A Blessing or a Burden? The Impact of Overpopulation on Egypt's Economic Growth (1969-2019)

Ganna Mohamed Chouckry

Monitoring, Evaluation, and Learning Assistant at USAID's Business

gannamohamed804@yahoo.com

Dr. Manal Mohamed Emira

Assistant Professor of Economics at the Faculty of Economics and Political Science, Cairo University

manalemera@feps.edu.eg

Scientific Journal for Financial and Commercial Studies and Research (SJFCSR)

Faculty of Commerce – Damietta University

Vol.5, No.2, Part 1., July 2024

APA Citation:

Chouckry, G. M. and **Emira**, M. M. (2024). A Blessing or a Burden? The Impact of Overpopulation on Egypt's Economic Growth (1969-2019), ***Scientific Journal for Financial and Commercial Studies and Research***, Faculty of Commerce, Damietta University, 5(2)1, 349-396.

Website: https://cfdj.journals.ekb.eg/

A Blessing or a Burden? The Impact of Overpopulation on Egypt's Economic Growth (1969-2019)

Ganna Chouckry and Dr. Manal Emira

Abstract

Does a nation's rapid population growth foster or depress its economic growth? Over the years, economists have been debating whether a country's population growth affects its economic growth. The present study examines the relationship between population growth and economic growth in Egypt from 1969 to 2019 using the Autoregressive Distributed Lag Model (ARDL) and Vector Error Correction Model (VECM). In both the short and long run, these variables show a negative correlation. The Granger Causality Test, however, did not reveal a causal relationship between the two variables. This empirical analysis could be helpful for policymakers to draft policies aimed at reducing population growth. Implementing family planning programs and campaigns such as "Two is Enough" could effectively achieve positive and long-lasting results.

Keywords: Population Growth, Economic Growth, ARDL, Egypt, Malthusian Theory.

Introduction

For the past few centuries, economic development has never been an easy process. Economic development has traditionally been viewed as a sequence of successive stages of economic growth. As per their definition, economic development is the increase in the country's real income per capita during a specific period. They only focused on the growth of the economy without taking into consideration other important variables such as poverty and inequality. However, modern theories view economic development as an increase in economic growth displayed in a rise in the real per capita income, along with a decrease in the unemployment level, poverty, and inequality (Todaro & Smith, 2015). In the 21st century, it is well known that the economic development of a given country depends on a set of factors[1] of which the most important is the economic growth that relies itself on another set of factors (Bongaarts, 2009).

[1] The main factors of the economic development could be: Barriers to trade between countries, the political stability in a country, foreign aids, and the natural resources that the county has.

One of the most important variables that affect a country's economic growth is population growth, i.e., overpopulation. The latter is defined as the increase in the number of citizens living in a particular nation for a certain period (Kuhe, 2019). Further, population growth is a consequence of two factors: the natural increase of the population, and, the increase in migration (Fullerton, *et al*, 2015). The first factor refers to a rise in the number of births within a country; it could be due to economic, regional, or international factors. However, the second factor refers to a case where the country's immigrants' number is higher than its number of immigrants. It is a matter of assessing the expected real salary and the likelihood of obtaining a formal job that determines whether an individual migrates or not (Harris and Todaro, 1970).

Therefore, overpopulation is an interesting subject for policymakers to implement different policies, and, for economists to try to assess its impact on the countries' economic growth (Mamingi, 2013). Determining the interconnection between both variables remains ambiguous. Generally, the economic performance in a country is usually affected by its demographic structure; however; the impact itself differs from one country to another (Abba Mahmud, 2015).

According to the World Population Prospects, Egypt ranked 14th in the world with 102.8 million citizens in 2021 and became the largest Arab country[2]. This rapid population growth represents a burden on the country's limited resources, and it is threatening Egyptians' health life, their quality of life, as well as the quality of education provided to them (Youssef *et al.*, 2014). Thereby, to achieve inclusive sustainable growth in the long term, the government needs to intensify its efforts to tackle population challenges (Khalifa *et al*., 2012).

This study aims to examine the relationship between population growth and economic growth in Egypt from 1969 to 2019. There has been considerable debate over the relationship between population growth and economic growth in a variety of countries over the years. The Egyptian case, however, lacks research in that field. Accordingly, this study aims to fill a significant gap in the literature about how population growth impacts economic growth in Egypt in the period under consideration. This study will

[2] World Bank Development Indicators, Egypt, 2021.

also be crucial for policymakers to grasp the potential consequences of a rapidly growing population on the environment and enable them to draft more demographic policies to tackle the problem of population encompassing economic growth rate. Accordingly, the empirical study intends to answer the following questions: “How did the population growth affect Egyptian economic growth and development between 1969 and 2019?” and “What policies should the government implement to take advantage of this growth to contribute to Egypt's economic well-being?”

In light of this, the study follows the following structure. A review of relevant literature in that field is presented in the first section. Data and facts are discussed in the second section, while the authors' approach and methodology are presented in the third section. The fourth section presents the results of the econometric model. The fifth section concludes with some policy recommendations for decision-makers, as well as for future research.

1 Literature review

1.1 Theoretical framework

There is always debate over the impact of population growth on economic growth among economists. Economists have noted a positive effect in some countries, while others noted a negative impact due to the country's overpopulation, which is rarely addressed by adequate policies. Thus, we can divide the theories studying the relationship between both variables into two main categories: pessimistic theories and optimistic theories.

1.1.1 Optimistic theories: Population growth can fuel economic growth

In contrast to Thomas Malthus, and the Neo-Malthusians, who were the first to start the debate on the relationship between both variables, there are the Anti-Malthusians. According to them, the increase in the population is viewed from a positive perspective: rapid population growth fuels the nation’s economic growth as well as its economic development, which will eventually benefit the country. The more the population grows, the more we produce brains that generate technology and increase productivity.

Countering the pessimism of the Neo-Malthusians, Condorcet (1795) contended that rapid population growth will lead to the discovery of new technologies, which in turn, will lead to agricultural advances, thus, food productivity increases. Moreover, he confirmed that future educational reform will produce persons with reasoned ideas and beliefs. In addition, he argued that over the years, birth rates will decrease due to technological progress and humans will be able to tackle the overpopulation problem with their voluntary actions and not by government mandates.

Throughout the 20^{th} century, the debate between scholars on the relationship between both variables was exacerbated. For instance, Keynes (1937) pointed out that population growth and economic growth are the two main variables that affect a country's economic development. He argued that when the population increases, the production increases, the savings increase as well as the investments. Keynes argues that a growing population is essential to increase the demand for the goods and services that a nation produces. Consequently, the population will establish a good market, and the demand for capital will increase allowing everyone in the nation to prosper. Thus, this virtuous cycle will increase the country's economic growth and development.

A decade later, the world population increased rapidly, yet, some scholars argued that this boost will benefit countries. For Example, Kuznets (1955) explained that an increase in the population could be viewed as an increase in the labor force. According to Kuznets, if the increase in the population were proportional to the increase in the labor force, the output produced by each worker would eventually increase. He argued that a rise in the population would raise the number of workers and increase as well the natural resources exploited.

Boserup (1965) agreed with Kuznets and explained that the population determines the agricultural methods and not the opposite. She believed that since necessity is the mother of invention, population growth would generate the technological progress required for economic growth. Boserup agreed that an increasing population helps the country to exploit its resources, therefore, economic growth increases. However, if a country tries to diminish its population growth, its economic growth will be restricted and some resources will never be used, and countries will be stuck at a low level of economic growth and development.

Moreover, Simon (1981) also disagreed with the Malthusian theory. In addition, he argued in his book that the population size affects the technological techniques used in production. Simon's ideas about the impact of rapid population growth differed from those of the scholars mentioned above. On one hand, He argued that food scarcity might happen in the future due to overpopulation and limited resources. On the other hand, individuals would always be able to surpass such problems using advanced technologies and their innovative thoughts resulting from an improved education system. He believed that the newer generation who enters the workforce will have better education, advanced ideas, and better skills, and thus, they will enhance economic growth.

Other studies explained the relationship between both factors from a different perspective: do countries aim to reap the benefits of a growing population? Kothare (1999) clarified that developing countries have the highest rates of population growth, explaining that it is not the rate of growth itself that is problematic. The fundamental problem lies in the measures taken by countries facing rapid population growth. He stated that even with the high population growth rates in India, it is still one of the world's fastest-growing economies. Kothare explained that the fast population growth has been the most significant factor contributing to the country's economic growth over the years, as it has helped in the creation of a large labor force. He explained that India had learned how to manage its growing population by providing education and skills to job seekers. As a result, these individuals were more educated and skilled and were able to contribute more productively to the economy. This led to an increase in production in both the agricultural and industrial sectors, which in turn contributed to better economic growth. Therefore, he concluded that rather than trying to reduce population growth, governorates should learn to leverage it for their benefit.

1.1.2 Pessimistic theories: Population growth restricts economic growth

The British scholar Thomas Malthus (1798) was the first economist to start the debate on the rapid population growth’s negative impact. He examined whether it was possible or not to improve and develop a society that faces continuous population growth. In his essay, he argued that a country that faces rapid population growth would face huge pressure on its resources. According to him, the population in a particular country grows in an exponential way: (1,2,4, 8..) while food production grows arithmetically: (1,2,3,4..). Consequently, due to the limited technological progress of that era, it would never be possible to increase food production proportionally with the population growth, and eventually, people would die. Malthus also refused the cash transfer programs[3], claiming that it would only worsen their life. Individuals would think they became rich and would be able to support more individuals by increasing their family members, and hence, we would be stuck in a poverty trap.

Nevertheless, Marx (1867) was hostile to the Malthusian theory. However, his ideas were also pessimistic regarding the consequences of population growth on economic growth. Marx did not propose any theory of population, however; his “surplus population” theory has been conducted from his famous theory of communism. He opposed Malthus arguing that the social problems (poverty, hunger, wars, etc.) were not the result of population growth. They were the result of the capitalist system that exploited the country’s resources. Marx argued that the labor class (the poor one) would have more children to increase their income. Therefore, the population would increase as well as the labor supply, which decreases the wages in society. Thus, the industrial society (the rich one) would exploit more resources leading to poorer people without any increase in their wages. Marx insisted on the fact that social disasters and declining economic growth had nothing to do with overpopulation, they resulted from an inefficient allocation of resources.

Coale and Hoover (1958) agreed with Malthus' ideas that population growth and economic growth have a negative relationship, particularly when the economy relies heavily on agriculture. This is because an economy based on agriculture tends to have high mortality rates, high fertility rates, and poor nutrition due to limited access to public health programs and inadequate sanitary facilities. As a result, health habits suffer, and mortality rates increase. However, they suggested that countries could break this cycle by transitioning from the agricultural sector to the industrial sector, which is typically more urbanized. This shift would increase productivity, individual wages, and overall economic improvement.

[3] Programs aim to transfer directly the money from rich to poor individuals to help them with their basic needs.

A decade later, Ehrich (1968) warned in his book about the negative consequences of population growth if countries do not tackle such a problem. He argued that, given the limited resources of a country, overpopulation would be a threat to the future of the planet, and people would starve to death. He also predicted that in the 1970s, people would starve to death despite any governmental policies due to the scarce resources disposed of by each country. However, the global population continued to increase and his predictions did not happen due to several factors, among them, the technological progress in production.

1.2 Empirical framework

The relationship between population growth rates and economic growth is a topic of great concern in policy debates worldwide. Many scholars study this relationship in different countries to implement appropriate policies. For example, Bloom and Williamson (1998) examined the connection between demographic change and economic growth during the twentieth century in the East Asian region[4]. During the mentioned period, the region was experiencing the third phase of the demographic transition, in which both mortality and birth rates were declining rapidly. Bloom and Williamson's econometric model was created using data from 78 countries, including Asian and non-Asian, between 1965 and 1990. Their study revealed that the working-age population[5] in East Asia increased to 2.39% per year while the entire population grew by 1.58%, which increased their GDP per capita. The East Asian region's economy significantly grew as a result of this demographic shift[6]. Hence, in their views, the active population had a positive consequence on the region's economic growth (on the growth rate of the real GDP per capita during that period). They also showed that the continuously declining rates of mortality and fertility during this period promoted Asia's rapid economic growth.

[4] Japan, South Korea, Singapore, Taiwan, Hong Kong, Thailand, Malaysia and Indonesia.

[5] The working age population is defined as those who can work in the population. Their ages are between 15 and 64 years old.

[6] They called that economic growth "the East-Asian miracle" due to the fast economic growth the eight countries had. Their income per capita level increased twice as fast as any other country in the region.

To elucidate the relationship between both factors, Adediran (2012) tested the Malthusian theory of population in Nigeria, as it is a developing country and subject to rapid population growth. He studied the effect of overpopulation on Nigerian economic development in a time series analysis between 1981 and 2007. He employed an Ordinary Least Square estimation method[7] to estimate the economic development of Nigeria taking into consideration the rapid population growth. Hence, he constructed two models with two dependent variables: the Real Gross Domestic Product and the Income per capita to measure the standard of living. For the independent variable, he only used the population growth rate of the country. Before running the regression, the author applied the Phillips-Perron Unit Root Test[8], and the results showed that the variables were stationary at 1st difference. Based on his research, a positive relationship between Nigeria's economic development and its population growth rate is indicated by the real GDP and the GDP per capita. Although Adewole's study showed this positive correlation between the variables, the study only related to the population quantity, but the quality of the population and their abilities to perform their social as well as their economic role were not taken into consideration by the author. As a result, he pointed out that the country needed to implement some population policies to improve the economic situation of the country such as food subsidizing for citizens.

