

Macro Determinants of Private Investment in Egypt: Co-integration Approach

Dr. Sahar Aboud* and Dr. Asmaa Melegy †

Abstract

This study investigates determinants of private investment in Egypt from 1982 to 2021 by employing the Johansen Cointegration Approach and Vector Error Correction Model (VECM). Private investment is estimated as a function of real gross domestic product, real public investment, credit to the private sector, real exchange rate, inflation rate, and a variable indicating the implementation of economic reform programs in Egypt.

The results indicate that real gross domestic product has a positive impact on stimulating private investment in Egypt, aligning with mainstream economic theories. Furthermore, the findings reveal a significantly positive effect of public investment. However, additional analysis is warranted for sub-economic sectors and different periods to determine whether the effect is crowding-in or crowding-out.

Concerning credit facilities to the private sector, the model reveals a negative impact on private investment in Egypt. Two factors may explain this situation: firstly, the high degree of informality in the Egyptian economy, and secondly, the government acquiring the lion's share of total domestic credit. This implies more effort is needed to encourage formalization, financial inclusion, and an improved business environment. However, the analysis should be complemented with a micro-level study of the financing structure of private enterprises in Egypt.

Additionally, the results indicate that, while the real exchange rate and inflation have a negative effect on private investment, the economic reform variable has a positive impact. This suggests that reducing uncertainty and adopting economic reform programs play a crucial role in achieving economic stability and restoring private sector confidence, with positive implications for long-term investment in Egypt.

Keywords: Private Investment, Real GDP, Public Investment, Cointegration, VECM

* Assistant Professor of Economics - Macro Economic Policies Center- Institute of National Planning

† Assistant Professor of Economics - Macro Economic Policies Center- Institute of National Planning

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1. Introduction

Investment, or capital accumulation, stands as a pivotal driver of economic growth and development, a fact widely acknowledged in economic literature and demonstrated by successful development experiences. The subdued growth observed in developing countries often traces back to low rates of investment.

In pursuit of economic development, Egypt has undertaken significant initiatives to enhance the business environment and promote private participation. Notably, in 2016, Egypt embraced an economic reform program designed to address the chronic imbalances within the economy. This reform program aimed at refining the business environment through the enactment of key legislations as Investment Law No. 72 of 2017 and the Bankruptcy Law. Additionally, there was a focus on streamlining industrial licenses and enhancing the mechanism for allocating industrial lands. These endeavors led to improvements in Egypt's rankings in global competitiveness indicators and business assessments in 2019, compared to previous years. However, while these reforms positively impacted several macroeconomic indicators, such as economic growth, the response from private investment was both limited and transient.

Despite the rise in the real value of private investment, it exhibited a downward trend as a percentage of GDP, accompanied by a volatile annual growth rate. The share of private investment in total investment declined compared to historical peaks, highlighting the challenges faced. Moreover, the levels of private investment, both in absolute terms and as a percentage of GDP, remained below pre-pandemic levels observed in other developing countries.

It is crucial to emphasize that low levels of investment not only impede economic growth but also hinder job creation, poverty alleviation, and the achievement of sustainable development goals (SDGs). The recent global economic repercussions of the Russia-Ukraine war, with its global economic ramifications, pose a new challenge to the Egyptian economy.

In response, the government has set a target to increase private investment to about 65 percent of total investment over the next three years. Consequently, an examination of the key macro determinants of private investment becomes imperative for successful and effective targeting, providing policymakers with evidence-based insights for designing and implementing policies.

While the research topic is relevant to many countries, this study focuses specifically on the Egyptian economy, aiming to address a research gap revealed by an updated

investment database made available by the Ministry of Planning and Economic Development.

The study comprises three sections. Section I provides a literature review elucidating investment and its determinants based on both economic theory and empirical work. Section II outlines stylized facts about private investment trends in Egypt from 1982 to 2021, and Section III details the research methodology and presents the results.

2. Literature Review

2.1. Theories of Investment

Factors influencing investment have been extensively examined in various economic theories, including the classical Keynesian theory, the accelerator model/flexible accelerator model, the neoclassical theory/liquidity theory of investment behavior, Tobin's 'Q' theory, and others.

According to Classical theory, disposable income plays a pivotal role in determining savings and investment. Keynes' theory of aggregate demand, developed in 1936, identifies investment as one of its key components. In his theory, Keynes asserts that investments are undertaken until the present value of expected future revenues equals the opportunity cost of capital used in the investment process. In other words, investments are pursued until the present value equals zero.

The flexible accelerator model represents a general type of accelerator model. The fundamental premise of this model is that a firm's investment is influenced by the magnitude of the gap between the current capital stock and the desired capital stock. Essentially, the larger this gap, the greater the firm's inclination to invest. The firm endeavors to narrow a fraction of the disparity between the desired capital stock (K^*) and the actual capital stock (K) in each period. What distinguishes the flexible accelerator model is its capacity to integrate various determinants of k^* , including output, internal funds, the cost of external financing, and other variables.

The neoclassical model encounters a limitation in its failure to provide a rationalization for the rate of investment or movement toward the optimal capital stock. Recognizing this drawback, Jorgenson (1971) introduced the neoclassical approach to investment, offering another iteration of accelerator theory. In his formulation, he contends that K^* (desired capital stock) is proportional to output and the user cost of capital. The user cost capital, in turn, hinges on the price of capital goods, the real interest rate, the depreciation rate, and the tax structure.

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In Tobin's 'Q' theory of investment, developed in 1969, the pivotal determinant of investment is the ratio between the market value of the current capital stock and the cost of replacement. If this ratio is greater than one ($q > 1$), the company deems additional investments feasible, anticipating that the resulting profit will surpass the cost of investment, and vice versa.

In 1973 McKinnon and Shaw proposed a neo-liberal approach to investment, emphasizing the role of financial deepening and high interest rates in propelling economic growth. According to their perspective, in the absence of repressive conditions, a conducive environment emerges, fostering savings, investment, and subsequent economic growth. In contrast to neoclassical theory, McKinnon and Shaw assert a positive correlation between the real interest rate and investment. Elevated interest rates facilitate an expansion in financial savings through financial intermediaries, thereby increasing investable funds. As described by McKinnon and Shaw (1973), the 'conduit effect' embodies this phenomenon. Despite being a variant of the neoclassical model, this approach is susceptible to the same criticisms.

