The effect of financial inclusion on poverty alleviation and economic growth: a view from an emerging market

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Abstract: This study investigates the impact of financial inclusion (FI) on Egypt's economic growth and poverty reduction. A summary of the extensive FI literature review is conducted, including Egypt's experience. Using 21 years' worth of data from the WDI database, the relationship between FI, economic growth, and poverty reduction was estimated using the least squares (LS) and autoregressive distributed lag (ARDL) regression models. Our results show that greater FI and government spending growth lead to more economic growth. However, an increase in trade openness reduces the rate of economic growth, indicating that trade openness happens in the direction of consumer imports. Moreover, improving FI leads to a higher poverty rate, and a greater concentration of income reduces the poverty rate.

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1   Introduction

In 2010, approximately 15.7% of the world's population were living on less than $2 a day. It was noted that there is a difference in the use of formal financial services between developed and developing countries (Stiglitz, 1998). Indeed, it was found that twice as many adults have an account with a financial institution in developed countries than in developing and poor countries. This observation was later confirmed by other research such as Beck et al. (2005). Bourguignon and Verdier (2000) raised an important question about the impact of financial sector development on poverty alleviation. It was found that poor families were the most deprived groups from the services of formal financial institutions and the highest users of informal financial services and family capital ties. Consequently, any support in the formal financial sector will be beneficial to the wealthy groups only.

That is why the United Nations (UN) Millennium Declaration, which was signed in September 2000 by 192 countries and at least 23 international organisations, obligated the UN member states to combat poverty, hunger, disease, illiteracy and discrimination against women. Eight goals were agreed upon as the Millennium Development Goals (MDGs). Since then, many studies began to focus on how to support development and poverty reduction processes around the world by increasing the average per capita share of GDP and developing the financial sector and banking system in a way that leads to economic growth and poverty reduction (World Bank, 2001, p.6).

Moreover, 55 countries pledged in 2010 to adopt what was called a Financial Inclusion (FI) policy to achieve one of the most prominent goals of the millennium,

which is the fight against poverty and the eradication of hunger. Accordingly, the World Bank's definition of FI is the access of individuals and companies to useful products and financial services -represented by transactions, payments, savings, credit and insurance- at affordable prices that meet their needs and are presented in a responsible and sustainable manner. It is expressed as the proportion of the population using formal financial services to the total population.

The Central Bank of Egypt defined FI as the possibility for every individual and institution in society to obtain financial products appropriate to their needs (demand side) through legitimate channels represented by banks, the postal authority, and others (supply side), at a cost suitable for all. The objective is to provide suitable opportunities for all groups of society to manage their money and their savings in a safe and secure manner and ensure that they do not resort to informal means that are not subject to control, may expose them to situations of fraud and do not guarantee protection of their rights as consumers.

In this context, international policymakers and institutions believe that using FI as a policy would lead to more sustainable growth. This is because it enables the poor, low-income and even small-business owners, especially in developing countries, to access financial services at a reasonable cost, and to find safe and secure avenues for savings opportunities and access to microfinance, which is the broadest FI tool to combat poverty all over the world (Adediran et al., 2017, Lal, 2018; Agyemang-Badu et al., 2018). In general, it has been shown that there is a direct link between financial development, economic growth and poverty reduction. The link happens through expanding access to banking and financial services and the presence of financial markets that allow greater access to all sectors of society, especially the poor and marginalised groups, which can lead to poverty reduction (Erlando et al., 2020).

Using data sourced from WDI for the 2000–2020 period the purpose of this study is to investigate the above assertions by asking the following question, does the adoption of FI policies, proxied by expanding banking and financial services to the poor and marginalised groups, supports economic growth and poverty reduction in Egypt[1]? Answering such a question is also important because of the difficulty of achieving many of the seventeen sustainable development goals without resorting to FI policies (Ojong and Asongu, 2021). Examples of these goals are poverty eradication (Goal 1), zero hunger (Goal 2), good health and well-being (Goal 3), quality education (Goal 4), gender equality (Goal 5), economic growth and decent work (Goal 5). Goal 8) and reduce inequality (Goal 10). So, in the current research, the aim is to measure the extent of the impact of FI on economic growth and its role in reducing poverty in Egypt.

The resulting research hypotheses are that FI supports economic growth and leads to poverty reduction in Egypt. To test these hypotheses, we estimate the relationship between FI, economic growth, and poverty reduction using the LS and ARDL regression models. Our results revealed that increasing FI along with growth in the government spending led to increased economic growth. We also found that increasing trade openness leads to a decrease in the rate of economic growth. This shows that trade openness is dominated by consumer imports. Further analysis shows that increasing FI leads to an increase in the poverty rate and an increase in income concentration in the lowest 20% of society. We conclude that misdirection of FI tools coupled with lack of interest in

integrating the poor and the marginalised may support economic growth, but it will not lead to poverty alleviation.

The rest of the paper is organised into five parts as follows. The next section classifies and summarises the extensive FI literature. Section 3 summarises the FI experience by Egypt, which is the context of the study. Section 4 describes the data and the empirical methodology. Section 5 reports the results, and finally, section 6 concludes the paper.

2   Financial inclusion related studies

The literature on FI can be divided into two strands. One strand investigates the determinants of FI, from both supply and demand side, and the reasons for financial exclusion. The other strand studies the impact of FI on the economic growth process and/or its impact on poverty alleviation. However, we notice that these studies overlap so much that sometimes it becomes difficult to differentiate between the two. In what follows we summarise and classify these studies into five parts.

The first part is concerned with financial exclusion. These studies found that among the reasons for restricting access to financial services are geographical constraints; the difficulty of communicating with bank branches staff; poor geographical distribution of automatic transfer machines (ATMs); banks requesting many conditions to offer products and at high prices; and the increasing technological orientation of the financial services providers while the poor and the marginalised are less likely to have access to these technologies (Devlin, 2009; Kempson et al., 2004; Kundu, 2015). Previous studies also show that financial and social exclusion is among the most basic causes of poverty for the inability of the poor and marginalised groups to access financial services[2] (Koomson et al., 2020). This means that poverty leads to decreased demand for financial services while financial exclusion leads to poverty. That is, both FI and poverty have a two-way causal relationship.

