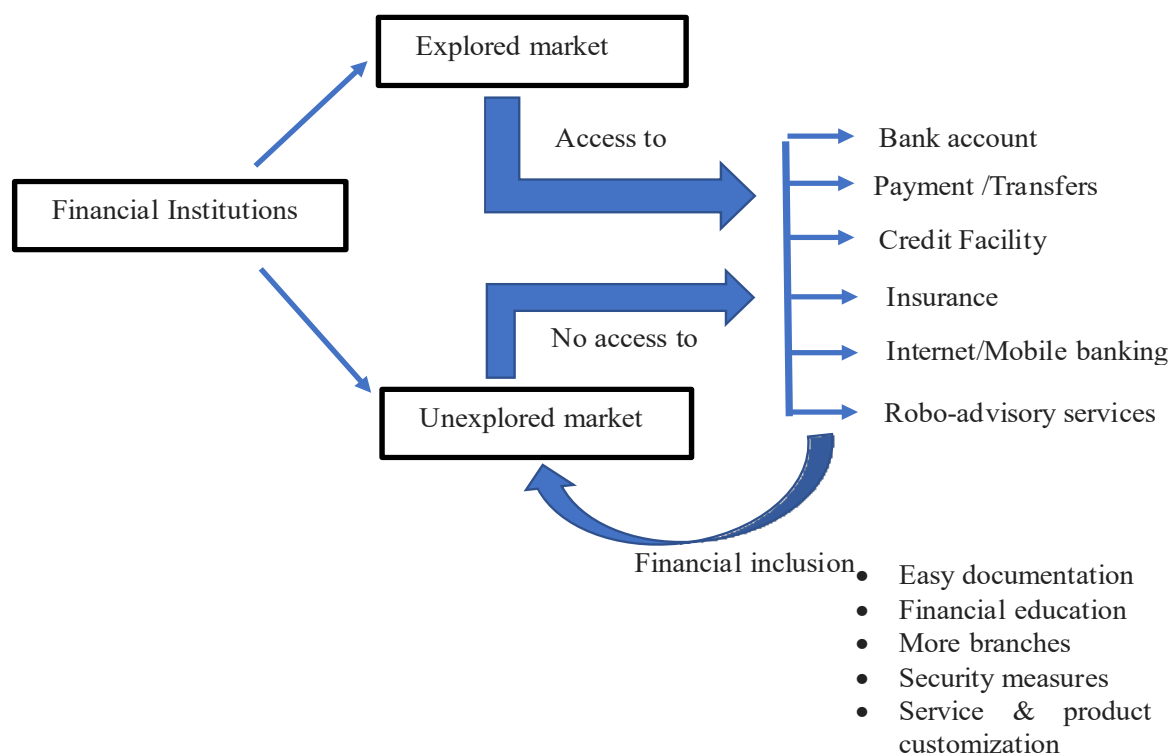
Financial inclusion is a term with many facets, and it is hardly surprising that there has been an explosion of definitions. Fundamentally, it aims to extend financial services to individuals at minimal cost and effort, regardless of the amount involved, enabling them to invest in a form acceptable to the investor, the financial institution, and society as a whole. Thus, financial inclusion can be defined as ensuring that all individuals, regardless of their financial status, and enterprises of any size have access to quality, low-cost financial products and services. It also seeks to provide fair access to financial opportunities for sustainable and long-term development.

Financial inclusion can also be described as providing a range of high-quality, formal financial products and services (e.g., payments, current and savings accounts, transfers, credit, finance, insurance), supplemented by regulatory measures that make these services accessible to the entire cross-section of society. This must be done in an equitable, transparent, and timely manner, at the least cost, and with adequate quality suitable to the requirements of the users, enabling their effective utilization. It is also necessary that these services be transferred through the formal institutions of the financial system, under a proper legal and regulatory framework, and in a prudent and sustainable manner, as shown in Figure 1.

The extent of financial inclusion expands to include the use of formal insurance products to manage financial risk more effectively, as well as access to formal institution loans that enable adults to finance business and education enterprises.

Scientific understanding of how macroeconomic progress relates to financial inclusion gaps remains limited, partly due to data limitations. Demonstrating such a connection requires a sufficiently long time series of financial inclusion programs. In contrast, the analysis of drivers of macroeconomic growth and inequality typically requires data spanning decades. The lack of comparable global data until recently has hindered the accurate assessment of the impact of financial inclusion (Ananth and Öncü, 2013).

Figure 1: Financial inclusion meaning



Source: wallstreetMojo

The Egyptian government has launched a comprehensive initiative to promote financial inclusion, aiming to provide automated services that enable citizens to meet their financial needs with ease and without incurring additional burdens. The establishment of the electronic payment and collection system was intended to save the nation 25% of the expense associated with printing money and circulation, as well as reduce the time spent processing payments by approximately 50%. Through the various steps initiated, the project has registered remarkable successes in this respect; see [Awad and Eid \(2018\)](#).

2. 1. 2. DIMENSIONS OF FINANCIAL INCLUSION

Financial inclusion is emerging as an increasingly important driver in the global economy, with over 50 countries having established National Financial Inclusion Strategies, and the UN recognizing it as a key factor in achieving poverty reduction by 2030. The IMF Financial Access Survey (FAS) is a critical source of information for policymakers, providing comprehensive, internationally comparable data on financial services access and use for the vast majority of countries worldwide.

Despite its recognized importance to economic development in low- and middle-income economies, financial inclusion remains a challenge to expand, as many remain without access to formal financial services. Scholarly consensus defines financial inclusion as a multilateral phenomenon encompassing not only access and use but also the costs, quality, and appropriateness of products (Figure 2). This corresponds with definitions that describe it as “the access to and use of formal financial services by households and firms” ([Andrianaivo and Kpodar, 2012](#)), typically encompassing availability, Usage, and quality dimensions ([Chibba, 2009](#)).

A significant amount of government focus and investment in the financial sector is necessary to achieve economic growth and stability, as this investment has a substantial impact on the economy as a whole ([Jordà et al.,2020](#)).

Figure 2: Different Dimensions of Financial Inclusion

Access	Availability of access to financial services (eg, access points as ATMs or branches)
Usage	Usage of financial services (eg, type of accounts, transaction amounts, outstanding balance)
Other Dimensions	Strength of consumer protection, presence of credit barriers, awareness and understanding of financial products, etc.

source: IMF staff

Financial inclusion has been recognized as a key tool for poverty alleviation and inclusive growth, as it enables savings, facilitates more efficient capital allocation, and allows for risk diversification. Furthermore, improved financial inclusion has the potential to enhance financial stability through diversified lending and broadening the base of depositors. A larger, more diversified base of depositors enhances the stability of deposit funding, particularly during periods of financial stress. But rapid expansion of access to finance—if the outcome of relaxed credit expansion or the development of unregulated segments of the financial system—may be equally perilous to financial stability; see [Demirgüç and Klapper \(2013\)](#).

2. 1. 3. MEASURES OF FINANCIAL INCLUSION

Financial inclusion is a complex concept that requires a comprehensive set of indicators for measurement. To do it justice, economies must move beyond measures of access and use of financial services to other key determinants, such as affordability, product availability, service quality, and levels of financial literacy. Therefore, measuring financial inclusion is a key concern for researchers, governments, and policymakers.

Typically, measurement has relied heavily on supply-side aggregate data on the availability and Usage of formal financial services. Some studies have employed individual-level demand-side data, including varying usage patterns and limiting behaviours, but these measures tend to be treated as stand-alone in analyses. Although valuable, this patchwork methodology fails to paint a synoptic view of the overall state of financial inclusion for a group of nations. Furthermore, as noted, there has been comparatively little effort to build composite indices towards a unified measure, which has been subject to methodological challenges and measurement flaws.

For that purpose, in fact, some components of financial inclusion are more quantifiable than others. Tangible factors like access—measured by bank branch or ATM density—and use—tracked by indicators like deposit sizes—are more quantifiable. It is for this reason that access and Usage are currently the most commonly employed proxies for measuring financial inclusion. This focus is also reflected in policy; a 2016 survey by the Bank for International Settlements (BIS) of 47 countries found that nearly all definitions of financial inclusion incorporate elements of access and Use ([Sarma, 2012](#)).

2. 1. 4. OBJECTIVES FOR FINANCIAL INCLUSION

Greater access to these services significantly advances the economy, particularly among the business sector, and indirectly improves key human development indicators, such as healthcare, education, poverty reduction, and income inequality (Sakariya, 2013). International momentum towards financial inclusion has encouraged collaboration between international financial institutions working through coordinated mechanisms, thereby increasing their benefits. Since developing an integrated financial system is the most effective way to reach the poor and low-income groups, as emphasized by the Consultative Group to Assist the Poor (Ratnawati, 2020).