Several studies have been conducted on the correlation between population growth and economic growth in relatively more developed countries. For example, Mamingi and Perch (2013) examined this correlation in Barbados from 1980 to 2010. During this time, Barbados was working towards building a green economy. The authors were interested in understanding the relationship between population growth and economic growth. To do this, they used the growth rate of the real GDP as an explicative variable for economic growth. For the independent variables, they used population density[9], the population growth rate, and the government

---

[7] Statistical method used to estimate the relationship between a dependent variable and independent variable (s).

[8] Developed by Phillips and Perron, it is a statistical test used to detect whether a time series is stationary or not.

[9] The ratio between the population in a certain area and the land is in square kilometers.

consumption expenditure[10] (as a part of the GDP). In addition, they added domestic investment (as a part of the GDP), trade openness,[11] and another variable to measure the country's international risk, which ranges between 0 and 100; with 0 representing a very high risk. The authors applied the Augmented-Dickey Fuller Test to test the stationarity of the variables, all the variables were integrated either at levels or, at 1st difference. Hence, they used an Autoregressive Distributed Lag Model[12] to test the correlation between the abovementioned variables in the long run. Their study showed that population growth had a positive and significant impact on the economic growth of the country in the long run.

The above study was reinforced by Mahmud (2015) who tested the impact of overpopulation on the economic growth in India from 1980 to 2013. He reformulated Solow's neoclassical growth model[13] into another model using other macroeconomic variables to demonstrate the relationship between population growth and economic growth. Thus, he employed the real GDP as a dependent variable to measure the economy's growth. For the independent variables, he replaced the capital with the rate of urbanization[14] of the country. Furthermore, for labor, he added two variables: the population growth rate as well as the employment rate[15]. Applying the Johansen Cointegration Test[16] and Vector Error Correction Modelling, his analysis showed a positive and significant impact of population growth on economic growth in India, which supported the optimists' theories. Additionally, the Granger Causality Test revealed a unidirectional causal relationship running from GDP to population growth rate, which means that an increase in the GDP leads to an increase in the population growth rate.

---

[10] The general government expenditures to purchase goods or services.
[11] It is the summation of a country's imports and exports.
[12] According to William Greene, ARDL model is a least square regression, which includes lags of the dependent variable as well as the independent variables.
[13] Solow expressed his growth model as follows: the dependent variable was the total output of the country. The latter is a function of the accumulated capital, labor, and technology. $Y_t=f(K_t, AL_t)$.
[14] The number of people living in the urban areas.
[15] The ratio of the employed individuals and the total population.
[16] A statistical test used to test the cointegrating relationship between data in a time series analysis. It comes in two main forms: Trace Test, and Maximum Eigenvalue Test.

Similarly, Tartiyus, Dauda, & Peter (2015) were concerned about the impact of Nigeria's overpopulation on its economy, so they conducted a study on the population growth between 1980 and 2010. The authors used descriptive statistics as well as regression analysis to analyze the data. They adopted a simple regression model with the ARDL cointegrating approach and Ordinary Least Square model to measure the impact of population growth rate, fertility rate, life expectancy rate at birth, crude death rate, and export growth rate on Nigeria's economic growth, using real GDP as a proxy. According to their study, there was a positive relationship between population growth and economic growth in Nigeria, both in the long and short run, contrary to their initial expectations. However, the researchers recommended that the Nigerian government should implement demographic policies aimed at reducing the crude death rate, which has been negatively impacting the country's economic growth. Additionally, they suggested that the country should focus on enhancing its exports to achieve long-term economic growth[17].

Passing to the Egyptian case, few studies were done to investigate the nexus between both factors and the results obtained supported the Malthusian theory. Mohamed and Schachier (2016) conducted a study in Egypt to determine the relationship between economic growth rate and population growth. They used time series analysis to analyze the data from 1981 to 2017. The study aimed to measure the impact of demographic changes resulting from the implementation of the 'two-child program' on the relationship between economic growth rate and population growth. The variables in question were the GDP growth rate (dependent variable) and population growth rate, age dependency ratios, life expectancy at birth, and labor participation rate [18] (independent variables). Their study highlighted a negative correlation between both variables in Egypt in the short run. However, they stated that the impact will diminish in the long term, as the government will implement appropriate policies to tackle all obstacles resulting from the high population growth rates. Thus, they advised that the country needed to promote contraceptives to face the rapid population growth that decreased Egypt's ability to move forward.

[17] For instance, health-related policies such as improved access to water and better food for citizens.

[18] It is the number of individuals in the labor force (15 years old or more) as a percentage of the population.

Moreover, negative outcomes were not limited to the Egyptian case study. Zahan (2016) conducted a study on the impact of overpopulation on the GDP per capita of Bangladesh. He analyzed the GDP per capita and population growth rate data from 1960 to 2015 using a time series analysis. Similar to Mahmud's (2015) study, Zahan applied the Johansen Cointegration Test and discovered a negative long-term relationship between the population growth rate and GDP per capita. He also used Vector Error Correction Modelling and found a unidirectional causality from population growth to GDP per capita. In other words, population growth resulted in a decline in the GDP per capita, but an increase in GDP per capita did not affect population growth. Therefore, he suggested that the government's intervention to control population growth is more important than focusing on poverty reduction.

In his study, Kuhe (2019) examined the link between population growth and economic growth and development in Nigeria. He analyzed the data based on annual time series from 1960 to 2015. The data included the annual growth rate of the real GDP (in percentage), the annual growth rate of the population, the growth rate of the urban population, as well as the growth rate of the rural population. To analyze the data, he used various statistical tools, including a Linear Regression Model. The results indicated a positive correlation between population growth and economic growth in Nigeria in the long run. In contrast to the previous study conducted by Tartiyus et al. (2015), Kuhe (2019) has shown that rapid population growth does not significantly impact the economic growth of Nigeria in the short run. Additionally, his study did not establish a causal relationship between population growth and economic growth. As a result, the study concludes that it is not possible to declare that an increase in population accelerates economic growth. This finding is significant because it suggests that other countries may achieve better economic growth and development despite having a smaller population.

Recently, Befikadu (2022) conducted a study on the impact of overpopulation on Ethiopia’s economic growth. He used an Auto Regressive Distributive Lag approach to test this impact from 1980 to 2020. To ensure accuracy, the author used the logarithmic form of real GDP, population size, foreign direct investment, population growth rate, rate of inflation, and gross capital formation. The study found that despite being a developing nation, overpopulation had a positive and significant impact on Ethiopia's economic growth in the long term. The author suggested that the government should attract foreign direct investment and implement strategies to maintain this positive impact.

In summary, there is no consensus among scholars on the relationship between overpopulation and economic growth, especially in countries with different levels of economic development. Rapid population growth can be beneficial for countries with abundant resources but can be disastrous for others who cannot bear the costs. Over the past few decades, many studies have been conducted to investigate the nature of this relationship, both in the short and long term, to implement necessary policies for a sustainable and inclusive economy.

2 Data and Stylized Facts

After conducting an extensive review of empirical and theoretical studies that test the relationship between our two main variables, it is essential to analyze the historical trends of the data used in the study. In this section, we will present some of the important facts related to population growth and economic growth variables. We have relied on data obtained from the World Development Indicators of the World Bank for Egypt, covering the period from 1969 to 2019. This section aims to provide a preliminary analysis of the most basic variables in our dataset, including the GDP growth rate, population growth rate, life expectancy at birth, export growth rate, annual inflation rate, and dependency ratios.

2.1 Descriptive Statistics:

The authors of the study first need to perform elementary data analysis before presenting the empirical findings, this is to explain the data used. A summary of descriptive statistics for each variable is provided, including the Jarque-Bera test[19] for normality. This test checks whether the variable under observation is normally distributed or not, to ensure that the analysis does not violate the basic assumption of constant variance of an Auto Regressive Distributed Lag Model.

According to the descriptive statistics, the average rate of GDP growth is 5.20 and the probability of the Jarque-Bera statistics suggests that the variable is normally distributed (p-value is less than 5%), as indicated in Table 1 (Appendix 1). The dependency ratios statistics suggest that the average dependency ratio in Egypt within the study period is 74.7 and like the GDP growth rate, it is normally distributed.

[19] Jarque-Bera test is a statistical test used to test whether the variables in a dataset are normally distributed or not. If the probability is less than 0.05, we accept the null hypothesis, i.e., the variable is normally distributed.

Table 1 also provides summary statistics of life expectancy at birth in Egypt during the study period, showing an average of 64.35 years. The probability of Jarque-Bera statistics suggests that the variable is normally distributed. In addition, the population growth rate and export growth rate of Egypt, between 1969 and 2019, showed averages of 2.18 and 20.3 respectively. However, the Jarque-Bera test probability indicates that there is a deviation from the normal distribution line for these two variables.

Lastly, as presented in Table 1, the annual inflation rates and urbanization growth rate of Egypt during the study period, showed averages of 10.9 and 43.1 respectively. The urbanization growth rates follow the normal distribution law, however, the annual inflation rate throughout the years does not follow the normal distribution law, as per the Jarque-Bera test.

Second, Table 2 (Appendix 1) presents a correlation matrix that explains the relationship between our dependent variable, GDP growth rate, and the independent variables we selected based on previous studies. The results are mostly as expected and show that the dependent variable is not highly correlated with any independent variable, indicating no issue of multicollinearity. The findings reveal a negative correlation between population growth and economic growth, in line with the Malthusian theory. This means that an increase in population growth leads to a decrease in GDP growth. Similarly, an increase in dependency ratios also results in a decrease in the GDP growth rate. Additionally, life expectancy at birth also shows a negative relationship with the GDP growth rate. This is because an increase in life expectancy at birth leads to an increase in dependency ratios, which in turn negatively affects economic growth.

However, all other variables show a positive association with the GDP growth rate, consistent with previous studies conducted in Egypt and Bangladesh (Mohamed and Schachier, 2016, Zahan, 2016). Furthermore, the study found a negative relationship between life expectancy at birth and urban population growth, as mortality rates are generally lower in rural areas than urban areas due to increased pollution in urban areas.

2.2 The Annual Growth Rate of GDP in Egypt:

The first variable chosen in the study as a proxy for the economic growth in Egypt is the annual growth rate of the GDP for the period 1969-2019. As per Figure 1 (Appendix 1), we can see that there is instability in the GDP growth rate over the years.

The Egyptian economy witnessed a remarkable growth rate in 1975, achieving almost 13% growth in GDP. This significant progress was attributed to the implementation of the Open-Door Economic Policy, which resulted in major changes in the economic performance of the country. This policy aimed at opening up the Egyptian economy and society to the rest of the world. It marked a shift from a restricted economy, which primarily traded goods and services with the Eastern Bloc, towards greater trade with the west. This new policy was progressive and embraced the concept of "laissez-faire, laissez passer". As a result, the economy became more open to foreign investment, while the role of the public sector decreased, leading to increased growth and development in the private sector. The success of this policy and its significant impact on the Egyptian economy has been well-documented in studies such as Bruton (1983).

2.3 The Annual Population Growth Rate in Egypt:

Our second variable of interest in this study is the annual population growth rate in Egypt, presented in Figure 2 (Appendix 1). This variable is the most common variable among all the studies dedicated to the demographic change analysis in a country.

As shown in the above chart, the lowest population growth rate was achieved in 2007 (+1.8%) while the highest rate was achieved in 1987 (+2.7%). While moderate population growth is seen as an advantage for developed countries like Japan and Europe, high population growth is a major challenge for many developing countries. Moderate population growth in these developed countries accompanied by economic growth stimulates demand and encourages technological innovation. On the other hand, studies have shown that rapid population growth leads to an increase in demand for food, education, health, jobs, and infrastructure, which can be difficult to manage (Bloom et al., 2003). The problem of overpopulation is not just about numbers, it is about human welfare and national development.

Figure 3 (Appendix 1) presents a clear connection between the population growth rate and the GDP growth rate. However, the growth rate of the GDP is more volatile than that of the population growth rate. This can be attributed to demographic policies being more complex and less accepted by the population than economic policies implemented by the government. Demographic trajectories are a response to changes in cultural norms, traditions, and behaviors, and they take time to yield positive outcomes

(UNFPA, 2016). Although the growth rate of the GDP and the population grow at different rates, their trends are closely related for most of the period. However, from 2009 onwards, the gap between both rates seems to be smaller. The economic growth experienced stagnation while the population growth continued to increase rapidly. It is crucial to strike a balance between the long-term advantages of having more citizens and the current costs of managing rapid population growth.

2.4 Life Expectancy at Birth

Similar to the increase in the population growth rate previously explained, life expectancy at birth tends to increase over time. The minimum age in our dataset was almost 51 years old while the maximum age was almost 72 years old, and it still increases.

The present study uses life expectancy at birth as a proxy of the population’s health status in Egypt during the period under scope. The Egyptian healthcare system has made continuous improvements, despite facing emerging diseases and illnesses associated with poverty and lack of education (World Bank, 2015). Additionally, there has been a drastic decline in mortality rates, and the educational system has improved drastically. This translates to better job opportunities and access to better medical care that would otherwise be inaccessible. As Figure 4 (Appendix 1) demonstrates, women tend to have a higher life expectancy at birth than men.

The World Health Organization states that the life expectancy gap between genders exists across all societies, not just Egypt. This persistent difference is primarily due to the behaviors of men, such as smoking and a weaker immune system. However, some scholars argue that the reduction in fertility rates and infectious diseases is also a contributing factor. Nevertheless, the changing roles of women in society will soon lead to a reduction in this gender gap. Several researchers suggest that medical advancements will allow both men and women to live longer, while others point to the adoption of behaviors previously reserved for men, such as smoking and drinking, by women. Whatever the reason, it is evident that the gender gap in life expectancy will soon diminish.