The second part is about the supply side of FI. This literature shows that the number and efficiency of branches of the official banking system, the existence of groups of suitable alternatives from banking products and services, and the institutional capacity of financial service providers have a direct impact on both collecting deposits and granting loans, which improves the effectiveness of FI and positively affects the gross domestic product (Chen and Divanbeigi, 2019). However, there are many challenges that limit the effectiveness of the role of banks in FI, such as the excessive cost, the banks' need for additional employees, the inefficiency of the collection system and the lax repayment of loans, as well as the large size of the informal sector, which may lead to wide gaps in banking penetration between High-income countries, developing countries, and between regions of the poor and regions of the rich within the same country (Ananth and Öncü, 2013; Uddin et al., 2017). In addition to the importance of using technology, easy access to savings accounts, current accounts, rural banking financing services, and the use of mobile banking or electronic banking services via the internet. Thus, with the increase in the strength of technology and communication infrastructure, the effectiveness of FI increases (Aina and Oluyombo, 2014). The real obstacle is the high cost of using technology in banking operations and the inefficiency of the infrastructure and communications network, especially in areas that are not electrically covered.

The third part is the literature on the demand side of FI. It reveals the crucial factors affecting the demand side of FI are the high level of illiteracy, widespread ignorance, and

low awareness in rural areas and some parts of cities, where the high rate of literacy has a positive effect on the demand for FI, and the gender of the client is important and meaningful. Add to these the psychological and behavioural factors that affect financial decision-making, such as confidence, lack of or increased knowledge, the effects of a comfortable and attractive environment, preference for immediate short-term returns over long-term benefits, bias to the status quo, and optimism that the expectation of a positive event will be higher than the expectation (Kumar, 2021; Kundu, 2015). The occurrence of a negative event, and the various stages of life, the increase in the rural population and the age dependency ratio have a negative impact on FI.

The fourth part, which focused on the impact of FI on economic growth finds that easy access to financial services and easy financing is one of the crucial foundations for good economic growth (Emara and El Said, 2020 and Sethi and Sethy, 2019). Both supporting the socio-economic status of families belonging to the poor sectors of society and access to formal financing create opportunities for individuals to increase their income and productivity, improve the standard of living and reduce poverty (Iqbal and Sami, 2017; Okoye et al., 2017). The literature also shows that lack of access to adequate financing is a reason for the persistence of income inequality, the loss of economic opportunities and slowing economic growth.

The last part deals with the effect of FI on poverty reduction. This literature shows that access to formal financial services, whether through the spread of cooperative banks, units of the official banking system, or other methods, is crucial for economic growth (Inoue, 2019; Lal, 2018). It also has a positive impact on the lives of the poor and marginalised people, helping them out of poverty (Kelikume, 2021), improve their standard of living and reduce inequality (Emara and Moheildin, 2020).

Overall, and in terms of the indicators that are used to express FI, we found the studies to differ greatly. Some used singular indicators such as the number of depositors and borrowers from branches of commercial banks, which reflect banking penetration, or the number of bank branches and the number of ATMs, which reflect the ease of access to banking services. While other studies have created a composite index that reflects different dimensions of FI. This is the approach we followed in this study.

Furthermore, the previous research results differed between countries and between different studies in terms of the greater impact of FI on economic growth or on reducing poverty, with the relationship being insignificant in some studies. This opens the way for further studies to ascertain the potential impact of FI in each country separately, and our current study proposes to do just that focusing on the Egyptian economy.

3 The Egyptian context and experience of financial inclusion

In addition to the previous studies that dealt with the issue of FI, there are many studies that looked at FI procedures and methods used in different countries. In this section we provide a detailed review of the Egyptian FI experience which makes it an ideal ground for our study. We also offer our critical views on the shortcomings that accompanied the Egyptian experience.

Starting with the definition, the concept of FI, as per the Egyptian central bank, involves facilitating access to financial services for all citizens, especially the poor, marginalised and low-income people, in addition to encouraging the establishment of small, medium, and micro enterprises (SMMEs). Also, improving the financial capacity

of those targeted by providing multiple financial services such as savings, credit, and insurance to create new job opportunities to raise their incomes and alleviate poverty. Looking at the experience of Egypt, we found that its history bears many experiences, and that many other names have been used other than FI. These experiences include the following.

The experience of local savings banks, labelled Mit Ghamr experience, was born in the early sixties of the last century by Dr. Ahmed Abdel Aziz Al-Najjar, and was implemented in the Egyptian countryside from July 1963 to February 1967. This experience mobilised small savings in the countryside, especially for the farmers sector and the rest of the small savers (students, workers, and housewives). It granted exchange credit and encouraged the establishment of micro-industries with participatory financing. However, it failed for non-economic reasons related to political matters (El-Naggar, 1993).

Experiences characterised by geographical spread such as the Agricultural Development and Credit Bank with main branches across 27 governorates and 1024 branches covering most of the villages of Egypt. Nasser Social Bank with about 100 branches in the republic and about 4000 zakat committees. The Social Fund for Development spread in all governorates of the republic in addition to about 40 banks with hundreds of branches in all governorates. However, all of them are routinely managed and focus on the same conditions and guarantees as traditional financial and banking institutions, from complex procedures that only large institutions or wealthy groups in society can implement to adhering to the condition of a guarantee or guarantor. Consequently, many people wishing to benefit from banking and financial services have been denied.

The Social Fund for Development (SFD) experience established in 1991 in order to address the negative social impacts of the privatisation program and with the aim of reducing poverty, by providing micro, small and medium loans, in addition to improving access to adequate financing and increasing economic opportunities for the poor. However, the fund imposed a high interest rate of 14% in addition to 2% imposed by banks for the Credit Risk Guarantee Association, which represents an additional guarantee in addition to the original guarantees. This is even though the funds of the SFD consisted of grants and grants with interest not exceeding 1% or 2%. For this reason, and in addition to the complexity of the procedures and the exaggeration in the request for guarantees, the SFD did not fulfil its role in supporting youth, the poor and the marginalised projects (Ahmed, 2011).

Nasser Social Bank. Although it was established to help the poor, the need for a guarantee or a guarantor has deprived the poor and workers in the informal sector who do not have a steady income or do not have work contracts from benefiting from the bank's services. Government employees became the biggest beneficiaries of the bank's services even though they could obtain the same services from other banks under the same conditions. Consequently, several negative factors prevented the institution from achieving its goal due to the lack of financing real projects. The real use of loans was to complete some basic needs such as housing, marriage, children's education or recycling the loan to clients who are defaulting in repaying the loan on the specified date by re-lending them for the second time to pay off the obligations of the first loan. Thus, the picture shows the institution's success in expanding lending and preventing the borrower from being imprisoned.

Perhaps the reason for the ineffectiveness of the three institutions' experiences above is that they have relied heavily on the application of the rules of government bureaucracy, and the lack of development and innovation in providing services despite the great potential that was made available to them.

Modern FI experience started with the signing of the World Bank's pledge to achieve FI in 2010. However, the real breakthrough was with the adoption of the political leadership of this project and the Central Bank of Egypt joining the FI Alliance (AFI) in 2013, especially with the holding of the Global Forum on FI Policies in Sharm El-Sheikh in 2017.