In recent literature, uncertainty has been incorporated into investment demand theories due to the irreversibility of the investment decision (Pindyck 1991). Capital goods, typically representing investments, often experience a decrease in value upon resale. The determination of the return on investment occurs after incurring initial costs. Notably, the cost of the project exceeds the value of the positive investment. Consequently, the value of the capital unit must surpass the cost of purchasing and installing by an amount equal to the cost of continuing to invest.

In 1991, Rodrik introduced an additional factor of uncertainty, namely the uncertainty of policies, as a crucial element in investment decisions. Unexpected reforms may lead to alterations in the current policy or a return to the previous policy. Investors must exercise patience, waiting until a significant level of certainty is reached before adopting a rational policy.

The disequilibrium approach contends that investment is intricately linked to both profitability and output demand. Investment decisions unfold in two stages: firstly, the initial decision to augment productive capacity, and secondly, the determination of the capital intensity of the additional capacity (Serven and Solimano 1992). The first choice is influenced by the anticipated level of capacity utilization in the economy, serving as an indicator of demand conditions. The second decision relies on relative prices, including the cost of capital and labor. Firms may encounter constraints in current and anticipated future sales when navigating the investment decision.

2.2. Empirical Studies on Determinants of Private Investment

Considerable empirical work has been undertaken to investigate the determinants of private investment behavior at the macro level. Different methodologies and estimation techniques have been employed to analyze the factors influencing private investment in specific countries or regions.

In a recent study, Wang et al. (2022) examined how the Economic Policy Uncertainty Index (EPU) affects both private and corporate investment rates. The study focuses on assessing the influence of this index on the efficiency of corporate investment, utilizing a functional regression analysis model. The empirical results suggest a significant impact of the level of uncertainty in economic policy on the rate of corporate investment. Additionally, the study indicates that higher EPU strengthens the investment efficiency of firms. Moreover, the findings suggest a negative effect of the EPU level on the efficiency of non-governmental companies' performance.

Triplett et al. (2021) conducted an analysis using quarterly data spanning from 1953 to 2016 to examine the accelerator function of US commercial investment. The impact of the investment accelerator on the results appears to be weak. This can be attributed to various factors, including the crowding-out effect, the sensitivity of investment growth to the cost of capital, investment risks, cash-flow limitations, and economic policy uncertainty.

Ayeni (2020) employs the Autoregressive Distributed Lag (ARDL) co-integration methodology to investigate the factors influencing private investment in Gambia. Exogenous variables identified in the study include the exchange rate, credit to the private sector, external debt, real interest rate, and inflation. The findings indicate that a high exchange rate leads to an increased cost of investment. Additionally, the study reveals that burdensome external debt discourages private investment. Moreover, credit constraints are identified as a hindrance preventing the private sector from making positive contributions to investment in the Gambia.

BOĞA (2020) analyzed the key drivers of private investment in Türkiye utilizing the Autoregressive Distributed Lag (ARDL) methodology with annual data from 1975 to 2018. The determinants selected for the private investment model include corporate tax, private sector credit, GDP per capita, exchange rate, inflation, and interest rate.

According to the study, in the long run, corporate taxes and inflation exhibit a negative impact on private investment. In contrast, the impact of private sector credit, GDP per

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capita, and exchange rate is positive. Notably, the study finds that the impact of the interest rate is not statistically significant.

Ngoma et al. (2019) utilized panel data encompassing 35 Sub-Saharan African countries over the period from 2000 to 2017 to scrutinize the macroeconomic determinants of private investment. The study applied pooled regression, fixed effects, and random effects models, along with the Panel Corrected Standard Error (PCSE) technique to address heteroscedasticity, autocorrelation, and cross-sectional dependence issues identified in the fixed effects model. Additionally, the study conducted unit root and diagnostic tests, leading to the conclusion that the included time series are stationary. The findings of the study reveal that private investment exhibits a positive association with GDP, real interest rates, public investment, and inflation rates.

Petkov (2013) investigated the long and short-term relationships between investment and its determinants in Bulgaria from 1991 to 2011, utilizing the vector error correction model (VECM). The study provides evidence of a long-run relationship between private investment and its determinants. Results indicate that financial development and discount rates have a positive effect on both total and private investment in the long term, while inflation exhibits a negative effect in the short run.

Magableh and Ajlouni (2013) sought to explore the determinants of private investment in Jordan from 1976 to 2012. Employing the ARDL cointegration approach, the study tested for the existence of a long-run relationship and examined the short-run dynamics of private investment in Jordan. The study concludes that enhancing the productive sectors in the national economy may foster private investment in the long run. Additionally, it reveals that government capital expenditures play an insignificant role in boosting private-sector investment initiatives. This suggests a need to revisit, reassess, and prioritize public investment projects over private investment.

Ajide and Lawanson (2012) conducted a study on the long-run determinants of domestic private investment in Nigeria covering the period from 1970 to 2010. They utilized an advanced econometric technique, the Auto-Regressive Distributed Lag (ARDL) approach. The study revealed distinctions between long- and short-run determinants. In the long term, key determinants of domestic private investment included public investment, real GDP, real interest rate, exchange rate, credit to the private sector, terms of trade, external debt, and the reforms indicator variable. Conversely, in the short run, the main determinants were public investment, real GDP, and terms of trade.

In their study focused on Egypt, Aly and Youssef (2021) employed the vector error correction model (VECM) technique to investigate the impact of both government

investment and the state budget deficit on private investment over the period from 1985 to 2017. The study reveals a positive relationship between private investment and government investment. This suggests that state expenditures on essential infrastructure significantly facilitate the broader involvement of the private sector in various investments of the private sector in various investment sectors.

These findings align with the characteristics of the Egyptian economy as a developing economy, emphasizing the continued pivotal role in supporting the state in supporting the private sector and providing the essential infrastructure for work and production. These results also correspond with the structure of the state's general budget, where the proportion of unavoidable current spending surpasses investment spending. Consequently, the private sector assumes a crucial role in making essential investments to uplift the economy and enhance the rate of economic growth.

