The Impact of Shadow Economy on Sustainable Development in Egypt from 1990 to 2022

Prepared by:

Mayar Ahmady Gomaa,

Master's researcher at Faculty of Politics and Economics, Suez University

Under the supervision of:

Dr. Ahmed Sabry Abozied

Professor of Economics in university of Illinois and professor of Economics in AUC

Dr. Amany Ahmed Mokhtar

Lecturer of Economics in faculty of politics and economics, Suez university

Dr. Hamada Salah Youssef

Lecturer of Economics in faculty of politics and economics, Suez university

Abstract:

The main aim of the study is showing the impact of shadow economy in sustainable development in Egypt. Some studies found out that there is a positive impact of shadow economy in sustainable development, on the other hand other studies found there is a negative relationship that is why the study is settled in order to show the relationship between those two variables and at the end the study found out that, there is negative relationship. The study conducted using the quantitative methodology using ARDL model by using Egypt as a sample study from 1990 till

2022. The study measure shadow economy by using MIMC methodology and sustainable development by using ANS methodology " Adjusted net savings and it measured as following net National savings plus education expenditure and minus energy depletion, mineral depletion, net forest depletion, and carbon dioxide and particulate emissions damage". By searching further the empirical part found out that the relationship between shadow economy and each of the following variables "sustainable development, GDP and Foreign direct investment "FDI" is negative.

Keywords: Impact, shadow, Economy, sustainable, Development, Egypt.

الملخص :

الهدف الرئيسي من الدراسة هو توضيح تأثير اقتصاد الظل على التنمية المستدامة في مصر. أظهرت بعض الدراسات أن هناك تأثيرًا إيجابيًا لاقتصاد الظل على التنمية المستدامة، بينما وجدت دراسات أخرى علاقة سلبية، ولهذا السبب تم إجراء الدراسة بهدف توضيح العلاقة بين هذين المتغيرين، وفي النهاية توصلت الدراسة إلى أن هناك علاقة سلبية بينهما. تم إجراء الدراسة باستخدام المنهج الكمي باستخدام نموذجARDL ، مع استخدام مصر كنموذج دراسي من عام ١٩٩٠ حتى ٢٠٢٢. وقد تم قياس اقتصاد الظل باستخدام منهجيةMIMC ، والتنمية المستدامة باستخدام منهجية" ANS التوفير الصافي المعدل"، والتي تم قياسها كما يلي: التوفير الوطني الصافي بالإضافة إلى الإنفاق على التعليم، مطروحًا منها استنفاد الطاقة، استنفاد المعادن، الاستنفاد الصافي للغابات، وأضرار انبعاثات ثاني أكسيد الكربون والجسيمات. من خلال البحث في الجزء الاحصائي، تبين أن العلاقة بين اقتصاد الظل

وكل من المتغيرات التالية "التنمية المستدامة، الناتج المحلي الإجمالي، والاستثمار الأجنبي المباشر "(FDI) هي علاقة سلبية .

الكلمات الرئيسية: تأثير، اقتصاد، الظل، التنمية، المستدامة، مصر.

Introduction:

It is important to answer the question of what is the impact of shadow economy "SE" on sustainable development "SD". This is from the point of view that shadow economy is one of critical variables that can directly affect sustainable development but it doesn't have a sufficient attention. If any country suffers from huge percentage of shadow economy, this will end up with low in public revenues which can directly affect the quality of the goods and services that this country produces.

Any activity or project that is considered as a part of shadow economy is unregulated and also it doesn't report in tax administration. The shadow economy has a negative impact on public revenue and not only that but also on the economic stability. All of these will not lead also to get an accurate economic planning for having sustainable development. We can summarize that, if any country suffer from large size of shadow economy, this will end up with bad image for this nation which will affect negatively on its competitiveness and also on the international interaction.

From another point of view, shadow economy has a positive impact like increasing the actual revenue and decreasing the actual percentage of unemployment but this positive effect with

low portion and at the end we can summarize that shadow economy has a negative impacts more than the positive ones on sustainable development.

The structure of the research will go as following: the first part will discuss shadow economy and its indicators and the second one it will discuss sustainable development and its dimensions. The last not the least part will discuss the impact of shadow economy on sustainable Development and the impact empirically by using some statistical methods and applying ARDL model then we will summarize conclusion of the study and recommendations for further study.