Now we turn to the actions and measures to activate FI taken by the government, the central and the banking sector, then we conduct a comparison between before and after the measures implemented.

3.1 Financial inclusion policies

3.1.1 Actions taken by the government

These actions included stop dealing with government checks for all state agencies, funds and private accounts, switching to the electronic payments system and working with the unified treasury system (TSA), electronic collection of taxes and customs, electronic disbursement of salaries, pensions, investments and all expenditure items in the budget, close nearly 61,000 accounts for all state agencies to force citizens to deal electronically with the unified treasury system, and create an appropriate legislative environment and financial infrastructure to meet the requirements of FI.

3.1.2 Measures taken by the central bank

The Central Bank issued several instructions aimed at enhancing FI, directly and indirectly, the most important of which incorporated the following. Reducing the value of the capital required when establishing new small branches of operating banks and facilitating procedures for opening these branches to expand the provision of banking services and serve a larger base of customers. Directing the diversification of the locations of the spread of branches to cover all segments of society in the areas in which those branches will be opened. Establishing a framework for banks to control the provision of online banking services. Issuing initiatives to make funding available to the target groups in FI. Finally, paying attention to financial education and awareness by way of introducing financial education strategy in cooperation with the Banking Institute, the Ministry of Education, and the Ministry of Higher Education. Adopting the activities of the Arab FI Week. Finally, by urging banks to be present outside their branches, especially in schools, universities, remote and marginalised regions, and to open new accounts without fees and without a minimum.

3.1.3 Measures taken by banking sector

These measures included expanding the banking sector branches network; opening accounts and issuing special cards for transferring salaries to public and private business sector companies; providing electronic payment services for taxes and customs;

providing electronic wallet services such as BM3 Wallet; deploying ATMs; providing withdrawals and deposits, currency exchange, bill payments, and donations services through ATMs; introducing cash transfer services between customers' accounts in the same bank by means of ATMs; introducing cash transfer services with or without the use of cards, and providing withdrawal and deposit service for mobile phone wallets.

3.2   The policies outcomes

As a result of these measures, the World Bank data showed the development of the banking structure, as the number of commercial bank branches increased from 3784 branches in 2010 to 4009 branches in 2017. However, despite this increase, the percentage of branches per 100,000 citizens decreased from 4.50 in 2010 to 4.12 in 2017, while the number of ATMs increased by 8.44 per 100,000 citizens in 2010 to 12.1 in 2017.

Figure 1 shows an increase in the percentage of accounts at financial institutions between the years 2011 to 2017 by approximately 482% among the low-educated group, 417% among the rural and remote areas, 314% among the women and 335% among the outside labour force group. Figure 2 shows the increase in the percentage of debit card holders from the account between the years 2011 to 2017 to nearly 701% among women, 664% among the poorest 40% of society, 511% among the group outside the workforce, and 860% of the population with low education and 728% of the population of rural and remote areas. Figure 3 also shows an increase in the percentage of receiving payments in digital form, to 15.93% for women in 2017, after it was 1.39 in 2014, and 13.16% for the poorest 40% of society in 2017, after it was 0.72% in 2014, amounted to 17% in the outside labour force category in 2017 after it was 1.55% in 2014, exceeded 20% for the low-educated group in 2017 after it was 1.4% in 2014, and it reached 19.38% for the rural and remote areas in 2017 after it was 2.85 in 2014.

Figure 1   Financial institution account (% age 15+) Egypt (see online version for colours)
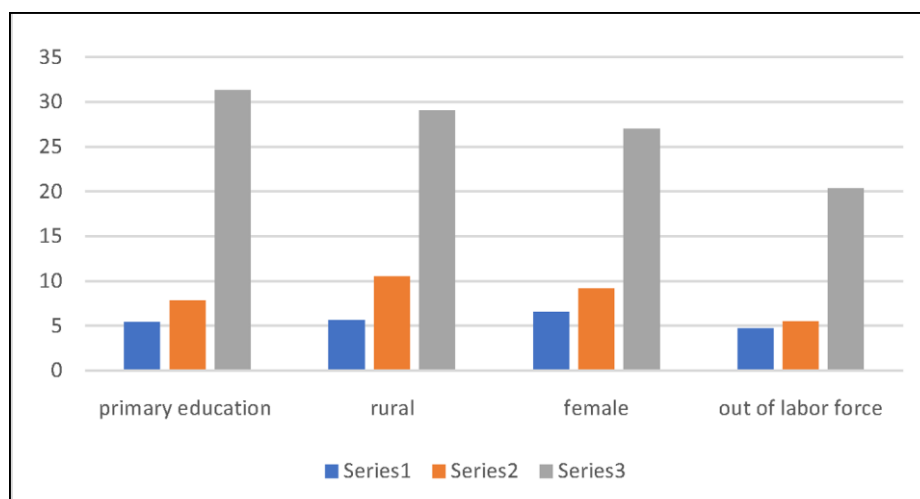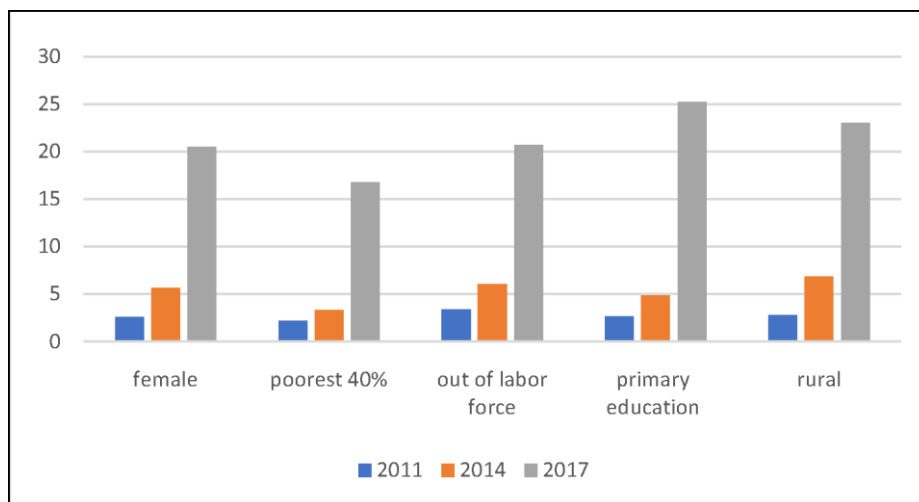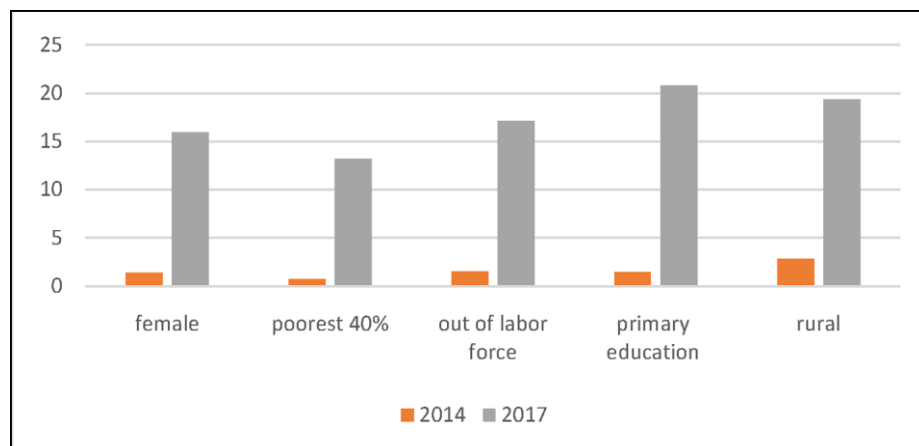
Figure 2 Debit card ownership, (% age 15+) Egypt (see online version for colours)