2.5 Age Dependency Ratios

The age dependency ratio is a crucial indicator of the detrimental effects of population growth rates. It reveals that Egypt had a high age dependency ratio (74.7%) from 1969 to 2019, as shown in Figure 5 (Appendix 1). This ratio highlights the potential social support requirements arising from changes in population age distributions. It indicates the economic burden of supporting children and older persons who are dependent on workers whose age varies from 15 to 64 (Assad, 2020). The higher the ratio, the greater the burden to ensure the basic services to the elderly population and children such as education, health, and security.

The decline in age dependency ratios started in the 1990s until 2008 and then started to increase again. Zaky (2009) argues that the decline in the dependency ratio during that period results from the decline in the young dependents ratio and the increase in the working-age population. This pattern is defined by The United Nations (2004) as 'the demographic window'. It is a time frame when a country witnesses changes in dependency ratios due to the demographic transition (Nassar *et al.,* 2017)

Decomposing the variable into its two components allows us to better account for trends within its two components. Thereby, figure 6 (Appendix 1) represents the average dependency ratios of the elderly population and children from 1969 to 2019. We can see that the young non-working population represents the highest ratio due to the increase in fertility rates and population growth rates. This variable started to decrease in the mid-1990s due to the decrease in fertility rates after implementing the two-child program. The elderly non-working population exhibits a different trend: the ratio is almost stagnant and does not change over time. It is essential to ensure basic services to the elderly population and children and to alleviate the economic burden on the working-age population. We must continue to monitor the trends and changes in the age dependency ratio to prepare for the demographic transition and provide sufficient support to all age groups.

2.6 Exports Growth Rates

Understanding the factors that impact GDP growth is essential for making informed economic decisions. According to Figure 7 (Appendix 1), Egypt's exports have experienced fluctuations from 1969 to 2019, with a maximum of almost 33% of the total GDP in 2009 and a minimum of almost

10% in 2016. The sharp drop in exports in 2016 was followed by a sharp increase. This follows the j-curve theory[20]: a trend line that starts with a sharp decrease in exports followed by a sharp increase in commodity exports due to the currency devaluation in 2016 (Youssef & Zaki, 2019).

As shown in Figure 8 (Appendix 1), while both imports and exports increased over the years, the rate of increase in imports outpaced exports, resulting in a trade balance deficit of over $US 40 billion in 2017 (Ezzat, 2018). Despite this, commodity exports have shown promising growth in recent years, especially from late 2016 to 2019.

2.7 Annual Inflation Rates

Regarding inflation rates, Egypt has experienced high and low rates over the years as shown in Figure 9 (Appendix 1). The highest annual inflation rates occurred in 2017 after the exchange rate was liberalized, while the lowest rates prevailed in the 1990s. The early 1970s saw low inflation rates, but they increased after the first oil price shock. In the 1990s, Egypt implemented many economic reforms such as Economic Reform and Structural Adjustment Program in cooperation with the International Monetary Fund and the World Bank to reduce inflation rates. As Figure 9 shows, these programs succeeded in reducing inflation. However, despite the reforms, the rates increased again. Thus, it is clear that inflation rates can significantly impact Egypt's economic growth.

1.8 Urban Population Growth Rates

Furthermore, urbanization is crucial for modernization and achieving sustainable development goals. Therefore, the urban population growth rate is an essential variable to consider while analyzing the consequences of overpopulation on Egypt's economic growth. As per Figure 10 (Appendix 1), the trend of urban population growth rate increased at an increasing rate from 1969-75, and after that, it slightly decreased until the 1970s, and then the rate increased again until 1997. After 1997, the trend became stable as the growth rate of the urban population was nearly equal to the growth rate of the total population. Hence, by analyzing the population growth rate trends and the urban population growth trends, it is evident that the urban population in

[20] James Davies first introduced the J-curve theory in 1962, he suggested that after a currency's devaluation/depreciation, the current account balance will fall sharply for a period and then it will rise once again on the long term.

Egypt was growing at a faster rate than the total population growth rates from the 1960s until the 1980s. However, from the mid-1980s, the two rates were almost equal, and sometimes the urban population growth rates fell below the total population growth rates. The authors suggest that the discontinuation of the urban population growth was due to severe economic problems and sociopolitical instability that affected Egypt during that period.

3 Approach and Methodology:

3.1 Baseline Specification

We will be studying the period from 1969 to 2019, based on the data collected by the World Bank during that time. This period was selected because it saw significant historical events such as wars, revolutions, and the implementation of new economic and social reform programs, including family planning programs (Wisensale & Khodair, 1998). The Egyptian family planning program, also known as "The Two Child Family Program," traces its roots back to the 1930s when researchers began to worry about the persistent imbalance between available resources and population growth. However, the effective implementation of these family planning programs did not begin until the late 1950s.

For this study, we will be using a paper by Tartivus, Dauda, and Amade (2015) conducted in Nigeria as a point of reference. In their study, Tartivus *et al.* (2015) used an ARDL Model and Ordinary Least Squares (OLS) Regression to estimate their econometric model. They aimed to test whether overpopulation has a positive or negative impact on the economy's growth. Therefore, our study will also be using the same econometric model, but we will be making some adjustments due to differences in the data structure.

The econometric model they adopted in their study is presented as follows:

$$GDPG = \beta_0 + \beta_1 POP + \beta_2 FER + \beta_3 LEX + \beta_4 CDR + \beta_5 EXT + \varepsilon_1 \quad (1)$$

Where GDPG is the real gross domestic product growth, POP is the population growth rate, FER is the fertility rate, LEX is the life expectancy at birth, CDR is the Crude death rate, and $\varepsilon 1$ is the error term that captures measurement errors.

GDPG is the dependent variable measuring the economic growth. *POP* measures the rate of change in the population of a country during a certain period, according to the World Health Organization (WHO). We expect to find a negative relationship between *POP* and *GDPG*, as higher population growth rates may lead to increased pressure on resources and infrastructure, which can hinder economic growth. *FER* is defined as the average number of children a woman can give birth to during her reproductive period, if she is not subject to mortality, according to WHO. It is an important demographic indicator as it can affect the size and age structure of a population, which can in turn impact economic growth.

LEX is defined as the average number of years a newborn could expect to live if he/she were to pass through the same death rates prevailing at that time, in that area, according to WHO. We expect that there will be a negative relationship between *LEX* and *GDPG*, as countries with lower life expectancies may have higher mortality rates, which can impact economic growth. *CDR* is defined as the number of deaths per 1000 individuals, according to WHO definition. Crude death rates are expected to decline as long as a country's economic growth is increasing, as there will be more resources available for healthcare and better living conditions. *EXT* is defined by the World Bank as the value of goods and services provided by a country to the rest of the world, and calculated as the ratio of exports and the GDP in the same year. A positive relationship between *EXT* and *GDPG* is expected, as countries with higher export growth rates tend to have more open and diversified economies, which are more resilient to external shocks.

3.2 Estimation Methodology

For our current research, we plan to use a different econometric model that does not include certain variables that were previously determined[21] due to the existence of high multicollinearity among variables. This was identified using the variance inflation factor technique as shown in Table 3 (Appendix 2). By excluding these variables, the accuracy and reliability of our model will be achieved.

Therefore, to ensure accuracy, the model incorporates variables previously identified in the literature as having a significant impact on the relationship between population growth and economic growth. Additionally, all variables will be transformed into logarithmic form to prevent spurious regression and unreliable estimates.

[21] The authors dropped the following variables: fertility rate and crude death rates.

As a result, the new equation is specified as follows:

$$\text{Log}(GDPG_t) = \beta_0 + \beta_1(\text{Log}(POPt)) + \beta_2(\text{Log}(DEPt)) + \beta_3(\text{Log}(LEXt)) + \beta_4(\text{Log}(INFt)) + \beta_5(\text{Log}(EXTt)) + \beta_6(\text{Log}(URBt)) + \varepsilon_t \quad (2)$$

Where *DEPt* is the Age dependency ratio, *URBt* is the Urban population growth rate, *INFt* is the Annual inflation rate and ε_t is the error term which captures measurement errors.

DEPt is defined by the World Bank as the proportion of dependents; whose age is less than 15 or more than 64, to the working age population; those aged 15 to 64. Mohamed and Schachier (2016) found a negative relationship between this variable and the dependent variable in question. Thus, β_2 is expected to have a negative sign indicating the negative association between *DEPt* and economic growth. *URBt* is defined as the growth rate of the population living in urban areas, as indicated by the World Bank. As long as URB is increasing, the country's economic growth is expected to increase (Kuhe, 2019). INFt is defined as the annual percentage change in the cost to the average consumer of acquiring a basket of goods at a specified time. It is expected to affect the economic growth negatively (Befikadu, 2022).

This research project employs advanced econometric tools for data analysis. An Auto Regressive Distributed Lag (ARDL) Model will be used to estimate the coefficients. Since ARDL utilizes the OLS estimation technique, there is no need to perform the latter as it may yield biased results (Pesaran and Shin, 1998; Pesaran et al. 2001). The authors have taken extra care to ensure that the assumptions of ARDL are respected, including checking for the absence of autocorrelation between residuals, ensuring that the data used follow the normal distribution, confirming the absence of heteroscedasticity, and verifying that the variables are either integrated at levels or at 1st difference.

To avoid multicollinearity between regressors, equation 2 is used to determine the relationship between population growth and economic growth, as equation 1 revealed high multicollinearity among the original variables of the first model. Diagnostic tests, including the Augmented-Dickey Fuller Unit Root test, Co-integration test, Error Correction Mechanism, and Granger Causality test, are applied to ensure reliable results. the Augmented-Dickey Fuller Unit Root test will be applied. In addition, the Co-integration test will be employed to determine if there are co-integrating equations. The Error Correction Mechanism will then be used to correct the short-run dynamics of the data. Finally, the Granger Causality test will be applied to check if there is a causal relationship between our two main variables in question.

Finally, the robustness of the econometric model is examined with diagnostic tests, including the Normality test, Ramsey RESET test, Heteroscedasticity test, Serial Correlation, and CUSUM test. By utilizing these advanced tools and techniques, this research project will provide reliable and insightful results to better understand the relationship between population growth and economic growth.

4 Empirical Results and Main Findings

4.1 Model Results

The authors first conducted a Variance Inflation Factor (VIF) test on the variables of the second equation before performing any regression analysis. This test aimed to detect multicollinearity among the variables as it indicates the increase in the variance of a regression coefficient as a result of collinearity. The results, presented in Table 4 (Appendix 2), indicate that the values of all variables (Centered VIF) were below 10, therefore we can conclude that there is no correlation between any of the variables in our dataset (Kutner *et al.,* 2006).

In the present study, the econometric methodology first examines whether each variable under discussion is stationary. This is an important step in obtaining a meaningful regression analysis. A time series is considered stationary when the statistical properties of the data, such as the mean, variance, and covariance of its distribution, remain constant over time (Dickey & Fuller, 1979). To determine stationarity, the Augmented Dickey-Fuller (ADF) Unit Root test is used. According to Table 5 (Appendix 2), GDP growth, population growth, life expectancy at birth, dependency ratios, and export growth rates are stationary at levels, while annual inflation rate and urban population growth rate are stationary at first difference, as indicated by ADF test statistic values. Therefore, we conclude that all variables in the dataset are integrated either at levels or at first difference, which justifies the usage of ARDL. Testing for stationarity is essential to establish a solid conclusion regarding the relationship between the variables under study.

To estimate our model effectively, we must determine the appropriate lag length for each variable. This is a crucial step to reduce residual correlation. To ensure optimal lag selection, we can use three criteria: *Akaike Information Criteria*, *Schwarz Bayesian Criteria*, and *HannanQuinn Criteria*. While all three criteria estimate the order of lag consistently, the Akaike Information Criterion tends to overestimate the lag's order with positive probability (Lütkepohl, 1991). To get the lag selection, we apply the Vector Autoregression model before identifying assumptions about the short-run and long-run association between our two main variables. Based on the results presented in Table 6 (Appendix 2), the guideline to select the lag is the lower value of each criterion. By choosing a lag of 4, we can optimize the accuracy of upcoming tests.

The authors have employed the *Autoregressive Distributed Lag approach of co-integration "ARDL"*[22] to capture the short- and long-term linkages between the variables under review. This approach incorporates the lags of both independent and dependent variables as regressors in the regression equation. Therefore, before estimating the ARDL model, the *Autoregressive Distributed Lag Bound Test* (Pesaran, Shin, & Smith, 2001) is used to check if there is a co-integration between the variables. The test results presented in Table 7 (Appendix 2) show that the value of the F-Statistic[23] is 8.17, which means the authors must reject the null hypothesis and accept the presence of a long-term correlation between the variables under scope. This assumption answers our first sub-question in this study's objectives: between 1969 and 2019, there was a consistent correlation between Egypt's population growth rate and its economic growth.

The authors estimate the long-run coefficients of the variables to determine whether there is a positive or negative long-term relationship between population growth and economic growth. Unlike the previous study performed by Mohamed and Schachler (2016) suggesting that the negative

---

[22] H_0: no long-run relationship between the variables. H_1: there is a long-run relationship between variables.

[23] If the F-Statistic is higher than the upper bound, then we conclude the existence of a long-run relationship. If it is less than the upper bound, we accept the null hypothesis and conclude there is no long-run relationship between the variables. However, if the F-Statistic falls between the lower and upper bounds, we conclude that the results are inconclusive.

relationship between economic and population growth rates in Egypt diminishes in the long term, this study presents different results. Based on the estimates displayed in Tables 8 and 9 (Appendix 2), we can conclude that all the variables are significant in the long run except for the export growth rates. As expected, the population growth rate affects negatively Egypt's economic growth in the long run. and if the population growth rate increases by 1%, the GDP growth rate will decrease by 10.63% in the long run. This supports the Malthusian theory and indicates that rapid population growth is a burden on the Egyptian's economic growth in the long run. More people require more food, more production, more job opportunities, a better education system as well as an improved healthcare system. Except for the export growth rates, which are not statistically significant, all other variables are significant and positively correlated with the GDP growth rate. However, the export growth rate does not affect the GDP growth rate in the long run. The adjusted R-squared at 67% implies that independent variables have a significant impact on the dependent variable, and the model is highly significant with a p-value of less than 5%.

