

What are the main drivers of private saving in Egypt?

Hebatalla Atef Emam

*Department of Economics, Faculty of Economics and Political Science,
Cairo University, Giza, Egypt*

Abstract

Purpose – This study aims to investigate the main drivers of private saving in Egypt (2005–2020).

Design/methodology/approach – It employs an autoregressive distributed lag (ARDL) approach for quarterly data on private saving, lagged private saving, real gross domestic product (GDP) growth, public saving, inflation, real interest rate, money supply, current account deficit and unemployment.

Findings – Private saving in Egypt displays persistency and public saving depresses private saving in the short run and long run. Real interest rate, inflation and unemployment have negative and statistically significant impacts on private saving in the short run and long run. The current account deficit displays a negative effect on private saving but is significant only in the short run. Other incorporated variables, like real GDP and money supply, are not statistically significant. This could be attributed to the high consumption rather than saving motive of the Egyptian population and their tendency to rely more on other informal saving channels.

Research limitations/implications – Findings are of policy relevance as unleashing the determinants of private saving guides policymakers in formulating the appropriate sustainable development policies. It also assists in identifying the main obstacles hindering the promotion of private saving and hence major areas for policy intervention, like financial inclusion, poverty eradication, employment generation and structural reforms.

Originality/value – This study contributes to the literature: (1) it tackles private saving figure rather than aggregate saving figure that is covered by similar studies due to lack of consistent data, (2) given the relatively low quality, unavailability and inconsistency of data on private saving in developing countries, investigating the determinants of private saving should be carried out on an individual country basis which is done by this study, (3) this study fulfills the gap in literature related to the lack of up-to-date studies on private saving in Egypt and (4) it relies on quarterly data that could produce more reliable results.

Keywords Private saving, Public saving, Interest rate, ARDL, Egypt, Monetary policy

Paper type Research paper

1. Introduction

Among the main challenges for development in developing countries is securing the needed finance for development (Salem *et al.*, 2018). Theoretically speaking, such finance could be acquired either through mobilization of domestic saving or foreign capital flows. Yet, empirical studies conclude that countries with relatively low reliance on foreign saving (like China) grow faster and in a more sustainable manner than those who rely more on foreign saving. As foreign capital is subject to sudden reversals with exogenous shocks, on the contrary, domestic saving usually displays a more stable and sustainable trend (Ganioglu and Yalcin, 2015). Thus, developing countries need to work on mobilizing their private saving to safeguard the needed finance for development.

JEL Classification — C22, E21, E49

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Accordingly, understanding the main determinants of private saving is vital for guiding development policies. Empirical studies [like, [Dayal-Ghulati and Thimann \(1997\)](#), [Masson *et al.* \(1998\)](#), [Nwachukwu and Egwaikhide \(2007\)](#) and [Hussein *et al.* \(2017\)](#)] identify various macroeconomic and financial drivers for private saving, like, real income, degree of financial development, real interest rate, macroeconomic stability, current account deficit and public saving. It is remarkable that some studies [like [Metin Özcan and Ziya Özcan \(2005\)](#)] conclude that public saving crowds out private saving.

Nevertheless, most of the relevant empirical literature concentrates on the aggregate saving figure rather than private saving in their analysis due to the lack of consistent data on private saving. Moreover, studies on private saving in developing countries are challenged by the relatively moderate quality and inconsistency of available data ([Athukorala and Sen, 2004](#); [Hussein *et al.*, 2017](#)). Accordingly, private saving behavior has been examined on a cross-country basis to overcome the data limitation issue, yet the empirical outcome is a bit questionable for two reasons. First, the vast structural and institutional disparities among developing economies make them a bit far from demonstrating homogenous saving behavior or drivers. Second, the difference in the nature and quality of saving data among countries, especially those with weak national accounting frameworks, would yield a high magnitude of errors in any pooled cross-country regression. Thus, undertaking robust analysis of saving behavior needs to be carried out on an individual country basis by combining both the quantitative and qualitative features of the country to yield sound policy-relevant outcomes ([Athukorala and Sen, 2004](#); [Hussein *et al.*, 2017](#)).

The issue is even more critical for a developing country like Egypt, with only a few studies [like [Hussein *et al.* \(2017\)](#)] providing an in-depth analysis of private saving behavior in Egypt. Yet, this study is a bit outdated as it only tackles the period from 1990 to 2010 in its analysis. Thus, there is a need for more up-to-date studies investigating the behavior of private saving in Egypt, especially in the recent era with the various efforts exerted by the Egyptian government and the Central Bank of Egypt to promote financial inclusion and private saving.

With that being said, the present study aims to fill this gap by examining the determinants of private saving in Egypt using quarterly data from 2005 to 2020 through the employment of the autoregressive distributed lag (ARDL) approach. To the best of the researcher's knowledge, this is nearly the only study that tackles private saving drivers in Egypt during this period. Private saving rate as a percentage of gross domestic product (GDP) is employed in the study as the dependent variable. Explanatory variables, on the other hand, encompass lagged private saving rate, growth rate of real GDP, public saving as a percentage of GDP, real interest rate, inflation rate, M2 as a percentage of GDP, current account deficit as a percentage of GDP and unemployment rate. Anticipated findings are of policy relevance. Unleashing the main drivers of private saving and understanding the behavior of private saving in Egypt would assist policymakers in formulating the appropriate development policies and in mobilizing domestic private saving.

The present study is divided into four main sections, in addition to the introduction and the conclusion. The first one reviews the existing literature by encompassing both a theoretical framework and an empirical review. The second section, on the other hand, highlights some stylized facts on private saving in Egypt. The third section tackles the methodology, data and specification of the employed empirical model. Lastly, the final section presents the main empirical findings.