Figure 3 Received digital payments in the past year (% age 15+) Egypt (see online version for colours)

In addition, the percentage of credit card holders increased between the years 2011 to 2017 by nearly 197% among women and 286% among the rural and remote population category, while it decreased by 23.46% among the outside labour force group, and it reached 0.7% among the poorest 40% of society in 2017 and 1.2% among the low-educated group. Furthermore, the percentage of withdrawals using an ATM was 51.28% in 2014 and the percentage of recipients of government payments through their first-time bank accounts was 69.61% of aid recipients in bank accounts in 2017.

Figure 4 shows that the percentage of borrowers from financial institutions increased between 2011 and 2017 by nearly 66% among women, 36.56% among the poorest 40% of society, 46.58% among the outside workforce group, 113 % among people with low education, and 100% among people living in rural and remote areas. However, the percentage of outside the workforce borrowers from formal financial institutions with the aim of establishing or expanding projects amounting to 0.47% in 2014 increased to

1.56% in 2017. That percentage increased from 1.97% in 2014 to 2.5% in 2017 for borrowers from the poorest 40% of the population. Figure 5 shows that the percentage of using cash accounts on the phone increased between the years 2014 and 2017 by approximately 309% among women, 147% among outside the workforce group, 85% among the people with low education group, and 3.11% among people living in rural and remote areas. However, that percentage reached 0.23% in 2017 for the poorest 40% of society. Figure 6 also shows the percentage of using the internet in financial operations during 2017 with online purchases the highest in all categories except for rural and remote areas, followed by paying bills through the internet and finally using accounts through the internet.

Figure 4   Borrowed from a financial institution (% age 15+) Egypt (see online version for colours)
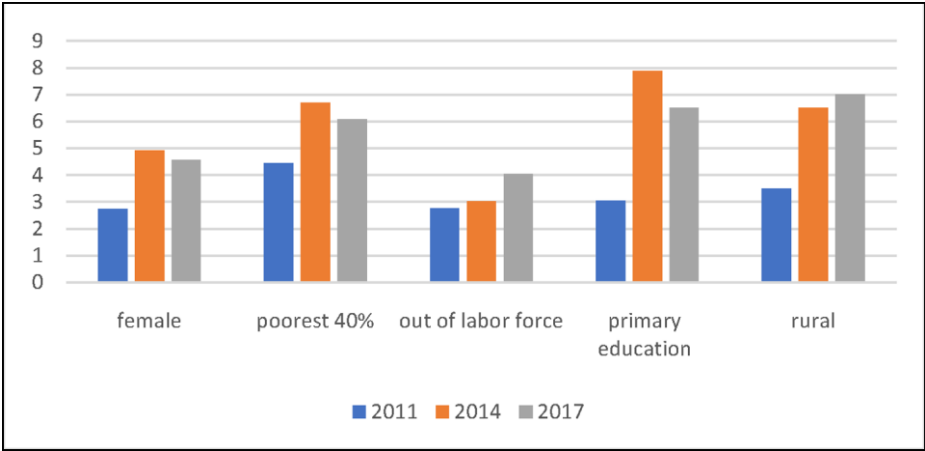

Figure 5   Mobile money account (% age 15+) Egypt (see online version for colours)
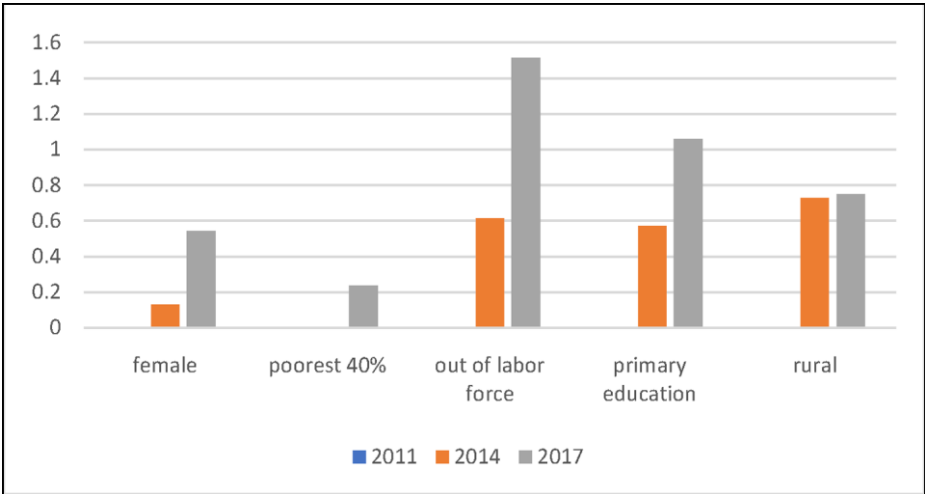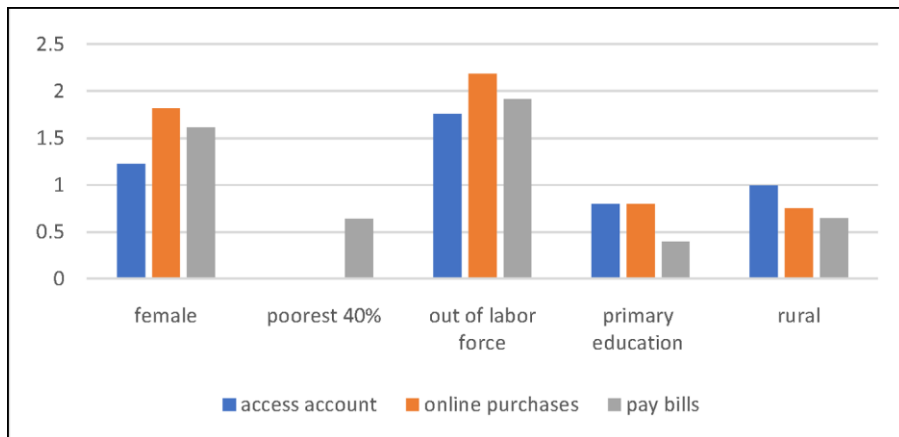
Figure 6 Used internet in financial operations (% age 15+) Egypt 2017 (see online version for colours)