Shadow Economy and its Indicators:

The shadow economy is a concept that lacks a universally agreed-upon definition, although many scholars and policymakers concur on its key characteristics. Various terms are used interchangeably to describe this phenomenon, including the underground economy, unobserved economy, hidden economy, cash economy, and informal economy. The absence of a precise definition makes it challenging to distinguish the shadow economy from the formal economy and to determine what specific activities it encompasses. Some definitions define the shadow economy as any activity that is done for personal gain or on a business-to-business basis, and most of it will not be taxed.

Smith (1994) defines shadow economy as following **"market-based production of goods and services, whether**

legal or illegal, that escapes detection in the official estimates of GDP". On the other hand, IMF defines it as following **"The shadow economy includes all economic activities which are hidden from official authorities for monetary, regulatory, and institutional reasons." (IMF, Jan, 2018)** [1]

Some definitions also distinguish between legal and illegal activities, with legal activity being taxed if it is reported and continues; illegal activity, such as selling illegal drugs, will result in law enforcement action to put an end to it. While any definition will have shortcomings, having a better understanding of the extent of the 'shadow economy' can help both in building a comprehensive 'whole government' strategy at home and in facilitating mutual knowledge and understanding among tax administrations. This is especially important given the various ways in which administrations operate.

For the international labor organization, it defined shadow economy as **"All economic activities by workers and economic units that are – in law or in practice – not covered or insufficiently covered by formal arrangements. It thrives mostly in a context of high unemployment, underemployment, poverty, gender inequality and precarious work".(Schneider, 2010)** [2]

In order to capture a broader range of the various components of the shadow economy, the pragmatic approach expand the definition as follows: · **"Economic activities, both**

legal and illegal, that are legally required to be reported to tax administration but that are not, therefore, tax exempt, unlike activities that are reported but do not go tax". **(Benkelmanson, 2019)**

This definition is imperfect, but it may have some benefits when considering strategic approaches to reduce the shadow economy.

- It clarifies that there are limits to the economic activities that can be reported to the tax authorities in this context.

- It recognizes that there can be shadow economy activity in a legal business that is not fully reported. New strategies are being developed to reduce under-reporting;

- It recognizes that some activity may be captured outside of the scope of the tax authorities. For instance, a company may have obtained a license from another public authority, acquired goods or services from another party, or used a third party to facilitate transactions between the business and its customers. Capturing such data can be a valuable tax administration tool, such as data from financial agents.

The following table will summarize the types of shadow economic activities:

Type of Activity	Monetary Transactions		Nonmonetary Transactions	
ILLEGAL ACTIVITIES	Trade in stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling; fraud.		Barter of drugs, stolen, or smuggled goods. Producing or growing drugs for own use. Theft for own use.	
	Tax Evasion	Tax Avoidance	Tax Evasion	Tax Avoidance
LEGAL ACTIVITIES	Unreported income from self-employment. Wages, salaries, and assets from unreported work related to legal services and goods	Employee discounts, fringe benefits.	Barter of legal services and goods.	All do-it-yourself work and neighbor help.

source:
https://www.imf.org/external/pubs/ft/issues/issues30/

1- Causes of shadow economy

There are many causes that lead to increase the shadow economy. This section will distribute these causes mainly intro three groups, the first one will be the causes of shadow economy according to tax system, the second one will be according to labor market institutions, and the last not the least one will be according to the financial system.

- Causes of shadow economy according to the tax system

There are lots of causes for increasing shadow economy. These causes are mostly related to the design of tax system. Some of them are the size of tax burden, the fiscal burden of labor, social welfare system, the efficiency of the tax

administration in collecting taxes, the penalties for tax evasion, the structure of the tax system and the complexity of the tax system. The aim of this part of the research is discussing these causes in some details.