In a study spanning 1991-2019, Morsy (2021) investigates the relationship between private credit provided by the banking sector and private investment in Egypt. Utilizing the Johansen cointegration technique, the study concludes that there exists a significant positive relationship between private investment and credit. Additionally, a negative correlation is identified between private investment and the borrowing interest rate.

Ashour et al. (2020) employ a co-integration model to examine the key determinants of private investment in Egypt over the period 1990/1991–2015/2016. Furthermore, the study utilizes the same model to predict the behavior of private investment for the subsequent period, 2016/2017–2018/2019. Empirical findings suggest that private investment is predominantly influenced by aggregate demand and public investment.

In a study spanning from 1982 to 2025, Sallam (2019) investigates the determinants of private investment in Egypt, considering the uncertainty associated with corporate financing decisions. The analysis is grounded in the Tobin-Q theory of investment (1969) and the model incorporates variables such as the investment rate, average Q index, prices of capital goods, internal financing, and external financing.

Methodologically, the study employs the dynamic model, especially the average Q model. This includes a unit root test, vector error correction model (VECM), and long-term cointegration analysis. The primary conclusion of the study suggests that in the VECM, an impulse response indicates a positive impact on the investment rate with a one-standard deviation shock to the value of the firm. Furthermore, the study implies that stochastic shocks to both internal and external finance result in a positive response

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from investment. Conversely, it suggests that a stochastic shock to capital good prices has a negative impact on investment.

Elbanna (2016) investigates the determinants of private investment in Egypt, utilizing annual time series data from 1983 to 2014. The study employs a multiple regression model, concluding that money supply, exchange rate, and GDP are positively associated with private investment. Furthermore, the study recommends various policies to improve the private investment ecosystem, including implementing an expansionary monetary policy, reforming exchange policies, and accelerating GDP growth.

Ramadan (2014) discusses the determinants of private investment in the Egyptian economy over the period 1975–2013. The private investment equation is estimated using the cointegration methodology. Empirical findings suggest that private investment in Egypt is positively influenced by the growth rate of real GDP, the share of public investment to GDP, credit to the private sector (bank loans) to GDP, real interest rate, real exchange rate, and economic ideology in terms of economic freedom.

In summary, variables that may affect private investment can be classified into two sets: *Economic* and *non-economic*. Economic variables mainly include real GDP growth, real interest rate, government investment, real exchange rate, real credit to the private sector, inflation, trade openness, external debt, and FDI. Non-economic variables include political stability, regulatory framework, bureaucracy, corruption, and governance.

3. Stylized Facts about Private Investment Trends in Egypt

Egypt has long aspired to achieve economic development, and in light of limited financial resources, successive governments have implemented various measures to increase investment levels. These efforts have led to a notable increase in the value of private investment from less than EGP 100 billion during the 1980s and 1990s to approximately EGP 200–300 billion during the 2000s, as depicted in Figure 1.

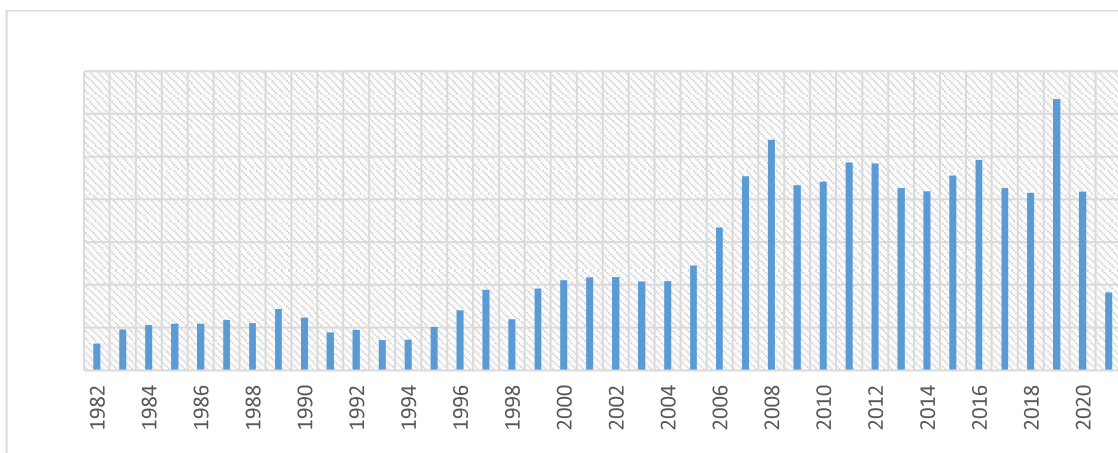


Figure 1: Value of Private Investment in Egypt, 1982-2021 (constant billion LCU)

Source: World Development Indicators.

The Open Door Policy, known in Arabic as Al-Infatih initiated in 1974, significantly spurred private investment. By the end of 1989, the share of private investment in GDP had risen to around 11.8 percent, and its contribution to total investment averaged approximately 39 percent during this period.

Despite facing three crises during the period 1990–1999—the Asian financial crisis, Luxor terrorist attacks, and the First Gulf War—total private investment saw an increase to approximately 8.8 percent of GDP and 42 percent of total investment by the end of the decade. This resurgence in private investment can be attributed to the implementation of the Economic Reform and Structural Adjustment Program (ERSAP) in 1991. Additionally, the conducive business environment was enhanced by the issuance of the Investment Law 7/1998 and the establishment of the General Authority for Investment and Free Zones (GAFI) in 1997.

From 2000 to 2010, concerted efforts were made to further improve the private investment ecosystem. This included the establishment of the Ministry of Investment in 2004, the implementation of supportive policies aimed at streamlining customs and taxation, and the signing of numerous supranational trade agreements. As a result, private investment reached its peak, with its share in GDP and total investment reaching approximately 10 percent and 53 percent, respectively.

In response to the political and economic instability witnessed between 2011 and 2014, Egypt implemented an economic reform program in 2016 to address chronic imbalances within its economy. Various measures were taken to enhance the private business environment, including the issuance of Investment Law No. 72 of 2017, the introduction

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of the Bankruptcy Law, streamlining industrial license procedures, and refining the mechanism for allocating industrial lands. These initiatives had a positive impact on Egypt's rankings in the Doing Business and global competitiveness indicators by 2019 compared to preceding years.