3.3 Registered obstacles

Despite the above noted successes, some obstacles were registered which incorporated. lack of seriousness of the points of sale in cashless dealings due to the imposition of high fees by banks and delayed settlement of payments; slow internet service that reduces the effectiveness of ATMs and causes customers to lose confidence in the ATMs; high cost of mobile data internet, especially in remote locations, increases users' cost of banking; and private commercial and investment banks are not interested in setting up ATMs in poor and marginalised areas, as the cost exceeds the expected return. Furthermore, although the interest in the spread of branches and ATMs is good and supports FI, we must bear in mind that the increase in the number of bank branches may not necessarily improve FI. Particularly if these new branches are located where there are already other banks in a small geographical location. This seems to be a common occurrence and leads to many illegal practices to capture clients. However, if bank branches were to open where there are no existing banks, then FI will increase with the opening of new accounts for those who have not been dealt with before. In addition, attention must be paid to factors affecting the demand side by increasing education, financial education in particular, in terms of not only types of banking products and electronic services, but also in terms of how each product is used.

Other obstacles include the following. First, although the central bank encourages banks to open new accounts without a minimum, the exemption from fees is only for the first year and not for the subsequent years, which is still expensive for the poor. Second, the difficulty of owning mobile phones by the poor and the marginalised reduces the effectiveness of using modern smart technologies in FI. Third, the prolonged implementation period of banking procedures in the branches due to bureaucracy and the increase in the prices of banking services reduces the desire of citizens to engage in banking. Fourth, banks' lack of interest to engage in FI projects because of their interest in guaranteed short-term profitability. Finally, and as an extension of the last obstacle, commercial and private investment banks, like most profit-oriented financial institutions, do not want to spend time and resources on something that does not generate an adequate return. Therefore, they prefer not to finance small projects with lower interest rates

except through government-backed and guaranteed initiatives that guarantee them not to lose money such as the central bank's initiative to finance small projects.

4 The model, variables and methodology

Using data for the 2000–2020 period, from the WDI database, the aim of this study is to estimate the relationship between FI, economic growth and poverty reduction in Egypt. Following Lenka and Sharama (2017) we used the following two models. The first one is to test the impact of FI on economic growth is as follow:

$$rGDPc_t = \beta_0 + \beta_1 FI_t + \beta_2 X_t* + \mu_t \ldots \tag{1}$$

where $rGDPc_t$ is growth rate of real GDP per capita as proxy of economic growth, FI_t is degree of FI, X_t* represents the control variables derived from previous studies such as government spending (GOVSPD), trade openness (TRDOPN), total domestic savings (TDS), inflation (INF), human capital (referred to as secondary school enrolment because the objective of the model is to measure the impact on Economic Growth) (HC) (see Table 1).

The second model to test the impact of FI on poverty reduction is as follows:

$$PVRT_t = \beta_0 + \beta_1 FI_t + \beta_2 X_t* + \mu_t \ldots \tag{2}$$

where $PVRT_t$ is the poverty ratio as a representative of poverty, FI_t is the degree of FI, X_t* represents control variables derived from previous studies such as population (POP), per capita GDP growth rate (cGDPg), education (referred to as primary school enrolment because the objective of the model is to measure the impact on the poor including the least educated) (EDU), per capita GNI (cGNI), income of the top 10% of society (TOP10%INC) and income of the lowest 20% of society (LOW20%INC) (see Table 1).

It is worth noting that much of the previous research used individual variables that provided only partial information about FI. The most used indicators were the number of bank accounts, bank branches, or ATMs, the amount of bank credits or deposits. However, the use of individual indicators was failing to adequately capture the true status of FI and led to a misleading representation of the extent of FI in an economy. This prompted Sarma to develop a mathematical model that integrates several aspects of FI into a single index.

The Sarma 2008 index is based on three basic dimensions of the FI system. The first dimension is banking penetration. The banking system must have the largest possible number of users that is, the number of people with a bank account. The index used the number of depositors and borrowers from commercial bank branches (per 1000 citizens 15+) as an indicator of this dimension. The second dimension is the availability of banking services, which must be easily available to their users. The availability of services can be indicated by the number of bank branches or ATMs per 100,000 citizens of 15 years old. The banking use is the third dimension that measures the extent of using bank accounts by their owners in their daily lives and financial dealings. This is because the mere ownership of a bank account is not sufficient to measure FI, as it was observed that several people who have bank accounts use very little of the services offered. For FI to be effective, banking services must be used appropriately. Two basic services were used, which are deposits and credits. Therefore, the index used the volume of domestic banks' credit to the private sector as a percentage of GDP to measure this dimension.

Table 1 Growth and poverty models' variables

Growth model variables		Poverty model variables	
Ln GDP per capita (constant 2010 US$)	rGDPc	Poverty headcount ratio at national poverty lines (% of population)	PVRT
Financial Inclusion	FI	Financial inclusion	FI
Ln Gross national expenditure (current LCU)	GOVSPD	Ln Population, total	POP
Ln Trade openness	TRDOPN	GDP per capita growth (annual %)	cGDPg
Gross domestic savings (% of GDP)	TDS	School enrolment, primary (% gross)	EDU
Inflation (annual %)	INF	Ln GNI per capita (constant 2010 US$)	X
School enrolment, secondary (% gross)	HC	Income share held by highest 10%	TOP10%INC
		Income share held by lowest 20%	LOW20%INC

The index was developed further by Park and Mecado (2015) and a number of studies have used this index including Agyemang-Badu and Agyei (2018). The FI Index is calculated as follow:

$$dt = (At - m) / (Mt - m)$$

where: At is the actual value of the element in time t, m is the lowest value of the element, and M is the highest value of the element, using five elements as inputs. These are commercial bank branches (per 100,000 people), borrowers from commercial bank branches (per 1000 citizens age 15 or more), depositors with commercial bank branches (per 1000 citizens age 15 or more), (4) ATMs (per 100,000 citizens age 15 or more), and domestic bank credits to the private sector as percentage of GDP. The FI index is measured by the following equation and it ranges between 0 and 1. The higher the index, the greater the FI of different groups of society.

$$FI = 1 - \frac{\sqrt{(1-d_1)^2 + (1-d_2)^2 + (1-d_3)^2 + (1-d_4)^2 + (1-d_5)^2}}{\sqrt{n}}$$

With the first model that estimates the relationship between FI and economic growth, Theory and empirical research shows that FI index positively affects economic growth. Increasing trade openness positively affects economic growth because it brings competition to local companies, which makes them efficient, provides them with an opportunity to explore foreign markets and expands the basket of goods available for consumption. The increase in human capital, which embodies the skill level of the labour force in the economy, positively affects economic growth. The increase in public spending positively affects economic growth, as it stimulation the economy. Total domestic savings positively affects economic growth as it increases domestic investment, and inflation negatively affects economic growth.