Key objectives and benefits of financial inclusion are:

- Making overall economic and social benefits through positive externalities, particularly by raising investment and savings rates that spur economic growth.
- Enhancing the reduction of poverty levels and overall prosperity and economic welfare.
- Enhancing financial risk management through digital services that facilitate fund mobilization during crises.
- Encouraging savings habits among low-income, vulnerable individuals who face persistent financial uncertainty.
- Providing savings accounts for supporting the accumulation of reserves for essential expenditure or productive investments.
- Offering formal banking facilities for the encouragement of financial discipline and offering substitutes to informal credit sources such as moneylenders or family members.
- Support rural well-being and productivity by providing transparent, adequate, and timely formal credit facilities.
- Establishing formal remittance channels for poor individuals who now need to employ costly informal transfer channels
- Redesigning social benefit payment by cutting cash payments and product subsidies in favor of direct bank account transfers, reducing leakage
- Enhancing service efficiency, eliminating corruption, and increasing transparency through electronic payment systems, while reducing administrative costs.

Lastly, bringing unbanked communities into the formal financial mainstream, mobilizing their deposits, funding entrepreneurial activities through access to credit, and contributing towards overall economic growth.

2. 1. 5. DIGITAL FINANCIAL SERVICES AND FINANCIAL TECHNOLOGY

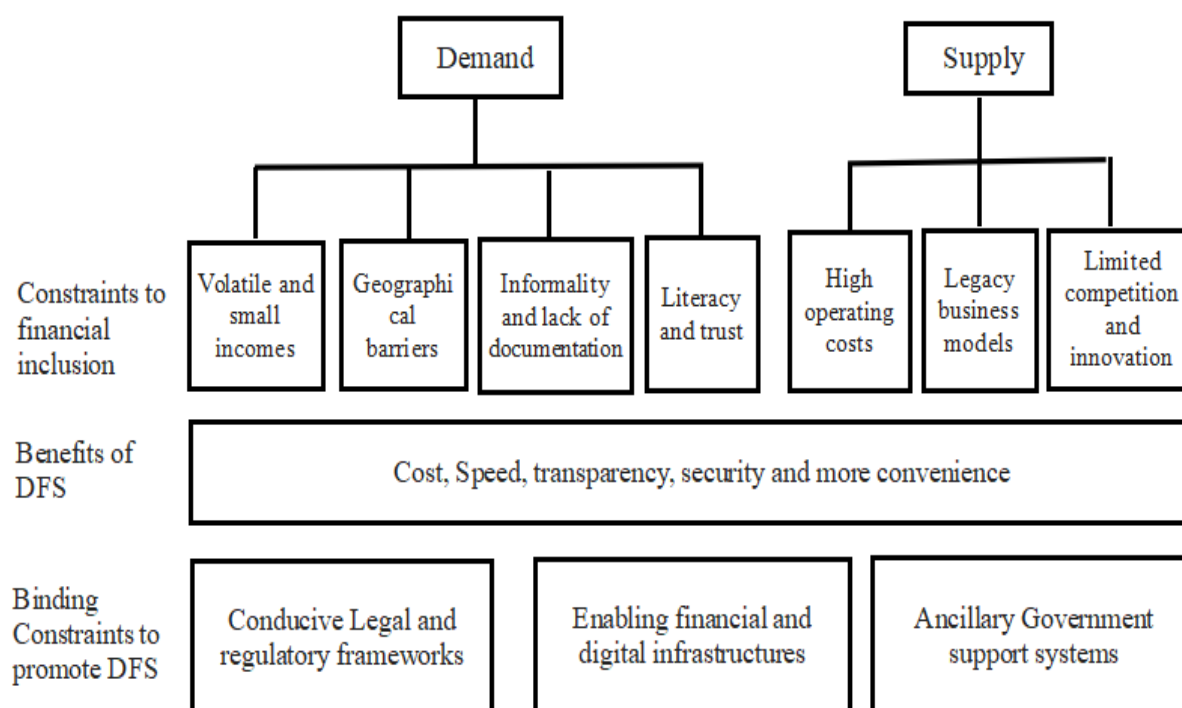
Financial inclusion and digital finance offer governments, economies, consumers, and service providers significant, multi-faceted benefits. The G20 and the World Bank have been leaders in promoting financial inclusion in developing nations since 2010, as part of their efforts to combat poverty. The expansion of digital technology has enabled the offering of a broader range of financial services, including internet and mobile banking, as well as universal access to digital wallets and cards. While customers are grateful for the ensuing convenience and ease, this economic shift is vulnerable to enormous threats, primarily the risk of cyber-attacks. Despite the increased adoption of cashless transactions, their growth is hindered by security threats, weak network infrastructure, merchant resistance, cost, and a lack of user technical know-how (Pazarbasioglu et al., 2020).

For people experiencing poverty and those with low incomes, digital financial services offer a viable alternative to traditional banking, enabling savings, borrowing, and income-earning more conveniently and affordably. Digital financial services offer a more efficient way to hold

and transfer money than cash. A diverse landscape of banks, mobile operators, fintech players, and regulators offers digital products that may overcome traditional cost barriers, providing secure and accessible services to the underbanked. As noted in Figure 3, electronic finance can overcome long-standing demand and supply barriers that have previously excluded low-income individuals from accessing low-cost financial services (Gabor and Brooks, 2020).

Lastly, financial inclusion—defined as the access to and use of appropriate financial services by households and firms—is essential for enhancing the lives of poor households and stimulating economic activity. Digital services are typically considered a key driver of such inclusion. Additionally, promoting the shift away from cash supports financial inclusion, which, in turn, enables digital payments that facilitate immediate, low-cost transfers between individuals and businesses (Hasan et al., 2022).

Figure 31. Barriers to digital financial services growth and financial inclusion



Source: Pazarbasioglu et al. (2020)

2. 1. 6. THE ROLE OF FINANCIAL INCLUSION IN ENHANCING FINANCIAL STABILITY AND ECONOMIC GROWTH

Financial inclusion is measured differently in different nations. The U.S. measures the reach of banking services; China uses bank account ownership; and other countries consider deposit levels. Expanding the coverage and quality of such services promotes equality and unlocks economic opportunities. It empowers individuals with low incomes, women, and youth by facilitating small investments, boosting productivity, and promoting consumption. The bank account serves as an entry point for managing money, facilitating smooth consumption, and financing business or educational opportunities. Consequently, financial inclusion is essential for growth, stability, and poverty reduction (Pham and Doan, 2020).

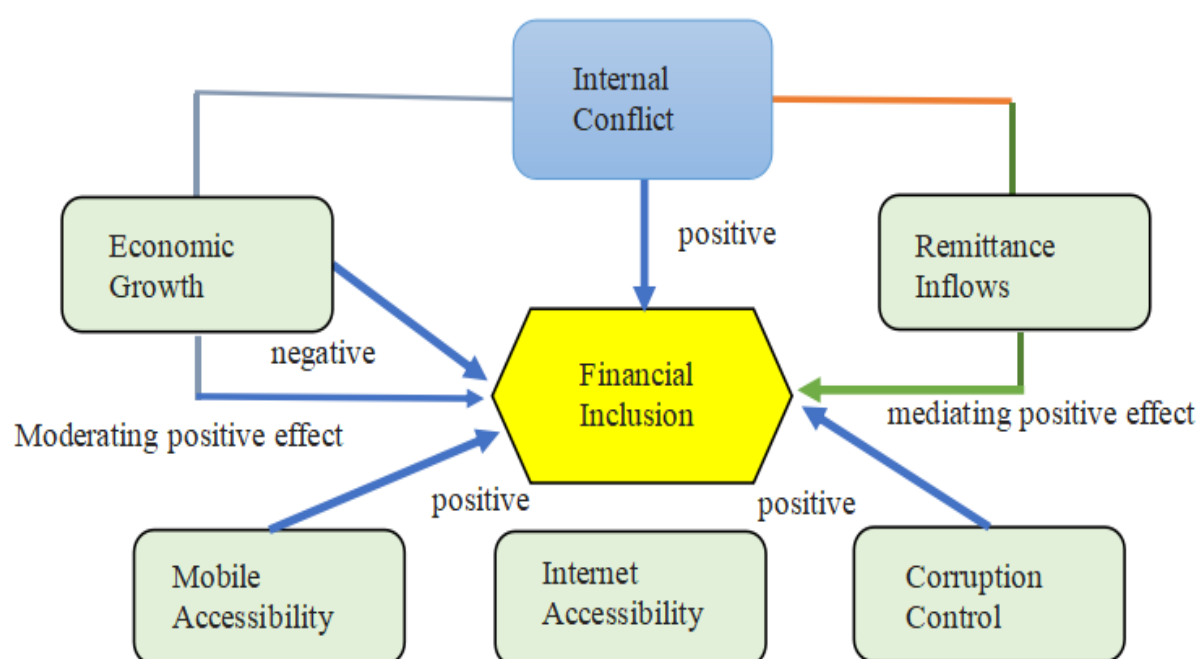
In addition to traditional banks, providers now include cooperatives, NGOs, and specialist financiers. Digital technology is also pivotal in driving down costs and extending coverage. The Arab Monetary Fund (2020) notes that financial inclusion and system stability are complementary: stability cannot be attained without inclusion, and inclusion strengthens stability by rais-

ing living standards and supporting a thriving small business sector. It also renders monetary policy more effective by extending the formal financial sector and spreading risk (Pal and Bandyopadhyay, 2022). The impact of financial inclusion on economic growth can be illustrated by its core role in providing affordable loans at reasonable interest rates to low-income segments of society. This helps spur productive activities in rural areas. This, in turn, results in increased productivity, job creation, and an enhanced living standard, translating into higher gross national product and, hence, improved economic growth rates. Equally efficient, financial inclusion has proved to be one of the strongest tools for poverty reduction in rural areas, through improvements in living standards resulting from increased income.