While these reforms led to improvements in several macroeconomic indicators, the response of investment to these measures was limited and transient. Despite an increase in the real value of private investment, it exhibited a downward trend as a percentage of GDP, accompanied by a volatile annual growth rate. The share of private investment in total investment also declined compared to its historical peak. Moreover, the COVID-19 pandemic exacerbated the challenges faced by the investment landscape.

Between 2011 and 2021, the average share of private investment accounted for about 7 % of GDP and 46 percent of total investment. Notably, the decline in private investment was offset by substantial public investment in numerous megaprojects, as illustrated in Figure 2.

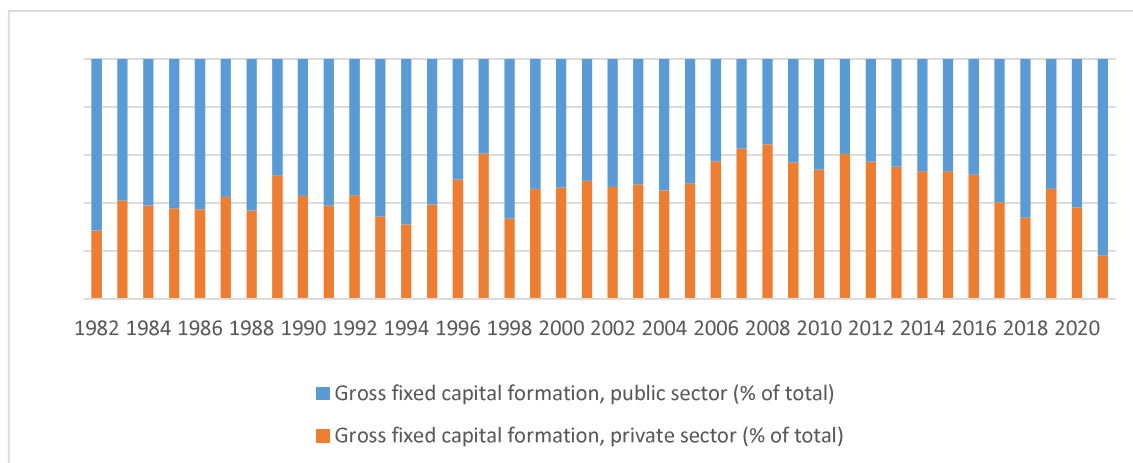


Figure 2: Private and Public Investment in Egypt in 1982–2021 (as % of total investment)

Source: World Development Indicators

While private investment, in real value, exhibited an upward trend during the period 1982-2021, its growth rate experienced sharp fluctuations. Additionally, the share of both private and public investment in GDP depicts a downward trend, as illustrated in Figures 1 and 2.

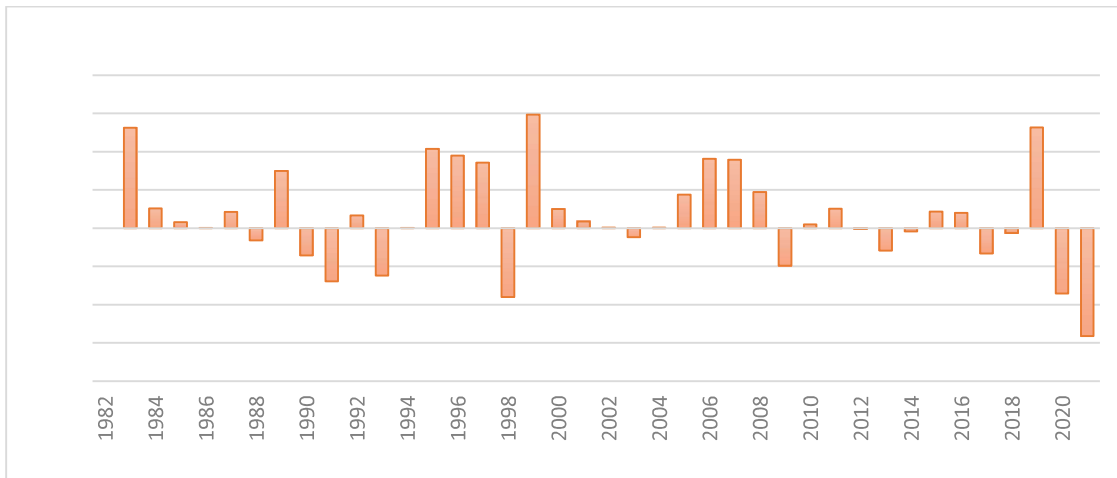


Figure 3: Real Annual Growth Rate of Private Investment in Egypt (1982-2021)

Source: World Development Indicators

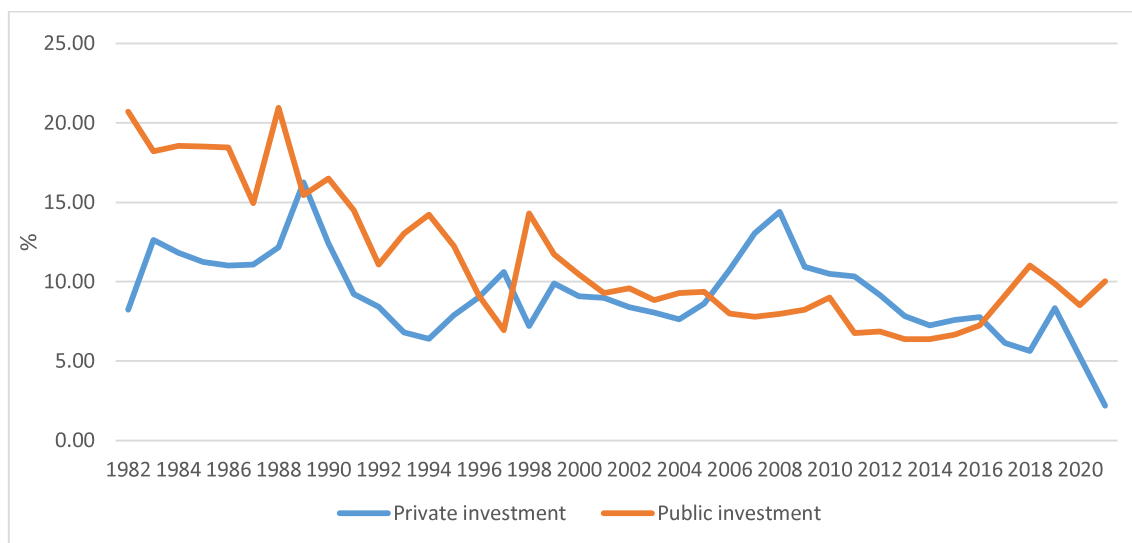


Figure 4: Private and Public Investment as % of GDP in Egypt, 1982-2021

Source: World Development Indicators

Despite a temporary improvement in the percentage of private investment relative to GDP, it remains significantly lower in Egypt compared to other developing countries. For instance, the average share of private investment in Egypt’s GDP was 9.3 % from 1982 to 2021, while this figure doubled in Mexico and tripled in Korea and China, as depicted in Figure 5.