The next step is to estimate the Error Correction Model (ECM) that is linked to the long-term estimates. The model's ARDL long-run dynamics will produce an error correction term, which must be statistically significant and have a negative sign. This term measures the speed of adjustment of the model back to the long-term equilibrium after a short-run shock. As presented in Table 10 (Appendix 2), the error correction term is negative (-0.80) and statistically significant (with a p-value of less than 5%). This means that there is a short-run relationship within the variables under scope, and the speed of adjustment of the model towards the long-run equilibrium is almost 80%. In other words, it takes more than 80 years for the GDP growth rate to adjust to the growing population.

From the results of the regression, all the variables are statistically significant. The population growth rate negatively affects the economic growth rate in the short run. If the population growth rate increases by 1%, the economic growth rate declines by 16.71%. This finding is consistent with other studies from the literature, such as Mohamed and Schachier's (2016) study, which also found a negative short-run relationship between population growth and economic growth.

Furthermore, the *Granger Causality*[24] *test* is employed to determine the direction of causation between the variables. The model results, reported in Table 11 (Appendix 2), summarize the fact that the population growth rate does not Granger cause the growth of the GDP (p-value= 0.6) and the GDP growth rate does not Granger cause the population growth (p-value=0.08). Therefore, there is no causal relationship between both variables. These findings are consistent with previous studies, including Kuhe (2019) who also found no causal relationship between these variables in Nigeria.

4.2 Goodness of fit for the model

Once the long- and short-term models have been estimated, it is crucial to examine the residual estimates of the model with diagnostic tests. In time series analysis, autocorrelation occurs when errors from one period affect subsequent periods. To check for serial correlation, the *Breusch-Godfrey Serial Correlation LM* Test is used. The authors report the results in Table 12 (Appendix 2) and do not reject the null hypothesis of no serial correlation. The Chi-Square (4) probability value was 9.1%, which is higher than the acceptable level of 5%.

Second, the present study adopts the *Breusch-Pagan-Godfrey* [25] *Heteroscedasticity Test*, as presented in Table 13 (Appendix 2). The authors accept the null hypothesis that there is homoscedasticity since the p-value is greater than 5%.

Third, to test for the normality of the econometric model, the authors apply the normality test. Figure 11 (Appendix 2) indicates that the model is normal and well-behaved because the *Jarque-Bera value* (19.28%) is higher than the 5% threshold.

Furthermore, the *Ramsey test* is carried out to test if there is a specification error in the model. From Table 14 (Appendix 2), the authors cannot reject the null hypothesis of no model specification problems given a p-value (0.16) greater than 5%.

[24] H_0: the variable x does not granger cause the variable y. H_1: the variable y does not granger cause the variable x.

[25] H_0: the variances for the errors are equal (i.e. homoscedasticity). H_1: the variances are not equal (i.e. Heteroscedasticity)

Finally, the present study performs the *CUSUM test* on the residuals to check if there are structural breaks in the regression. The model's results, reported in Figure 12 (Appendix 2), stated that since the blue line is positioned between the two critical lines, the parameters are therefore stable.

In light of the findings of this analysis, it is evident that the population growth rate has harmed Egypt's economic growth in both the short and long run. The Granger causality test shows that there is no causal relationship between these two variables. Therefore, an increase in the population growth rate does not lead to higher economic growth, nor the latter can lead to the former. To further validate the model's reliability, the authors applied numerous statistical tools that confirm the absence of heteroscedasticity, serial correlation, and specification error. Additionally, all parameters followed the normal distribution, and the model was both stable and significant.

5 Concluding Remarks and Policy Implications

In conclusion, the impact of overpopulation on the economic growth and development of a country has always been a subject of debate among experts. There are two primary schools of thought regarding the link between population growth and economic growth. The first is the optimistic approach, which argues that overpopulation leads to an increase in economic growth. The second is the pessimistic approach, which suggests a negative correlation between the two variables, citing increased economic burdens as the reason for this association.

This paper is an empirical analysis of the relationship between population growth rate and economic growth in Egypt from 1969 to 2019. The authors use an Auto Regressive Distributed Lag Model 'ARDL' to reveal the impact of overpopulation on Egypt's economic growth. The study uses data from the World Bank, including variables such as GDP growth, population growth rate, life expectancy at birth, inflation rates, urban population growth rate, dependency ratios, and export growth rates. The results show that population growth has a negative association with economic growth in Egypt in the long and short run. However, the study does not establish a causal relationship between the two variables.

Our second sub-goal is to identify the challenges that Egypt faces after proving the negative impact of rapid population growth. The authors highlight the challenges as follows. Firstly, fertility rate trends differ across Egypt's governorates. In contrast to urban areas, fertility rates are still high in many rural governorates, which hampers economic growth and poses health risks for women and children. It also reduces access to education, nutrition, employment, and clean water, thereby decreasing the quality of life. Secondly, the fertility replacement rate[26] in Egypt is 2.1 births per woman, while the fertility rate was 3.28 in 2019 (World Development Indicators, 2019). As a result, the population will continue to grow for several years due to the population momentum. This phenomenon is a powerful demographic force that occurs after the demographic transition (Zohry, 2005; Khalifa et al., 2012). It happens when a significant number of women are in their reproductive years (15-49 years old), leading to an overall increase in the number of births despite the decreasing fertility rate. Therefore, the sooner the government intervenes to reduce fertility rates, the lower the number of children added to the population through the population momentum.

Egypt is facing a significant challenge due to its population's age structure. Although fertility rates have been decreasing, there has been an increase in the number of young people entering childbearing years. In conjunction with the decrease in number of children, the number of working-age population increases. For instance, the working-age population has increased from 54.4% in 1985 to 65.2% in 2019. Therefore, it is essential to anticipate this age group's growth to avoid high unemployment rates in the future.

Finally, difference in income levels remains a persistent challenge faced by the government. Income in developing countries like Egypt remains low when compared to developed countries like Europe, Japan, and North America during their fastest population growth periods before the demographic transition they are currently experiencing. Poverty rates are still high: 29.7% in 2019, according to CAPMAS. In addition, political and social institutions are less well-established, and human and physical capital are less developed.

---

[26] It is the level at which the population replaces the preceding one to achieve a 0% population growth rate. The replacement fertility rate fluctuates with mortality rates: the higher the mortality rates in a country, the higher the replacement fertility rate. On average, the rate is estimated to be 2.1 births/woman.

The research indicates that Egypt's economy and its "Vision 2030" goals cannot be achieved without addressing the problems caused by rapid population growth. Although it is risky to draw policy conclusions from a single study, the paper presents some policy implications to achieve moderate population growth rates in the future.

Firstly, family planning programs need to be taught in schools to tackle the problem of high fertility rates, especially in rural areas. Changing the mindset of citizens is a crucial step in changing the tradition of having large families in rural Egypt.

Second, contraceptives must be provided for free, and the government must ensure all women, especially in remote areas, have access to them. In addition, information and access to reproductive health care should be available for all the population. Implementing other family planning programs, and advertising campaigns such as 'Two is Enough' will also be necessary to increase citizens' awareness of overpopulation threats.

Third, the government can encourage women's empowerment by providing them with higher education, more stable job opportunities, and achieving gender equity. Women's participation in the labor force has a massive role in reducing fertility rates (Atake & Gnakou, 2019).

Fourth, the government can benefit from the mass media to raise young couples' awareness of adopting a "small family" policy to generate more income, save more, and, improve the household's socio-economic conditions. Finally, the government and non-governmental organizations (NGOs) must coordinate to share awareness among the youth regarding marriage without having an earning source. Moreover, increasing public expenditures to fund the family planning program will help get positive results. The private sector also has to cooperate with the government to create more job opportunities for youth, and in particular for women, to reduce the economic burden falling on the government.

In future studies, it is important to consider the impact of macroeconomic and socioeconomic variables that affect both population growth and economic growth in Egypt. Factors such as mortality rates and fertility rates should be taken into account, as well as net migration rates, labor participation rates, and contraceptive rates. These variables have been shown in the literature to have a dual impact on population growth and economic growth in several countries. Therefore, they should not be neglected in any analysis of Egypt's growth prospects.

References

Adediran, O.A. (2012). Effect of Population on Economic Development in Nigeria: A Quantitative Assessment. *IJPSS, Vol.2(5):1-14.*

Asaad, R. (2020). Prospects for Egypt's Population and Labor Force: 2000 to 2050, *Working Papers 1398, Economic Research Forum*.

Atake, EH., & Gnakou A.P. (2019). Women's empowerment and fertility preferences in high fertility countries in Sub-Saharan Africa. *BMC Women's Health* 19**,** 54

Baum, F., Musolino, C., Gesesew, H., & Popay, J. (2021). New Perspective on Why Women Live Longer Than Men: An Exploration of Power, Gender, Social Determinants, and Capitals. *International Journal of Environmental Research and Public Health. 18. 661*.

Befikadu, A. (2021). An Empirical Analysis of the Effects of Population Growth on Economic Growth in Ethiopia using an Auto Regressive Distributive Lag (ARDL) Model Approach.

Bloom, D.E. & Williamson, J.G. (1998). Demographic Transition and Economic Miracles in Emerging Asia, *The World Bank Economic Review, Vol. 12, No. 3, pp. 419-455.*

Bloom, D. E., Canning, D., & Sevilla, J. (2003). The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change (1st ed.). RAND Corporation

Bongaarts, J. (2009). Human population growth and the demographic transition. *Philosophical Transactions of the Royal Society of London, Series B, Biological Sciences. 364. 2985-90.*

Boserup, E. 1965. The conditions of Agricultural Growth. *The Economics of Agrarian Change under Population Pressure, London*

Bruton, H. J. (1983). Egypt's Development in the Seventies. *Economic Development and Cultural Change*, *31*(4), 679–704

Chao, D.N. (2005). Family Planning in Egypt is a Sound Financial Investment.

Coale, A.J. and Hoover, E.M. (1958) Population Growth and Economic Development in Low-Income Countries. *Princeton University Press, Princeton, 6-25.*

Ehrlich, P. (1968). "The Population Bomb (1968)". *The Future of Nature: Documents of Global Change*, edited by Libby Robin, Sverker Sörlin and Paul Warde, New Haven: Yale University Press, 2013, pp. 54-62.

Ezzat, M. (2018). The effect of exchange rate movements on trade balance performance in Egypt: Is there a J-curve phenomenon? *Scientific Journal of Economics and Commerce, 48, pp. 692-659.*

Fullerton, T., Walke, A. & Villavicencio, D. (2015). An Econometric Approach for Modeling Population Change in Doña Ana County, New Mexico. *Journal of Finance and Economics. 3. 20-28.*

Furuoka, F. (2009). Population Growth and Economic Development: New Empirical Evidence from Thailand. Economics Bulletin

Galal, M. (2021). Causal link between the government expenditure and economic growth in Egypt over the period from 1952 to 2020. *Systematic Reviews in Pharmacy.*

Hellen, J. A. (1981). The Delivery of Family Planning Services in Egypt with particular Reference to Population Policy and Health Care Planning. *GeoJournal*, *5*(4), 369–384.

Keynes, J.M. (1937). Some economic consequences of a declining population, in J.M. Keynes, *Collected Writings XIV, London: Macmillan, pp. 124-133.*

Khalifa, M., DaVanzo, J. & Adamson, D. (2012). Population Growth in Egypt. *A Continuing Policy Challenge.*

Kothare, R. (1999). Does India's Population growth has a Positive Effect on Economic Growth, *Social Science 410, pp. 2-14.*

Krafft, C. & Assaad, R. (2014). Beware of the Echo: The Impending Return of Demographic Pressures in Egypt. *Economic Research Forum Policy Perspective.*

Kuhe, D. (2019). The Impact of Population Growth on Economic Growth and Development in Nigeria: An Econometric Analysis. 3. 100-111.

Kutner, M.H., Nachtsheim, C.J. and Neter, J. (2004) Applied Linear Regression Models. *4th Edition, McGraw-Hill/Irwin, New York.*

Kuznets, S. (1955). Economic Growth and Income Inequality. *The American Economic Review, 45(1), 1–28.*

Lütkepohl, H. (1991). Introduction to Multiple Time Series Analysis. *Springer Publishing Company, Incorporated*

Mahmud, M.A. (2015). Econometric Model on Population Growth and Economic Development in India: An Empirical Analysis.

Malthus, T.R. (1798). An Essay on the Principle of Population. *J. Johnson, in St. Paulís Church-Yard, London, UK.*

Mamingi, N., & Perch, J. (2013). Population Growth and Economic Growth/Development: An Empirical Investigation for Barbados. *Journal of economics and sustainable development.*

Marx, K. (1867). Capital: A critique of political economy. *Volume 1, Part 1: The process of capitalist production. New York, NY: Cosimo*

Mohamed, G.G.A., & Schachler, M.H. (2016). Population Growth and Transitional Dynamics of Egypt Theoretical Analysis & Time Series Analysis from 1981 to 2007. *International Journal of Asian Social Science, 7(2), 110–118.*

Nassar, H, Osman, M. & Ekhishin, S. (2017). A Micro-Investigation of the reasons behind the slowdown of Demographic transition in Egypt: Will Egypt Witness a Demographic Window?, *International Journal of Economic Research, 14, 289-325.*

Pesaran, M.H. & Shin, Y. (1998). An Autoregressive Distributed-Lag Modelling Approach to Cointegration Analysis. *Econometrics and Economic Theory in the 20th Century: The Ragnar*

Pesaran, M.H., Shin, Y. & Smith, R. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics 16(3): 289–326.*

Simon, J.L. (1981). The Ultimate Resource. *Princeton: Princeton University Press.*

Simon, J.L. (1983). The Effects of Population on Nutrition and Economic Well-Being. *The Journal of Interdisciplinary History*, *14*(2), 413–437.

