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THE RELATIONSHIP BETWEEN FINANCIAL INCLUSION AND MONETARY POLICY TRANSMISSION: THE CASE OF EGYPT

Abstract:

Financial Inclusion is critical for the competitiveness, employment creation, and for raising incomes and reducing poverty. There is limited literature investigating the specific relationship between financial inclusion and monetary policy transmission. Central bank of Egypt (CBE) has launched three initiatives to support development and achievement of financial inclusion. They include an initiative to support financing small- and medium-sized enterprises (SMEs), another to support the tourism sector, in addition to a real estate financing initiative for medium- and low-income individuals. To explore the relationship between financial inclusion and monetary policy transmission in Egypt for the period of 2000 to 2017, it is proposed to use the principal component analysis (PCA) method to assign the weight of factors in financial inclusion index (by comprising selected indicators of financial development in a single index). And VECM approach to examine financial inclusion and monetary policy transmission, Granger Causality tests, and basic trend analyses, to explore empirically the relationship between financial inclusion indicators and monetary policy. The paper is arranged in sections. After the introduction, section II presents literature survey on links between financial inclusion and the goals of monetary policy, and presents stylized facts about financial inclusion in Egypt. Section III discusses the methodology of analysis. In section IV, results of econometric estimations are presented. Section V summarizes the paper with policy implications.

Keywords:

Financial Inclusion, Monetary Policy, VECM, Granger Causality Test

JEL Classification: E52, G18, C32

1. Introduction

Financial inclusion is a popular concept for the developed countries, but it is a new area for the developing countries. These developing nations are mostly Asian, African, and Latin American countries. There is rich literature about financial inclusion, however, there is a noticeable shortage on this topic for developing countries.

Financial inclusion policy targeted raising the number of people having bank accounts for savings and investment in the formal financial system. It also enhances the formal and modern banking tools such as ATM, net banking, and mobile banking. The accessibility and affordability of financial services enhance the financial inclusion remarkably. The higher the financial awareness; the more chances for getting better financial services by optimum utilization of their savings and investment (Kelkar, 2010).

Financial inclusion means facilitating the banking services to a large segment of the society. It helps to eradicate the problem of leakages from subsidy and welfare distribution, increase saving, increases credit availability, and eliminate poverty (Ellis, et al. 2010). This results in better circulation of money that intensifies the rate of investment and purchasing power parity with lower inflation rate. Expanding financial inclusion ensures monetary stability, reduces the cost of cash management, and shields the strengths of the local currency (Mbutor and Uba, 2013). Many definitions of financial inclusion have been suggested. Common aspects of these definitions include access to a wide range of financial services at a reasonable cost (Bhaskar, 2013).

Mahendra (2006) defined financial inclusion as “the availability of banking services at an affordable rate to the large segment of the vulnerable and low-income groups”. He stated that financial inclusion offers wide range of services beside credit such as savings, insurance, payments and remittance facilities issued by formal financial institutions.

According to Khan (2011), financial inclusion has the ability to upgrade the financial status and standards of living of the vulnerable class of the society. Khan added that accessibility to basic financial services would increase economic activities and employment opportunities. However, this has a multiplier effect on the economy, as it would lead to higher disposable income for the rural households which will in turn lead to more savings and a robust deposit base for banks and other financial institutions.

Hariharan and Marktanner (2012) defined financial inclusion as access to formal financial services such as credit, savings and insurance opportunities. They stated that lack of financial inclusion is a multifaceted socio- economic phenomenon that results from various factors such as geography, culture, history, religion, socio-economic inequality, structure of the economy and economic policy. They however noted that financial inclusion is a huge source of economic growth and development, adding that it is a strong and significant correlate of a country’s total factor productivity and, therefore, possess the ability to create capital. The study concluded that financial inclusion has the potential to increase the financial sector savings portfolio, the efficiency of financial intermediation, and allows for tapping of new business

opportunities.

Cross-country evidence relates to the benefits of financial depth rather than to broad financial inclusion; whereas deep financial systems are not necessarily inclusive ones, especially when financial access is heavily skewed toward the wealthy (CGAP, 2012).

Financial inclusion is generally defined as ensuring access to formal financial services at an affordable cost in a fair and transparent manner (FATF, 2011a, p. 12 in De koker and Jentzsch, 2013). In the past decade, the multilateral agencies have promoted financial sector deepening as a means to improve economic growth, reduce poverty, and promote social inclusion. Perceived benefits of financial inclusion, preliminary data, and strong anecdotal evidence can be found in Demirgüç- Kunt et al. (2008) and De koker and Jentzsch (2013).

Interestingly, only few studies have considered financial inclusion and its relationship with monetary policy effectiveness. For example, Mbutor & Uba (2013), using Nigerian data over the period 1980 and 2012, showed that growing financial inclusion improved the effectiveness of monetary policy. Mehrotra & Yetman (2014), using a theoretical framework based on Galí, López-Salido, & Vallés (2004), examined how financial inclusion influences welfare-maximizing monetary policy. They showed that “optimal monetary policy implies a positive relationship between the share of financially included households and the ratio of output volatility to inflation volatility. The empirical results are driven primarily by central banks with a high degree of autonomy in their monetary policy decisions, who might be most likely to set monetary policy optimally” (Mehrotra and Yetman, 2014). Lenka and Bairwa (2016), in a study of SAARC countries, found a significant impact of financial inclusion on monetary policy, meaning that increased financial inclusion can lead to reduced inflation in an economy, thus leading to increased monetary policy effectiveness.

Reliable and comprehensive data that capture various dimensions of financial inclusion are a critical condition for evidence-based policymaking. That includes the definition of consistent financial inclusion indicators that not only may set a clear direction for policymaking by translating the concept of financial inclusion into operational terms but also may allow tracking progress and measuring outcomes of policy reforms (Hannig and Jansen, 2010).

This presents several challenges, though. Thus the definition of financial indicators has traditionally been shaped by previously formulated policy objectives. On other occasions, some indicators may introduce important distortions into the analysis prior to policymaking discussions by prioritizing aggregate volumes over numbers and characteristics of clients.

Broadly speaking, financial inclusion can be measured through the following lenses in order of complexity (Crockett, 2002): Access: the ability to use available financial services and products from formal institutions¹. Quality: the relevance of the financial service or

¹ A very basic proxy for access can be derived by counting the number of open accounts across financial institutions and estimating the proportion of the population with an account.

product to the lifestyle needs of the consumer². Usage: beyond the basic adoption of banking services, usage focuses more on the permanence and depth of financial service and product use³. And impact: measuring changes in the lives of consumers that can be attributed to the usage of a financial device or service poses serious methodological challenges to survey design.