- Labor Market Institutions as an incentive to the shadow economy

Informal labor markets and the shadow economy are closely related because, by definition, any activity that takes place in the shadow economy involves the informal labor market to some extent. Economic subjects may choose to leave the formal sector voluntarily due to the financial and non-financial advantages of informality, or they may be excluded from the formal labor market due to a lack of opportunities. In various social and economic contexts, these two motivations may be viewed as complementary, with varying emphasis on each. Therefore the following section of the research will introduce the main causes of increasing the shadow economy from labor market dimensions. **(WorldBank, 2011)**[3]

- Financial sector as an incentives for shadow economy

The substantial portion of cash transactions in the overall, informal finance, and unregistered remittance inflows sent by foreign migrants are the main elements that indirectly sustain the shadow economy within the financial system.

2- Measuring shadow economy

Due to its hidden nature, measuring the size of the informal economy presents significant challenges. There are several ways to measure the informal economy. In this research the ways of measuring shadow economy will distributed mainly into three main approaches as following " direct approach which contains surveys and tax audits " , " indirect approaches which include discrepancy in natural account, electricity consumption approaches and currency demand approach" and "model- based approach which contain MIIMC, Tax gap approach, CGE model and time series model"

Direct Approaches

Direct approaches are based on compliance methods, surveys and tax auditing. These methods allow us to get detailed information about the shadow economy structure. However, this information that comes from direct approaches may not be consistent across countries and may not be representative. **(IMF, 2019)**[4]

Surveys

The survey is designed in order to extract some information needed to get the value of the shadow economy all of that by assessing the main types of economic activities. The results that come from these surveys are mainly not accurate and the policy makers should not depend on those results when they build up their policies. **(IMF, 2019)**

Tax Audits

It is calculated as a main difference between the actual and expected tax revenue as following:

$$Tax\ Gap = Expected\ Tax\ Revenue - Actual\ Tax\ Revenue$$

Indirect Approaches

These methods, also known as indicator approaches, are primarily macroeconomic and make use of a variety of economic and other indicators that provide data on how the shadow economy has evolved over time. They give value-added figures that relate to the definition of the shadow economy. Typically, legally purchased material is included; therefore, they offer upper-bound estimates with the risk of a double counting issue because of the legally purchased material. **(Schneider, 2016)**[5]

Discrepancy in natural accounts

The foundation of this strategy is the disparity between income and spending data. The income and expenditure measures of GNP should be equal in national accounting. The difference between the expenditure and income measures can therefore be used as a gauge of the size of the shadow economy if an independent estimate of the national accounts' expenditure side is available The initial discrepancy or first estimate, not the published discrepancy, should be used as an estimate of the shadow economy because national accounts statisticians are eager to reduce this disparity. This method would, in fact, produce a reliable estimate of the size of the shadow economy if

every element on the expenditure side were measured accurately. But regrettably, that isn't the case. Rather, the disparity is a reflection of the shadow economy and all the mistakes and omissions in the national accounts statistics. As a result, these estimates might be imprecise and unreliable. **(Schneider, 2016)**

Energy consumption approaches

According to most of researches, the level of the shadow economy and the volume of energy consumed by the great majority of EU nations are statistically correlated. Given the significance of energy resources in the production process, including in the unorganized sector of the economy, their correlation shows the relationship between the nation's economic and environmental development on the one hand, and can also be used as a tool to indirectly gauge the extent of the shadow economy on the other. According to the hypothesis, a method was put forth to estimate the extent of the shadow economy by taking into account the relationship between shading, energy consumption, and the nation's level of scientific and technological advancement. **(SEDMÍKOVÁ, 2021)**

Ratio of the shadow economy and energy consumption by the country's development stages

Source: Authors own compilation
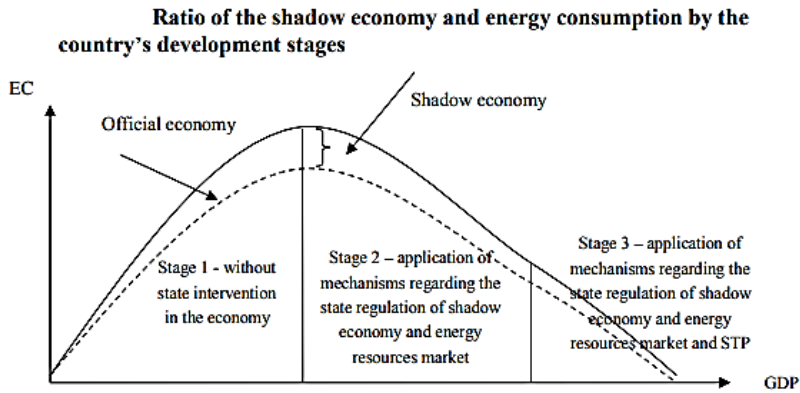
The calculations will be based on data from the World Bank (2021) and the European Commission (2021).