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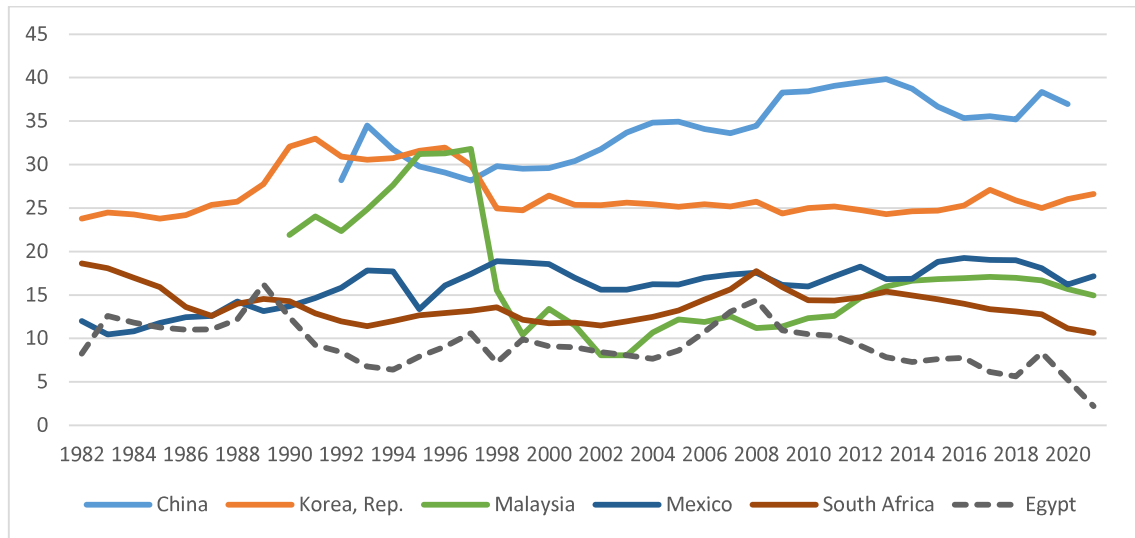


Figure 5: Private Investment in Egypt and Selected Developing Countries (as % of GDP)

Source: World Development Indicators

4. Estimation and Model Specification

4.1 The Model and Data Sources

$$LPI_t = B_0 + B_1LY_t + B_3LGI_t - B_4LC_t - B_5RER_t - B_6inf_t + B_7Dy_t + \epsilon_t$$

Where LPI_t is the logarithm of private investment valued at constant prices, LY_t is the logarithm of real gross domestic product, LGI_t is the logarithm of public investment valued at constant prices, LC_t is domestic credit to private sector as percentage of GDP, RER_t is the real exchange rate (nominal exchange rate deflated by CPI), inf_t is the inflation rate, and Dy is an indicator variable to represent economic reform programs in Egypt during 1991, 2004, 2014 and 2016. Table 1 below shows the rationale for each explanatory variable and its expected sign.

Table 1: The rationale for each explanatory variable and its expected sign

| Variable | Rationale | Expected Sign |
|-------------------------------|---|---------------|
| Gross Domestic Product | In the flexible-accelerator model desired capital stock and level of real output growth are positively correlated. Similarly, there is a positive association between private investment and income per capita in the neoclassical investment theory. | + |
| Public Investment | <p>The effect of public investment on private investment depends on the net crowding-in or crowding-out effect.</p> <p><i>Developmental investment [crowding-in effect]:</i> This type of investment is intricately linked to the essential and proper functioning of the market via providing infrastructural investments in the form of physical infrastructure to promote private returns. This includes the provision of public goods, transport access, and different facilities such as health, school, communication services, and related activities. In essence, the government creates a favorable environment for private investors.</p> <p><i>Non-development investments [crowding-out effect]:</i> Conversely, when public investment increases, aggregate demand rises, leading to an increased demand for money and subsequently higher interest rates. Consequently, private investment tends to decrease. Moreover, if additional public investment is financed by a deficit, this can result in higher interest rates, credit rationing, and increased current and future tax burdens. When domestic credit is directed to the government, it has the effect of crowding out private-sector investments.</p> | +/- |
| Inflation | <p><i>Inflation may have a negative or positive effect on private investment:</i> High inflation reflects high macroeconomic instability, and discourages investment. This results in a decline in the purchasing power of money, leading to reduced bank savings and less credit available for financing investment projects.</p> <p>Although some studies suggest that inflation could potentially stimulate private investment, the final impact of inflation depends on various factors. These include the reasons behind inflation, its magnitude, the policies implemented, and the structure of industries. Industries with an export-oriented focus, for instance, may benefit from inflation under certain conditions.</p> | +/- |

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| | | |
|--|---|-------|
| Domestic Credit to the Private Sector | As finance becomes more available, individuals gain increased access to funds for essential projects, consequently elevating private investment rates. This relationship is, however, influenced by various other factors. | + |
| Real Exchange Rate- | This variable may exhibit a positive relationship, as currency devaluation has the potential to enhance competitiveness, boost exports, and stimulate private sector investments. It achieves this by increasing the profitability of tradable goods and encouraging higher rates of private investments. However, there are studies suggesting that currency devaluation could also result in a decline in real income, productivity capacity, and an increase in capital cost, especially when most capital and intermediate goods are imported. | + / - |
| ---- Economic Reforms Indicator | Implementation of economic reform programs restores confidence in the economy and rectifies fundamental imbalances, thereby positively influencing private investment. | + |

Source: Prepared by the Authors based on the literature review

Figure 6 shows the development of explanatory variables used in the private investment function. The study employs annual data covering the period from 1982 to 2021. For consistency, all data were collected from the World Bank's World Development Indicators database (WDI).