2. Financial Inclusion and Monetary Policy: Some Arguments

Theoretical work on financial inclusion and monetary policy is related to research on limited asset market participation. Various implications have been considered in the literature. These include modelling the behavior of agents who are neither able to save nor borrow; the stability conditions of monetary policy rules in an environment of limited financial access; the effectiveness of monetary policy when some agents are excluded from the formal financial system; and the implications for optimal policy outcomes in terms of output and inflation⁴.

Using a framework that has provided the basis for many subsequent papers, Galí et al. (2004) introduce rule-of-thumb consumers in an otherwise standard sticky price model. They showed that the presence of such consumers, together with their interaction with countercyclical mark-ups, changes the range of parameter values for which a Taylor-type interest rate rule guarantees stability in the economy⁵. Results also showed that when the monetary policy reaction function is forward looking, a large share of rule-of-thumb consumers may result in no equilibrium at all, or stability may require that nominal interest rates increase by less than the rise in inflation.

Drawing on the approach by Galí et al. (2004), Di Bartolomeo and Rossi (2007) argued that monetary policy effectiveness could actually increase when a fraction of consumers are unable to smooth consumption. In their framework, an increase in interest rates reduces the consumption of the financially included consumers. This induces a fall in real wages and consumption demand of the financially excluded households as well. As this “Keynesian” effect dominates the impact of inter-temporal substitution on consumption, monetary policy effectiveness increases as the share of credit constrained consumers’ rises in the model.

In the model by Bilbiie (2008), a stable equilibrium generally requires that monetary policy is passive—nominal interest rates rise by less than inflation—when there is a

² Quality encompasses the experience of the consumer, demonstrated in attitudes and opinions toward those products that are currently available to them. The measure of quality therefore would be used to gauge the nature and depth of the relationship between the financial service provider and the consumer as well as the choices available and consumers’ levels of understanding of those choices and their implications.

³ Hence determining usage requires more details about the regularity, frequency, and duration of use over time. To measure usage, it is critical that information reflect the user’s point of view, that is, data gathered through a demand-side survey.

⁴ Many authors model financial exclusion by incorporating rule-of-thumb consumers into the theoretical framework. These consumers do not save or borrow. Instead, they consume all of their disposable income every period, which implies that their demand is determined by current real wages. As interest rates do not affect their inter-temporal consumption decisions, the transmission mechanism of monetary policy is affected by the degree of financial inclusion in the economy.

⁵ As the share of rule-of-thumb consumer increases, the nominal interest rate must increase by more, for a given change in the inflation rate, in order for equilibrium to be determined. Therefore, increasing the nominal interest rate by more than the inflation rate—the so-called Taylor principle—will not necessarily guarantee stability when some consumers are rule-of-thumb.

large share of agents who are not able to smooth consumption. The author called this the “inverted Taylor principle”. In related work, Bilbiie and Straub (2013) argued that the monetary policy of the US Federal Reserve prior to the 1980s was consistent with equilibrium determinacy and macroeconomic stabilization, even if monetary policy was passive. In Bilbiie and Straub (2012), the authors showed how changes in asset market participation can lead to a change in the sign of the interest rate coefficient in the output Euler equation when asset market participation increases.

In contrast to some of the work mentioned above, Ascari et al. (2011) and Colciago (2011) argued that limited asset market participation may not fundamentally change the nature of optimal monetary policy⁶. On the other hand, Motta and Tirelli (2010) found that the introduction of consumption habits in the framework with financially excluded consumers will restore Bilbiie’s inverted Taylor principle. These findings suggested that it is the interaction of various frictions that determine the conditions required for a stable equilibrium.

Moving on to policy outcomes in terms of output and inflation, Mehrotra and Yetman (2014) focused on the interaction between financial inclusion and the volatilities of the key target variables of the central bank. They showed that, as the share of financially included consumers increases, the ratio of output volatility to inflation volatility will rise if the central bank is conducting policy to maximize the weighted welfare of the financially included and excluded consumers. The financially excluded population benefits more in relative terms from output than inflation stabilization, as they are unable to smooth consumption over time. The authors used data for a large cross-section of economies to confirm the model’s predictions.

Nevertheless, previous literature has suggested various ways through which consumption smoothing can occur in practice even without access to formal financial institutions. Rosenzweig and Wolpin (1993) showed how consumption smoothing has occurred through trading livestock in India. Also, farmers can adjust how much they work in response to shocks (Jayachandran, 2006). Loans could be obtained from family, friends, or informal lenders. Allen et al. (2008) document the large extent to which Chinese entrepreneurs use loans from friends and “private credit agencies”, especially in the growth phase of enterprises, despite the typically high interest rates charged by private lenders. Thus, the financially excluded may be able to smooth consumption through informal means, but the extent to which interest rate setting by the central bank directly affects their inter-temporal choices may still be limited, unless the interest rates in the informal sector are benchmarked to the formal sector.

Mehrotra and Yetman (2014) showed that optimal monetary policy implies a positive relationship between the share of financially included households and the ratio of output volatility to inflation volatility. They found strong empirical support for the model’s predictions using a broad cross-country dataset on financial inclusion. The empirical results were driven primarily by central banks with a high degree of autonomy in their

⁶ They highlighted that if nominal wages are assumed to be sticky, the Taylor principle is restored as a determinant of determinacy, even if the share of financially constrained consumers is large.

monetary policy decisions, who might be most likely to set monetary policy optimally. While, The result of Babajide et al. (2015) showed that financial inclusion is a significant determinant of the total factor of production, as well as capital per worker, which invariably determines the final level of output in the economy.

The impact of financial inclusion on effectiveness of monetary policy in the SAARC countries was examined by Lenka and Bairwa (2016). The empirical investigation of this paper found that the impact of financial inclusion on monetary policy is highly significant. The association between financial inclusion and inflation, which was used for measuring effectiveness of monetary policy, is highly negative and statistically significant. It indicates that, if the financial accessibility (financial inclusion) increases than it may reduce the inflation rate in an economy, which causes the stability of the price level.

The study of Sanya and Olumide (2017) found that financial discipline, use of banks products and services, distance, household size, access to political contract, gender and age were major determinants of financial. Based on their findings, it is recommended that more commercial bank branches and cash centers should be opened, more bank products and services should be introduced such as grants, overdraft and special funds that can easily be accessible by customers.

The results of Mbutor and Uba (2013) on the impact of financial inclusion on monetary policy in Nigeria between 1980 and 2012 supported the notion that growing financial inclusion would improve the effectiveness of monetary policy. However, Evans established that financial inclusion is not a significant driver of monetary policy effectiveness in Africa. For increased financial inclusion in Africa, therefore, heightened effectiveness of monetary policy will be required (Evans, 2016). While Samba (2010) indicated that there are too many differences among the CEMAC countries in the effects of the common monetary policy. There exist differences in the transmission mechanisms of monetary policy, although the formation of a currency union between these countries.