2. Literature review

2.1 Theoretical framework

The origin of the saving and consumption theory dates back to Keynes who developed the “fundamental psychological law of consumption” in 1936. Keynes introduces the concept of

marginal propensity to consume (MPC) and differentiates between two sets of objective and subjective factors that affect individuals' decisions to consume or save. Objective factors incorporate changes in the price level, interest rates, fiscal policy, capital values, expectations about the relation between current and future income and availability of credit. Subjective factors, on the other hand, encompass social habits and society structure in terms of the distribution of wealth and institutions. Keynes assumes that the two sets of factors do not change in the short run and hence it is mainly the current income that affects consumption and saving decisions in the short run (Keynes, 1936; Grigoli *et al.*, 2018; Dessouky, 2019).

The initial start of modern theories on private saving has been dominated by the permanent income hypothesis (PIH) and the life-cycle hypothesis (LCH). Notably, the two hypotheses rely on the micro-foundations of consumer choice (Dessouky, 2019). Modigliani and Brumberg (1954) launch the LCH which enriches the theoretical literature on saving. It focuses on a representative, infinitely lived consumer who evenly spreads his lifetime consumption throughout his life by accumulating saving during working years to maintain the same level of consumption during retirement. LCH states that demographic variables, like, age dependency ratio, as well as financial variables like interest rates, inflation, wealth and income affect saving decisions (Hussein *et al.*, 2017).

On another note, PIH—introduced by Friedman (1957) - rests on Friedman's concept of permanent income. Friedman distinguishes between permanent income and transitory income, whereas, saving decisions are primarily determined by permanent income (Hussein *et al.*, 2017). According to PIH, consumer equates his permanent income net of present value of taxes throughout his life. A variant of PIH, the Ricardian equivalence hypothesis claims that a rise in government saving (i.e. higher current taxes) is fully counterbalanced by a decrease in private saving. This hypothesis rests on the assumption that consumers are rational and on the existence of perfect capital markets (Touny, 2008; Grigoli *et al.*, 2018).

Despite their undeniable contribution, both LCH and PIH face some criticism as both fail to account for the role of uncertainty that leads to the rise in precautionary saving motive. Besides, given the imperfection of capital markets and borrowing constraints in some countries, saving is more sensitive to the volume of credit rather than wealth and interest rate (Grigoli *et al.*, 2018). In light of that, some scholars attempt to modify the two hypotheses to make them more empirically plausible. Among them is Hall (1978) who introduces the concept of rational expectations and differentiates between expected and unexpected permanent income shocks and their impact on an individual's saving decisions (Dessouky, 2019).

Based on the aforementioned theoretical literature, Table 1 below summarizes the main theoretical drivers of private saving.

2.2 Empirical review

Empirical studies that endeavor to investigate the determinants of saving employ different econometric approaches along with diverse samples of countries. Namely, some studies tackle the determinants of private saving across groups of countries [like, Dayal-Ghulati and Thimann (1997)] while others are concerned with the analysis of determinants within a specific country to account for country-specific characteristics [like, Burnside and Dollar (2000)]. Besides, some studies employ macroeconomic variables solely within their models, others use a mix of macroeconomic and demographic variables. Finally, studies vary concerning the time horizon of the analysis with some studies estimating the drivers of private saving over both the long term and short term, while others are concerned only with long run dynamics. This section pinpoints some of the relevant empirical studies.

Among the studies that tackle determinants of saving *across a group of countries* are Dayal-Ghulati and Thimann (1997) which investigate the drivers of private saving for countries in Latin America and Southeast Asia from 1975 to 1995. The results imply that

Variable	Expected effect	Justification
Income growth	Ambiguous	LCH claims a positive relation as higher income growth increases lifetime earnings and hence private saving. Yet, more complicated and realistic versions of the LCH argue that the effect depends on the age profile of saving. Younger people are expected to save more for retirement while old people are expected to consume more based on their previously accumulated assets
Real interest rate	Ambiguous	Depends on the substitution and income effect of changes in the real interest rate on private saving and which effect dominates the other According to LCH, a change in real interest rate triggers two opposing effects on saving. The substitution effect implies that a higher interest rate increases the current price of consumption relative to the future price, thus affecting saving positively. The other effect, which is called the income effect, indicates that if the household is a net lender, an increase in the interest rate will increase lifetime income and so increase consumption and reduce saving. Therefore, the net effect of changes in real interest rate depends on the relative strength of each of the two effects
Inflation and macroeconomic uncertainty	Positive	LCH claims that financial variables like inflation affect saving decisions. Higher inflation promotes the precautionary saving motive leading to higher private saving. Also, higher inflation could reflect higher profits for corporations and hence higher corporate saving
Financial development	Ambiguous	More financial development reduces the cost of banking transactions and hence promotes private saving. Yet, this depends on the degree of substitution between financial saving and other form of saving. In the presence of unstable or unorganized financial markets, higher development and banking credit could trigger higher informal saving and reduce private saving
Current account deficit	Negative	A higher deficit implies higher foreign saving which could act as a substitute for private domestic saving
Fiscal policy (Public saving)	Negative	Higher public saving crowds out private saving, but the magnitude of the effect depends on whether REH holds or not
Demographic variables (dependency ratio/unemployment)	Negative	A higher dependency ratio or higher unemployment implies more people need support and hence lower private saving

Table 1.
Theoretical
determinants of private
saving

Source(s): Done by the authors based on [Touny \(2008\)](#) and [Grigoli *et al.* \(2018\)](#)

fiscal policy in general and social security measures in specific, are considered the main policy instruments for promoting private saving rates in Asian countries. Moreover, inflation volatility, financial market liberalization and financial deepening variables have a negative impact on private saving in Latin America. Notably, both macroeconomic stability and financial deepening have statistically significant effects on private saving in Latin America and Southeast Asia.

In 1998, Masson *et al.* investigate the main drivers of private saving for both industrial and developing countries using time series and cross-section data. The study concludes that changes in public saving partially offset private saving in industrial countries, whereas GDP

growth and demographic variables are the main drivers of private saving in developing countries.