From the figure, as science and technology progress, the gap between the index of change in internal electricity consumption and the index of change in GDP widens when investing in energy-efficient projects and energy-saving measures. **(SEDMÍKOVÁ, 2021)**[6]

Currency demand approaches

The demand for currency will rise as the shadow economy grows in size. An equation for currency demand is estimated over time in order to separate the resulting from the excess demand for currency. The development of income, payment patterns, interest rates, the use of credit and other debt cards in place of cash, and other potential conventional factors are all taken into account. Furthermore, the estimation equation incorporates variables that are thought to be significant contributors to people working in the shadow economy, such as

direct and indirect tax burdens, government regulations, state institutions, and tax morale According to Tanzi (1983), the fundamental regression equation for currency demand is as follows: (**Mihaela, 2023**)[7]

$$ln\ (C\ /\ M_2)_t = \beta_0 + \beta_1\ ln\ (1 + TW)_t + \beta_2\ ln\ (WS\ /\ Y)_t + \beta_3\ ln\ R_t + \beta_4\ ln\ (Y\ /\ N)_t + u_t,$$

where WS/Y is the proportion of wages and salaries in national income (to capture shifting payment and money holding patterns), R is the interest paid on savings deposits (to capture the opportunity cost of holding cash), Y/N is per capita income, C/M2 is the ratio of cash holdings to current and deposit accounts, and TW is a weighted average tax rate (as a proxy for changes in the size of the shadow economy). The growing tax burden and other factors that push people into the shadow economy are then blamed for any "excess" increase in currency, or the amount that cannot be explained by traditional or typical factors. Calculating the difference between the development of currency when the direct and indirect tax burden and government regulation are held at their lowest values and the development of currency with the current (higher) burden of taxation and government regulation is a first step in determining the size and development of the shadow economy. The size of the shadow economy can be calculated and compared to the official GDP if, in a subsequent step, the income velocity for the currency used in the shadow economy is the same as that for the legal M1 in the

official economy. One of the most popular methods is this one. Despite being implemented in numerous nations worldwide, it has been criticized for a number of reasons. The following are the most frequent criticisms of this approach: **(Mihaela, 2023)**

(1) Cash is not used for every transaction in the shadow economy. Using the survey method, Isachsen (1985) discovered that in 1980, about 80% of all transactions in the hidden sector in Norway were paid with cash. As a result, the size of the entire shadow economy—including barter—may be even greater than previously thought.

(2) The tax burden is the only factor that most studies look at as the root cause of the shadow economy. Since trustworthy data is unavailable for the majority of countries, other factors—such as the effect of regulations, taxpayers' attitudes toward the state, tax morality, and so forth—are not taken into account. The extent of the hidden economy may be higher than most studies report if, as appears likely, these additional factors also play a role. **(Mihaela, 2023)**

(3) According to Garcia (1978), Park (1979), and Feige (1996), at least in the case of the United States, increases in currency demand deposits are mostly the result of a slowdown in demand deposits rather than an increase in currency brought on by shadow economy activity.

(4) The majority of research assumes that the money velocity in the official and shadow economies is the same. The velocity of

money in the official economy is highly uncertain, and it is even more challenging to estimate the velocity of money in the hidden sector, as stated by Hill and Kabir (1996) for Canada and Klovland (1984) for the Scandinavian nations. One must assume that money moves at the same rate in every sector if they are unaware of the velocity of currency in the shadow economy. **(Mihaela, 2023)**

Model – Based approaches

There are three ways to critique the methods that currently used for estimating the size of the shadow economy. First, ad-hoc econometric assumptions and specifications form the basis of all these techniques. Second, econometric estimations are susceptible to measurement errors due to their extensive use. Finally, they lack any micro-economic underpinnings, which leave them vulnerable to the Lucas Critique, despite the fact that their econometric specifications include a number of macroeconomic variables. **(Elgin, 2017)**