Scatter diagrams for the bilateral relationship between dependent and independent variables show a positive relationship between private investment and gross domestic product. The other relationships appear ambiguous.

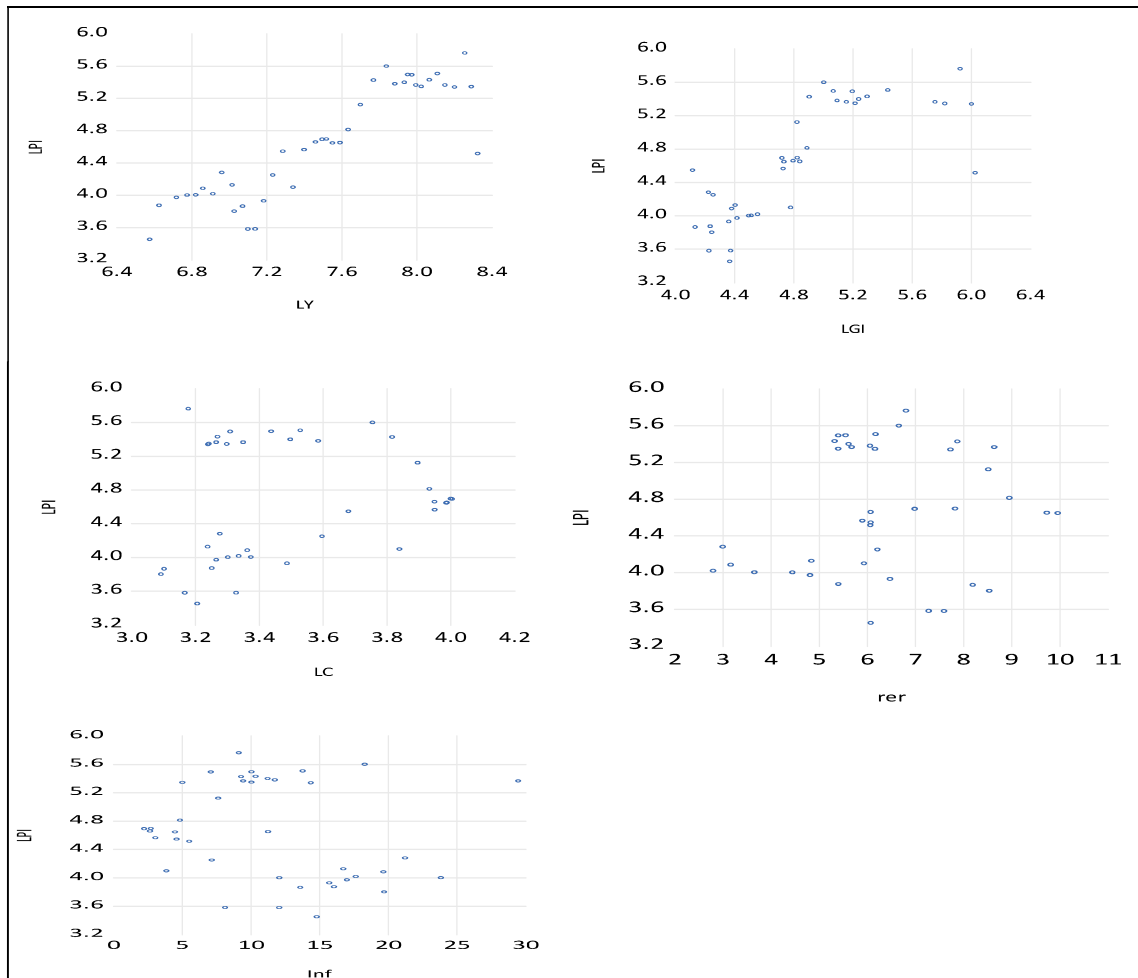


Figure 6: Scatter plots for private investment and explanatory variables.

Source: World Bank

4.2. The Stationarity Test

In time-series analysis, it is important to conduct stationarity tests before testing any relationships. Therefore, the study employs Augmented Dickey-Fuller (ADF) tests to assess the presence of unit roots for all variables.

The ADF tests for LPI_t , LY_t , LGI_t , LC_t are estimated with trend and intercept, because the data show time trend, while the ADF test for inf_t , and RER_t are estimated without trend, as the data show fluctuations over time.

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Table 2: Unit root test

| Probability values | | |
|--------------------|--------|------------------|
| Series Name | Level | First Difference |
| LIP | 0.478 | 0.003 |
| LY | 0.5923 | 0.0302 |
| LIG | 0.974 | 0.0000 |
| *LC | 0.6670 | 0.004 |
| *RER | 0.5052 | 0.001 |
| *INF | 0.1145 | 0.0000 |

Source: Prepared by the Authors

* Unit root test without trend and intercept.

The results of unit root tests show that time series are non-stationary in level, but after the first difference, the series becomes stationary.

4.3. Cointegration Technique

As all model variables are integrated into order one, the study employs the Johansen cointegration approach to examine the existence of a long-run relationship between private investment and the explanatory variables, following the steps outlined below.

4.3.1. Determining optimal lag length

By applying unrestricted vector autoregression “VAR” in levels, and using the Schwartz criterion, the optimal lag length is specified to be one.

Table 3: Lag length criteria

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|-----|---------------|-----------|-----------|----------------|----------------------|----------------|
| 0 | - 196.0159 | NA | 0.000187 | 11.27866 | 11.58657 | 11.38613 |
| 1 | 68.43276 | 411.3645 | 1.25E-09 | -0.690709 | 1.772543 * | 0.169032 |
| 2 | 131.2355 | 73.26983* | 8.01E-10 | -1.457526 | 3.161071 | 0.154488 |
| 3 | 209.2745 | 60.697 | 4.41e-10* | - 3.070804* | 3.703138 | - 0.706516* |

Source: Prepared by the Authors

4.3.2. Testing for the existence of a long-run relationship

The study employs Johansen’s cointegration test based on the maximum eigenvalue to assess for the existence of a long-run relationship between private investment and explanatory variables.