At the financial markets level, access to banking services and insurance products by marginalized populations increases financial liquidity. This persuades individuals to invest their savings in these financial markets and ensures that capital is channeled toward long-term investments. Financial flows like these also help reduce liquidity risks, as evidenced by the unavailability of cash flows, and stimulate investment, thereby increasing production and enhancing distribution (Shen et al., 2024).

Globally, over 90 developing countries view financial inclusion as central to sustainable development (Emara and El-Said, 2021). The World Bank (2020) states that over two-thirds of regulatory bodies include its promotion as part of their mandate, and in over 50 nations, official targets have been set due to its positive economic impact and contribution to financial stability.

Figure 4: The relationship between financial inclusion and economic growth



Source: Murshed, 2023, Graphical Abstract

2. 1. 7. FINANCIAL INCLUSION IN EGYPT

Financial inclusion is among the most prominent priorities of the Egyptian government, which is implementing reforms to stimulate economic growth, improve living standards, and ensure stability. Among the high-priority initiatives is the launch of automated services that enable citizens to access financial resources more conveniently. Egypt aims to become a regional leader in digital payments, fuelling its digital economy transformation.

One of the primary aims is to integrate the informal economy, including MSMEs and low-income families, into the formal financial system. The expansion of bank services is found to

raise income, reduce poverty, and improve the standard of living (Lenka and Barik, 2018).

This project aligns with “Egypt Vision 2030,” which actively promotes a cashless economy to enhance governmental efficiency and transparency. The Central Bank of Egypt plays a crucial role in regulating electronic payment systems to maintain stability. The electronic payment systems are designed to provide low-cost, automated financial services (Ismael and Ali, 2021). The national electronic payment system is expected to reduce currency printing and distribution costs by nearly 25% and decrease processing time by up to 50%.

Important milestones are:

- Alliance for Financial Inclusion (AFI): Joined in 2013 and hosted the AFI Annual Conference in 2017.
- Visa Partnership (2017): A Memorandum of Understanding for developing technological infrastructure for financial transactions.
- Partnership with Fawry (2018): A cooperation agreement to provide electronic payment and e-commerce services.
- Egypt Post Expansion (2017): A partnership with Banque Misr and Visa to enhance electronic payment acceptance nationwide.
- National Financial Inclusion Strategy: A multi-stakeholder strategy developed by key institutions and ministries.
- This coordinated strategy emphasizes Egypt’s commitment towards an inclusive, digitalized financial environment.

2. 1. 7. 1. THE CENTRAL BANK’S PLAN TO ENHANCE FINANCIAL INCLUSION IN EGYPT

Recognizing the link between financial stability and inclusion, global central banks are encouraging financial inclusion policies. The Central Bank in Egypt is strengthening legislative and financial infrastructure to promote inclusion, enhance consumer protection, and develop inclusive financial products (Hassouba, 2023).

Despite these efforts, the level of inclusion remains low due to structural, social, and legal obstacles that limit the effectiveness of financial inclusion. In 2015, IMF Managing Director Christine Lagarde noted that only 10% of Egyptians had bank accounts. That figure has since risen to approximately 32%, due to initiatives such as paying salaries and pensions through banks, alongside improvements in financial literacy.

Efforts driving this growth include:

- Mobile Payment Expansion: New regulations enabled the expansion of mobile payment services for salaries, bills, and government transfers.
- Electronic Banking Structure: Guidelines were issued to ensure secure e-banking, enabling greater access for digital customers.
- Branch Network Growth: A 2014 guideline eased rules for small branches to promote retail and SME banking reach.
- SME Financing Schemes: The government and Central Bank introduced various programs, ranging from credit facilities to a real estate finance scheme worth EGP 7 billion. The Central Bank funded 17,000 projects independently with EGP 19 billion, creating 81,000 new accounts in one week.
- Despite the improvement, with 40-45% of financial portfolios originating from bank credit (El-Deeb et al., 2021), expansion of central bank programs is still necessary.

2. 1. 7. 2. THE IMPACT OF FINANCIAL INCLUSION ON THE EGYPTIAN ECONOMY

To quantify the impact of financial inclusion on Egypt's economy, we examined several key macroeconomic variables. We tracked their quantitative variations from 2013 through 2022, attributing significant changes to the advancement of financial inclusion as a primary driver. Key observed improvements include higher international competitiveness rankings, lower inflation, greater financial stability, fewer informal financial transactions, reduced financing of terrorism and corruption, and more substantial anti-money laundering efforts.

In addition, financial inclusion had a notable social influence, as discussed below:

2.1.7.2.1. FINANCIAL INCLUSION AND EGYPT'S RANKING IN INTERNATIONAL COMPETITIVENESS INDICATORS

Financial inclusion, along with the electronic payment and collection system, contributed to improving Egypt's credit rating. The system aimed to conserve approximately 50% of service delivery time and reduce procedures, which positively impacted Egypt's ranking in international competitiveness indicators related to "cost, time, and procedures," in addition to ease of doing business and transparency indicators:

- Credit Rating: Egypt maintained a (B) rating in 2020, both locally and abroad, compared to 2015, reflecting international institutions' confidence in the Egyptian economy.
- Ease of Doing Business Index: Egypt ranked 114th in 2020, up from 126th in 2015.
- Transparency Index: Egypt's score improved from 36/100 in 2015 to 33/100 in 2020. Hussein (2020).

2.1.7.2.2. FINANCIAL INCLUSION AND ECONOMIC STABILITY

An increase in the money supply and market liquidity can drive inflation, but financial inclusion counteracts it by regulating domestic liquidity. Egypt's inflation, for example, fell from 8.3% in 2015 to 5.1% in 2020. Financial inclusion also reduces currency issuance costs by around 25%, freeing up funds for industrial and service sector growth (Mahmoud El-Baz, 2020).

It also incorporates informal enterprises into the formal economy—a market valued at approximately 3 trillion Egyptian pounds (approximately \$70 billion) and over 2 million enterprises that employ 29.3% of the labour force (OECD, 2025). Enrolments of these players into the formal system seize extraordinary tax revenues and widen the taxpayer base

Furthermore, the use of electronic payments—i.e., bank cards and mobile wallets—is also reducing cash usage and slowing informal transactions. Egyptian banks had issued 36.9 million cards by December 2020, up from 31.3 million in 2018 (Almaleeh, 2020). The electronic systems further facilitate anticorruption, anti-money laundering, and counterterrorism efforts.

2.1.7.2.2 Financial inclusion and economic stability

Financial inclusion has a significant impact on social development by enhancing support for impoverished and low-income populations, extending services to individuals and micro, small, and medium-sized enterprises (MSMEs), and ultimately improving overall societal well-being. This impact manifests through several key indicators:

- Poverty rates, as documented by the Income and Expenditure Surveys, exhibited a concerning upward trend over the past two decades, rising from 16.7% in 1999 to 32.5% in 2019. This trend has been attributed to the social programs of the Egyptian government for supporting poor and low-income populations in an effort to curtail poverty, within the framework of "Egypt's Vision for Sustainable Development 2030." The main drivers behind this development are programs such as the National Project for Developing

Egyptian Rural Villages, aka Decent Life, and conditional cash transfer programs under Takaful and Karama. A notable reversal occurred in 2020, with the rate declining to 29.7%, a shift partly attributable to broader financial inclusion efforts.

- The advancement of financial inclusion has directly contributed to improved living standards. This is evidenced by citizens' increased access to a greater volume and higher-quality goods and services. A concrete measure of this progress is the rise in GDP per capita, which reached 42,900 Egyptian Pounds in 2019, a substantial increase from 22,230 Pounds in 2013. The growth in exports and foreign direct investment was the most important positive economic driver, driving an upward swing in gross domestic product during the study period, 2000-2020. The research results showed an 8.1% increase in gross domestic product during the period under review (Mahmoud, 2023).
- A further beneficial social outcome of financial inclusion is the potential reduction in crime rates. By expanding financial services to MSMEs, inclusion fosters entrepreneurship, facilitates project financing, and generates employment opportunities, thereby addressing some of the root causes of criminal activity (Ayadi et al., 2018).