Recent study by Lal (2018) argued that financial inclusion through cooperative banks has a direct and significant impact on income. Lal highlighted that access to basic financial services such as savings, loans, insurance, credit, etc., through financial inclusion has generated a positive impact on the lives of the poor and help them to come out of the clutches of poverty.

While, Williams et. al, (2017) empirically investigated the role of financial inclusion in poverty reduction and economic growth in a developing economy using panel data analysis ranges from 2006 to 2015 within a log linear model specification framework. It was found that one percent increase on ratio of active ATM will leads to about 0.0082 percent increase in the gross domestic product and a reduction of poverty in developing economy.

3. Key Facts About Financial Inclusion in Egypt

Access to finance is one of the most crucial challenges faced by households practicing entrepreneurial activities. The formal finance sector does not oblige the needs of

investors who may not have securements to offer for loans⁷. Variety of countries face challenges in accessing and utilizing formal financial services. The World Bank's Global Financial Inclusion (Global Findex⁸) data demonstrated a positive trend regarding the expanding adoption of formal financial services globally⁹, but the database also exposed that the gap between account ownership of men and women has remained flat over the past few years. From 2011 to 2014, for example, the percentage of women in developing economies with formal financial accounts increased by about 13 percentage points¹⁰. In relative terms, these accomplishments were comparable to those among men in developing economies during the same time period; however, about half of women in developing economies are excluded from the formal financial system (Global Findex, 2015).

The Financial and Digital Inclusion Project Report (FDIP)¹¹ generally emphasize the presence of this global gender gap¹². As noted in the FDPI 2015 report, there are various legal, regulatory, policy, and cultural challenges that forbid women's engagement in the financial ecosystem. Moreover, few countries¹³ have stalked gender-disaggregated data and established precise quantitative targets by gender (The Global Banking Alliance for Women, 2015).

Addressing this gender gap would yield benefits not only for women, but also for their families, communities, and beyond (Murray, 2016). From a macroeconomic perspective, facilitating broader access to and usage of quality financial services enables opportunities for "sustained inclusive and equitable economic growth, and sustainable development," as noted in a recent study by the Global Banking Alliance for (The Global Banking Alliance for Women, 2015).

According to the Global Findex (2014) database, Sub-Saharan Africa has stepped major paces toward progressing financial inclusion, Nigeria, Ethiopia, and Tanzania—are probable to contribute more in the following years, Uganda tied with South Africa as

⁷ Over the last year, both these organizations have started to work with CARE International, one of the leading development organizations in Africa, to offer an innovative approach to micro-lending or peer-to-peer lending. Through the site www.lendwithcare.org, an individual can select an entrepreneur to support by considering their profile, their particular business proposition and the loan requested. At present, this site only supports borrowers from Togo and Benin with plans to extend to other African countries.

⁸ The Global Findex database, the world's most comprehensive database on financial inclusion, provides in-depth data on how individuals save, borrow, make payments, and manage risks. The Global Findex is based on interviews with about 150,000 adults in over 140 countries. ^[1] ^[2] ^[SEP]

⁹ Globally, the financial inclusion gender gap remained at seven percentage points between 2011 and 2014, and in developing economies the gap was at nine percentage points (Global Findex, 2015).

¹⁰ see: Global Findex 2014 - Financial Inclusion, The WorldBank, 2016.

<http://www.worldbank.org/en/programs/globalindex/infographics/infographic-global-findex2014financialinclusion>.

¹¹ Brookings Financial and Digital Inclusion Project (FDIP), launched in summer 2014, examines access to and usage of secure, affordable formal financial services, it assesses countries' financial inclusion ecosystems based on four dimensions of financial inclusion: country commitment, mobile capacity, regulatory environment, and adoption of selected traditional and digital financial services.

¹² Of the 26 focus countries examined within the 2016 FDIP Report, only six (the Dominican Republic, Indonesia, the Philippines, Mexico, South Africa, and Vietnam) exhibited either gender parity or a greater percentage of women than men.

¹³ For example, a 2016 report published by the Alliance for Financial Inclusion examined 12 national financial inclusion strategies and found that only four strategies (including FDIP countries Malawi and Rwanda) had explicit quantitative targets related to women's financial inclusion. See "Policy Frameworks to Support Women's Financial Inclusion," Alliance for Financial Inclusion and Women's World Banking, 2016. http://www.afiglobal.org/sites/default/files/publications/2016-02-womenfi.1_0.pdf.

the second-highest scoring FDIP. Egypt's level of adoption of formal financial services was on average level as other countries in the Middle East. However, currently this adoption level falls far below the average for other lower middle income countries, which was about 43 percent as of 2014¹⁴. It is expected that recent political turmoil in Egypt complicates the country's financial inclusion environment for the forthcoming years¹⁵.

On the supply-side of the financial services landscape, according to the 2015 International Monetary Fund Financial Access Survey, there were about five commercial bank branches per 100,000 adults and about 13 ATMs per 100,000 adults in Egypt as of 2014 (Financial Access Survey, 2015). With respect to demand-side dynamics, the gender gap in Egypt echoes the 9 percentage point gap across developing countries in terms of account ownership (Demirguc-Kunt, 2015). According to the 2014 Global Findex, about 9 percent of women had an account with a bank or other formal financial institution in Egypt, compared with about 18 percent of men. Account penetration among low-income individuals was even lower, with about 5 percent of adults in the bottom 40 percent of the income spectrum holding an account with a formal financial institution as of 2014.

Adoption of card-based financial services was well below that of other lower middle income countries as of 2014. About 10 percent of adults in Egypt had a debit card in 2014, and about 3.5 percent of adults had used a debit card to make payments within the previous year. Less than 2 percent of adults had used a credit card to make payments within the previous year.

In 2014, in terms of saving and borrowing behavior, borrowing from formal financial institutions slightly exceeded saving at formal financial institutions in Egypt. Only about 4 percent of adults in Egypt saved at a financial institution, while about 26 percent total saved any money. Informal borrowing mechanisms were prevalent, relative to borrowing from formal financial institutions: About 6 percent of adults had borrowed from a financial institution, while far more (22 percent) had borrowed from family or friends. There were about 114 mobile subscriptions per 100 people in Egypt, placing it among the top FDIP countries with respect to mobile penetration. Yet while mobile subscriptions are prevalent, and four mobile money deployments were active in Egypt, adoption of mobile money has been limited to date (World Development Indicators, 2014).

About 1.1 percent of all adults in Egypt used mobile money as of 2014, and only 0.6 percent of low-income adults used mobile money. Among those who received wages, use of mobile money to receive wages was about 1.2 percent, while among those who paid utility bills, use of mobile money to pay those bills was negligible. With respect to the quality of mobile money agents, consumers generally appear satisfied with agent

¹⁴ However, The Central Bank of Egypt (CBE) was conducting a field survey to identify barriers to financial inclusion, Egypt's forthcoming national financial inclusion survey findings should contribute to a better understanding of financial inclusion pathways and barriers.