As for the second model, that assesses the effect of FI on poverty reduction, theoretical literature and empirical research maintains that an increase in the FI index, an increase in the per capita GDP, and an increase in education rates (represented by the percentage of enrolment in primary education), a rise in the per capita income of the gross national income, and a higher share of income held by the lowest 20% of society lead to reduction in poverty rate. However, the effect is reversed with an increase in population and income share held by the top 10% of the society.

5   Results and analysis

Before starting the model estimation process, a stationarity test should be performed in order to determine whether the variables in the equation have class I (0) or I (1) stationary. For that we use the Unit root test through the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. For testing the long-term relationship between the independent variables, the ARDL model is estimated, where the Bound Test is used to test for the null hypothesis that there is no long-term relationship between the variables of the H_0 model: $X_0 = X_1 = X_2 \ldots = 0$. We do that by comparing the calculated F value with two sets of critical values, giving us the following three possibilities. The first, that the calculated F value falls before the lowest tabular value and in this case the null hypothesis cannot be rejected, which means that there is no long-term relationship between the model variables. The second, that the calculated F value falls higher than the highest tabular value, and in this case the null hypothesis is rejected, which means that there is a long-term relationship between the model variables. The third: that the calculated F value falls between the two limits: the lowest and the highest, in which case the result will be inconclusive.

5.1   Testing the impact of FI on economic growth

Table 2 shows the descriptive statistics of the variables of the economic growth model, where we find the average per capita GDP is 7.766 with a SD of 0.1261, the average FI 0.649 and a SD of 0.095, the average total national expenditures is 27.652 with a SD of 0.781, the average trade openness is 17.392 and a SD of 0.338, average gross domestic saving is 11,749 with a SD 4498, average inflation 8805, with a SD of 4218, and average high school enrolment rate 78,818 with a standard deviation 5077.

After conducting the ADF and PP tests of the variables of Equation 1, we found that the variables rGDPc and FI are stationary at the rank I(0). As for the variables GOVSPD, TRDOPN, TDS, INF and HC, they have stationary at the rank I (1) (Table 3).

Furthermore, as the dependent variable rGDPc is found to be static at the Level, we cannot perform regression in the ARDL method. We made a simple regression considering the static ranks of the independent variables and that the regression equation is as follows

$$rGDPc_t = \alpha\beta_0 + \beta_1 FIt + \beta_2 FI + \beta_3\Delta GOVSPD + \beta_4\Delta TRDOPN + \beta_5\Delta TDS + \beta_6\Delta INF + \beta_7\Delta HC + \mu_t$$

The correlation matrix (Table 4) shows no strong multicollinearity exist between the independent variables, allowing the regression process to be performed.

Table 2 Descriptive statistics

	Obs	Std. Dev	Minimum	Maximum	Median	Mean
GDP per Capita (rGDPc)	18	0.126167	7.575896	7.932136	7.820179	7.766725
Financial Inclusion (FI)	18	0.095564	0.530086	0.826637	0.659354	0.649295
Gross national expenditure (GOVSPD)	18	0.781580	26.61657	28.99018	27.65586	27.65240
trade openness (TRDOPN)	18	0.338211	16.83220	17.94366	17.53689	17.39276
Gross national savings	18	4.498863	3.086455	17.11187	13.19591	11.74900
Inflation	18	4.218641	2.269757	18.31683	9.737747	8.805225
Progression to secondary school	18	5.077693	66.62542	85.94095	79.40992	78.81840

Table 3 Augmented dickey-fuller test (ADF) and Phillips-Perron test

	Variables	Level			First deference		
		t-Statistic	Prob.*		t-Statistic	Prob.*	
ADF	rGDPc	−3.533980	(0.0720)	I(0)			
	FI	−4.241460	(0.0210)	I(0)			
	GOVSPD	−3.199718	(0.1172)		−2.808952	(0.0791)	I(1)
	TRDOPN	1.741610	(0.9749)		−2.051624	(0.0419)	I(1)
	TDS	−1.618168	(0.7419)		−5.304574	(0.0034)	I(1)
	INF	−2.405684	(0.1547)		−5.630780	(0.0000)	I(1)
	HC	0.274284	(0.7536)		−3.012194	(0.0052)	I(1)
PP	rGDPc	−0.793505	(0.7952)		−1.054780	(0.2503)	I(1)
	FI	−5.097429	(0.0042)	I(0)			
	GOVSPD	−4.161103	(0.0226)	I(0)			
	TRDOPN	−1.689601	(0.7109)		−2.051624	(0.0419)	I(1)
	TDS	−1.474154	(0.7978)		−5.342497	(0.0032)	I(1)
	INF	−2.794222	(0.2175)		−8.524833	(0.0000)	I(1)
	HC	−1.523034	(0.7799)		−2.931787	(0.0062)	I(1)

Table 4 Correlation matrix

	FI	D(GOVSPD)	D(TRDOPN)	D(TDS)	D(INF)	D(HC)
FI	1.000000	0.465621	−0.065668	−0.411125	−0.047651	0.195810
D(GOVSPD)	0.465621	1.000000	0.490341	−0.561362	−0.083853	−0.231398
D(TRDOPN)	−0.065668	0.490341	1.000000	0.081047	0.153033	−0.036483
D(TDS)	−0.411125	−0.561362	0.081047	1.000000	0.553549	0.159385
D(INF)	−0.047651	−0.083853	0.153033	0.553549	1.000000	0.054257
D(HC)	0.195810	−0.231398	−0.036483	0.159385	0.054257	1.000000

The regression results (Table 5) show that the variables FI, GOVSPD and TRDOPN have a significant effect on economic growth. This means that an increase in FI and in government spending growth led to an increase in economic growth, as a 1% increase in FI will lead to a 0.96% increase in economic growth and a 1% increase in total national spending (GOVSPD) will lead to an increase of 0.89% in economic growth. This is consistent with the logic of economic theory.