Tartiyus, E.H., Dauda, M.I & Peter, A. (2015). Impact of Population Growth on Economic Growth in Nigeria (1980-2010). *IOSR Journal of Humanities and Social Science, 20 (4), 115-123*

Todaro, M. P., & Smith, S.C. (2015). *Economic Development* (Ed. 12th). Harlow: Pearson.

UNFPA. (2016). Monitoring progress towards a demographic dividend.

Wisensale, S. K., & Khodair, A.A. (1998). The Two-child Family: The Egyptian Model of Family Planning. *Journal of Comparative Family Studies, 29(3), 503–516.*

World Bank. (2015). A roadmap to achieve social justice in health care in Egypt. *International Bank for Reconstruction and Development / The World Bank, Washington, DC.*

World Bank. (2019). The Changing Nature of Work. World Development Report. *International Bank for Reconstruction and Development / The World Bank, Washington, DC.*

Youssef, H. *et al.* (2014). Responding to Rapid Population Growth in Egypt. *Population Reference Bureau, 48 (1).*

Youssef, H. and Zaki, C. (2019). From Currency Depreciation to Trade Reform: How to Take Egyptian Exports to New Levels?*, Policy Research Working Paper No. 8809*, *The World Bank.*

Zahan, I. (2016). The Long Run Relationship between Population Growth and Economic Growth: Empirical Evidence from Bangladesh. *BRAC Institute of Governance and Development.*

Zaky, H. (2009). The Timing of the Demographic Dividend in Egypt.

Zinkina, J. & Korotayev, A. (2013). Urbanization Dynamics in Egypt: Factors, Trends, Perspectives. *Arab Studies Quarterly, 35(1), 20–38*.

Zohry, A. (1997). Population Policies and Family Planning Program in Egypt: Evolution and Performance.

Appendix 1: Descriptive Statistics

Table 1: Descriptive Statistics Results

	GDP_GRO..	DEPENDE.	POPULA.	EXPORT..	URBANI.	LIFE_EX..	ANNUAL INF.
Mean	5.2023	74.7963	2.1884	20.2997	2.2811	64.3592	10.9886
Median	4.7445	80.3730	2.1758	18.9119	2.0890	66.2980	10.3172
Maximum	13.2796	85.491	2.7085	33.0429	3.3439	71.9900	29.5066
Minimum	1.1254	59.6147	1.7516	10.3454	1.6985	51.8650	2.1023
Std. Dev.	2.4294	9.7350	0.2688	5.8308	0.4621	6.4092	6.2008
Jarque-Bera	11.9182	6.7958	2.3551	3.2113	5.591	5.3134	3.5310
Probability	0.0025	0.0334	0.3080	0.2007	0.0410	0.0201	0.1710
Sum	265.3206	3814.614	111.612	1035.287	116.3372	3282.234	660.4220
Sum Sq. Dev.	295.1089	4738.479	3.6132	1699.944	10.6775	2053.937	1922.553
Observations	51	51	51	51	51	51	51

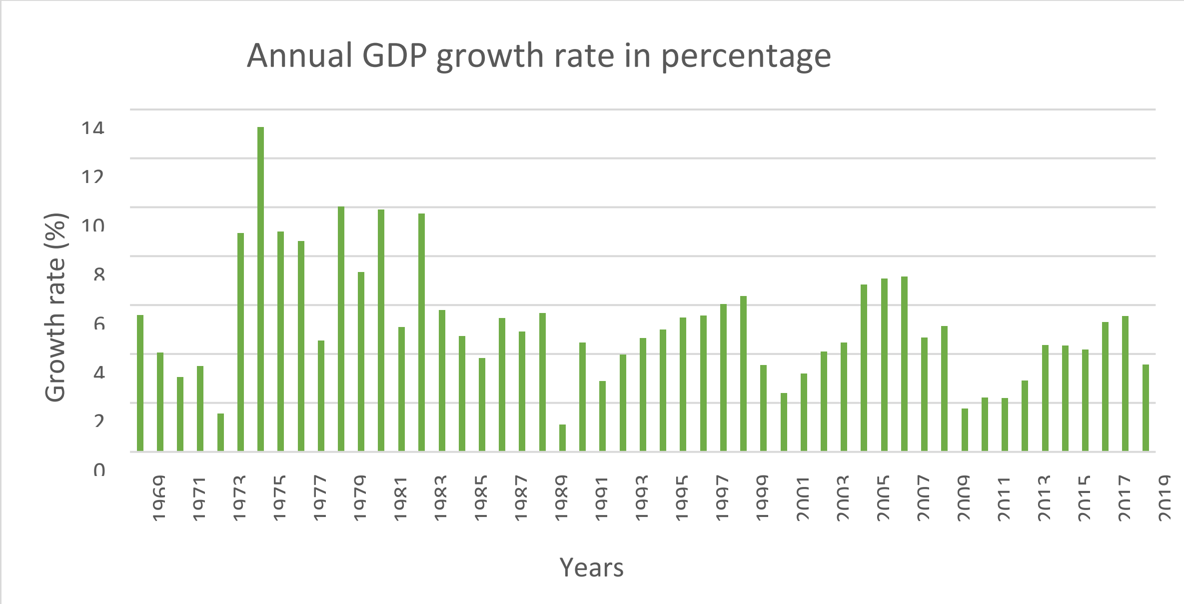
Source: Calculated by the authors using Word Development Indicators from the World Bank, Egypt, 1969-2019

Table 2: Correlation Matrix

	GDP_GRO..	POPULATI.	DEPENDE.	ANNUAL_IN..	EXPORTS.	URBANI.	LIFE_EX..
GDG..	1	-0.1375	-0.2807	0.1038	0.2961	0.2821	-0.3549
POPU...	-0.1375	1	0.6551	0.4411	-0.2950	0.6128	-0.5453
DEPE..	-0.2807	0.6551	1	0.0962	-0.1181	0.6347	-0.8376
ANNU..	0.1038	0.4411	0.0962	1	0.1901	-0.1026	0.0987
EXPO.	0.2961	-0.2951	-0.1181	0.1901	1	-0.4226	0.1449
URBAN..	0.2821	0.6128	0.6347	-0.1026	-0.4226	1	-0.8828
LIFE_E..	-0.3549	-0.5453	-0.8377	0.0987	0.1449	-0.8828	1

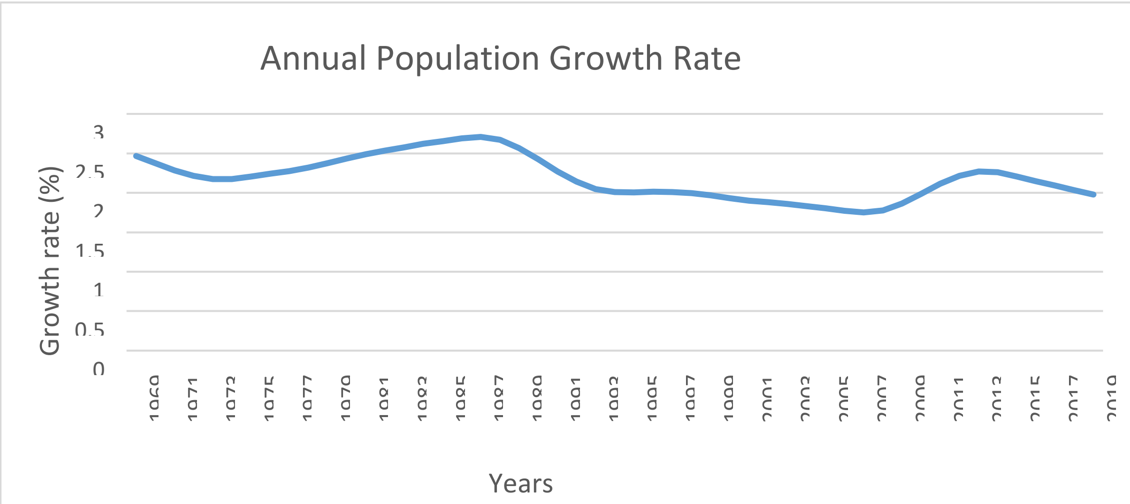
Source: Calculated by the authors using Word Development Indicators from the World Bank, Egypt, 1969-2019

Figure 1 Annual GDP Growth Rate between 1969 and 2019



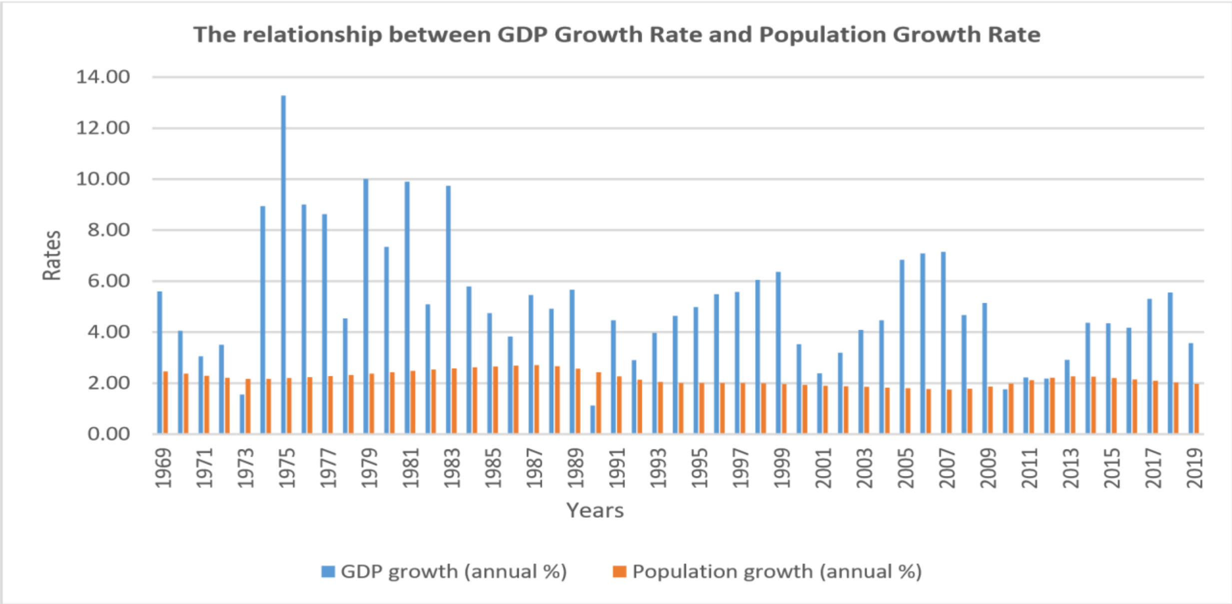
Source: Constructed by the authors using Word Development Indicators from the World Bank, Egypt, 1969-2019

Figure 2: Annual Population Growth Rate between 1969 and 2019



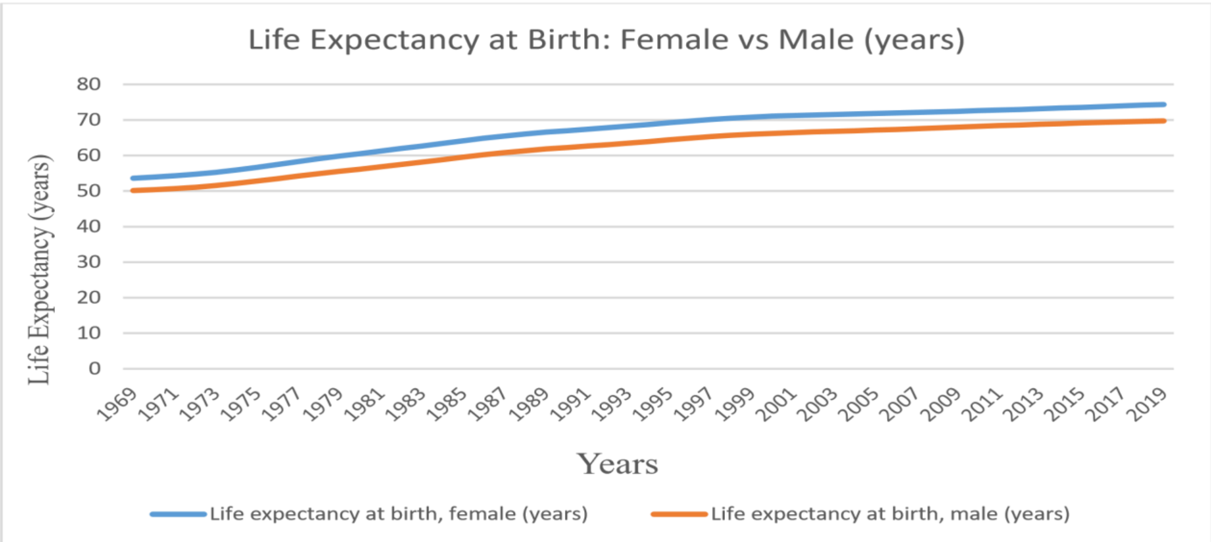
Source: Constructed by the authors using Word Development Indicators from the World Bank, Egypt, 1969-2019