¹⁵ See <http://www.usfinancialdiaries.org/about/>. 

performance. A 2015 GSMA report found that trust issues regarding agents were among the least-reported barriers to mobile money in Egypt (Santosham and Lindsey, 2015).

A 2015 report from the GSMA noted that among its focus sample, Egypt was one of “two interesting exceptions to the correlation between wealth and mobile phone ownership”, Like Kenya, Egypt demonstrated “very small gender gaps in mobile ownership relative to [...] income levels” (Santosham and Lindsey, 2015). One reason for the disparity may be that some women in Egypt must receive permission to spend money. Also, significantly more women surveyed in Egypt considered ID requirements for owning a mobile phone or using mobile services to be a barrier than did men (44 percent versus 26 percent, respectively). A recent initiative may help advance access to these identification documents for underserved groups such as women. However, a significantly lower percentage of women used mobile money than men as of 2014—0.1 percent compared with 2.1 percent (Global Findex, 2014).

While Egypt is not a signatory of the Maya Declaration, the Central Bank of Egypt (CBE) has served as a principal member of the Alliance for Financial Inclusion since 2013¹⁶. Egypt has not yet published a specific national financial inclusion strategy¹⁷, but it does have a variety of legislation relating to microfinance, including Law No. 141 (2014), the first law in Egypt to regulate microfinance services¹⁸.

With respect to digital financial services-related legislation, the 2010 CBE regulations on mobile payments and transfers designated banks as electronic money issuers¹⁹. An International Finance Corporation (IFC) survey conducted in 2011 noted that the involvement of two regulators in the mobile payments space generated some confusion within the mobile money market. As of 2011, the National Telecom Regulatory Authority initiated “conditional” approval for mobile financial services, including to mobile network operators (Firpo et al., 2011). The CBE indicated that it aimed for interoperability between mobile money providers, but to date interoperability has not been instituted (Scharwatt, 2015).

Another recent initiative is the implementation of a national financial inclusion survey intended to inform a national financial inclusion strategy. As the CBE was conducting a field survey to identify barriers to financial inclusion²⁰. Moving forward, Egypt’s forthcoming national financial inclusion survey findings should contribute to a better understanding of financial inclusion pathways and barriers. Egypt also has a Financial

¹⁶ See “AFI Official Members,” Alliance for Financial Inclusion, 12 January 2016, http://www.afi-global.org/sites/default/files/publications/afi_official_members.pdf.

¹⁷ See the downloadable Excel document associated with the Economist Intelligence Unit’s “Global Microscope 2015: The Enabling Environment for Financial Inclusion” report, available at http://www.eiu.com/public/topical_report.aspx?campaignid=MicroscopeDec2015

¹⁸ “Micro Finance,” Egyptian Financial Supervisory Authority, 2014, Available at: http://www.efsa.gov.eg/content/efsa_en/micro_pages_en/main_micro_page_en.htm.

¹⁹ See “Regulations Governing Provision of Payment Orders through Mobile Phones,” [Unofficial translation], Central Bank of Egypt, Undated, <http://www.cbe.org.eg/en/PaymentSystems/RegulationsDL/MobilePayments.pdf>.

²⁰ See “Egypt: Central bank conducts financial inclusion survey,” *Asia Insurance Review*, 27 September 2015, <http://www.asiainsurancereview.com/News/View-NewsLetter-Article?id=33901&Type=MiddleEast>.

Literacy National Committee within the CBE that includes regulators, academic institutions, banks, and other financial institutions that conduct financial education awareness and training. The findings of this committee could contribute to a more holistic understanding of the issues raised in the forthcoming national financial inclusion survey results (El Baradei, 2014).

Here also some key facts about financial inclusion by gender in Egypt: SMEs contribute 38 percent of total employment, and 33 percent of Egypt's GDP. Of the estimated 6.4 million MSMEs in Egypt, only 406,000 SMEs operate in the formal sector. Women-owned SMEs (excluding agri-businesses) make up 40,000 of these enterprises and are concentrated primarily in the manufacturing and tourism sectors. It is estimated that women-owned SMEs in the formal sector have a credit demand of \$283 million and \$246 millions of potential deposits (IFC, 2016).

Evidence from IFC client banks indicates that women are the next frontier market and a potentially profitable market segment for financial institutions in Egypt. The financial sector forms a substantial part of the country's economy, accounting for 3.25 percent of GDP in 2014 (2016).

Within MENA, 55 percent of women-owned SMEs do not have access to credit. The credit demand for women-owned SMEs is \$50 billion per year, or \$72 billion per year including micro enterprises (IFC & McKinsey, 2010). Given that the MENA region has the lowest representation of female-owned formal SMEs - at 12-15 percent - there is room for further growth of this segment, and, in turn, the demand for financial services. In Egypt, women own 30 percent of businesses. This means that as women's economic participation grows, women's entrepreneurship can, and will, fuel future economic growth and job creation in the country and region (GPFI & IFC, 2011).

Notably, in Egypt, while levels of female and male enrollment in tertiary education are similar, there is a higher percentage of female students enrolled in Science, Technology, Engineering and Math (STEM) studies compared to men, according to the World Economic Forum (WEF, 2014).

Financial penetration is low in Egypt. World Bank 2014 Findex data indicates that only 14.1 percent of adults have a bank account and only 9.3 percent of women are banked. As such, there is considerable room for growth in the banking market overall. Meanwhile, emerging evidence suggests that financial inclusion contributes to economic stability, so promoting financial inclusion and targeting the women's market is a prerequisite for a solid and stable financial system. Therefore, increasing financial penetration levels in the Egyptian market can help contribute to financial stability and an improved operating context for banks, which will be good for business (World Bank, 2015).

4. Data and methodology

There is limited literature investigating the specific relationships between financial inclusion and monetary policy transmission. Most studies have focused on the effect of financial inclusion on growth, income inequality, and poverty reduction. So, the aim of

this paper is to evaluate the impact of financial inclusion on the effectiveness of monetary policy in Egypt and therefore, lays emphasis on the role of financial inclusion in transmitting monetary policy impulses to achieve the its objectives.

There are several motivations for this study. One, although a few studies have evaluated financial inclusion and monetary policy effectiveness, to the best knowledge of the researcher, there is no empirical evidence available on Egypt in this regard. Thus, this study fills that gap by determining the impact of financial inclusion on monetary policy transmission in Egypt. Two, with the growing number of initiatives to boost financial inclusion in Egypt it would be worthwhile to evaluate the impacts of financial inclusion in the Egyptian economy. By determining the impact of financial inclusion on the effectiveness of monetary policy, this study provides important inferences in establishing sound monetary policies.