Table 5   Regression

Variable	Coefficient	Std. Error	t-Statistic
C	7.037372	0.069219	101.6678
FI	0.969299	0.121975	7.946681
D(GOVSPD)	0.889705	0.260025	3.421617
D(TRDOPN)	−0.197262	0.079946	−2.467426
D(TDS)	0.011155	0.007477	1.491838
D(INF)	−0.003580	0.002708	−1.322246
D(HC)	0.004179	0.002846	1.468385
R-squared	0.951179	F-statistic	32.47171
Adjusted R-squared	0.921887	Prob(F-statistic)	0.000005
		Durbin-Watson stat	2.151480

However, trade openness (TRDOPN) and economic growth are negatively related. That is, a 1% increase in economic openness (TRDOPN) leads to a 0.19% decrease in economic growth. This unexpected result indicates that trade openness is tilted towards consumer imports. The variables, total domestic savings (TDS), inflation (INF) and human capital represented by enrolment in secondary schools (HC) show that they have no statistical significance or a significant impact on economic growth.

Table 6   Normality test

Series: Residuals	
Sample 2000 2020	
Observations 21	
Mean	−07.20e-16
Median	0.004806
Maximum	0.039580
Minimum	−0.044586
Std. Dev.	0.026609
Skewness	−0.116823
Kurtosis	1.584150
Jarque-Bera	1.458615
Probability	0.482243

To ensure the validity of the regression results, we performed the Normality Test (Table 6), the Breusch-Godfrey Serial Correlation LM Test, and the Heteroscedasticity Test. The Skewness and kurtosis values show the normality criteria being meet. Tables 7 and 8 show that our model is free from correlation and homogeneity problems.

Table 7   Breusch-Godfrey serial correlation LM test

F-statistic	0.411975	Prob. $F(2,8)$	0.6756

Table 8   Heteroscedasticity test: Breusch-Pagan-Godfrey

F-statistic	2.189300	Prob. F(6,10)	0.1309
Obs*R-squared	9.652079	Prob. Chi-Square(6)	0.1401
Scaled explained SS	0.975478	Prob. Chi-Square(6)	0.9865

5.2   Testing the impact of FI on poverty

The descriptive statistics of the poverty model variables are presented in Table 9. The average percentage of the number of poor in the national poverty lines is 22,283 with a SD of 4.278, the average FI is 0.649 and a SD of 0.095, the average of the population is 18,244 with a SD of 0.104, the average rate of growth of per capita GDP Total 2.204 and a SD 1.755, average primary school enrolment 99,413 with a SD of 4321, average GNI per capita 7758 and a SD of 0.116, average income share held by the top 10% of society 27,377 with a SD 0.764, and average income share held below 20% of society 9 111 and SD of 0.202.

By conducting the ADF & PP tests for the variables of equation 2, we found the dependent variable PVRT is not static at the level, but it enjoys stationary at the level of the first difference of rank I (1). Also, the non-stationary of the independent variables POP, EDU, cGNI, TOP10%INC and LOW20%INC at the level, but they enjoy stationary at the level of the first difference in rank I (1). As for the variables FI and cGDPg, they enjoy static at the level I (0), which calls for the use of the ARDL method (Table 10).

Table 9   Descriptive statistics of the impact of FI on poverty model

	Observ	*Mean*	*Median*	*Minimum*	*Maximum*	*Std. dev*
Poverty headcount ratio at national poverty lines (% of population)	18	22.28333	21.60000	16.70000	27.80000	4.278159
Financial Inclusion	18	0.649295	0.659354	0.530086	0.826637	0.095564
Population	18	18.22477	18.21864	18.06266	18.39591	0.104605
GDP per capita growth (annual %)	18	2.204829	2.187219	–0.341315	5.282444	1.755427
Primary school enrolment	18	99.41377	101.3175	91.00642	104.0100	4.321927
GNI per capita	18	7.758745	7.823519	7.584422	7.912759	0.116484
Income share held by highest 10%	18	27.37778	27.40000	26.00000	28.30000	0.764319
Income share held by lowest 20%	18	9.111111	9.100000	8.900000	9.500000	0.202598

Table 10   Augmented Dickey-Fuller test (ADF) and Phillips-Perron test

	Variables	Level			First Deference		
		t-Statistic	Prob.*		t-Statistic	Prob.*	
ADF	PVRT	–2.958961	(0.1705)		–5.482373	(0.0005)	I(1)
	FI	–4.241460	(0.0210)	I(0)			
	POP	9.092303	(1.0000)		–15.39158	(0.0001)	I(1)
	cGDPg	–4.266472	(0.0235)	I(0)			
	EDU	–2.010717	(0.2798)		–4.964490	(0.0060)	I(1)
	cGNI	–2.912558	(0.1843)		–3.713553	(0.0596)	I(1)
	TOP10%INC	–2.769264	(0.2276)		–5.041265	(0.0069)	I(1)
	LOW20%INC	–3.282737	(0.1068)		–3.972129	(0.0007)	I(1)
PP	PVRT	–2.958961	(0.1705)		–5.270338	(0.0036)	I(1)
	FI	–4.241460	(0.0210)	I(0)			
	POP	0.952366	(0.9994)		–15.39158	(0.0001)	I(1)
	cGDPg	–4.266472	(0.0235)	I(0)			
	EDU	–1.629986	(0.7369)		–4.964490	(0.0060)	I(1)
	cGNI	–2.912558	(0.1843)		–3.713553	(0.0596)	I(1)
	TOP10%INC	–2.769264	(0.2276)		–5.041265	(0.0069)	I(1)
	LOW20%INC	–1.759976	(0.3858)		–4.397915	(0.0050)	I(1)

Furthermore, by analysing the correlation matrix, the results show the existence of a strong multicollinearity linear correlation between the independent variables POP, EDU and cGNI, and the independent variable FI (Table 11). This indicates that FI is affected by the number of populations, degree of education, and per capita national income and as a result of this strong correlation, these independent variables have been removed from the model. The regression model using the ARDL method is as follow:

$$\Delta Y_t = \alpha_0 + \Sigma\alpha_{1i}\,\Delta Y_{t-i} + \Sigma\alpha_{2i}\,\Delta FI_{t-i} + \alpha_{3i}\,cGDPg + \Sigma\alpha_{3i}TOP10\%INC$$
$$+ \Sigma\alpha_{3i}\,LOW20\%INC + u_t$$

Table 11   Correlation test

	FI	POP	cGDPg	EDU	cGNI	TOP10%INC	LOW20%INC
FI	1.000000	0.972143	–0.221166	0.812143	0.939161	–0.462868	0.652848
POP	0.972143	1.000000	–0.227231	0.824222	0.943220	–0.494804	0.654066
cGDPg	–0.221166	–0.227231	1.000000	0.119520	–0.064197	0.233526	–0.372707
EDU	0.812143	0.824222	0.119520	1.000000	0.921329	–0.627754	0.661021
cGNI	0.939161	0.943220	–0.064197	0.921329	1.000000	–0.539291	0.659012
TOP10%INC	–0.462868	–0.494804	0.233526	–0.627754	–0.539291	1.000000	–0.940406
LOW20%INC	0.652848	0.654066	–0.372707	0.661021	0.659012	–0.940406	1.000000

To test the long-term relationship between FI and poverty, we conduct the Bound Test. We found that the calculated F falls between the two limits: the lowest and the highest, which indicates lack of assertion of the existence of a long-term relationship between the variables and thus the results of ARDL can be considered in the short term (Table 12).