The test indicates the presence of two cointegrating vectors among the variables at the 5% significance level. These results are delivered on the null hypothesis of the number of cointegration equations (r) against the alternative hypothesis ($r+1$). The null hypothesis can be rejected if the test statistic is greater than the critical value at the 5% significance level.

Table 4: Unrestricted cointegration rank test (maximum eigenvalue)

| Hypothesized | | Trace | 0.05 | |
|--------------|------------|-----------|----------------|----------|
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.** |
| None * | 0.883003 | 180.5633 | 125.6154 | 7.30E-07 |
| At most 1 * | 0.615402 | 101.1757 | 95.75366 | 0.020087 |
| At most 2 | 0.462386 | 65.82012 | 69.81889 | 0.099993 |
| At most 3 | 0.41255 | 42.85739 | 47.85613 | 0.136073 |
| At most 4 | 0.345013 | 23.17472 | 29.79707 | 0.237577 |
| At most 5 | 0.164375 | 7.518516 | 15.49471 | 0.51821 |
| At most 6 | 0.023351 | 0.874219 | 3.841466 | 0.349789 |

Source: Prepared by the Authors

* Denotes rejection of the hypothesis at the 0.05 level

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

3.3.3. Estimation of long-run coefficients

The existence of a cointegrating vector implies the existence of a long-run relationship between private investment and its determinants. The long-run coefficients are estimated and reported in Table 5 below.

Table 5: Long run coefficient

| Variable | Coefficient | t-Statistic |
|------------|-------------|-------------|
| LY | 0.3 | 3.1 |
| LIG | 0.8 | 7.1 |
| LC | -0.2 | -2.6 |
| INF | -0.04 | -7.6 |
| RER | -0.1 | -5.0 |
| DY | 0.5 | 5.4 |

Source: Prepared by the Authors

The estimation of a long-run relationship between private investment and its determinants reveals that the coefficient of real gross domestic product is statistically significant at the five percent significance level, with a positive sign. This implies that if GDP increases by one percent, real private investment will increase by 0.3 percent. This

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finding aligns with economic theory and empirical studies as well (BOĞA 2020; Ngoma et al. 2019)

Additionally, public investment is identified as having a significant and positive impact on private investment in Egypt. More precisely, the coefficient indicates that a one-percent increase in public investment causes a 0.8 percent increase in private investment over the long run. This suggests that public investment plays a crucial role in stimulating private investment, especially if it is focused on infrastructure. However, considering that the model uses overall values for investment, further analysis is needed on disaggregated investment data to decide if there is a crowding-in or crowding-out effect and the nature of economic activities.

Furthermore, the results from the long-run analysis indicate, contrary to economic literature, that credit to the private sector has a negative impact on private investment in Egypt. This observation could be attributed to two overarching factors: firstly, the prevalent informality in the Egyptian economy, which impedes access to credit from banks and financial institutions; secondly, the fact that two-thirds of domestic credit is allocated to the government, with the private sector receiving no more than one-third (CBE 2023). Additional factors may also play a role, necessitating further research, particularly in understanding the financing structure of private enterprises in Egypt.

The coefficient for the real exchange rate is both negative and significant, indicating that an increase in the real exchange rate (depreciation of the Egyptian pound against the US dollar) is associated with a decline in private investment. This is attributed to the elevated real cost of imports, particularly capital goods, making investment more expensive. Ayeni (2020) supports this finding.

Inflation, serving as a proxy for macroeconomic instability, exhibits a significantly negative impact on private investment over the long run. The inflation coefficient suggests that private investment in Egypt decreases by 0.04 percent with a one percent point increase in inflation.

Additionally, the coefficient of the indicator variable, representing economic reform programs in Egypt, is statistically significant and positive. This implies that economic reform stimulates private investment in Egypt. The positive effect of the dummy variable is rationalized by the notion that economic reform instills confidence in the stability of the Egyptian economy, subsequently increasing certainty in longer-term investment projects in Egypt. This result aligns with the conclusions of Wang et al. (2022).

The long-run model is given by the following equation:

$$LPI_t = 0.3LY_t + 0.8LGI_t - 0.02LC_t - 0.1 RER_t - 0.04 inf_t + 0.5Dy_t$$

4.3. VECM

The study applies the VEC model (VECM) to investigate the short-run dynamics of the variables. The results show that the value of the error correction term, which is the speed of adjustments toward long-run equilibrium, is negative and significant at 5%, which means that there is a conversion from short-run dynamics toward long-run equilibrium. The adjustment coefficient is about -0.26, which indicates that around 26% of the disequilibrium in private investment in the short term is corrected annually. To be more specific, it takes about four years to correct for short-term disequilibrium and to restore long-term equilibrium.

The real exchange rate is significant at the 90% confidence level and retains its negative hypothesized sign just like the long run, indicating a short-run causality running from this variable to private investment. Meanwhile, other variables are insignificant in the short run.

4.4. Diagnostic Tests and Robustness Check

The model is also examined by applying residual serial correlation LM tests with the null hypothesis of no serial correlation, and residual heteroscedasticity tests with the null hypothesis of no heteroscedasticity in the error term.

The results show an LM (Lagrange multiplier) STAT of 51.2 at probability values of 0.348, indicating that residuals are serially uncorrelated. Similarly, the findings of the heteroscedasticity test show that data series are homoscedastic because the VEC residual heteroscedasticity tests CHI-sq statistic is about 537, with a probability value of 0.146.

To test for robustness, the private investment model is re-estimated using a different period from 1951 to 2012, applying the above-mentioned methodology. The results showed that there is a long-run relationship between private investment and its determinants. Additionally, the long-run coefficients incur similar signs to the original model. The results of re estimation are provided in Table 6.