With regards to financial inclusion, it is measured by a number of indicators. In particular, the overriding target of monetary policy that financial inclusion influences; is price stability. Thus, inflation (measured by Consumer Prices Index CPI) is used as the proxy for monetary policy transmission in this study. Exchange rate, money supply and interest rate were employed as the control variables so as to preclude omitted variable bias. All the variables are collected annually for the period 2000–2017.

4.1 Financial Inclusion Estimation

In the course of literature survey there were no unique study that has empirically investigated the impact of financial inclusion on monetary policy. So there is a challenge regarding the choice of financial inclusion indicators to be used in the model. The IMF Financial Access Survey started in 2004 adopts the following indicators of financial access and usage:

Access Indicators: 1. Number of commercial bank branches per 1000 km² 2. Number of commercial bank branches per 100, 000 adults 3. Number of ATMs per 1,000 km² 4. Number of ATMs per 100,000 adults. While, *Usage Indicators are as follows:* 1. Number of borrowers from commercial banks per 1000 adults 2. Outstanding loans from commercial banks (% of GDP) 3. Number of depositors with commercial banks per 1000 adults 4. Outstanding deposits with commercial banks (% of GDP).

There are other indicators used by other organizations interested in financial inclusion. The AFI Core Set of Financial Inclusion Indicators measures access with indicators like: 1. Number of access points per 10,000 adults at a national level and segmented by type and by relevant administrative units 2. Percentage of administrative units with at least one access point 3. Percentage of total population living in administrative units with at least one access point. It measures usage with indicators like 4. Percentage of adults with at least one type of regulated deposit account (in countries where these data are not available, use as proxy the number of deposit accounts per 10,000 adults) 5. Percentage of adults with at least one type of regulated credit accounts (in countries where this data is not available, use as proxy the number of loan accounts per 10,000

adults.

The Global Financial Inclusion (Global Findex) Core Indicators and FinScope Indicators adopt other variants of measures to indicate extent of financial inclusion²¹. In fact, the major issue about the various compilations of indicators is to enable cross country comparisons. Therefore, since the aim of this paper is not to compare financial inclusion across countries, emphasis should be concentrated on the local measures that indicate growing or waning extent of financial inclusion in Egypt. To arrive at these, country specific information and data constraints are taken into account.

The Global Findex Database is the world's most comprehensive gauge of how adults around the world save, borrow, make payments and manage risk. Launched in 2011 with the support of the Bill & Melinda Gates Foundation, the Global Findex for the first time made it possible to measure financial inclusion for adults around the world, including women, the poor, and rural residents.

Three years later, the 2014 Global Findex provides an update on the indicators collected in 2011 while adding more nuanced data on mobile money accounts and domestic payments. The Global Findex indicators are drawn from survey data collected by Gallup, Inc. over the 2014 calendar year, covering around 150,000 adults in more than 140 economies and representing about 97 percent of the world's population.

The 2017 Global Findex database shows that 1.2 billion adults have obtained an account since 2011, including 515 million since 2014. Between 2014 and 2017, the share of adults who have an account with a financial institution or through a mobile money service rose globally from 62 percent to 69 percent. In developing economies, the share rose from 54 percent to 63 percent. Yet, women in developing economies remain 9 percentage points less likely than men to have a bank account. The third edition of the database points to advances in digital technology that are key to achieving the World Bank goal of Universal Financial Access by 2020.

This study uses the Principle Component Analysis (PCA) method to comprise the five selected indicators of financial inclusion in a single index. According to this procedure, the j th factor Index can be expressed in the following equation:

$$IFI_j = W_{j1}X_1 + W_{j2}X_2 + \dots + W_{jp}X_p \quad (1)$$

Where IFI_j is the Financial Inclusion Index; W_j is the weight on factor score coefficient; X is the respective original value of the components; and P is the number of variables in the equation. Thereafter, taking factor score (weights) calculated by PCA, and multiplying it with the respective variable then adding them all for getting the final index. By doing so, a composite single value Index is obtained.

Here, the composite financial inclusion index has been formed by three dimensions where each dimension consists of certain indicator/s. The three dimensions are: geographic penetration, demographic penetration, and banking penetration. The

²¹ However, the definition of financial inclusion is the same for all stake holders so that the different indicators by different stakeholders essentially point to achieving the same objective, the extent to which financial services reach the populace at affordable costs.

variables employed and sources for the composite index are summarized in table 1 below.

Table 1: Indicators of Financial Inclusion Index and Sources

Symbo l	Indicator Name	Source
CBB	Commercial bank branches (per 100,000 adults)	International Monetary Fund, Financial Access Survey.
ATM	Automated teller machines (ATMs) (per 100,000 adults)	International Monetary Fund, Financial Access Survey.
DC	Domestic credit to private sector (% of GDP)	International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates.
AO	Account ownership at a financial institution or with a mobile-money-service provider (% of population ages 15+)	Demirguc-Kunt et al., 2018, Global Financial Inclusion Database, World Bank.
DP	Depositors with commercial banks (per 1,000 adults)	International Monetary Fund, Financial Access Survey.

4.2 Model Specification

This study tries to empirically investigating the impact of financial inclusion on monetary policy transmission in Egypt. Hence, the transmission mechanism of the monetary policy is the process through which monetary policy decisions affect the economy in general, and the price level in particular. So there are many different initial challenges that need to be overcome to set the stage for the analysis. It is known that, the main objectives of effective monetary policy are full employment, price stability, increasing economic growth and maintaining balance of payments. The main role of monetary policy is to control inflation in an economy and stabilize the price level. The Central Bank of Egypt (CBE)²² left its key interest rates unchanged, as expected, and lowered its inflation target to an average of 9.0 percent, plus/minus 3 percentage points, during the fourth quarter of 2020, from the target of 13 percent for the fourth quarter of this year, which was set in May 2017 (CBE, 2018). So, inflation is taken as a proxy variable to measure the success of monetary policy. Thus the operating model is:

$$Inf_{it} = \alpha + \beta_0 + \beta_1 IFI_{it} + \beta_2 Ctrl_{it} + \mu_{it} \quad (2)$$

²² Law no. 88 of 2003 of the "Central Bank, Banking Sector and Monetary System" entrusts the Central Bank of Egypt (CBE) with the formulation and implementation of monetary policy, with price stability being the primary and overriding objective. The CBE is committed to achieving, over the medium term, low rates of inflation which it believes are essential for maintaining confidence and for sustaining high rates of investment and economic growth. The Government's endorsement of the objective of price stability and its commitment to fiscal consolidation is quite important for achieving this objective.