2. 2. EMPIRICAL LITERATURE REVIEW

Numerous research works have examined the consequences of financial inclusion. A growing body of research seeks to investigate the relationship between financial inclusion and economic growth from various angles. It is generally agreed that financial inclusion can enhance economic well-being.

The influence of financial inclusion on borrowing and savings choices for individuals in the UAE and the U.S. is also noted by Niankara and Muqattash (2018), who similarly determine that Americans are more likely to save than their UAE counterparts. Additionally, they noted a gender gap in borrowing and saving that favoured men, and that having access to a bank account and debit card increased one's willingness to save and borrow. Financial inclusion can be achieved through improved regulation and the depoliticization of the financial sector, making it a social cause rather than just a commercial endeavour (Dev, 2006).

Fungáčová and Weill (2015) discuss China's financial inclusion and compare it with that of other BRICS nations. They find that the use of formal savings accounts and formal financial accounts is higher in China than in the other BRICS nations, indicating a high degree of financial inclusion in China. They further discover that additional use of formal accounts and formal credit in China is correlated with increased incomes, increased education levels, being male, and advanced age. Bachas et al. (2018) explore whether debit cards improve financial inclusion. They discovered that by closing the distance to access bank accounts in Mexico, debit cards mitigate transaction costs.

In Nigeria, there has been hardly any research on financial inclusion. For example, Efobi et al. (2018) analysed the effect of financial inclusion on the export potential of Nigerian manufacturing firms, finding that, while more firms have access to finance, its impact varies by firm location. In line with the analysis by Adegbite and Machethe (2020), Nigeria exhibits a growing gender disparity in financial inclusion, where men have better access to the Nigerian financial system than women. Adetunji and David-West (2019) demonstrate that savings behaviour in Nigerian financial institutions is influenced by financial literacy.

Furthermore, the macroeconomic contribution of financial inclusion is a key focus of another research. Ibrahim and Aliero (2020) propose that there is a strong positive relationship between per capita income growth and the extent of financial inclusion. According to Ozili's (2021) research, the unemployed and individuals with at least a secondary schooling level hold more

debit cards and bank accounts. Financial inclusion promotes GDP growth and broader financial inclusion, according to David et al. (2018), who provide evidence on the drivers of financial inclusion in Nigeria between 1990 and 2016. Despite political, infrastructural, and structural constraints that affect absolute financial inclusion in African nations, fintech is driving the expansion of financial inclusion across these nations.

Demirgüç and Klapper (2012) assert that most people in Africa save and borrow money through alternative channels, and hardly any of them have a bank account. They further assert that most small and medium-sized enterprises in Africa experience severe financial exclusion and are seriously hampered from getting finance to do business. Grimes et al. (2010) investigate whether economic education influences an individual's choice to bank. In a nationwide telephone survey, respondents who had been trained in economics and business were less likely to be unemployed. Conversely, the survey found that the economically literate adult population was more likely to be financially included. According to Klapper et al. (2015), wealthy, well-educated individuals tend to have higher levels of financial literacy. Ozili (2020) demonstrates how financial innovation, poverty, financial literacy, and regulation all contribute to the extent of financial inclusion.

Saraf and Kayal (2022) examined the role of financial inclusion in promoting economic development and poverty alleviation, as it is a significant concern for economic development, societal advancement, and reducing the disparity between the poor and the wealthy. Financial institutions are a solid pillar of advancement and development. The study used secondary data from the Government of India's Ministry of Finance report and employed a multiple linear regression model over 7 years. The study's results were meaningful and positive, particularly regarding the impact of the number of bank outlets and the share of credit deposits on the country's GDP. In contrast, ATM growth rates had no significant impact on Indian GDP growth. Klapper et al. (2015) note that individuals with higher levels of wealth and education tend to have greater financial literacy. Ozili (2021) illustrates how financial innovation, poverty, financial literacy, and regulation collectively influence the level of financial inclusion.

3. METHODOLOGY: SPECIFICATIONS AND ESTIMATES

3. 1. VECTOR AUTO-REGRESSION MODEL

In the realm of multivariate time series analysis, one of the most powerful, versatile, and achievable approaches is the Vector Autoregression (VAR) model. The VAR model is a natural extension of the univariate autoregressive model to dynamic multivariate time series contexts. The VAR model is most applicable in forecasting and describing the dynamic behaviour of financial and economic time series. It is used as an alternative to theory-based simultaneous equation models and tends to yield superior predictions than univariate time series models. Among the leading advantages of VAR-based predictions is their flexibility, which allows them to be conditioned on hypothetical future paths of several variables in the model.

The applicability of the VAR model extends from data description and forecasting to structural inference and policy analysis. Structural analysis utilizes the VAR machinery to trace the causal impact of unanticipated shocks, or innovations, on a particular variable within the entire system. This requires the researcher to make some assumptions regarding the underlying causal structure of the data. These causal dynamics are typically interpreted using two primary tools: impulse response functions and forecast error variance decompositions (see Zivot and Wang, 2006).

Let $Y_t = (y_{1t}, y_{2t}, \dots, y_{nt})$ Denote an $(n \times 1)$ vector of time-series variables. The basic p-lag VAR(p) model has the form;

$$Y_t = \alpha + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \dots + \beta_p Y_{t-p} + \varepsilon_t, t = 1, \dots, T \quad (1)$$

where β_i are $(n \times n)$ coefficient matrices and ε_t is an $(n \times 1)$ unobservable zero mean white noise vector process (serially uncorrelated or independent) with time invariant covariance matrix Σ . A bivariate VAR (2) model equation by equation has the form;

$$\begin{pmatrix} y_{1t} \\ y_{2t} \end{pmatrix} = \begin{pmatrix} \alpha_1 \\ \alpha_2 \end{pmatrix} + \begin{pmatrix} \beta_{11}^1 & \beta_{12}^1 \\ \beta_{21}^1 & \beta_{22}^1 \end{pmatrix} \begin{pmatrix} y_{1t-1} \\ y_{2t-1} \end{pmatrix} + \begin{pmatrix} \beta_{11}^2 & \beta_{12}^2 \\ \beta_{21}^2 & \beta_{22}^2 \end{pmatrix} \begin{pmatrix} y_{1t-2} \\ y_{2t-2} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} \quad (2)$$

or

$$\begin{aligned} y_{1t} &= \alpha_1 + \beta_{11}^1 y_{1t-1} + \beta_{12}^1 y_{2t-1} + \beta_{11}^2 y_{1t-2} + \beta_{12}^2 y_{2t-2} + \varepsilon_{1t} \\ y_{2t} &= \alpha_2 + \beta_{21}^1 y_{1t-1} + \beta_{22}^1 y_{2t-1} + \beta_{21}^2 y_{1t-2} + \beta_{22}^2 y_{2t-2} + \varepsilon_{2t} \end{aligned} \quad (3)$$

where $\text{cov}(\varepsilon_{1t}, \varepsilon_{2s}) = \sigma_{12}$ for $t = s$; 0 otherwise. Notice that each equation has the same regressors - lagged values of y_{1t} and y_{2t} . Hence, VAR(p) the model is just a seemingly unrelated regression (SUR) model with lagged variables and deterministic terms as common regressors, see Youssef et al. (2021). In lag operator notation, the VAR(p) is written as;

$$\beta(L)Y_t = \alpha + \varepsilon \quad (4)$$

where $\beta(L) = I_n - \beta_1 z - \dots - \beta_p z^p$. The VAR(p) is stable if the roots of

$$\det(I_n - \beta_1 z - \dots - \beta_p z^p) = 0 \quad (5)$$

Lie outside the complex unit circle (have modulus greater than one), or, equivalently, if the eigenvalues of the companion matrix, see [Lütkepohl \(2009\)](#).

$$F = \begin{pmatrix} \beta_1 & \beta_2 & \dots & \beta_n \\ I_n & 0 & \dots & 0 \\ 0 & \ddots & 0 & \vdots \\ 0 & 0 & I_n & 0 \end{pmatrix}$$

Have modulus less than one. Assuming that the process has been initialized in the infinite past, then a stable VAR(p) process is stationary and ergodic with time-invariant means, variances, and autocovariances, see [Kamel and Alqarni \(2022\)](#).