Figure 3 The GDP Growth Rate and Population Growth Rate in Egypt



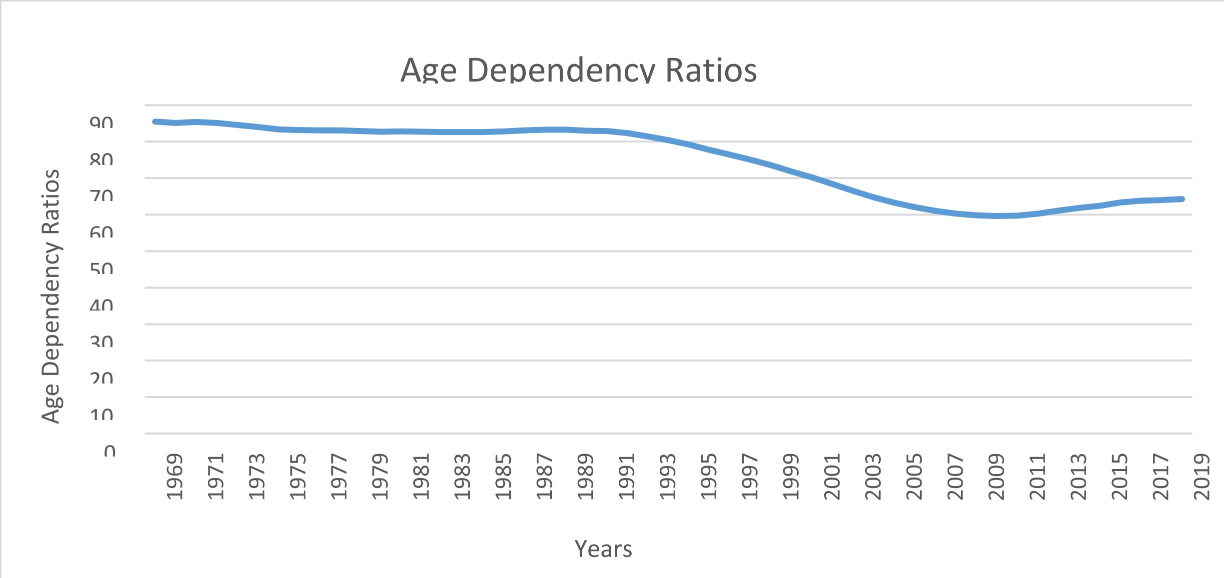
Source: Constructed by the authors using data from the World Development Indicators, Egypt, 1969-2019.

Figure 4: Persistent Gap in life expectancy at birth between genders



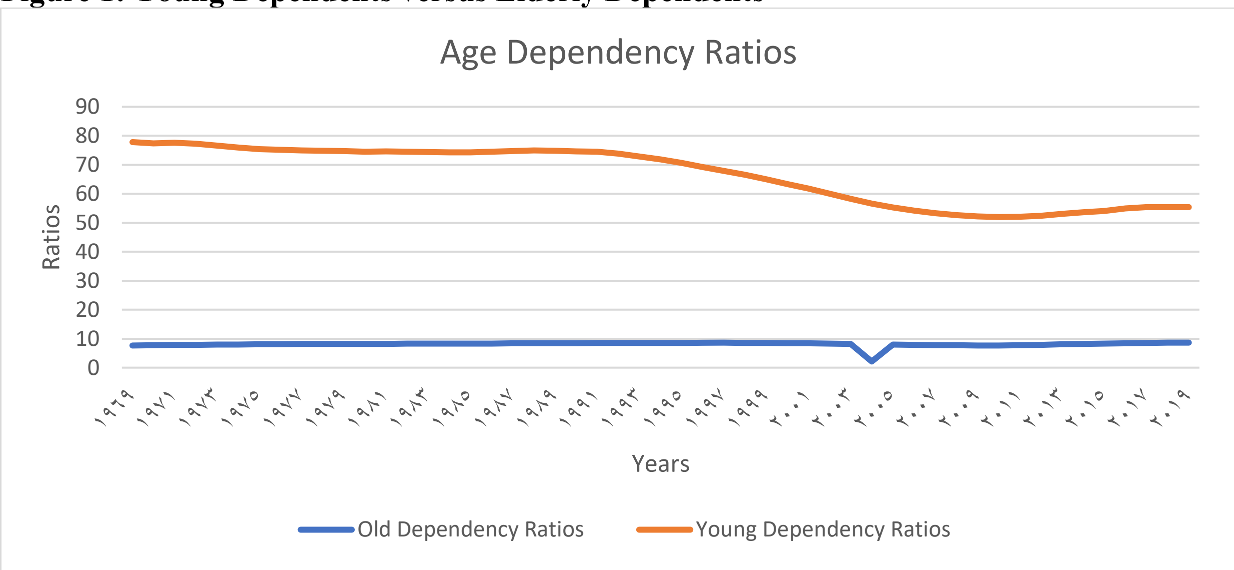
Source: Constructed by the authors using data from the World Development Indicators, Egypt, 1969-2019.

Figure 5: Age Dependency Ratios Trend



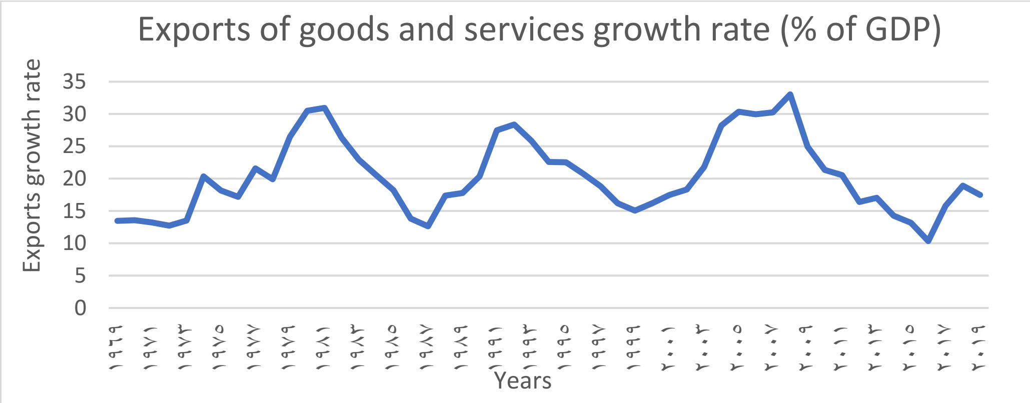
Source: Constructed by the authors using data from the World Development Indicators, Egypt, 1969-2019.

Figure 1: Young Dependents versus Elderly Dependents



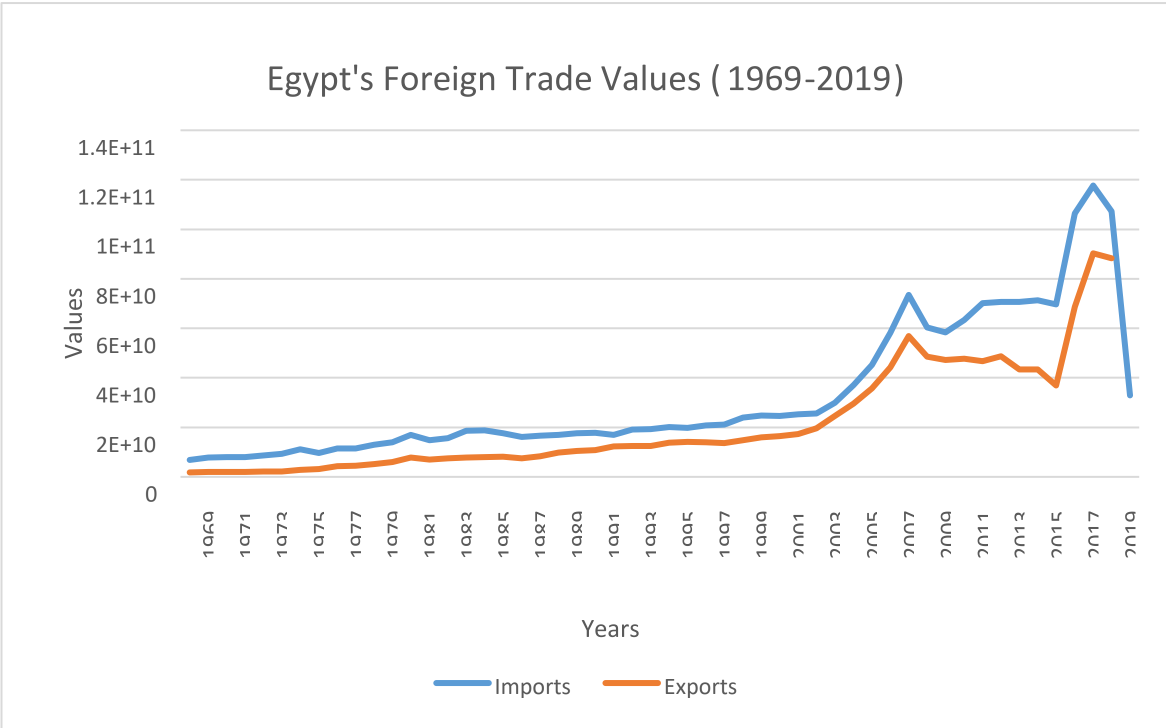
Source: Constructed by the authors using data from the World Development Indicators, Egypt, 1969-2019.

Figure 2: Exports growth as a percentage of the total GDP in Egypt



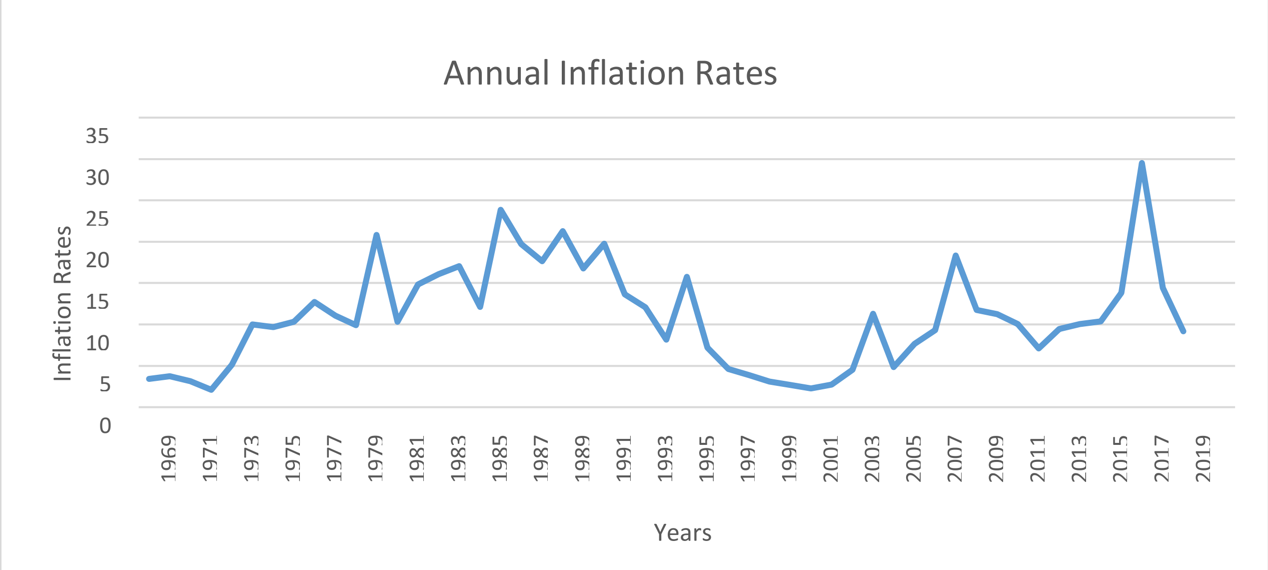
Source: Constructed by the authors using data from the World Development Indicators, Egypt, 1969-2019.

Figure 8: Egypt's Foreign Trade Values from 1969 to 2019



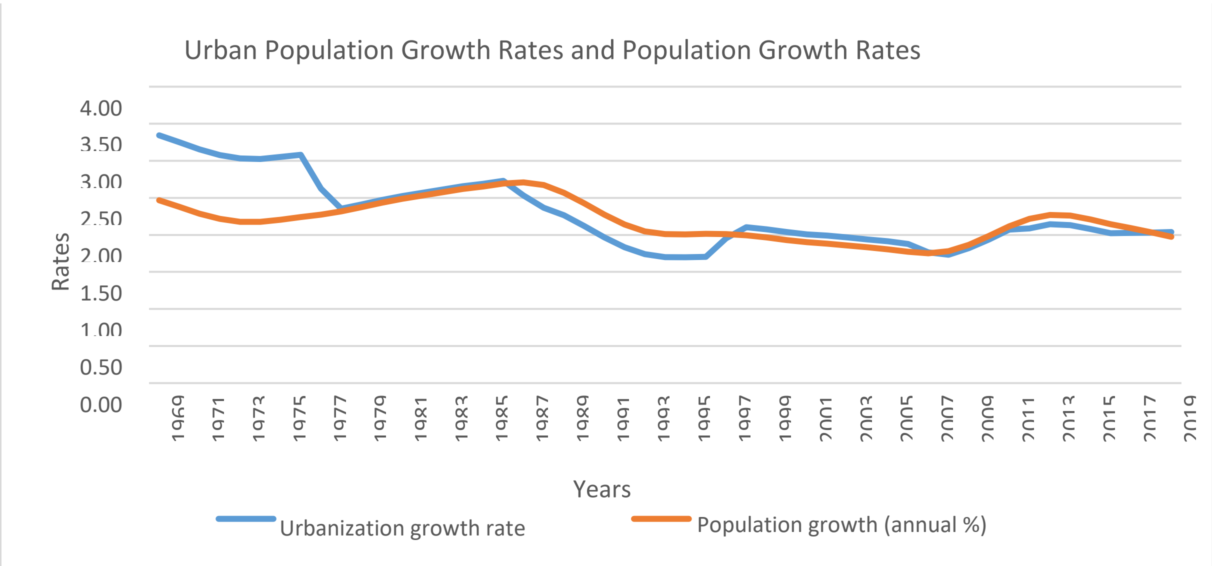
Source: Constructed by the authors using data from the World Development Indicators, Egypt, 1969-2019.