Here, in Equation (2), the explained variable (*Inf*) is inflation rate, measured by Consumer price index (*CPI*)²³. The explanatory variables are the Index of Financial Inclusion (*IFI*), which includes several financial accessibility variables. The (*Ctrl*) are control variables which include commercial bank lending rate²⁴ (*IR*), foreign exchange rate (*ER*) measured by the official exchange rate²⁵ and broad money (*M2*)²⁶. So the above model is extended to:

$$Inf_{it} = \alpha + \beta_0 + \beta_1 IFI_{it} + \beta_2 ER_{it} + \beta_3 IR_{it} + \beta_4 M2_{it} + \mu_{it} \quad (3)$$

Data collected from International Monetary Fund, International Financial Statistics and data files. The study covers an annual data from 2000 to 2017.

To investigate the relationship between financial inclusion and the transmission of the monetary policy in Egypt, the model proceeds in different steps: firstly, unit root test is conducted to check the stationarity of the data under study. Secondly, principal component analysis (PCA) method is employed to assign the weight of factors in financial inclusion index (by comprising selected indicators of financial development in a single index). Then, Johansen Cointegration Model and Vector Error Correction Model (VECM) were used to examine the long run and short run relationship between financial inclusion and monetary policy transmission respectively. Lastly, Granger Causality test explores empirically the relationship between financial inclusion indicators and monetary policy.

5. Results and Interpretation of Findings

5.1 Unit Root Test

To determine the stationarity of the series unit root test is conducted. The absence of a unit root is premised on the assumption that the series exhibit the same order of integration. In general terms, if the series need to be differenced “n” times in order to achieve I(0), i.e. to be integrated to order zero, then the series is said to be integrated of order “n” and can be expressed as $X_t \sim I(n)$, Awe and Olawumi (2012).

The null hypothesis of the existence of a unit root is $H_0: \alpha=0$. Failure to reject the null hypothesis leads to conducting the test on further differences of the series. Further differencing is conducted until stationarity is reached and the null hypothesis rejected. Akaike information criteria is used to determine the length of lags.

²³ CPI reflects changes in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.

²⁴ Lending rate is the bank rate that usually meets the short- and medium-term financing needs of the private sector. This rate is normally differentiated according to creditworthiness of borrowers and objectives of financing. The terms and conditions attached to these rates differ by country, however, limiting their comparability

²⁵ Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar).

²⁶ Broad money is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveler's checks; and other securities such as certificates of deposit and commercial paper.

Table 2: Augmented Dickey-Fuller Unit Root Test

Variable	At Level		At 1 st Difference	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
CPI	0.465760	2.202387	2.777967*	1.769447*
IFI	0.980859	2.843395	4.992920*	5.183636*
ER	-0.254611	-1.142517	-3.068077*	-3.013594*
IR	-0.378544	2.815466	-2.197142*	-3.745885*
M2	-4.607892*	-2.719434*	-1.713963*	-2.80135*

*Results are significant at 5% level.

Source: Author's computation, using E-views software version 9

In this study Augmented Dickey-Fuller (ADF) unit root test is employed. The result of Table 2 shows that almost the series were non-stationary at their levels. The ADF test indicates that M2 is stationary at its levels while the rest remain non-stationary. Hence, all the series were differenced at first differencing to attain a trend stationary level. The above result, therefore suggests that the series were integrated to order 1, represented as I(1). The implication of the presence of a unit root is the probability of having a series that could be persistently influenced by external shocks and disturbances on the variables which could also result to a spurious result if unchecked.

5.2 Financial Inclusion Estimation

Through PCA method, five factors were included as described earlier in table 1 to reach up to a single index. Table 3 and figure 1 show financial inclusion estimation and trend respectively.

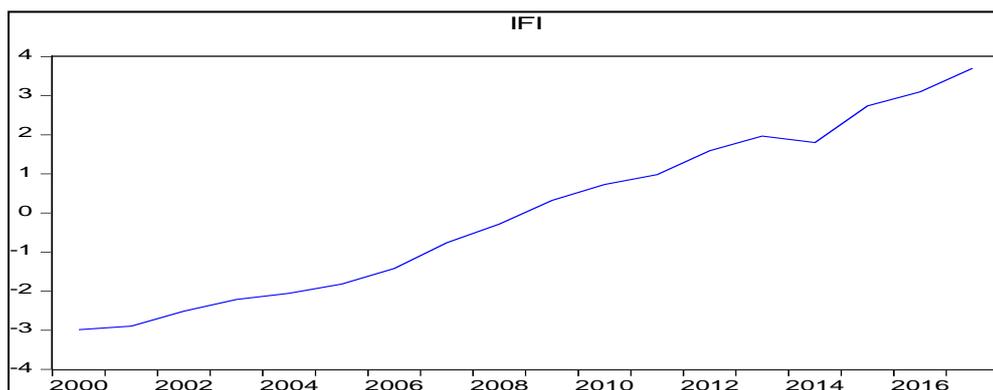
Table 3: Estimation of Financial Inclusion Index (2000-2017)

	CBB	ATM	DC	AO	DP	IFI
2000	3.12637382 9	1.65627281 9	51.9532784 5	3.83627182 8	305.837282 9	-2.984605123
2001	3.26373828 3	1.78291028 9	54.9311402 3	4.02928119 3	308.637282 9	-2.89210867
2002	3.56272828 2	2.17892018 3	54.6553972	4.26352289 2	310.739290 1	-2.513384411
2003	3.67282191	2.36729202 8	53.8976287 4	4.56783617 3	316.738220 3	-2.213265074
2004	3.70927259 3	2.58525059 5	54.0429142 8	4.87363526 2	320.837282 9	-2.055225567
2005	3.71874224 2	3.26342593	51.1654340 5	4.92826142 4	322.738292 8	-1.817491187
2006	3.82958916 2	4.33549201 8	49.2909797 4	5.92826251 6	325.748393	-1.418148316
2007	4.11762642 6	5.30048784 6	45.5152215 7	6.73627283 9	330.738392 9	-0.759783106

2008	4.35141931	6.32187333	42.7975137	6.87382921	332.837627	-0.28365219
		7	8		3	
2009	4.47247577	7.50711488	36.0927133	7.82625162	335.748102	0.321836019
			5	7	9	
2010	4.50115365	8.44031962	33.0722952	8.92826151	340.738392	0.728694223
		2	2	3	7	
2011	4.51173226	9.01317941	31.1549232	9.71998024	343.839527	0.980894688
	1	8	9			
2012	4.47291327	10.0951868	27.3884497	11.7362728	356.596902	1.593486987
	9	9	3	2	6	
2013	4.47493251	10.7332207	26.2224395	13.8463526	363.700843	1.968931821
	2	5		3		
2014	4.48129046	11.8493317	25.6066805	14.1267967	349.597611	1.802108394
	6		4	2	2	
2015	4.53407130	13.4459216	26.3163937	24.9863728	360.416741	2.742119415
	5	2	6	2		
2016	4.68392019	14.7281910	34.1348626	30.7483928	365.938726	3.097258236
	3	1	3	4	4	
2017	4.76483920	15.7383929	28.5200495	32.7843589	370.838292	3.702333861
	1	2	7	8		

Source: Author's computation, using E-views software version 9

Figure 1: Trend of Financial Inclusion Index



Source: Author's computation, using E-views software version 9

Trend shows the upward behavior of the inclusion index over the past twenty years, which is aligned with the adoption of various initiatives to widen the inclusion of all segments societies across Egypt into the formal financial system.