Table 12 ARDL bounds test

Test Statistic	Value	K
F-statistic	2.744139	4
Critical value bounds		
Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Table 13 ARDL

Variable	Coefficient	Std. Error	t-Statistic
rGDPc(–1)	–0.586502	0.745357	–0.786873
rGDPc(–2)	–0.380811	0.446719	–0.852461
FI	0.513508	19.73630	2.601848
FI(–1)	24.43091	35.21406	0.693783
FI(–2)	32.66206	25.89647	1.261255
cGDPg	–0.369798	0.550004	–0.672356
cGDPg(–1)	–0.820852	0.520806	–1.576118
cGDPg(–2)	0.225613	0.290105	0.777695
TOP10%INC	6.068608	2.389314	2.539896
TOP10%INC(–1)	4.441966	4.558690	0.974395
TOP10%INC(–2)	0.521621	0.795216	0.655949
LOW20%INC	–27.03280	13.43679	–2.011849
LOW20%INC(–1)	–17.68294	17.29417	–1.022480
C	685.1686	408.4798	1.677362
R-squared	0.993033	F–statistic	21.92978
Adjusted R-squared	0.947751	Prob(F–statistic)	0.044424
F-statistic	4.644843	Prob. F(1,1)	0.2766

Regression by ADRL method show that variables FI, cGDPg, TOP10%INC and LOW20%INC have a significant effect on the percentage of poor people in society. Although the increase in the FI index is supposed to lead to a decrease in the percentage of the poor in society, and despite what the statistical data of the experience of FI in Egypt have shown in terms of an increase in the rates of those who have an account in formal financial institutions and those who use electronic banking services, ATM cards and payments using the mobile phone and paying bills using internet means, however, the

result of the multiple linear regression estimation ARDL showed that the value of the index of FI index means that a 1% increase in FI will lead to an increase of 0.51% in the percentage of the poor in society with statistical significance. This indicates that the procedures followed in FI did not target the poor and marginalised groups in a sound manner, which would increase income and break the cycle of poverty.

Results also show that an increase of 1% in the growth of per capita GDP (cGDPg) will lead to a decrease of 0.36% in the percentage of the poor in society, a 1% increase in income share for the highest 10% of society (TOP10%INC) will lead to a 6% increase in the percentage of poor people in society, and a 1% increase in income share for the least 20% of society (LOW20%INC) will lead to a 27% decrease in the percentage of poor people in society (Table 13).

Table 14   Normality test

Series: Residuals	
Sample 2000 2020	
Observations 21	
Mean	6.39e-14
Median	−0.016987
Maximum	0.457028
Minimum	−0.653103
Std. Dev.	0.334561
Skewness	−0.553550
Kurtosis	2.626524
Jarque-Bera	0.910103
Probability	0.634415

Like with the previous model and to ensure the correctness of the regression results, we performed the Serial Correlation Test, the Normality Test, and the Heteroscedasticity Test for the residuals. The results reported in Tables 14–16 show that the model is free from correlation and homogeneity problems and that the residue distribution is normal, which confirms the conformity of the regression model assumptions.

Table 15   Breusch–Godfrey serial correlation LM test

F-statistic	4.644843	Prob. F(1,1)	0.2766

Table 16   Heteroscedasticity test: Breusch-Pagan-Godfrey

F-statistic	0.462034	Prob. F(13,2)	0.8456
Obs*R-squared	12.00322	Prob. Chi-Square(13)	0.5274
Scaled explained SS	0.152528	Prob. Chi-Square(13)	1.0000

6 Conclusion and recommendations

The current study estimated the relationship between FI, economic growth and poverty reduction in Egypt by using the LS regression model to measure the impact of FI on economic growth, and the ARDL regression model to measure the effect of FI on poverty reduction using data sourced from the WDI database for the 2000–2020 period.

The OLS regression shows that increasing FI and government spending growth led to increased economic growth, which means accepting the null hypothesis. We also find growth of trade openness leads to a decrease in the rate of economic growth, which indicates that the trade openness tends towards consumer imports. The ARDL regression analysis shows that increasing FI will lead to an increase in both poverty rate and an increase in concentration of income in the lowest 20% of society will lead to a reduction in the poverty rate. This agrees with the results of Neaime and Gaysset (2018) study which concluded that successful FI supports economic growth and alleviates poverty. However, misdirection of FI tools and their lack of interest in integrating the poor and marginalised may support economic growth, but it will not lead to poverty alleviation.

Finally, we make the following recommendations. First, attention must be paid to coordination between banks to distribute branches and publish collection points and electronic sales in a more efficient way that achieves spread to cover all remote, poor and marginalised areas. Attention must also be paid to the methods of granting loans and monitoring how they are being used so that they are used for the purpose for which they were granted, do not constitute a source of high-cost credit for the poor, and that borrowers do not fall into the debt trap, especially when exposed to a negative financial shock. Second, there is a need for establishing incentives for large projects that involve small investors in creating SMMEs to meet large projects' needs that are imported from abroad, for example spare parts and raw materials. It is also important to determine the needs of each area of small and medium enterprises, which can then constitute the basis for granting the necessary licenses to practice the activity; link the percentage of incentives for exporters to the percentage of the local component in the products that are exported. Furthermore, attention must be paid to knowing the needs of the poor, providing easy financial information and attractive savings products, and avoiding traditional business models adopted by the formal banking sector so as not to allow informal entities to fill the void and collect deposits from the poor. Attention should also be paid to increasing conventional as well digital financial literacy. With relation to the digital, it is imperative to help the poor to acquire smartphones, which would increase the benefits of switching from cash to digital payments that affects the demand side and supports effective FI. It is also essential to educate the people in managing and hedging risks that expose them to negative financial shocks such as loss of work, health problems, the death of the family breadwinner or economic shocks. Finally, as for future research, attention should be paid to studying the behavioural factors that affect citizens' financial decisions as one of the most important factors affecting FI.

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Notes

[1]Please see section two for details on why Egypt is chosen as the testing ground in this study.

[2]Lack of a bank account due to the inability to pay bank expenses, to open accounts or the distance to reach official bank branches and thus inability to save or access to credit.

[3]Bank Masr, i.e., Egypt bank