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Table 6: Long run coefficient

| Variable | Coefficient | t-Statistic |
|-----------------|--------------------|--------------------|
| LY | 0.3 | 2.5 |
| LIG | 0.45 | 2.3 |
| LC | -0.15 | -1.5 |
| INF | -0.04 | -5.9 |
| RER | -0.07 | -4.6 |
| DY | 0.02 | 0.2 |

Source: Prepared by the Authors

Conclusion

Investment or capital accumulation serves as a major catalyst for economic development and growth. Consequently, a thorough examination of the key macroeconomic determinants of private investment is imperative for successful and effective targeting, as it may help Egyptian policymakers to design and implement evidence-based policies.

The study investigates the key macroeconomic determinants of private investment in Egypt from 1982 to 2021, utilizing the Johansen Cointegration Approach and Vector Error Correction Model (VECM). It identifies six variables as key determinants of private investment in Egypt: real gross domestic product, real public investment, credit to the private sector, real exchange rate, inflation rate, and an indicator variable representing economic reform programs in Egypt.

The model outcomes reveal that real gross domestic product, real public investment, and economic reform programs exert a positive impact on private investment, while real exchange rate and inflation exhibit a negative relationship with private investment in the long run.

Furthermore, the results highlight a significantly positive effect of public investment in the long run, emphasizing the constructive role of public investment in fostering private investment. However, a more in-depth analysis, utilizing disaggregated investment data, is warranted to discern the presence of crowding-in or crowding-out effects and the nature of economic activities.

Additionally, the model presented that credit facilities to the private sector negatively influence private investment in Egypt. Two contributing factors to this scenario are identified: firstly, the high degree of informality in the Egyptian economy, and secondly, the government's predominant share of total domestic credit. This implies a need for intensified efforts to promote formalization, financial inclusion, and an improved

business environment. Nonetheless, a micro-level study of the financing structure of private enterprises in Egypt is essential to complement this analysis.

Finally, the results indicate that the real exchange rate and inflation negatively impact private investment, while the economic reform variable positively affects it. This suggests that reducing uncertainty and adopting economic reform programs play an important role in achieving economic stability and restoring private sector confidence, with positive implications for long-term investment in Egypt.

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References:

- Ajide, Kazeem, and Olukemi Lawanson. 2012. "Modelling the Long Run Determinants of Domestic Private Investment in Nigeria." *Asian Social Science* 8, no. 13.
- Aly, Haidy, and Heba Youseff. 2021. "Private Investment, Government Investment and the State Budget Deficit in the Egyptian Economy during 1985-2017: Complementarity or Competition." *Journal of the Faculty of Economics and Political Science* 22, no. 1: 7–23.
- Ashour, A, S. Ahmed, Asmaa M., and H. Mohamed. 2020. "An Econometric Study to Estimate the Private Investment Function in Egypt." *Egyptian Journal of Development and Planning*, June, 1, no. 28: pp. 5–29.
- Ayeni, Raphae. 2020. "Determinants of Private Sector Investment in a Less Developed Country: A Case of the Gambia." *Cogent Economics & Finance* 8, no. 1, 1794279, DOI: 10.1080/23322039.2020.1794279
- BOĞA, S. 2020. "Determinants of Private Investment in Turkey: An ARDL Bounds Testing Approach." *Eurasia Journal of Social Sciences and Humanities* 11.
- Central Bank of Egypt. 2023. *Monthly Statistical Bulletin*. Cairo: Egypt.
- Elbanna, Islam. 2016. "Determinants of Private Investment in Egypt." *Economics* 5, no. 5, May.
- Jorgenson, D. W. 1971. "Econometric Studies of Investment Behavior: A survey." *Journal of Economic Literature*, IX, no. 4: 1111–1147.
- MacKinnon, J. G., A. A. Haug, and L. Michelis. 1999. "Numerical Distribution Functions of Likelihood Ratio Tests for Cointegration." *Journal of Applied Econometrics*, 14: 563-577.
- Magableh, S. I. and S. A. Ajlouni. 2013. Determinants of Private Investment in Jordan. Yarmouk University, Department of Economics.
- McKinnon, R. 1973. *Money and Capital in Economic Development*. Washington, D.C.: The Brookings Institution.
- Morsy, Eman. 2021. "Banking Credit and Private Investment in Egypt: Econometric Study for the Period 1991-2019." *Port Said University Financial and Commercial Journal* 2: 130- 173, January.
- Ngoma Gerald, G. Bonga and Thabani Nyoni, 2019. "Macroeconomic Determinants of Private Investment in Sub-Saharan Africa." *Journal of Economics and Finance (DRJ-JEF)* 4, no. 3 (October, 2019): 01-08.
- Petkov, P. 2013. "An Econometric Analysis of the Investment Function for Bulgaria Allowing for the Impact of Structural Breaks." *Economics* 21, no. 2 Eng/2013: 48-70.
- Pindyck, R. 1991. *Journal of Economic Literature*, 29, no. 3, 1110-1148.
- Ramadan, A. 2014. "Determinants of Private Investment: An Applied Study on the Egyptian Economy." *Journal of Commerce and Finance*, no. 2. Tanta University - Faculty of Commerce.
- Rodrik, D. 1991. "Policy Uncertainty and Private Investment in Developing Countries." *Journal of Development Economics*, 36, no. 2: 229-242.
- Sallam, S. S. 2019. "Determinants of Private Investment in Egypt: An Empirical Analysis." *Review of Economics and Political Science* 4, no. 3 (2019): 257-266. Emerald Publishing Limited 2631-3561, DOI 10.1108/REPS-12-2018-0043.
- Shaw, E. 1973. *Financial Deepening in Economic Development*. New York: Oxford University Press.

- Tobin, J. 1969. “A General Equilibrium Approach to Monetary Theory.” *Journal of Money, Credit and Banking* 1, no. 1: 15-29.
- Triplett, R. E., N. Ozdemir, and P. M. Mason. 2021. “Structural Change in the Investment Function”. *Journal of Economics and Finance* (2022) 46: 220–236, <https://doi.org/10.1007/s12197-021-09564-6>.
- Wang, D., T. Liu, X. Li, Y. Huang, and Y. Zhou. 2022. “Identifying the Dynamic Influence of Economic Policy Uncertainty on Enterprise Investment Using Functional Data Analysis.” *Hindawi Mathematical Problems in Engineering* 2022, Article ID 7822710, 15 pages. <https://doi.org/10.1155/2022/7822710>.