Figure 9: Annual Inflation Rates Trend



Source: Constructed by the authors using data from the World Development Indicators, Egypt, 1969-2019.

Figure 10: Urban Population Growth Rates versus Population Growth Rates



Source: Constructed by the authors using data from the World Development Indicators, Egypt, 1969-2019.

Appendix 2: Estimation Methodology and Empirical Results

Table 1: Variance Inflation Factor Using Equation (1)

Sample: 1969 2020
Included observations: 51

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	959.7631	1269351.	NA
LOG_CRUDE_DEAT...	25.59804	30023.01	747.1912
LOG_EXPORTS_GR...	0.115724	257.0523	2.320446
LOG_FERTILITY_RA...	4.932703	2629.521	81.69850
LOG_LIFE_EXPECT...	228.1001	984985.3	596.8645
LOG_POPULATION_...	3.874977	596.0192	14.13795

Source: Calculated by the authors using Word Development Indicators, Egypt, 1969-2019

Table 4 Variance Inflation Factors using Equation (2)

Sample: 1969 2020
Included observations: 51

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	118.8013	150875.2	NA
LOG_POPULATION_...	1.210797	178.8304	4.241969
LOG_DEPENDENCY...	0.897809	3991.396	3.843452
LOG_INFLATION_RA...	0.022222	28.29311	2.317553
LOG_LIFE_EXPECT...	1.441090	5975.504	3.620933
LOG_URBANIZATIO...	51.26891	173884.6	2.503094
LOG_EXPORTS_GR...	0.114719	244.6876	2.208828

Source: Calculated by the authors using Word Development Indicators, Egypt, 1969-2019

Table 5 Augmented Dickey Fuller Test Results

		At levels I(0)				At 1st difference				Integration
		T-Statistics	*Critical values*		*P-Value*	*T-Statistics*	*Critical Values*		*P-Value*	
Variables			1%	5%			1%	5%		
GDP	Without Trend	-3.47	-3.574	-2.923	0.0128	-10.60	-3.571	-2.92	0.0000	I(0)
	With Trend	-3.98	-4.161	-3.50	0.0159	-10.49	-4.156	-3.50	0.0000	
POP	Without Trend	-1.62	-3.605	-2.936	0.4601	-1.96	-3.610	-2.93	0.3003	I(0)
	With Trend	-3.76	-4.205	-3.52	0.0292	-1.917	-4.21	-3.52	0.626	
INF	Without Trend	-0.65	-3.571	-2.92	0.8474	-4.70	-3.57	-2.92	0.0004	I(1)
	With Trend	-1.831	-4.15	-3.50	0.6741	-4.655	-4.156	-3.50	0.0025	
LEX	Without Trend	-2.90	-3.58	-2.928	0.0525	-1.627	-3.596	-2.93	0.4599	I(0)
	With Trend	-4.20	-4.19	-3.52	0.0009	-2.236	-4.180	-3.51	0.4579	
EXP	Without Trend	-4.76	-3.58	-2.92	0.0003	-4.259	-3.59	-2.9	0.0016	I(0)
	With Trend	-4.64	-4.17	-3.51	0.0028	-4.387	-4.192	-3.52	0.006	
DEP	Without Trend	-7.36	-3.56	-2.92	0.0000	-6.235	-3.588	-2.92	0.0000	I(0)
	With Trend	-7.28	-4.152	-3.502	0.000	-6.15	-4.180	-3.51	0.0000	
URB	Without Trend	-2.224	-3.57	-2.92	0.2003	-3.804	-3.571	-2.92	0.0053	I(1)
	With Trend	-2.471	-4.156	-3.504	0.3404	-3.886	-4.156	-3.50	0.0201	

Source: Calculated by the authors using Word Development Indicators, Egypt, 1969-2019

Table 6 Vector Auto Regression Output for Optimum Lag Order Selection 'VAR'

VAR Lag Order Selection Criteria
Endogenous variables: LOG_GDP_GROWTH LOG_POPULATION_GROWTH_RATE...
Exogenous variables: C

Sample: 1969 2020
Included observations: 47

Lag	LogL	LR	FPE	AIC	SC	HQ
0	549.6576	NA	2.21e-19	-23.09181	-22.81626	-22.98812
1	1144.675	987.4754	1.83e-29	-46.32659	-44.12216	-45.49705
2	1332.418	255.6508	5.75e-32	-52.23057	-48.09726	-50.67518
3	1493.053	170.8876	7.35e-34	-56.98097	-50.91878	-54.69973
4	1617.471	95.29890*	7.24e-35*	-60.19024*	-52.19918*	-57.18315*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Calculated by the authors using Word Development Indicators, Egypt, 1969-2019

Table 7 ARDL Bound Test Results

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	8.176854	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99
Actual Sample Size	47		Finite Sample: n=50	
		10%	2.17	3.22
		5%	2.55	3.708
		1%	3.424	4.88
			Finite Sample: n=45	
		10%	2.188	3.254
		5%	2.591	3.766
		1%	3.54	4.931

Source: Calculated by the authors using Word Development Indicators, Egypt, 1969-2019

Table 8 ARDL Model Estimation Results

Dependent Variable: LOG_GDP_GROWTH
Method: ARDL
Sample (adjusted): 1973 2019
Included observations: 47 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LOG_DEPENDENCY_RATIOS
LOG_EXPORTS_GROWTH_RATE LOG_INFLATION_RATES
LOG_LIFE_EXPECTANCY_AT_BIRTH LOG_POPULATION_GROWTH_
RATE LOG_URBANIZATION_GROWTH_RATE
Fixed regressors: C
Number of models evaluated: 62500
Selected Model: ARDL(4, 0, 0, 2, 3, 3, 4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG_GDP_GROWTH(-1)	-0.422531	0.146435	-2.885447	0.0081
LOG_GDP_GROWTH(-2)	-0.222383	0.134302	-1.655849	0.1108
LOG_GDP_GROWTH(-3)	-0.287057	0.137297	-2.090779	0.0473
LOG_GDP_GROWTH(-4)	-0.274434	0.142563	-1.925001	0.0662
LOG_DEPENDENCY_RATIOS	-22.93037	5.279255	-4.343485	0.0002
LOG_EXPORTS_GROWTH_RATE	0.378113	0.440048	0.859253	0.3987
LOG_INFLATION_RATES	0.070446	0.192427	0.366092	0.7175
LOG_INFLATION_RATES(-1)	0.071467	0.164393	0.434730	0.6676
LOG_INFLATION_RATES(-2)	-0.419596	0.133284	-3.148148	0.0044
LOG_LIFE_EXPECTANCY_AT_BIRTH	117.3037	581.9921	0.201556	0.8420
LOG_LIFE_EXPECTANCY_AT_BIRTH(-1)	-213.9347	1531.083	-0.139728	0.8900
LOG_LIFE_EXPECTANCY_AT_BIRTH(-2)	811.2610	1432.450	0.566345	0.5764
LOG_LIFE_EXPECTANCY_AT_BIRTH(-3)	-726.0515	486.9017	-1.491166	0.1489
LOG_POPULATION_GROWTH_RATE	-44.28515	12.88336	-3.437391	0.0022
LOG_POPULATION_GROWTH_RATE(-1)	96.39184	31.89449	3.022210	0.0059
LOG_POPULATION_GROWTH_RATE(-2)	-106.2251	33.52381	-3.168647	0.0041
LOG_POPULATION_GROWTH_RATE(-3)	57.77647	16.74663	3.450036	0.0021
LOG_URBANIZATION_GROWTH_RATE	3.359848	1.566416	2.144927	0.0423
LOG_URBANIZATION_GROWTH_RATE(-1)	-2.401568	2.393710	-1.003283	0.3257
LOG_URBANIZATION_GROWTH_RATE(-2)	-0.972648	2.481255	-0.391998	0.6985
LOG_URBANIZATION_GROWTH_RATE(-3)	0.569897	2.329106	0.244685	0.8088
LOG_URBANIZATION_GROWTH_RATE(-4)	-5.211866	1.830081	-2.847888	0.0089
C	62.86203	21.22681	2.961445	0.0068

R-squared	0.828890	Mean dependent var	0.674820
Adjusted R-squared	0.672040	S.D. dependent var	0.219147
S.E. of regression	0.125501	Akaike info criterion	-1.006384
Sum squared resid	0.378009	Schwarz criterion	-0.100993
Log likelihood	46.65003	Hannan-Quinn criter.	-0.665680
F-statistic	5.284586	Durbin-Watson stat	2.217137
Prob(F-statistic)	0.000074		

*Note: p-values and any subsequent tests do not account for model selection.

Source: Calculated by the authors using Word Development Indicators, Egypt, 1969-2019

Table 9 Long Run Elasticity Output

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_POPULATION_G...	-10.63830	1.757263	-6.053904	0.0000
LOG_DEPENDENCY_...	0.001756	0.000250	7.029818	0.0000
LOG_INFLATION_RATES	0.279761	0.071683	3.902766	0.0009
LOG_LIFE_EXPECTAN...	4.347571	2.054661	2.115956	0.0471
LOG_URBANIZATION_...	29.02397	13.43736	2.159945	0.0431
LOG_EXPORTS_GRO...	-0.632860	0.435944	-1.451701	0.1621
C	-51.49514	18.46596	-2.788652	0.0113

EC = LOG_GDP_GROWTH - (-10.6383*LOG_POPULATION_GROWTH_RATE + 0.0018*LOG_DEPENDENCY_RATIOS + 0.2798*LOG_INFLATION_RATES + 4.3476*LOG_LIFE_EXPECTANCY_AT_BIRTH + 29.0240 *LOG_URBANIZATION_RATES -0.6329*LOG_EXPORTS_GROWTH_RATE - 51.4951)

Source: Calculated by the authors using Word Development Indicators, Egypt, 1969-2019

Table 10 Error Correction Modelling Results

ARDL Error Correction Regression
Dependent Variable: D(LOG_GDP_GROWTH)
Selected Model: ARDL(4, 4, 4, 4, 4, 4, 4)
Case 2: Restricted Constant and No Trend
Date: 05/15/22 Time: 19:28
Sample: 1969 2020
Included observations: 47

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG_GDP_GROWTH...	-0.227581	0.091925	-2.475725	0.0292
D(LOG_GDP_GROWTH...	-0.382478	0.090873	-4.208950	0.0012
D(LOG_GDP_GROWTH...	-0.636678	0.093835	-6.785054	0.0000
D(LOG_DEPENDENCY...	14.06359	2.665020	5.277105	0.0002
D(LOG_DEPENDENCY...	12.47591	5.226057	2.387252	0.0343
D(LOG_DEPENDENCY...	-10.47715	5.820876	-1.799927	0.0970
D(LOG_DEPENDENCY...	-18.53657	3.980823	-4.656467	0.0006
D(LOG_LIFE_EXPECT...	-25.76748	30.72718	-0.838589	0.4181
D(LOG_LIFE_EXPECT...	-69.84713	88.81173	-0.786463	0.4468
D(LOG_LIFE_EXPECT...	407.5982	98.08680	4.155485	0.0013
D(LOG_LIFE_EXPECT...	-204.4549	38.84446	-5.263425	0.0002
D(LOG_POPULATION_...	-0.161755	0.584082	-0.276939	0.7865
D(LOG_POPULATION_...	1.211849	0.752688	1.610029	0.1334
D(LOG_POPULATION_...	-3.698980	0.685648	-5.394868	0.0002
D(LOG_POPULATION_...	-1.145443	0.383211	-2.989068	0.0113
D(LOG_INFLATION_RA...	11.83267	5.262191	2.248621	0.0441
D(LOG_INFLATION_RA...	16.70869	12.51317	1.335288	0.2066
D(LOG_INFLATION_RA...	54.91998	13.32930	4.120247	0.0014
D(LOG_INFLATION_RA...	-21.28196	6.286062	-3.385579	0.0054
D(LOG_EXPORTS_GR...	-0.001826	0.010582	-0.172590	0.8659
D(LOG_EXPORTS_GR...	-0.213768	0.021797	-9.807084	0.0000
D(LOG_EXPORTS_GR...	-0.110499	0.016294	-6.781593	0.0000
D(LOG_EXPORTS_GR...	-0.053653	0.013286	-4.038471	0.0016
D(LOG_URBANIZATION)	-0.010189	0.028077	-0.362871	0.7230
D(LOG_URBANIZATION...	-0.369437	0.045663	-8.090453	0.0000
D(LOG_URBANIZATION...	-0.213381	0.037908	-5.628866	0.0001
D(LOG_URBANIZATION...	-0.073351	0.035720	-2.053487	0.0625
CointEq(-1)*	-0.803701	0.059308	-13.55132	0.0000

R-squared	0.970646	Mean dependent var	0.022305
Adjusted R-squared	0.928933	S.D. dependent var	0.010181
S.E. of regression	0.002714	Akaike info criterion	-8.694955
Sum squared resid	0.000140	Schwarz criterion	-7.592739
Log likelihood	232.3314	Hannan-Quinn criter.	-8.280184
Durbin-Watson stat	2.677678		

* p-value incompatible with t-Bounds distribution.