MIMC model "multiple indicator multiple causes"

The idea behind the MIMC model is to use the information of covariance between several observable variables to analyze the relationships between a latent variable called "size of shadow economy" and observable variables. The latent variable's causes and indicators are categorized using the observable variables. The MIMC approach's main benefits are that it takes into account the shadow economy's numerous

determinants (causes) and effects (indicators) and permits modeling of its activities as an unobservable (latent) variable. The magnitude of shadow economy activity is measured as an unobserved variable over time using a factor-analytic approach. Since the size of the shadow economy cannot be directly measured, the unknown coefficients are estimated using a set of structural equations as the "unobserved" variable. The MIMIC model is composed of two formal components: a measurement model and a structural equation model.

Figure 1: The MIMIC model
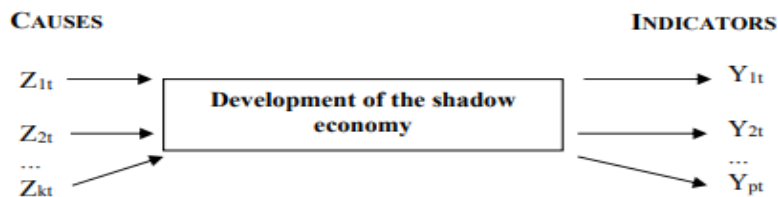
source: Schneider, 2016

In the measurement model, the unobservable variable ηt determines a p vector yt $= (y_{1t}, y_{2t}, y_{3t}, \ldots\ldots y_{bt})$ of indicators, that is, observable variables that reflect shadow economy activities, subject to a p vector of random error terms $\varepsilon't = (\varepsilon 1t, \varepsilon 2t,...,\varepsilon pt)'$. The unobservable variable ηt is a scalar and λ is a p column vector of parameters that relates t y to ηt . The measurement equation is given by: **(Schneider, 2016)**

$$y_t = \lambda \eta_t + \varepsilon_t$$

The criticism for this model is:

The most common objection concerns the latent variable's meaning. One is more likely to ascertain whether a particular model is valid than to "find" a suitable model because this approach is confirmatory rather than exploratory. Since it refers to the theoretical presumptions underlying the variable selection and empirical constraints on data availability, this criticism—possibly the most prevalent in the literature—remains challenging to overcome.

Tax gap approach

The shadow economy is estimated using macro models, which offer a possible way to compute tax gaps. Independent of the national accounts, these models estimates national income using a macroeconomic model. One indicator of the shadow economy is the discrepancy between the GDP in the national accounts and the independent estimates of national income. The shadow economy is estimated by the macro models by combining income from crime, which is not reported, with underreported income from underground production, which contributes to the tax gap. When income from crime is included in the national accounts, it is estimated separately and can be readily removed from the calculation of a tax gap. Unlike the national accounts, the macro models only offer one estimate of national income, and it is difficult to separate out income from crime from this estimate. Generally speaking, the shadow

economy is merely estimated using macro models. Estimates of the shadow economy are occasionally also taken to be a gauge of the tax gap. A proper estimate of the tax gap would incorporate macro models with both a theoretical liability calculation and a conversion of national accounts data to taxable income, rather than assuming that the shadow economy and the tax gap are synonymous. A common perception of the unreliability of macro model estimates of the shadow economy may be reflected in the apparent lack of any accurate estimate of the tax gap from the shadow economy. (**Rubin, 2011**)[8]

Feige Exchange Method

Fige relied in his estimation of the size of the hidden economy on Fisher's equation for the quantity of money in its well-known form:

$$MV=PT$$

Assuming that other factors remain constant and in the absence of a hidden economy, the national product calculated in this way must equal the gross national product shown by the national accounts. However, in the event of a difference between them, this difference is considered an indicator of the existence of a hidden economy. (**Rubin, 2011**)

Demand for currency "Tanzi"

According to this method, the demand function for currency is determined by making two estimates of currency possession, in the presence of taxes and in the absence of taxes, and the difference

between the two estimates as a result of the presence of the tax variable expresses shadow economy. By dividing the gross national product by the amount of illicit money, we obtain the velocity of circulation of money, and by multiplying the velocity of circulation by the amount of illicit money, we obtain the size of the shadow economy. **(Schneider, 2016)**[9]