5.3 Johansen Cointegration Test

This stage involves using Johansen Cointegration Test to check for the presence of cointegrating relationship among the variables under study. As shown in table 4 Johansen test confirms cointegration among the variables. The results suggest the existence of one (or more) long-run relationships among the set of variables.

Table 4: Johansen Cointegration Test

Sample (adjusted): 2002 2017
 Included observations: 16 after adjustments
 Trend assumption: Linear deterministic trend

Series: CPI IFI ER IR M2
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.993183	206.8816	69.81889	0.0000
At most 1 *	0.974103	127.0671	47.85613	0.0000
At most 2 *	0.955919	68.60921	29.79707	0.0000
At most 3 *	0.545273	18.66164	15.49471	0.0161
At most 4 *	0.314971	6.052717	3.841466	0.0139

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.993183	79.81447	33.87687	0.0000
At most 1 *	0.974103	58.45789	27.58434	0.0000
At most 2 *	0.955919	49.94757	21.13162	0.0000
At most 3	0.545273	12.60892	14.26460	0.0898
At most 4 *	0.314971	6.052717	3.841466	0.0139

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Author's computation, using E-views software version 9

5.4 Vector Error Correction Model (VECM)

Here, the estimation of the VECM takes place, this involves adjustments to both short-run changes in the variables and the deviations from long run equilibrium. In order to understand the results of the VECM, Impulse Response Functions (IRF) and Variance Decompositions (VD) were estimated.

Figure 2 explains the impacts of financial inclusion, exchange rate, interest rate and money supply on the inflation, which is used for effective and sound monetary policy. The reaction of monetary policy transmission to the positive financial inclusion shock is negative and significant. Similarly, interest rate is also negatively associated with inflation but insignificant.

Policy reaction to the positive money supply shock is statistically significant and positive in the short-run while reactions remain stable in the long run. On the other hand, the exchange rate shocks have a positive and statistically significant permanent effect on the level of monetary policy effectiveness. Therefore, there is a negative relationship

between financial inclusion and inflation rate in Egypt.

Table 5: Vector Error Correction Estimates

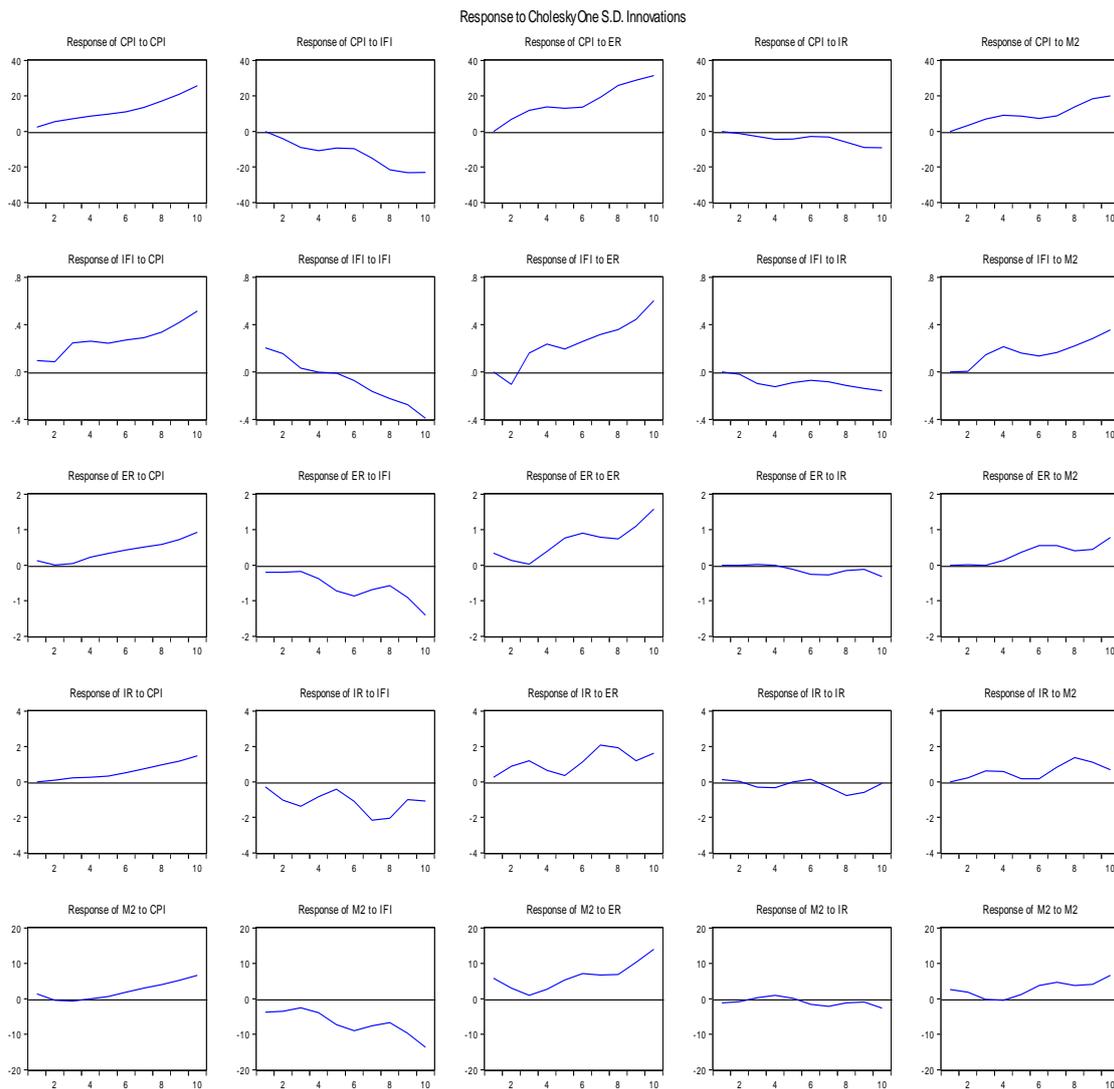
Vector Error Correction Estimates
 Sample (adjusted): 2002 2017
 Included observations: 16 after adjustments
 Standard errors in () & t-statistics in []