If Y_t In equation (1), if the process is covariance stationary, then the unconditional mean is given by;

$$\mu = (I_n - \beta_1 - \dots - \beta_p)^{-1} \alpha \quad (6)$$

The mean-adjusted form of the is then.

$$Y_t - \mu = \Pi_1(Y_{t-1} - \mu) + \Pi_2(Y_{t-2} - \mu) + \dots + \Pi_p(Y_{t-p} - \mu) + \varepsilon_t \quad (7)$$

The basic model may be too restrictive to represent the main characteristics of the data sufficiently. Other deterministic terms, such as a linear time trend or seasonal dummy variables, may be needed to correctly represent the data. Additionally, stochastic exogenous variables may also be required. The general form of the VAR model with deterministic terms and exogenous variables is given by.

$$Y_t = \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \dots + \beta_p Y_{t-p} + \Phi D_t + G X_t + \varepsilon_t \quad (8)$$

where D_t Represents an $(l \times 1)$ matrix of deterministic components, X_t Represents an $(m \times 1)$ matrix of exogenous variables, and Φ and G are parameter matrices. Ordinary least squares may estimate

each equation independently without sacrificing efficiency as compared to generalized least squares. This study will use semi-annual data from 2008 to 2023. Using semi-annual data enables researchers to capture the short-run dynamic effects of financial inclusion on economic growth, which are often masked in analyses that rely on annual data. The period of 2008 represents a pivotal starting point because financial inclusion attained global policy prominence in the wake of the financial crisis, while extending it to 2023 ensures coverage of the most recent influential variables.

The research methodology followed the VAR model to analyse the interdependencies among multiple time series. At the same time, statistical gaps and structural breaks were handled using specialized techniques, primarily interpolation and dummy variables. It is worth noting that all data for a sample of banks listed on the Egyptian Stock Exchange were analysed using EViews 12. Table 1 summarizes the study's variables and their abbreviations.

Table 1. Description of variables

Variables	Abbreviation	Unit of Measurement
Gross domestic product	GDP	Billion dollar
Number of bank accounts	NBA	Thousand
Number of bank payment cards	NBPC	Thousand
Number of bank branches	NBB	Thousand
Number of ATMs	NATM	Thousand
The volume of individual deposits	VID	Billion dollar
The amount of credit granted to individuals	VCGI	Billion dollar

Source: Authors' calculation by EViews

Then, the equation of the study VAR model was formulated as follows:

$$GDP_{it} = \beta_0 + \beta_1 NBA_{it} + \beta_2 NBPC_{it} + \beta_3 NBB_{it} + \beta_4 NATM_{it} + \beta_5 VID_{it} + \beta_6 VCGI_{it} + \varepsilon_t ;$$

$$i = 1, 2, \dots, N, t = 1, 2, \dots, T \quad (9)$$

3. 2. DESCRIPTIVE STATISTICS

The paper began the analysis with descriptive statistics. The results in Table 2 present the descriptive statistics for the model variables, indicating that the averages, as well as the minimum and maximum values, are all positive. Based on the Jarque-Bera normality test, the data series for the model variables are confirmed to follow a moderate-normal distribution, with constant variance and zero covariance.

Table 2. Descriptive statistics of variables

Statistics	GDP	NBA	NBPC	NBB	NATM	VID	VCGI
Mean	360.7321	30.04139	47.10438	4404.765	16124.00	216.2877	111.0770
Median	347.3500	26.30000	48.46500	4489.500	15940.00	221.7114	111.3380
Maximum	476.7500	54.35802	80.05292	5177.719	28146.89	276.3000	133.5000
Minimum	235.4000	7.300000	14.97000	3610.000	4765.000	151.8000	96.50000
Std. Dev.	82.30392	16.06717	21.11425	514.5390	7849.790	34.56424	9.988000
Skewness	-0.040631	0.111107	-0.013676	-0.233251	0.055730	-0.230858	0.634085
Kurtosis	1.633963	1.453687	1.728975	1.872884	1.556090	2.615248	3.324367
Jarque-Bera	1.248440	1.626975	1.077501	0.992009	1.398199	0.240811	1.142312
Probability	0.535679	0.443309	0.583477	0.608959	0.497033	0.886561	0.564872
Sum	5771.714	480.6622	753.6700	70476.24	257984.0	3460.603	1777.232
Sum Sq. Dev.	101609.0	3872.308	6687.173	3971255.	9.24E+08	17920.30	1496.402
Observations	32	32	32	32	32	32	32

Source: Authors' calculation by EViews

3. 3. PEARSON CORRELATION MATRIX

The correlation matrix shows the strength and direction of the relationships between the study variables, using the correlation coefficient, and the significance level of each relationship, indicated by the p-value. From an economic perspective, these initial correlations are quite instructive about how these different dimensions of financial inclusion-Access, Usage, and Depth-relate to each other in a way that is indicative of their joint association with the general level of economic activity, as captured by GDP. To determine the direction of the correlation between the variables in the research model, the Pearson correlation coefficient was used. The Pearson correlation coefficient ranges from -1 to +1, where a positive value indicates a positive correlation between the two variables under study, suggesting complementary development, such as the growth of bank branches accompanying an increase in the number of various types of payment cards issued. On the other hand, the negative value reflects an inverse relationship that, although not widespread in this context, could, in principle, signal substitution effects or a policy tradecorrelation coefficient between From this angle, the researcher examined the correlation coefficients for the study variables to ensure they met the threshold criteria for a correlation coefficient of less than 80%, to exclude variables that had a correlation coefficient of more than 80%, as reported by [Kamel and Abonazel \(2023\)](#), due to the problem of multicollinearity, which prevents the straightforward interpretation of the specific economic contribution of each indicator of financial inclusion to GDP growth. Table 3 depicts the results of the Pearson correlation matrix and VIF analysis for all variables as follows:

Table 3. Correlation matrix between all variables

Correlation							
Probability	GDP	NBA	NBPC	NBB	NATM	VID	VCGI
GDP	1						

NBA	0.706813	1					
	0.0000	-----					
NBPC	0.638248	0.781499	1				
	0.0001	0.0000	-----				
NBB	0.703036	0.624792	0.768588	1			
	0.0024	0.0000	0.0000	-----			
NATM	0.569422	0.590413	0.694045	0.551127	1		
	0.0000	0.0000	0.0000	0.0000	-----		
VID	0.466574	0.273112	0.215491	0.115183	0.220277	1	
	0.0685	0.3061	0.4228	0.6710	0.4123	-----	
VCGI	0.345631	0.022321	-0.070118	-0.179292	-0.061774	0.745371	1
	0.1898	0.9346	0.7964	0.5064	0.8202	0.0009	-----
VIF	----	2.9352	4.7923	1.8934	3.7894	4.0153	3.9658

Source: Authors' calculation by EViews

According to Table 3, the variables exhibited a correlation of less than 80%. Additionally, the variance inflation factor (VIF) values were calculated for all explanatory variables. Since the VIF is less than 5, the VIF analysis indicates that the VAR model considered in this work is not susceptible to multicollinearity.

3. 4. AUGMENTED DICKEY-FULLER STATIONARITY TEST

The stability test is used to study the characteristics of the time series, ascertain their stability, determine their degree of integration, and, before they are used in statistical analysis, to avoid the emergence of the problem of false regression and thus to obtain misleading results. The present study relied on the use of the Augmented Dickey-Fuller (ADF) test, and the results of the time series stabilization test were as follows:

Table 4. ADF unit root test

Level			First Different		
Variables	t-Statistic	Prob.	Variables	t-Statistic	Prob.
GDP	-0.154885	0.9229	D(GDP)	-3.296768	0.0441
NBA	1.365788	0.9967	D(NBA)	-3.640332	0.0264
NBPC	0.201809	0.9609	D(NBPC)	-4.377789	0.0089
NBB	-0.736007	0.8034	D(NBB)	-3.405380	0.0326
NATM	1.729248	0.9988	D(NATM)	-4.774731	0.0042
VID	-2.621370	0.1156	D(VID)	-4.056012	0.0125
VCGI	-2.336562	0.1759	D(VCGI)	-3.416188	0.0343

Source: Authors' calculation by EViews

To determine whether the variables are stationary, we conduct a unit root test, primarily the Augmented Dickey-Fuller test. The outcome of this test is shown in Table 4, which indicates that the data series of all variables are stationary at the first difference (I(1)), as evidenced by the P-values being less than 0.05.

3. 5. JOHANSEN COINTEGRATION TEST

One requirement for joint integration of the study variables is that they be integrated to the same degree. Based on the results of the Augmented Dickey-Fuller test, all study variables are found to be integrated of the same degree, I (1). Using the Johansen cointegration test, the following results were obtained:

Table 5. Results of Johansson's cointegration test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.
None	0.567625	11.91669	15.49471	0.1610
At most 1	0.012650	0.178234	3.841466	0.6729
At most 2	0.482115	9.381213	15.49471	0.3313
At most 3	0.012011	0.169178	3.841466	0.6808
At most 4	0.579697	12.17196	15.49471	0.1489
At most 5	0.002642	0.037043	3.841466	0.8473
At most 6	0.066694	1.518489	3.841466	0.2178
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.
None	0.567625	11.73846	14.26460	0.1209
At most 1	0.012650	0.178234	3.841466	0.6729
At most 2	0.482115	9.212036	14.26460	0.2689
At most 3	0.012011	0.169178	3.841466	0.6808
At most 4	0.579697	12.13492	14.26460	0.1057
At most 5	0.002642	0.037043	3.841466	0.8473
At most 6	0.066694	1.518489	3.841466	0.2178

Source: Authors' calculation by EViews

From Table 5, the P-value for Johansson's cointegration test exceeds 5%, indicating no cointegration between the variables, confirming the time series' stability and their different degrees of integration. The most appropriate methodology in this study is therefore the use of the VAR model to illustrate the degree of integration of the variables, and there is no requirement for standard integration of the study variables. Since the variables under study are stable and exhibit no cointegration, the VAR model can be applied.