Regarding the Middle East and North Africa (MENA) region, [Metin Özcan and Ziya Özcan \(2005\)](#) test the relationship between financial and macroeconomic variables and private saving rate for a sample of 15 MENA countries from 1981 to 1994. The findings indicate that variables like the growth rate of income, per capita income and macroeconomic stability as captured by inflation have a positive and statistically significant effect on private saving. Besides, public saving partially crowds out private saving. As for the financial variables, the study claims that the deeper the financial system the higher the private saving in the underlying country.

[Loko et al. \(2022\)](#) reexamine the main drivers of private saving in 31 countries in Sub-Saharan Africa post the COVID-19 pandemic, using unbalanced panel data models during the period from 1983 to 2021. The model incorporates the following explanatory variables; lag dependent variable to account for private saving inertia, real per capita GDP, real per capita GDP growth rate, inflation rate, private sector credit, public saving, terms of trade and share of urban population. The study finds that real per capita GDP growth is considered an essential driver of private saving.

Notwithstanding the contribution of the aforementioned studies in explaining the determinants of private saving, there results must be taken with caution as studying the determinants across a group of countries might fail to capture the individual variations among countries over the economic, social and demographic levels. Thus, another group of studies tackles private saving determinants *within specific countries* ([Athukorala and Sen, 2004](#)). Namely, [Burnside and Dollar \(2000\)](#) examine private saving in Mexico using quarterly data throughout the period 1980–1995. The study utilizes both the correlation coefficient among variables of interest and the vector autoregressions (VAR) model. The findings assert the existence of a negative correlation between private saving and fiscal balance. Moreover, private saving is more correlated with private disposable income than with gross national product (GNP) [1]. This implies that transitory movements in income are mainly absorbed by saving, not consumption. Lastly, tax shocks seem to be the primary driver of private saving.

[Hallaq's \(2003\)](#) study investigates private saving drivers from 1976 to 2000 in Jordan. The study employs both the instrumental variable methods and the ordinary least square (OLS). The findings imply that GDP per capita income, GDP growth rate, development of consumer credit market, welfare public expenditures and social security have positive statistically significant effects on private saving. Nevertheless, inflation, real interest rate and terms of trade have statistically insignificant effects on private saving. Notably, the dependency ratio is found to have a negative statistically significant impact on private saving while government saving depresses private saving.

Similarly, [Metin Özcan et al. \(2003\)](#) analyze private saving drivers for Turkey from 1968 to 1994. They conclude that private saving has strong inertia. Moreover, higher government saving crowds out private saving, yet this is done in less than a one-to-one manner. Although income level positively affects private saving, its growth rate is statistically insignificant. Financial depth, financial development and inflation have a positive impact on private saving rates in Turkey. External factors like shocks in terms of trade boost private saving, whereas the effect of the current account deficit on private saving is statistically insignificant in Turkey. Concerning demographic variables, life expectancy negatively affects private saving. Lastly, the study stresses that the effect of a change in any determinant of saving is fully realized in the long run, not the short run.

[Nwachukwu and Egwaikhide \(2007\)](#) investigate private saving drivers in Nigeria. The study estimates the saving function in Nigeria by employing the error correction model and annual data throughout the period from 1970 to 2005. Akin to previous studies, the results reveal that saving is positively correlated with disposable income, yet it is negatively

correlated with the rate of growth of income. Real interest rate has a negative statistically significant effect on saving, however, inflation, external debt service ratio and terms of trade seem to positively affect private saving. Lastly, the study asserts that public saving does not crowd out private saving in Nigeria, in contrast to other developed economies (Hussein *et al.*, 2017).

Tang *et al.* (2020), attempt to investigate the drivers of private saving in Malaysia by employing both the cointegration and the variance decomposition techniques on a set of annual data from 1980 to 2016. The study concludes that private disposable income, financial sector development and dependency ratio have a positive impact on private saving. On the contrary, macroeconomic uncertainty displays a negative effect on private saving.

Abu and Staniewski (2022) try to investigate the effect of corruption on domestic saving in Nigeria. Using quarterly data from 1996 to 2019 and using the ARDL technique, the study confirms the existence of a strong long-term relationship between corruption and private saving. Other significant long-term drivers of private saving mentioned by the study incorporate income, inflation, oil prices, interest rate and unemployment.

About the *Egyptian case*, among the relevant empirical studies is that of Hussein and Mohieldin (1997). It endeavors to investigate the relationship between real interest rate and financial saving in Egypt from 1960 to 1990 using cointegration test. It argues that real interest rate is negatively associated with financial saving and investment. Thus, it has been claimed that hiking interest rates could not be considered the optimal policy to alleviate the financial repressions of the 1960s.

Correspondingly, in 2002, Hussein analyzes the effect of financial liberalization on financial saving in Egypt from 1967 to 1996 by employing the ARDL procedure. His findings reveal that the expected real interest rate positively affects saving; yet, the interest elasticity of financial saving in Egypt is statistically weak and small [2]. Likewise, both expected inflation and real per capita income display a positive impact on saving in the long run. Lastly, the study claims that increasing the real interest rate in Egypt is neither a feasible nor a rational path for the development and promotion of the financial sector (Hussein, 2002).

In 2006, Al-Mashat examines the impact of financial reforms in Egypt on nongovernment saving from 1970 to 1999. Non-government saving includes both physical saving and financial saving [3]. The study incorporates measures of the financial sector reforms like the real interest rate (as a proxy for the cost of capital), the ratio of M2 to GDP (to indicate the volume of intermediation), as well as the ratio of reserve money to quasi-money and to total deposits (as measures for degree of effectiveness of financial intermediation process) [4]. It estimates the model three times; one for the whole period of analysis (1976–1999), one for the pre-financial reform period (1976–1990) and one for the reform period (1991–1999). For the entire period, the study claims that the only statistically significant financial variable is the ratio of reserve money to bank deposits, which could be attributed to the dominance of “forced saving”. On the contrary, most of the financial variables (except for M2) display a significant effect on saving during the reform period. Accordingly, the study concludes that the adoption of a more market-oriented financial system, the surging efficiency of the financial system, the higher real interest rates on saving and the higher degree of financial intermediation and resource mobilization have all contributed to the higher saving figure recorded (Hussein *et al.*, 2017).