	CPI	IFI	ER	IR	M2
CPI(-1)	1.700553 (0.34592) [4.91599]	0.034501 (0.03331) [1.03575]	0.002805 (0.06080) [0.04614]	0.041331 (0.06141) [0.67298]	-0.14403 (1.13262) [-0.12717]
CPI(-2)	-0.658693 (0.37535) [-1.75486]	-0.001285 (0.03614) [-0.03556]	0.061714 (0.06597) [0.93543]	0.067888 (0.06664) [1.01873]	0.590391 (1.22898) [0.48039]
IFI(-1)	3.176737 (2.77081) [1.14650]	0.378680 (0.26681) [1.41928]	-0.560682 (0.48701) [-1.15128]	-1.79395 (0.49192) [-3.64680]	-7.292215 (9.07217) [-0.80380]
IFI(-2)	0.400818 (0.66211) [0.60536]	-0.027775 (0.06376) [-0.43563]	-0.276516 (0.11638) [-2.37607]	0.074483 (0.11755) [0.63363]	-1.972446 (2.16788) [-0.90985]
ER(-1)	-4.298468 (2.84335) [-1.51176]	-0.240119 (0.27380) [-0.87700]	0.323110 (0.49976) [0.64653]	0.429803 (0.50480) [0.85143]	-3.11877 (9.30968) [-0.33500]
ER(-2)	1.453306 (2.48061) [0.58587]	0.095179 (0.23887) [0.39846]	-0.19358 (0.43600) [-0.44399]	-0.935183 (0.44040) [-2.12348]	3.116363 (8.12199) [0.38369]
IR(-1)	2.518665 (1.36553) [1.84446]	-0.12455 (0.13149) [-0.94721]	0.015592 (0.24001) [0.06497]	0.923891 (0.24243) [3.81091]	-0.00306 (4.47100) [-0.00068]
IR(-2)	-5.291257 (1.42344) [-3.71724]	-0.171167 (0.13707) [-1.24878]	0.028193 (0.25019) [0.11268]	-1.359241 (0.25271) [-5.37857]	1.605736 (4.66061) [0.34453]
M2(-1)	1.293572 (0.22211) [5.82389]	0.001564 (0.02139) [0.07310]	0.004076 (0.03904) [0.10440]	0.084858 (0.03943) [2.15192]	0.704223 (0.72725) [0.96834]

M2(-2)	-0.671199 (0.22213) [-3.02159]	0.020517 (0.02139) [0.95919]	-0.010891 (0.03904) [-0.27894]	0.046342 (0.03944) [1.17509]	-0.351955 (0.72731) [-0.48391]
R-squared	0.999210	0.995069	0.957440	0.975713	0.764236
Akaike information criterion*	9.752978				
Schwarz criterion	12.16732				

*The lag length is determined by Akaike’s Information Criterion (AIC)
 Source: Author’s computation, using E-views software version 9

Figure (2): Impulse Response Functions



Source: Author’s computation, using E-views software version 9

Table 6: Variance Decomposition

Variance Decomposition of CPI:

Period	S.E.	CPI	IFI	ER	IR	M2
1	2.331576	100.0000	0.000000	0.000000	0.000000	0.000000
2	10.56505	32.40775	15.35936	40.70544	1.186146	10.34131
3	21.01047	19.63979	22.39806	42.22014	2.229985	13.51203
4	30.40650	17.30263	23.55656	40.72028	3.237853	15.18268
5	37.01290	18.64794	22.36960	39.79411	3.537194	15.65115
6	42.77369	20.65133	21.82567	39.85913	3.096488	14.56739
7	51.91011	20.80578	23.31356	40.69697	2.461738	12.72196
8	65.93371	19.55146	25.20727	40.61188	2.384310	12.24507
9	81.12628	19.64822	24.91462	39.46370	2.801324	13.17213
10	96.14591	21.14752	23.50716	38.76315	2.911252	13.67092

Source: Author's computation, using E-views software version 9

The variance decomposition is shown in Table 6. In the short-run, financial inclusion, money supply and exchange rate shocks have some role in explaining variations in the monetary policy effectiveness, but in the long-run, 21 percent of variations are explained by financial inclusion, while, more than 38 percent accounts for exchange rate shocks. Interest rate shocks remain ineffective in both short run and long run over the period under study.

5.5 Granger Causality Tests

Table 7: Granger Causality Tests

Pairwise Granger Causality Tests
Sample: 2000 2017
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
IFI does not Granger Cause CPI	16	4.20071	0.0441
CPI does not Granger Cause IFI		10.1328	0.0032

The lag length is determined by Akaike's Information Criterion (AIC)

Source: Author's computation, using E-views software version 9

Table 7 reports the result of the panel Granger causality. There exists a bidirectional causality between monetary policy effectiveness and financial inclusion. As p-value is lower than 5% in both directions. In a nutshell, the grand summary of the empirical results indicates that, over time, financial inclusion and monetary policy effectiveness are linked by a set of long-run relationships. However, financial inclusion has a

significant impact on monetary policy transmission, also monetary policy effectiveness causes financial inclusion²⁷.

The reaction of policy effectiveness to the positive financial inclusion shock is not significant. Policy reaction to the positive money supply shock is statistically significant and positive in the short-run while reactions are not significant different from zero in the long-run. On the other hand, the positive interest rate has statistically significant permanent effect on the level of monetary policy effectiveness.

Conclusion

This study used annual data over the period 2000-2017, VECM approach and panel Granger causality to examine the impact of financial inclusion on monetary policy transmission in Egypt. The study has shown that financial inclusion and monetary policy are linked by a set of long-run relationships. The reaction of policy effectiveness to the positive financial inclusion shock is statistically significant. Policy reaction to the positive money supply shock is statistically positive in the short-run while reactions remain stable in the long run. On the other hand, the positive interest rate has a negative but insignificant permanent effect on the level of monetary policy. The study found that financial inclusion, money supply and exchange rate shocks have some role in explaining variations in monetary policy effectiveness, but in the long-run, more than 38 percent of variations in monetary policy effectiveness are explained by exchange rate shocks, while 21 percent by financial inclusion. Moreover, while there is a bidirectional causality from monetary policy to financial inclusion, this holds for all specifications tried. Therefore, this study has established that financial inclusion is a significant driver of monetary policy transmission in Egypt. On the contrary, monetary policy effectiveness is the driver of financial inclusion. For increased financial inclusion in Egypt, therefore, heightened effectiveness of monetary policy will be required. Most national financial institutions have been leading major policy initiatives to encourage financial inclusion. Yet, there is still a wide gap. Financial inclusion policies for harder-to-reach rural and remote populations should be the focus of monetary policy. Other areas are policies for improving digital access to finance, sustaining financial service delivery to remote areas and culturally fitting models for increasing the financial capabilities of populations with cultural/language barriers and poor literacy/numeracy.

²⁷ The findings of this study is, therefore, in contrast to earlier studies such as Lenka & Bairwa (2016) which found a significant impact of financial inclusion on monetary policy effectiveness in a study of SAARC countries; and Mbutor & Uba (2013) which showed that growing financial inclusion improved the effectiveness of monetary policy in Nigeria.

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