3. 6. VAR MODEL RESULTS

3. 6. 1. LAG ORDER SELECTION FOR THE VAR MODEL

Before estimating the VAR model, the appropriate delay period is determined by selecting the value that yields the lowest values for the following indicators.

Table 6. Results of lag order selection for the VAR model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-215.6874	NA	1.10e+11	31.09820	31.18950	31.08975
1	-175.2503	63.54407	6.11e+08	25.89290	26.16678	25.86754
2	-172.9914	2.904243	8.26e+08	26.14163	26.59810	26.09938

Source: Authors' calculation by EViews

Indicates lag order selected by the criterion.

LR: sequential modified LR test statistic (each test at 5% level).

FPE: Final prediction error.

AIC: Akaike information criterion.

SC: Schwarz information criterion.

HQ: Hannan-Quinn information criterion.

Table 6 shows that the appropriate delay period for the study variables is 1 (Lag = 1), indicating the optimal delay period for the study model.

The results above also show that the data exhibit minimal variation and contain no outliers. If the dataset contains outliers, the classical estimator is inefficient; a robust estimator must be used to estimate the parameters. Several papers on various regression models discuss robust estimators; see, e.g., [Youssef et al. \(2022\)](#), [Alharbi et al. \(2022\)](#), and [Kamel et al. \(2022\)](#) for more accurate and highly efficient results.

3. 6. 2. RESULTS FOR VAR ESTIMATES

The study has used the VAR model to estimate the model parameters and test for dynamic causal relationships and temporal interactions between GDP and indicators of financial inclusion in Egypt. This model enables us to transcend static correlations to explore how a shock or change in one financial inclusion variable, for example, an increase in the number of ATMs, starts not just a direct effect on GDP but also feeds back throughout the system over time. The following Table presents the results of the VAR model estimate, interpreted not only in terms of statistical significance but also in terms of their economic implications concerning the channels and strength through which financial inclusion in Egypt drives or is driven by economic growth:

Table 7: VAR model results

Variables	GDP	NBA	NBPC	NBB	NATM	VID	VCGI
GDP(-1)	1.051473	0.074737	-0.008438	-5.261111	20.44681	0.410079	0.021624
	(0.69651)	(0.01493)	(0.03185)	(2.43308)	(8.41350)	(0.91757)	(0.20102)
	[1.50964]	[5.00551]	[-0.26494]	[-2.16233]	[2.43024]	[0.44692]	[0.10757]
NBA(-1)	-3.653823	-0.085847	-0.441142	28.80047	-41.15574	0.253412	0.687066
	(4.38251)	(0.09395)	(0.20039)	(15.3092)	(52.9388)	(5.77349)	(1.26481)
	[-0.83373]	[-0.91378]	[-2.20143]	[1.88125]	[-0.77742]	[0.04389]	[0.54322]
NBPC(-1)	-3.139086	0.786010	0.902652	41.36267	159.7093	0.388232	0.261337
	(4.87046)	(0.10441)	(0.22270)	(17.0138)	(58.8331)	(6.41632)	(1.40564)
	[-0.64451]	[7.52830]	[4.05322]	[2.43113]	[2.71462]	[0.06051]	[0.18592]
NBB(-1)	-0.009231	-0.005845	0.000465	-0.323672	3.062831	-0.003343	-0.022863
	(0.10711)	(0.00230)	(0.00490)	(0.37417)	(1.29387)	(0.14111)	(0.03091)
	[-0.08618]	[-2.54568]	[0.09486]	[-0.86504]	[2.36718]	[-0.02369]	[-0.73959]
NATM(-1)	0.018367	-1.97E-05	0.001202	-0.044079	0.343070	-0.004058	-0.000846
	(0.01908)	(0.00041)	(0.00087)	(0.06664)	(0.23043)	(0.02513)	(0.00551)
	[0.96282]	[-0.04806]	[1.37776]	[-0.66146]	[1.48880]	[-0.16147]	[-0.15363]
VID(-1)	0.323320	-0.017077	0.009623	-0.741592	-11.92227	0.899682	0.259218
	(0.28374)	(0.00608)	(0.01297)	(0.99119)	(3.42751)	(0.37380)	(0.08189)
	[1.13948]	[-2.80746]	[0.74170]	[-0.74818]	[-3.47841]	[2.40683]	[3.16544]
VCGI(-1)	-2.858730	-0.143501	0.051427	12.68548	-24.54539	-2.839291	-0.474178
	(1.84281)	(0.03950)	(0.08426)	(6.43742)	(22.2604)	(2.42771)	(0.53185)
	[-1.55129]	[-3.63256]	[0.61032]	[1.97058]	[-1.10265]	[-1.16953]	[-0.89157]
C	255.2152	18.45719	-3.882768	4461.085	-9430.132	241.9890	180.4907
	(370.275)	(7.93752)	(16.9307)	(1293.46)	(4472.76)	(487.797)	(106.863)
	[0.68926]	[2.32531]	[-0.22933]	[3.44894]	[-2.10835]	[0.49609]	[1.68899]
R-squared	0.938697	0.979116	0.967700	0.977592	0.948804	0.637853	0.778384
Adj. R-squared	0.867176	0.968084	0.965017	0.951449	0.927408	0.215348	0.519832
Sum sq. resids	4816.233	2.213244	10.06948	58771.78	702764.9	8358.696	401.1577
S.E. equation	28.33206	0.607350	1.295472	98.97119	342.2389	37.32447	8.176773
F-statistic	13.12486	968.4915	371.8711	37.39436	715.7125	1.509694	3.010551
Log likelihood	-60.74997	-6.952952	-17.55830	-78.26166	-95.63118	-64.60914	-43.35222
Akaike AIC	9.821424	2.136136	3.651186	12.32309	14.80445	10.37273	7.336032
Schwarz SC	10.18660	2.501312	4.016362	12.68827	15.16963	10.73791	7.701207
Mean dependent	316.7257	20.63571	34.09500	4103.857	11485.93	201.8519	107.3626
S.D. dependent	77.73921	13.87575	18.35276	449.1696	6722.579	42.13618	11.80009

Source: Authors' calculation by EViews

These range from 0.93, 0.97, 0.96, 0.97, 0.94, 0.63, and 0.77, respectively, as shown in Table 7. From an economic perspective, such high explanatory power values, particularly for the GDP equation (0.93), provide evidence that the set of financial inclusion indicators specified in the VAR model captures a dominant share of the systemic fluctuations in economic output in Egypt over the period under study. This strongly suggests that the evolution of the financial ecosystem, proxied by variables such as account penetration, payment infrastructure, and credit depth, is a fundamental driver of the business cycles and growth trends in the Egyptian economy. However, the substantially lower R-squared of 0.63 for the volume of individual deposits

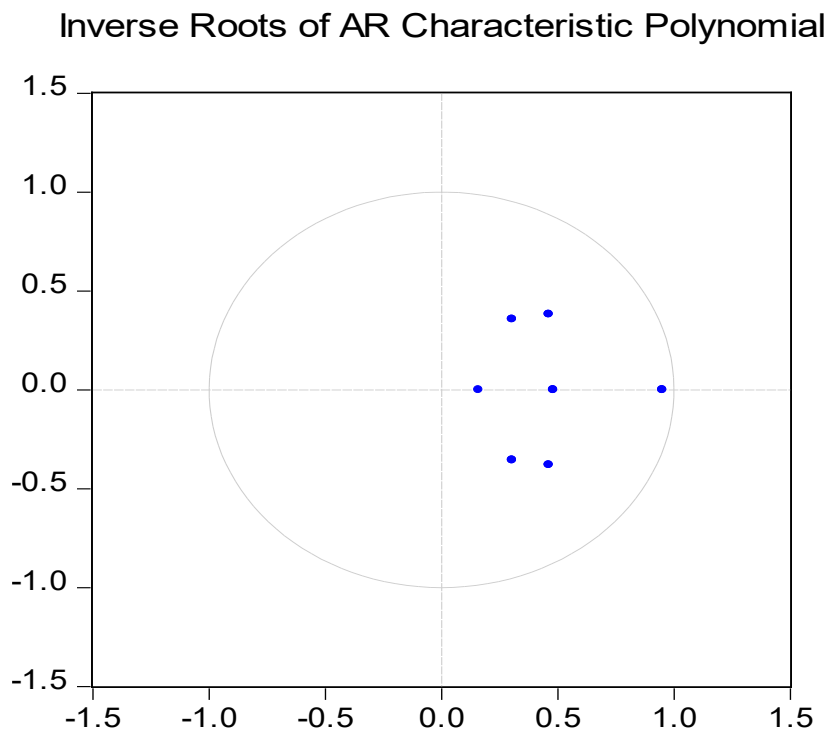
equation hints that a broader set of factors drives domestic savings behavior than the immediate financial inclusion framework might have captured; it may be combined with factors such as income levels, inflation expectations, and cultural savings habits. The closeness of the variables' R-squared values to the adjusted R-squared value supports the statistical fitness of the VAR model, reinforcing the economic validity of the selected variables in representing the core dynamics of finance and growth.