In 2008, Touny relies on the cointegration tests to quantify the domestic saving drivers in Egypt from 1975 to 2006. He concludes that both inflation and per capita income influence domestic saving positively in the short run and long run. While the budget deficit negatively affects saving; indicating that government saving partially crowds out private saving.

Moreover, M2 to GDP affects saving positively and significantly only in the long run. On the contrary, real interest rate displays a positive statistically significant impact only in the short run. Lastly, the study indicates that current account deficit negatively and significantly affects saving over both the short run and long run. This implies that external saving could be considered an alternative to domestic private saving.

Lastly, Hussein *et al.* (2017) utilize a mix of the simple PIH and LCH determinants to interpret real private saving behavior in Egypt. Using quarterly data from 1991 to 2010 and by employing a vector error correction model, they conclude that real interest rate and financial development are the main drivers of private saving in Egypt over the long run. Whereas exchange rate and inflation are the key drivers in the short run. Notably, real interest rate has a negative effect on private saving in the long run; indicating that greater consumption is becoming more affordable at a lower cost.

To this end, it is evident that the literature on the drivers of private saving in Egypt is relatively thin with most of the existing studies either tackling relatively old-time frames in the analysis or employing different measures for saving. Consequently, there is a need for a more recent study analyzing these determinants especially post the banking sector reform that was embarked on in Egypt in 2004.

3. Some stylized facts on private saving behavior in Egypt

Egypt has been suffering historically from relatively low rates of gross saving compared to other lower-middle-income countries (as shown in Figure 1 below). Private saving is also considered the main trigger of domestic saving in Egypt since public saving is always negative and backed by political and social considerations rather than economic ones. Private saving has been historically tracing investment and growth trends (Handy, 1998). Hence, promoting private saving remains a crucial mean to support sustainable growth and development in Egypt.

In Egypt, the private saving rate has declined throughout the period from 2011 to 2016 in the face of the witnessed political instability and lack of trust that have directed savers away from the formal channels of saving [5]. Starting 2017, with the enactment of the comprehensive home-grown economic reform program, restoring political stability and rectifying macroeconomic imbalances, private saving rates started to pick up slightly again in Egypt.

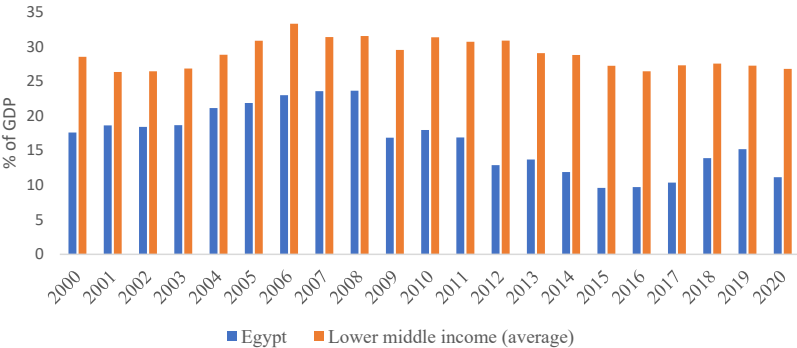


Figure 1.
Gross saving rate (% of GDP) in Egypt versus lower middle-income countries (2000–2020)

Source(s): Done by the author based on data from the World Bank-World Development Indicators (2021)

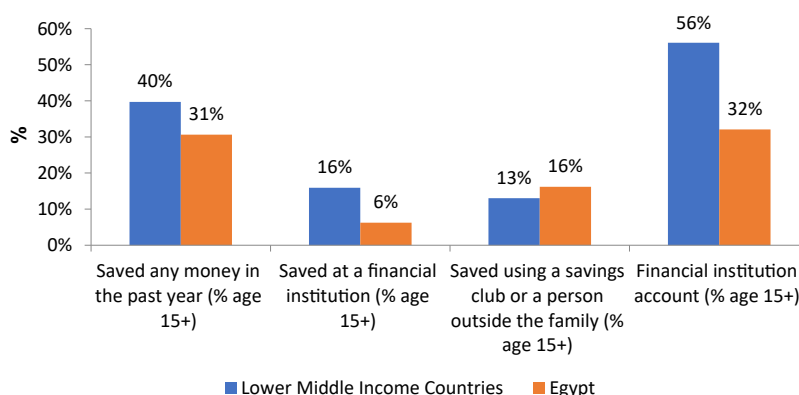
Nevertheless, private saving rates remain relatively low in Egypt compared to peer countries (Hevia and Loayza, 2011), which could be attributed to the following factors:

- (1) The relatively high consumption motive for the Egyptian population (Esmail, 2014), is evident by the high ratio of private consumption to GDP exceeding 70% of GDP. Such a figure is also backed by low levels of income and prevalent poverty among the Egyptian population.
- (2) The weakness and relative inefficiency inherited in some of the formal saving channels along with the prevailing negative real interest rate on formal saving, given the rising inflation. Accordingly, informal saving has elevated against formal saving. This is obvious by analyzing the Global Findex Database for the formal and informal saving ratios for Egypt compared to lower middle-income countries in 2017 (shown in Figure 2). Though formal saving in Egypt is relatively lower than in peer countries, informal saving through saving clubs or households is higher in Egypt.

According to the Global Findex database, the reason behind this trend is the prevalence of poverty and lack of sufficient funds for saving, the relatively high transaction costs of financial institutions in Egypt and the bureaucracy. This is in addition to the lack of necessary documentation to engage in a formal saving channel and the lack of nearby financial institutions, especially in rural areas.

- (3) The existence of some borrowing constraints for the private sector as banking credit is mainly directed towards the public sector rather than the private sector, especially with the widening budget deficit in Egypt. Accordingly, the private sector refrains from using formal saving channels to invest their saved funds.
- (4) The inflated informal sector in Egypt has been estimated to represent around 20% of GDP in 2015, as well as the prevailing high level of unemployment (United Nations, 2019).