Source: Calculated by the authors using Word Development Indicators, Egypt, 1969-2019

Table 11 Pairwise Granger Causality Tests

Sample: 1969 2020
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
LOG_DEPENDENCY_RATIOS does not Granger Cause LOG_GDP_GROWTH	47	1.24816	0.3072
LOG_GDP_GROWTH does not Granger Cause LOG_DEPENDENCY_RATIOS		0.90250	0.4722
LOG_EXPORTS_GROWTH_RATE does not Granger Cause LOG_GDP_GROWTH	47	1.29925	0.2877
LOG_GDP_GROWTH does not Granger Cause LOG_EXPORTS_GROWTH_RATE		1.30217	0.2866
LOG_INFLATION_RATES does not Granger Cause LOG_GDP_GROWTH	47	1.83791	0.1417
LOG_GDP_GROWTH does not Granger Cause LOG_INFLATION_RATES		0.03105	0.9981
LOG_LIFE_EXPECTANCY_AT_BIRTH does not Granger Cause LOG_GDP_GROWTH	47	1.77403	0.1542
LOG_GDP_GROWTH does not Granger Cause LOG_LIFE_EXPECTANCY_AT_BIRTH		0.32789	0.8575
LOG_POPULATION_GROWTH_RATE does not Granger Cause LOG_GDP_GROWTH	47	0.61112	0.6572
LOG_GDP_GROWTH does not Granger Cause LOG_POPULATION_GROWTH_RATE		2.19681	0.0877
LOG_URBANIZATION_GROWTH_RATE does not Granger Cause LOG_GDP_GROWTH	47	0.73648	0.5729
LOG_GDP_GROWTH does not Granger Cause LOG_URBANIZATION_GROWTH_RATE		1.81987	0.1451
LOG_EXPORTS_GROWTH_RATE does not Granger Cause LOG_DEPENDENCY_RATIOS	47	1.19536	0.3286
LOG_DEPENDENCY_RATIOS does not Granger Cause LOG_EXPORTS_GROWTH_RATE		0.45727	0.7665
LOG_INFLATION_RATES does not Granger Cause LOG_DEPENDENCY_RATIOS	47	0.52431	0.7184
LOG_DEPENDENCY_RATIOS does not Granger Cause LOG_INFLATION_RATES		0.55638	0.6956
LOG_LIFE_EXPECTANCY_AT_BIRTH does not Granger Cause LOG_DEPENDENCY_RATIOS	47	1.32217	0.2793
LOG_DEPENDENCY_RATIOS does not Granger Cause LOG_LIFE_EXPECTANCY_AT_BIRTH		0.45151	0.7706
LOG_POPULATION_GROWTH_RATE does not Granger Cause LOG_DEPENDENCY_RATIOS	47	1.89167	0.1319
LOG_DEPENDENCY_RATIOS does not Granger Cause LOG_POPULATION_GROWTH_RATE		1.22869	0.3149
LOG_URBANIZATION_GROWTH_RATE does not Granger Cause LOG_DEPENDENCY_RATIOS	47	1.38774	0.2566
LOG_DEPENDENCY_RATIOS does not Granger Cause LOG_URBANIZATION_GROWTH_RATE		0.55447	0.6970
LOG_INFLATION_RATES does not Granger Cause LOG_EXPORTS_GROWTH_RATE	47	0.92087	0.4619
LOG_EXPORTS_GROWTH_RATE does not Granger Cause LOG_INFLATION_RATES		2.00659	0.1131
LOG_LIFE_EXPECTANCY_AT_BIRTH does not Granger Cause LOG_EXPORTS_GROWTH_RATE	47	1.17145	0.3387
LOG_EXPORTS_GROWTH_RATE does not Granger Cause LOG_LIFE_EXPECTANCY_AT_BIRTH		0.98296	0.4284
LOG_POPULATION_GROWTH_RATE does not Granger Cause LOG_EXPORTS_GROWTH_RATE	47	0.12571	0.9723
LOG_EXPORTS_GROWTH_RATE does not Granger Cause LOG_POPULATION_GROWTH_RATE		1.53040	0.2129
LOG_URBANIZATION_GROWTH_RATE does not Granger Cause LOG_EXPORTS_GROWTH_RATE	47	1.70012	0.1701
LOG_EXPORTS_GROWTH_RATE does not Granger Cause LOG_URBANIZATION_GROWTH_RATE		2.99076	0.0306
LOG_LIFE_EXPECTANCY_AT_BIRTH does not Granger Cause LOG_INFLATION_RATES	47	1.07416	0.3828
LOG_INFLATION_RATES does not Granger Cause LOG_LIFE_EXPECTANCY_AT_BIRTH		3.76253	0.0113
LOG_POPULATION_GROWTH_RATE does not Granger Cause LOG_INFLATION_RATES	47	2.19668	0.0878
LOG_INFLATION_RATES does not Granger Cause LOG_POPULATION_GROWTH_RATE		0.70564	0.5930
LOG_URBANIZATION_GROWTH_RATE does not Granger Cause LOG_INFLATION_RATES	47	2.10537	0.0991
LOG_INFLATION_RATES does not Granger Cause LOG_URBANIZATION_GROWTH_RATE		1.57708	0.2002
LOG_POPULATION_GROWTH_RATE does not Granger Cause LOG_LIFE_EXPECTANCY_AT_BIRTH	47	1.59116	0.1965
LOG_LIFE_EXPECTANCY_AT_BIRTH does not Granger Cause LOG_POPULATION_GROWTH_RATE		3.39751	0.0180
LOG_URBANIZATION_GROWTH_RATE does not Granger Cause LOG_LIFE_EXPECTANCY_AT_BIRTH	47	1.47668	0.2284
LOG_LIFE_EXPECTANCY_AT_BIRTH does not Granger Cause LOG_URBANIZATION_GROWTH_RATE		1.29979	0.2875
LOG_URBANIZATION_GROWTH_RATE does not Granger Cause LOG_POPULATION_GROWTH_RATE	47	0.90861	0.4687
LOG_POPULATION_GROWTH_RATE does not Granger Cause LOG_URBANIZATION_GROWTH_RATE		2.38296	0.0684

Source: Calculated by the authors using Word Development Indicators, Egypt, 1969-2019

Table 12 Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 4 lags

F-statistic	1.858661	Prob. F(4,40)	0.1367
Obs*R-squared	7.993458	Prob. Chi-Square(4)	0.0918

Source: Calculated by the authors using Word Development Indicators, Egypt, 1969-2019

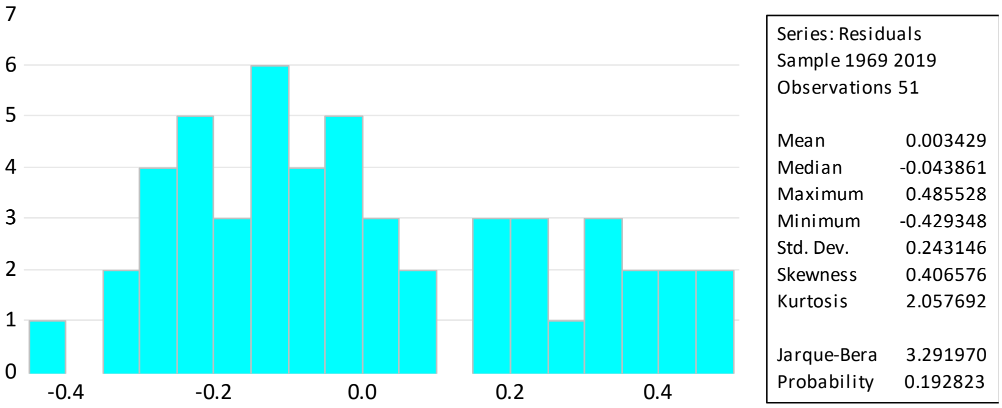
Table 13 Heteroscedasticity Test: Breusch-Pagan-Godfrey Test Results

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.192601	Prob. F(6,44)	0.9773
Obs*R-squared	1.305172	Prob. Chi-Square(6)	0.9714
Scaled explained SS	1.895355	Prob. Chi-Square(6)	0.9291

Source: Calculated by the authors using Word Development Indicators, Egypt, 1969-2019

Figure 11 Normality Test Results



Source: Constructed by the authors using Word Development Indicators, Egypt, 1969-2019

Table 2 Ramsey Test Results

	Value	df	Probability
t-statistic	1.409622	41	0.1662
F-statistic	1.987035	(1, 41)	0.1662
Likelihood ratio	2.318998	1	0.1278

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.074893	1	0.074893
Restricted SSR	1.620214	42	0.038577
Unrestricted SSR	1.545321	41	0.037691

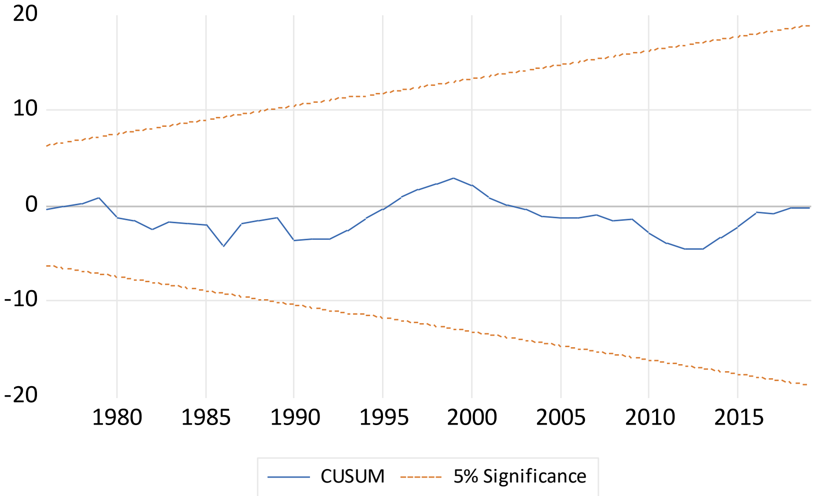
LR test summary:

	Value
Restricted LogL	13.99894
Unrestricted LogL	15.15844

Unrestricted Test Equation:
Dependent Variable: LOG_GDP_GROWTH
Method: Least Squares

Source: Calculated by the authors using Word Development Indicators, Egypt, 1969-2019

Figure 3 CUSUM Test Results



Source: Constructed by the authors using Word Development Indicators, Egypt, 1969-2019

أثر الزيادة السكانية على النمو الاقتصادي في مصر (1969-2019)

ملخص

في القرن الواحد والعشرين، قد اعتمدت التنمية الاقتصادية على مجموعة من العوامل أهمها النمو الاقتصادي الذي يعتمد بدوره على مجموعة أخرى من العوامل (Bongaarts, 2009). أحد أهم المتغيرات التي تؤثر على النمو الاقتصادي هي الزيادة السكانية (Kuhe, 2019). فإن تزايد السكان يمكن أن يؤثر على النمو الاقتصادي بعدة طرق، بما في ذلك الضغط على الموارد الطبيعية والبيئية، وتأثيراته على سوق العمل والبطالة، وتحديات توفير الخدمات العامة مثل التعليم والصحة. ومع ذلك، لا يزال تحديد الترابط بين كلا المتغيرين غامضا.

تشهد مصر تحديات كبيرة نتيجة للزيادة السكانية وتأثيرها الكبير على النمو الاقتصادي. وهذا يجعل فهم كيفية تأثير النمو السكاني على النمو الاقتصادي في مصر أمرًا مهمًا لوضع السياسات العامة والبرامج الاقتصادية التي تهدف إلى تعزيز التنمية المستدامة وتحسين جودة الحياة للمواطنين (Youssef *et al.*, 2014). بالإضافة إلى ذلك، يمكن أن يساهم البحث في هذا المجال في فهم كيفية تحقيق التوازن بين النمو السكاني والتنمية الاقتصادية والاجتماعية في مصر.

تهدف هذه الدراسة إلى فحص العلاقة بين نمو السكان والنمو الاقتصادي في مصر من عام ١٩٦٩ إلى ٢٠١٩ باستخدام نموذج الانحدار Autoregressive Distributed Lag Model (ARDL) ونموذج تصحيح الخطأ Vector Error Correction Model (VECM) علي المدى القصير والمدي الطويل مع الاعتماد علي مؤشرات التنمية الصادرة عن البنك الدولي "World Development Indicators" والتي تغطي الفترة من عام ١٩٦٩ إلى عام ٢٠١٩. واظهرت النتائج أن نمو السكان يمارس تأثيرًا سلبيًا على النمو الاقتصادي في مصر وذلك على المدى الطويل والقصير. إلا أن اختبار سببية Granger لم يكشف عن اي علاقة سببية بين المتغيرين.

وبناءً على النتائج التي تم الوصول إليها، تمكن الباحثون من تقديم بعض التوصيات التي يمكن أن تساهم في مواجهة تأثير الزيادة السكانية على النمو الاقتصادي في مصر. ينبغي على الحكومة، على سبيل المثال، المصرية تعزيز السياسات الديموغرافية والتخطيط العائلي، وزيادة الإنفاق العام لتمويل برامج تنظيم الأسرة فضلا عن أهمية الحملات الإعلانية التي تهدف إلي زيادة وعي المواطنين بمخاطر الزيادة السكانية على الاقتصاد المصري. كما يجب تحسين البنية التحتية وتوفير فرص العمل، وتعزيز التعليم والرعاية الصحية. وينبغي أيضًا إلى أهمية تشجيع الاستثمارات في مجالات التكنولوجيا والابتكار لزيادة إنتاجية العمالة، بالإضافة إلى تمكين المرأة وتشجيعها على المشاركة في سوق العمل. يجب أيضًا تعزيز التعاون بين القطاع الخاص والحكومة لخلق المزيد من فرص العمل للشباب وتخفيف العبء الاقتصادي الذي يقع على الحكومة. باختصار، يجب أن تكون السياسات الحكومية موجهة نحو التخفيف من تأثير الزيادة السكانية على النمو الاقتصادي في مصر، وتعزيز التنمية المستدامة وتحسين جودة الحياة للمواطنين.