Table 8. Roots of Characteristic Polynomial

Root	Modulus
0.951134	0.951134
0.462046 - 0.380640i	0.598643
0.462046 + 0.380640i	0.598643
0.482386	0.482386
0.305186 - 0.356300i	0.469136
0.305186 + 0.356300i	0.469136
0.159807	0.159807
No root lies outside the unit circle.	
VAR satisfies the stability condition.	

Source: Authors' calculation by EViews

Figure 5. Inverse Roots of AR Characteristic Polynomial for VAR Model.



Source: Authors' calculation by EViews

Figure 5 and Table 9 revealed that the VAR technique does satisfy the stability condition since all values in the Table are less than 1, and no root lies outside the unit circle

3. 6. 3. RESIDUAL DIAGNOSTICS TEST

Table 9. Normality test results

Component	Skewness	Chi-sq	df	Prob.
1	-0.068044	0.016977	1	0.8963
2	0.439522	0.708326	1	0.4000
3	0.042760	0.006704	1	0.9347
4	0.108337	0.043036	1	0.8357
5	0.165889	0.100904	1	0.7507
6	0.563452	1.164086	1	0.2806
7	-0.106397	0.041508	1	0.8386
Joint		2.081540	7	0.9552
Component	Kurtosis	Chi-sq	df	Prob.
1	2.871450	0.015148	1	0.9020
2	2.823075	0.028694	1	0.8655
3	2.858440	0.018369	1	0.8922
4	4.409084	1.820059	1	0.1773
5	4.121148	1.152226	1	0.2831
6	3.687178	0.432862	1	0.5106
7	1.963186	0.985401	1	0.3209
Joint		4.452758	7	0.7264
Component	Jarque-Bera	df	Prob.	
1	0.032125	2	0.9841	
2	0.737020	2	0.6918	
3	0.025074	2	0.9875	
4	1.863094	2	0.3939	
5	1.253129	2	0.5344	
6	1.596948	2	0.4500	
7	1.026908	2	0.5984	
Joint	6.534298	14	0.9512	

Source: Authors' calculation by EViews

To test the normality of the VAR model residuals, the Jarque-Bera test for normality was employed, as shown in Table 9. The P-value for the model test is greater than 5%. Therefore, the null hypothesis that the residuals follow a normal distribution is accepted, which is a good indicator of the quality of the models used in the study.

Table 10. Autocorrelation test for VAR model

Lag	LRE stat	df	Prob.	Rao F-stat	df	Prob.
1	67.81704	7	0.0387	1.468421	(7, 14.6)	0.2137

Source: Authors' calculation by EViews

The P-value in Table 10 is greater than 5%. Therefore, it is proven that there is no autocorrelation between the residuals of the VAR model.

Table 11. Heteroscedasticity test for VAR models

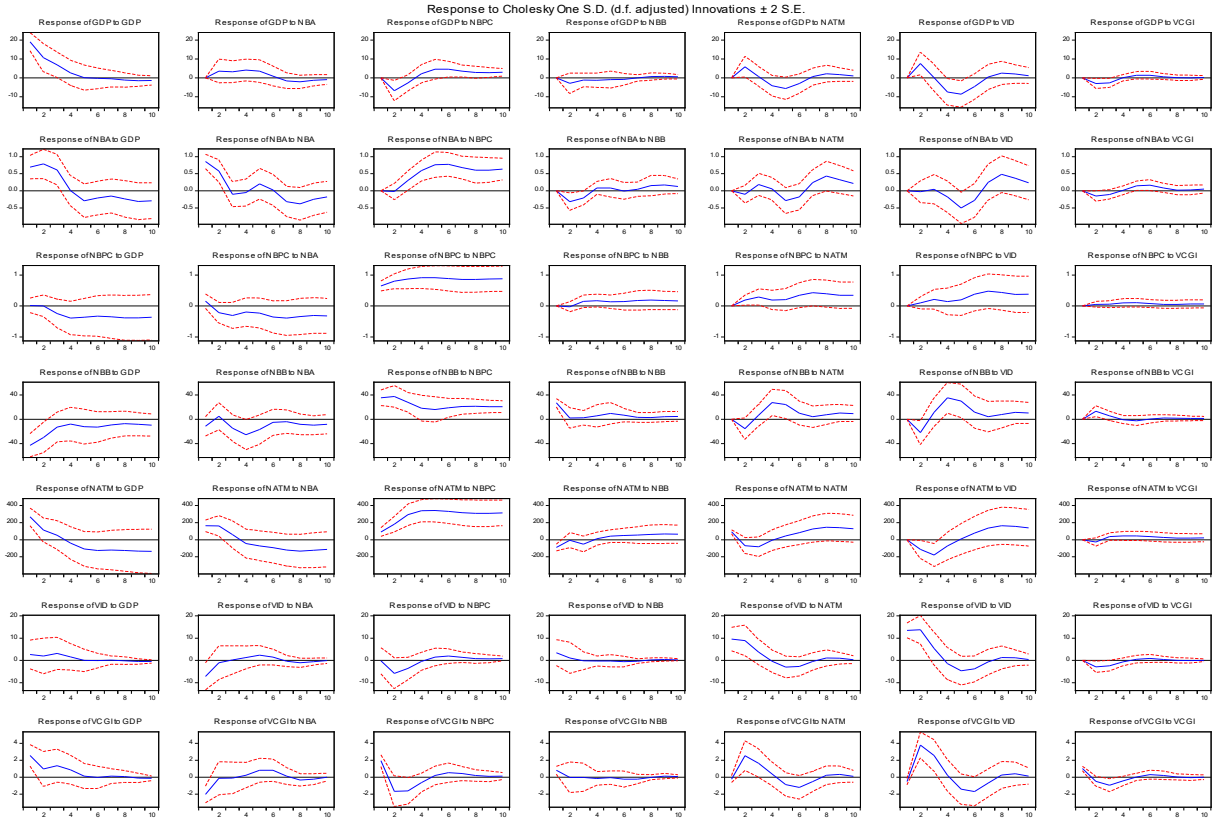
Chi-sq	df	Prob.
13.67284	7	0.5291

Source: Authors' calculation by EViews

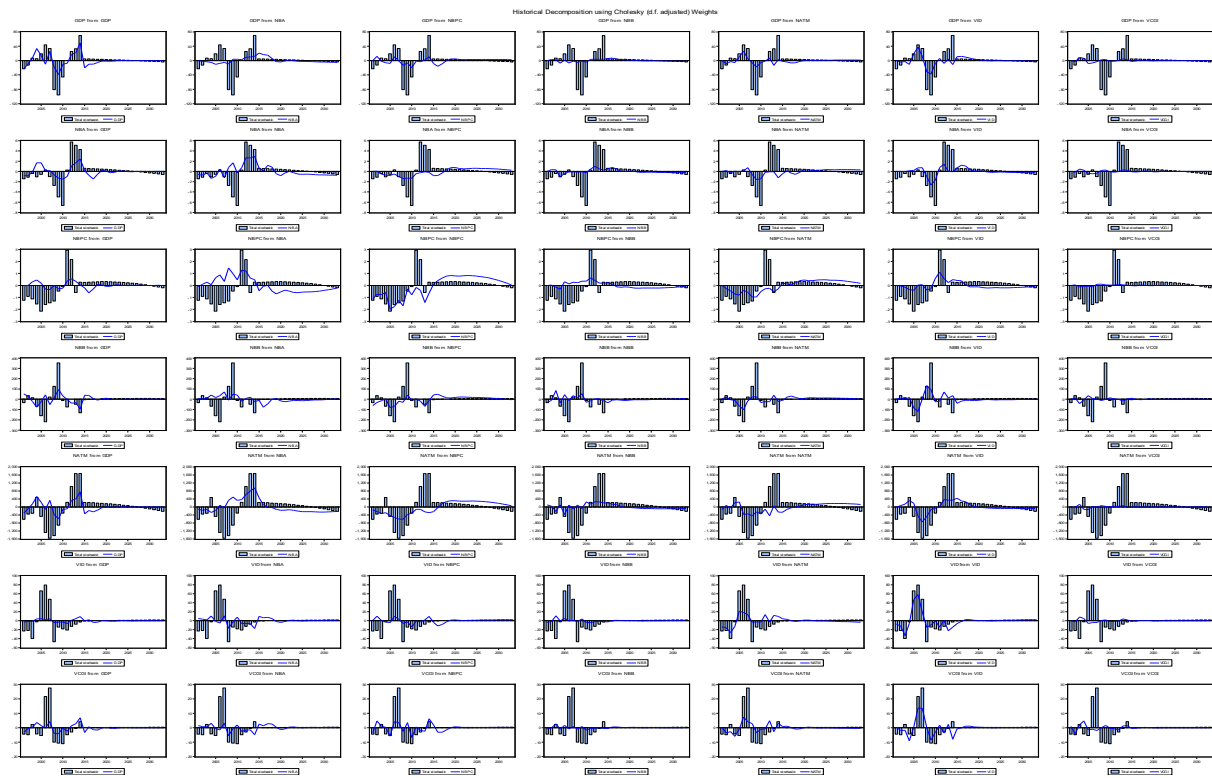
Since the p-value is greater than 0.05, we fail to reject the null hypothesis. Then, the Table shows that the VAR model studied does not exhibit heteroscedasticity. Then, we accept the estimated VAR model.