Nevertheless, the Central Bank of Egypt (CBE) has recently exerted various efforts to promote financial inclusion in Egypt through the launch of the financial inclusion strategy. Efforts incorporate reforming the legal environment, upgrading the infrastructure by opening more branches for banks in rural areas, building databases for measuring financial



Source(s): Done by the author based on data from World Bank-Global Findex Database(2020)

Figure 2.
Formal and informal
saving (% of
population above 15) in
Egypt in 2017

REPS
10,5

inclusion, developing new financial products that satisfy the needs of diverse customers and promoting digital financial services. Moreover, the CBE has been working on expanding banking credit to the private sector through the launch of credit initiatives and requesting banks to avoid high concentration ratios among clients.

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4. Methodology, data and model

In light of the presented theoretical and empirical background, this study selects seven variables as potential determinants for private saving in Egypt, namely real GDP growth, public saving rate, real interest rate, inflation rate, money supply, current account deficit and unemployment rate. The study relies on quarterly data from September 2005 to June 2020 [6]. The reason for selecting this period is the availability of data and the fact that a comprehensive banking sector reform in Egypt was embarked on in 2004 and 2005 which might have affected determinants of private saving. Table 2 below highlights the main incorporated variables, their description and source of data. Table 3 pinpoints the descriptive statistics of the variables incorporated in the analysis.

To further check for multicollinearity among regressors, the correlation matrix for the variables has been calculated and presented in Table 4 below. A correlation coefficient of less than 0.85 implies that the underlying model does not suffer from multicollinearity (Pindyck and Rubinfeld, 1998; Jiang and Ma, 2019). Hence, this model does not suffer from multicollinearity since all the correlation coefficients are by far less than 0.85.

4.1 Unit root tests

Since macroeconomic time series data could turn out to be nonstationary, employing the OLS procedure in the analysis could lead to spurious results. Including nonstationary variables (i.e. variables with unit root) in linear regression could lead to inconsistent estimates (Pindyck

Acronym	Description	Source
PVTS	Private saving rate (% of GDP) = (Domestic Saving – Public Saving)/GDP at current prices*100 Whereas domestic saving = GDP at current prices – private consumption – public consumption	Author’s calculation based on data from the Ministry of Finance and the Ministry of Planning and Economic Development in Egypt
RGDPG	Real GDP growth rate	Ministry of Planning and Economic Development in Egypt
PUBS	Public saving rate (% of GDP), where public saving is proxied by the general government cash balance = Public Saving/GDP at current prices*100	Author’s calculation based on data from the Ministry of Finance and the Ministry of Planning and Economic Development in Egypt
RR	Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator	World Bank – World Development Indicators
CPI	Inflation rate = quarter-on-quarter change in CPI	Author’s calculation based on data from the IFS
M2	An indicator for financial development and depth = M2/GDP *100	Extracted from the CBE monthly statistical bulletin (various issues)
CA	CA deficit (% of GDP) = (–CA balance)/GDP *100	Extracted from CBE monthly statistical bulletin (various issues)
UNEMPL	Unemployment rate	IFS and Ministry of Finance in Egypt
Source(s): Done by the authors		

Table 2.
Variables description
and source

and Rubinfeld, 1998). Hence, it is crucial to carry out the stationarity test for incorporated variables before model estimation, to select the appropriate empirical methodology for estimation. Thus, this study estimates both the Augmented Dickey–Fuller (ADF) and the Phillips and Perron (PP) unit root tests to further validate the results. It is notable that not accepting the null hypothesis within any of the two tests implies that the underlying variable is stationary, otherwise, the variable is nonstationary.

4.2 ARDL bound test for cointegration

This study first examines the presence of cointegration among incorporated variables to be able to estimate their long run coefficients. The estimated equation takes the form of:

$$PVT_SAVING = f(PVT_SAVING(-1), RGDP_GROWTH, PUBLIC_SAVING, RR, CPI, M2, CA, UNEMPLOYMENT) \quad (1)$$

The study relies on the ARDL bound test for cointegration that was formerly introduced by Pesaran and Shin (1999) and Pesaran *et al.* (2001), rather than the conventional methods of cointegration [like Engle and Granger (1987), Johansen (1988, 1991)]. The rationale behind employing the ARDL bound test is fourfold. First, the ARDL could be used to examine cointegration for variables with mixed order of integration $I(0)$ or $I(1)$ [7]. Second, the ARDL produces relatively more accurate results in the small sample size than conventional methods. Third, it allows variables of the equation to have different lags. Finally, it estimates one single equation that captures both short run and long run relations simultaneously (Emam, 2021; Abu and Staniewski, 2022).

Within the ARDL specifications, the dependent variable is expressed as a function of its own lagged values, as well as both the current and lagged values of independent variables:

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
PVTS	60	19.332	5.295	4.728	39.780
RGDPG	60	4.507	2.315	-4.489	7.942
PUBS	60	-9.523	4.553	-33.005	1.572
RR	60	0.518	3.234	-8.758	6.929
CPI	60	2.850	1.994	-0.07	11.423
M2	60	75.067	6.473	62.835	90.403
CA	60	0.575	0.649	-1.063	2.431
UNEMPL	60	10.842	1.853	7.578	14.428

Source(s): Done by the authors

Table 3.
Descriptive statistics of the variables

Variable	PVTS	RGDPG	PUBS	RR	CPI	M2	CA	UNEMPL
PVTS	1.000							
RGDPG	0.159	1.000						
PUBS	-0.444	0.325	1.000					
RR	0.247	0.189	-0.094	1.000				
CPI	-0.228	0.125	-0.022	-0.463	1.000			
M2	0.153	0.590	0.438	-0.048	0.243	1.000		
CA	-0.288	-0.431	-0.376	-0.225	0.088	-0.554	1.000	
UNEMPL	-0.044	-0.459	-0.469	-0.182	0.030	-0.403	0.259	1.000