Moreover, Figure 6 reports the impulse and response functions that trace the effect of a one-time shock to one of the innovations on the current and future values of the endogenous variables, assuming contemporaneous uncorrelation among the innovations. This is achieved through our study of the immediate response role of applying structural shocks to one of the study variables and determining their future transition to other variables (10 years).

Figure 6. Impulse and response functions for the VAR model.



(a)

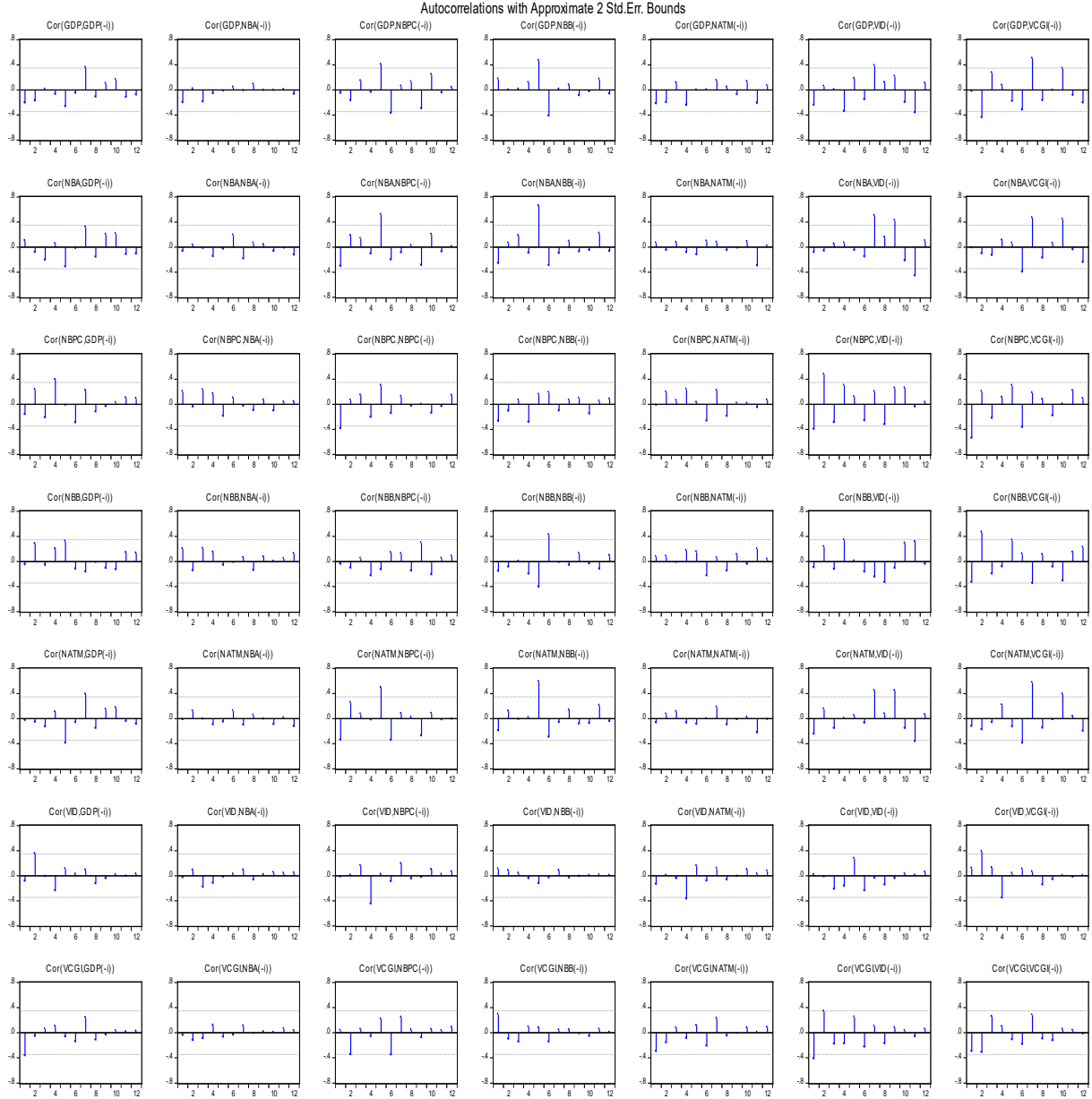


(b)

Source: Authors' calculation by EViews

The autocorrelation functions for the remaining equations are displayed two-by-two in Figure 7. This indicates that the majority of the equations fall within the confidence range, indicating statistical significance. This validates the absence of autocorrelation in the VAR model errors and supports the acceptance of the null hypothesis H_0 .

Figure 7. Autocorrelation functions for the VAR model



Source: Authors' calculation by EViews

It is clear from the results of the above study that there is an impact of financial inclusion on Egyptian economic growth, and this impact is slight, as this can be attributed to the obstacles that financial inclusion faces in Egypt, the most important of which are the following:

- High poverty rates.
- The need for awareness about financial culture.
- Low levels of individual incomes.
- High unemployment rates.
- High inflation rates.
- Increasing the size of the informal economy.
- Weak banking density index.
- High dependency rates.
- Weak awareness and banking culture.
- Lack of women's involvement in the financial economy.

4. CONCLUSIONS AND RECOMMENDATIONS

Egypt's slowing economic growth is causally linked to low real output, which has contributed to increased inequality and poverty. This economic trend is characterized by persistent inflation, high unemployment, and substantial budget and trade deficits, collectively devaluing the Egyptian pound. Through this process, successive governments have implemented fiscal and monetary policies that encompassed job creation, poverty reduction, and output stimulation through inclusive economic interventions.

At the global level, a few emerging economies, such as Malaysia, India, and Brazil, have been remarkably successful with their bold financial inclusion strategies. They have developed banking infrastructure systematically through branch proliferation, the widespread adoption of ATMs and point-of-sale terminals, and the simplification of business registration procedures. Above all, by improving credit availability, they have stimulated financial and economic activity, which in turn has materialized into real GDP growth and increased per capita income. Financial inclusion has thus established itself as an effective policy for alleviating poverty and promoting sustainable economic growth.

This study examines financial inclusion based on principal markers: density of banking infrastructure (number of branches and ATMs), penetration of accounts (number of accounts and payment cards), depth of finance (single quantities of deposits and credit extension), and institutional conditions (ease of doing business). Using a Vector Autoregression (VAR) model, our evidence in Table 7 establishes a robust causal relationship between these financial inclusion indicators and GDP. Our evidence suggests that increased access to finance leads to greater utilization of the formal financial system, enabling broader service provision, such as microfinance. Then, the expansion stimulates economic activity, which eventually drives aggregate economic growth.

To support Egypt's economic journey, we recommend that fiscal and monetary authorities expand access to financial services for unbanked and underbanked citizens. There must be a top-level national plan to bring the banking system within reach of 80-90% of Egyptians through financial education initiatives, tailored product sets, and improved physical/digital channel availability.

With the established socioeconomic benefits, we make the following strategic recommendations:

- Make financial inclusion a central government priority as a key objective, placing development of financial infrastructure in rural and excluded areas at its top
- Establish transparent and fair channels for banking services, supported by robust financial consumer protection systems, to foster systemic confidence and promote wider social integration.
- Engage in the production of new, low-cost financial products that are tailored to excluded groups' requirements, including Sharia-based options through Islamic banking channels to suit religious requirements.

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