Source(s): Done by the authors

Table 4.
Correlation matrix of the variables

$$\begin{aligned}
 \Delta PVT_SAVING_t = & \alpha_0 + \sum_{i=1}^p \alpha_{1i} \Delta PVT_SAVING_{t-i} + \sum_{i=0}^{K1} \alpha_{2i} \Delta RGDP_GROWTH_{t-i} \\
 & + \sum_{i=0}^{K2} \alpha_{3i} \Delta PUBLIC_SAVING_{t-i} + \sum_{i=0}^{K3} \alpha_{4i} \Delta RR_{t-i} + \sum_{i=0}^{K4} \alpha_{5i} \Delta CPI_{t-i} \\
 & + \sum_{i=0}^{K5} \alpha_{6i} \Delta M2_{t-i} + \sum_{i=0}^{K6} \alpha_{7i} \Delta CA_{t-i} + \sum_{i=0}^{K7} \alpha_{8i} \Delta UNEMPLOYMENT_{t-i} \\
 & + \delta_1 PVT_SAVING_{t-1} + \delta_2 RGDP_GROWTH_{t-1} + \delta_3 PUBLIC_SAVING_{t-1} \\
 & + \delta_4 RR_{t-1} + \delta_5 CPI_{t-1} + \delta_6 M2_{t-1} + \delta_7 CA_{t-1} \\
 & + \delta_8 UNEMPLOYMENT_{t-1} + \varepsilon_t
 \end{aligned} \tag{2}$$

The first step in estimating the ARDL model is to examine whether the long run coefficients are cointegrated or not, whereby H_0 shows that variables are not cointegrated ($H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = \delta_8 = 0$) against the alternative hypothesis that variables are cointegrated ($H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq \delta_7 \neq \delta_8 \neq 0$). Afterward, the calculated F -statistic is compared with the critical values of the lower bound $I(0)$ and the Upper bound $I(1)$. If it is greater than $I(1)$ then variables are cointegrated, while if it is lower than $I(0)$ then variables are not cointegrated. If the F -statistic lies between $I(0)$ and $I(1)$, the test is considered inconclusive. If cointegration is confirmed, the ARDL is then employed to estimate both the short run and the long run coefficients (Narayan, 2004).

Equation (3) estimates the short run coefficients while ECT represents the error correction term and ϕ reflects the speed of adjustment to equilibrium in case of any disturbance in the short run. For variables to be cointegrated the ECT coefficient (ϕ) should be negative and statistically significant.

$$\begin{aligned}
 \Delta PVT_SAVING_t = & \beta_0 + \sum_{i=1}^p \beta_{1i} \Delta PVT_SAVING_{t-i} + \sum_{i=0}^{K1} \beta_{2i} \Delta RGDP_GROWTH_{t-i} \\
 & + \sum_{i=0}^{K2} \beta_{3i} \Delta PUBLIC_SAVING_{t-i} + \sum_{i=0}^{K3} \beta_{4i} \Delta RR_{t-i} + \sum_{i=0}^{K4} \beta_{5i} \Delta CPI_{t-i} \\
 & + \sum_{i=0}^{K5} \beta_{6i} \Delta M2_{t-i} + \sum_{i=0}^{K6} \beta_{7i} \Delta CA_{t-i} + \sum_{i=0}^{K7} \beta_{8i} \Delta UNEMPLOYMENT_{t-i} \\
 & + \phi ECT_{t-1} + \varepsilon_{1t}
 \end{aligned} \tag{3}$$

Equation (4) below estimates the long run coefficients (Emam, 2021; Abu and Staniewski, 2022).

$$\begin{aligned}
 PVT_SAVING_t = & \beta_0 + \beta_1 RGDP_GROWTH_t + \beta_2 PUBLIC_SAVING_t + \beta_3 RR_t + \beta_4 CPI_t \\
 & + \beta_5 M2_t + \beta_6 CA_t + \beta_7 UNEMPLOYMENT_t + \varepsilon_t
 \end{aligned} \tag{4}$$

4.3 Diagnostic checks

Upon the model estimation, several diagnostic tests are carried out to confirm the robustness of the results. Specifically, the Breusch–Pagan–Godfrey heteroscedasticity test and lagrange multiplier (LM) serial-correlation test are carried out to test for the presence of heteroscedasticity and serial correlation in the model's residuals. Ramsey test is also employed to test for the correct specification of the model. Also, the Jarque–Bera normality test is used to decide whether the residuals are normally distributed or not. Specifically, the null hypothesis should be accepted for the residuals to be normally distributed. Lastly, the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUM of square) tests are carried out to assess the stability of the model. According to these tests, the model is considered stable in the long run if both the CUSUM and CUSUMs plots remain within the upper and lower bounds (Greene, 2003; Abu and Staniewski, 2022).

5. Empirical findings

5.1 Results of the unit root tests

Table 5 reveals the results of the ADF and PP tests. The findings show that only the money supply and the unemployment rate are integrated of order 1 while the remaining variables are integrated of order 0 (i.e. stationary). This justifies the employment of the ARDL model since the variables display a mixed order of integration with the highest order being I(1).

5.2 Results of the ARDL model estimation

Table 6 pinpoints the results of the ARDL model estimation.

The calculated F-statistic is higher than the upper bound of I(1) which implies that variables are cointegrated. Moreover, the coefficient of the ECT is negative and highly statistically significant implying that the model works properly and in the long run converges to the equilibrium path.

Regarding the estimated coefficients, Table 6 shows that lagged private saving has a negative statistically significant impact on the current level of private saving in Egypt, implying that private saving displays some degree of persistence in Egypt, whereby, the current level of private saving is affected by its historical patterns. Notably, both Touny (2008) and Hussein *et al.* (2017) confirm the strong inertia of private saving in Egypt. Income growth as represented by real GDP growth rate positively affects private saving over both

Acronym	ADF test		PP test	
	ADF test statistic (levels)	ADF test statistic (first difference)	PP test statistic (levels)	PP test statistic (first difference)
PVTS	−6.478*** (0.133)	—	−6.500*** (0.133)	—
RGDPG	−3.031** (0.110)	—	−3.024** (0.110)	—
PUBS	−6.335*** (0.129)	—	−6.367*** (0.129)	—
RR	−3.105** (0.089)	—	−2.687* (0.059)	—
CPI	−4.781*** (0.119)	—	−4.631*** (0.119)	—
M2	−2.892 (0.094)	−7.800*** (0.303)	−2.568 (0.094)	−20.428*** (0.127)
CA	−3.219** (0.094)	—	−3.021** (0.094)	—
UNEMPL	−1.321 (0.046)	−7.214*** (0.145)	−1.547 (0.046)	−7.372*** (0.145)

Note(s): *, ** and *** refer to being statistically significant at 10%, 5% and 1%, respectively. Numbers in parentheses represent standard errors

Source(s): Author's calculations

Table 5.
Results of the unit
root tests

Table 6.
Results of the ARDL
model estimation

Variable	Short run coefficients	Long run coefficients
PVTS (–1)	–1.050*** (0.188)	–
RGDPG	0.041 (0.203)	0.371 (0.264)
PUBS	–1.072*** (0.091)	–1.469*** (0.212)
RR	–0.750** (0.339)	–0.355* (0.191)
CPI	–0.527** (0.213)	–0.906*** (0.281)
M2	0.011 (0.088)	0.010 (0.084)
CA	–3.476*** (1.023)	–1.478 (1.002)
UNEMPL	–1.583*** (0.440)	–1.509*** (0.316)
ECT		–1.049***
F-Bounds test		6.141***

Note(s): *, ** and *** refer to being statistically significant at 10%, 5% and 1%, respectively. Numbers in parentheses represent standard errors
Source(s): Author's calculations

the short run and long run. Nevertheless, its coefficient is not statistically significant. Such a finding could be attributed to the tendency of a significant portion of the population to direct the increase in income to higher consumption rather than saving. This justification makes sense given that Egypt is a developing country that suffers from prevalent low income and poverty. Remarkably, [Metin Özcan *et al.* \(2003\)](#) and [Abu and Staniewski \(2022\)](#) reach the same conclusion in their study for the saving behavior in Turkey and Nigeria, respectively.

In line with the Ricardian Equivalence Hypothesis, the public saving figure displays a highly statistically significant negative coefficient over the short run and long run. Such finding reveals that expansion on fiscal policy and public debt (i.e. lower public saving) induce the private sector to increase their savings to offset the potential surge in future taxation to fund the higher government spending. This finding is in line with that of [Touny's \(2008\)](#) study on Egypt and [Metin Özcan *et al.*'s study \(2003\)](#) in Turkey.

Real interest rate has shown a negative and statistically significant impact on private saving over the short run and the long run, with a coefficient value less than one, implying that a 1% increase in real interest rate induces a moderate decrease in private saving, especially over the long run. This also reveals that the income effect of changes in real interest rate outweighs that of the substitution effect. Such negative influence of real interest rate on private saving in Egypt is consistent with the findings of [Hussein and Mohieldin \(1997\)](#) and [Hussein *et al.* \(2017\)](#).

Inflation, being regarded as a sign of macroeconomic uncertainty, displays a negative statistically significant impact on private saving over the short run and the long run. Such a finding could be explained by the tendency of a considerable portion of the population to mobilize their funds in informal saving channels or inflation hedges rather than formal saving channels during times of uncertainty.

Money supply as a percentage of GDP is an indicator of the degree of financial development and depth in Egypt. In this study, money supply has a statistically insignificant effect on private saving in the short run and the long run, indicating that financial development does not significantly affect private saving in Egypt. Such finding is consistent with that of [Al-Mashat \(2006\)](#). In contrast, the current account deficit records a negative statistically significant effect on private saving in the short run only, indicating that foreign saving act as a substitute for domestic saving in Egypt over the short run. This finding goes with that of [Touny \(2008\)](#) on saving in Egypt.

Lastly, the unemployment rate negatively affects private saving with a statistically significant coefficient in the short run and the long run only. Higher unemployment forces the private sector to withdraw from its savings to smoothen consumption patterns. Moreover, a

higher rate of unemployment reflects the existence of more people with no income earned, which reduces their ability to save. Such a finding is consistent with that of [Abu and Staniewski \(2022\)](#) in Nigeria.

5.3 Results of the diagnostic checks

As shown in [Table 7](#) below, all the diagnostic checks validate the robustness of the model and its findings. Specifically, residuals are homoscedastic, serially uncorrelated and normally distributed. Also, the Ramsey test confirms that the model is well-specified.

In addition, [Figures 3 and 4](#) reveal the stability of the model and its variable as neither CUSUM nor CUSUM of Square plots breaks out the lower and the upper bounds.

6. Conclusion and policy implications

6.1 Conclusion

The present study endeavors to determine the main drivers of private saving in Egypt in the short run and the long run by relying on quarterly data from 2005 to 2020. To the best of the researcher's knowledge, this study is the only one that tackles the determinants of private saving in Egypt during this recent period.

The study employs the ARDL approach to analyze quarterly data and incorporates a set of potential explanatory variables in Egypt. Those variables encompass lagged private saving, real GDP growth rate, public saving, real interest rate, inflation rate, money supply, current account deficit and unemployment rate. The findings indicate that private saving in Egypt displays some sort of persistence, as evidenced by the statistical significance of the

Test statistic	Results
Serial correlation: χ^2	0.317 (0.751)
Heteroscedasticity: χ^2	0.738 (0.675)
Functional form (Ramsey test): F -statistics	1.858 (0.181)
Jarque-Bera normality test	0.213 (0.899)

Note(s): Numbers in parentheses represent probability values
Source(s): Author's calculations

Table 7.
Results of the
diagnostic checks

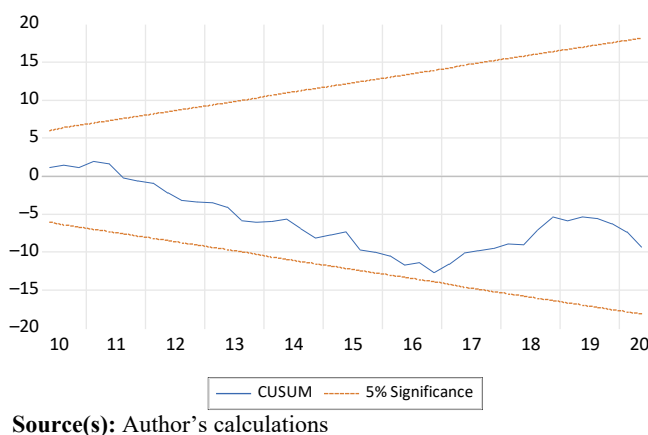
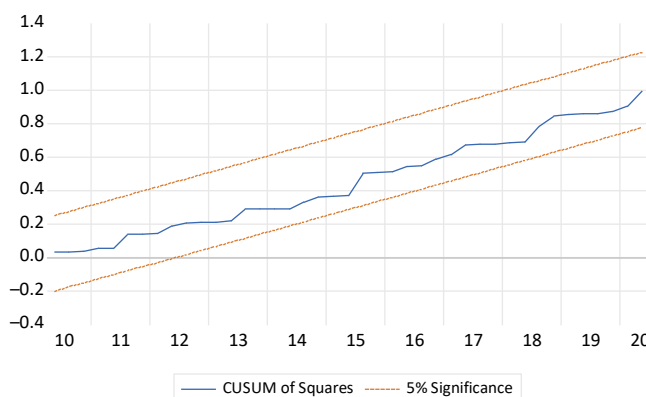


Figure 3.
Cumulative sum of
recursive
residuals plots

Figure 4.
Cumulative sum of
square recursive
residuals plots



Source(s): Author's calculations

lagged private saving term. Akin to relevant studies, public saving depresses private saving in the short run and the long run with a magnitude greater than one. This implies that fiscal expansion and high public debt induces the private sector to increase its saving. Real interest rate is also a main determinant of private saving in the short run and the long run. Its effect is negative indicating that the private sector in Egypt responds to higher interest rate by reducing their formal savings. Moreover, inflation as a sign of macroeconomic uncertainty, displays a negative and statistically significant coefficient, indicating that people tend to reduce their private saving with elevated macroeconomic uncertainty. The current account deficit has a negative statistically significant impact on private saving only in the short run, indicating that foreign saving could act as a substitute for domestic private saving only in the short run. Among demographic variables affecting private saving is the unemployment rate which is found to have a negative statistically significant coefficient in the short run and the long run. As higher unemployment forces the private sector to withdraw from its saving funds to smoothen its consumption pattern.

Real GDP growth rate does not have a statistically significant effect on private saving in Egypt. This could be attributed to the high consumption motive and the tendency of individuals to increase consumption rather than saving with a surge in income. The money supply coefficient is also statistically insignificant highlighting the shift of savers towards other informal channels of saving and other inflation hedges like real estate and gold, rather than formal saving. Such a result is evident by the [Global Findex Database \(2017\)](#) which shows a relatively high informal saving ratio in Egypt compared to peer countries.

6.2 Policy implications

The aforementioned results are of policy relevance for Egyptian policymakers. Given the crucial nature of private saving as a domestic source of funding the sustainable development goals (SDGs) and meeting Egypt's high growth aspirations, addressing the determinants of private saving should be assigned a national priority. Recommended policy measures to upsurge private saving in Egypt include:

- Promoting financial inclusion widens the scope of the bankable population and hence increases formal rather than informal saving.
- Fostering financial literacy and education to educate individuals about various financial instruments.

- Launching various attractive and affordable financial products that suit the needs of the wide population to motivate them to channel their saving through the financial system.
- Supporting high employment and value-added sectors like SMEs to eradicate poverty and reduce unemployment and hence increase private saving.
- Creating incentives for the informal sector to join the formal sector and hence use the financial system to save their funds rather than the informal channels of saving.

Notably, the Egyptian government and the Central Bank of Egypt have already taken some measures in this regard, yet more is needed to further promote private saving in Egypt.

6.3 Limitations of the study and area for future research

Even though the present study is (to the best of the researcher's knowledge) the only up-to-date study capturing the determinants of private saving in Egypt, it has some limitations that future research work could try to overcome. First, it might be useful to segregate the private sector saving figure into corporate and household savings and study the determinants of each one of them separately. Second, other robust empirical estimation methods could be employed in future research like threshold regression analysis.

Notes

1. It is notable that private disposable income has a significant cyclical component.
2. An increase in the interest rate by 1% causes a tiny increase in financial saving by 0.08 and 0.04% in the long and short term, respectively.
3. Physical savings represent an addition to physical assets as an investment in property, plant and equipment, whereas financial savings represent an addition to financial assets, as an increase in the firm's holdings of cash and marketable securities.
4. A decrease in the ratio of reserve money to total deposits and reserve money to quasi-money reflects an increasing efficiency of the banking system in mobilizing deposits and savings.
5. The financial sector in Egypt incorporates both banking and nonbanking financial sector, with a historical dominance of the banking sector (ERF, 2004). It accounts for around 89.8% of the total aggregate financial assets as of June 2020. While the nonbanking financial system offers diversified advanced financial instruments for saving and investment purposes. It comprises the postal sector and insurance sector (which accounted for more than 50% of the assets of the nonbank financial assets in June 2020), investment funds and security brokerage companies, foreign exchange companies and capital markets. This is in addition to ancillary financial companies, like (financial leasing companies, microfinance entities, mortgage finance companies, securitization companies, factoring companies and consumer finance companies) (Central Bank of Egypt CBE, 2020).
6. Notably, the real interest rate series has been extracted from the world development indicators on an annual basis; hence, it was transformed to quarterly frequency by applying the linear conversion method.
7. It is notable that the ARDL bound testing could not be used for variables integrated of order 2 I(2).

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Corresponding author

Hebatalla Atef Emam can be contacted at: hebatalla.atef@feps.edu.eg, hebatalla.emam@cu.edu.eg

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