Indicators of shadow economy

There are lots of indicators for shadow economy, but mainly there indicators can be distributed into 7 groups as following:
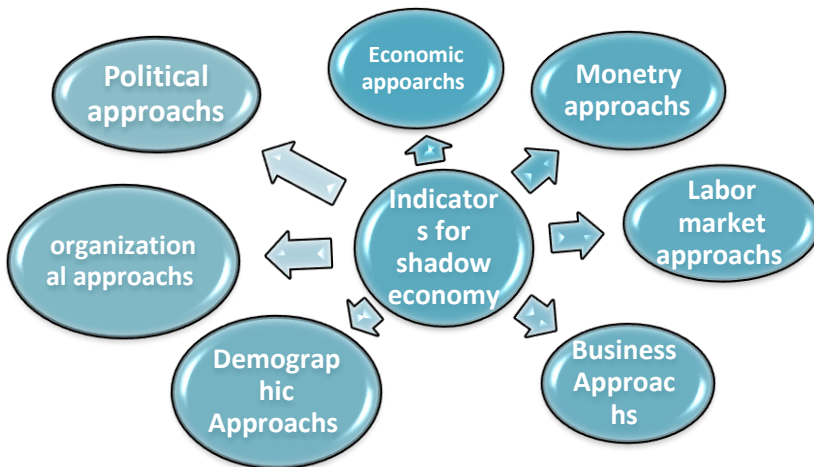
Source: made by researcher

Economic Approaches " GDP- SE"

The status of the official economy reflects the activities of the shadow economy. As an indicator variable, we utilize the

GDP per capita's annual growth rate. GDP per capita is calculated by dividing the gross domestic product by the population and converting it to foreign dollars using Purchasing Power Parity rates. Not only that but also unemployment rate which calculated by dividing the unemployment people by the whole population, The informal employment as a percentage of total employment can be used as an indicator, the tax burden, Minimum wage, Inflation rate and Growth of formal sector. **(Schneider, 2010)**

Monetary Approach

People involved in the shadow economy mostly use cash in order to avoid leaving any evidence of their transactions. As a result, the majority of shadow economy activities involve using cash (or currency) in additional ways. We use the M_0 over M_1 as an indicator to account for shadow economy: M_0 is the currency that is not in banks, and M_1 is typically defined as M_0 plus deposits. This approach contains mainly Cash in circulation M_0 versus M_1, Cash versus bank transaction, Shadow economy as % of GDP, Bank account per capita and Discrepancy between loans and declared income. **(Schneider, 2010)**[10]

Labor market approaches

After looking at the size, growth, and decline of the shadow economy in terms of value added over time, the analysis now turns to the "shadow labor market," since those involved in the shadow economy have a particularly close relationship and

"social network" within the official labor market. Furthermore, by definition, every activity in the shadow economy includes some degree of a "shadow labor market": Therefore, any situation in which employers, employees, or both hold a "shadow economy position" is considered to be part of the "shadow labor market." **(Schneider, 2010)**

Number of informal workers

What motivates individuals to work in the shadow economy? Taxes and social contributions on wages, along with the legal administrative regulation to control economic activity, significantly raise the costs that businesses (and individuals) must pay when "officially" hiring someone in the official labor market. These expenses are higher than the worker's actual pay in a number of OECD nations, which strongly encourages employment in the shadow economy. **(Lahrlid, 2016)**

Average weekly hours worked in informal sector

Changes in the regular (official) sector's net wage have a significant impact on the number of hours worked in the shadow economy. According to some of empirical findings, this is the result of an official's (mis-)allocation of work to the unorganized sector, where it is exempt from taxes. In this instance, there is a significant amount of substitution between the two sectors' labor market activities.

There are also some other indicators that is related to the labor market like turnover rate in the formal sector and women and child labor in the informal economy. **(Lahrlid, 2016)**

Business Approaches

For governments all over the world, removing economic activity from the shadow economy is a key goal. Although the goal of formalization initiatives from the standpoint of the revenue authority is typically to boost revenue yields, preventing informality can further a variety of public policy goals. By guaranteeing minimum working conditions and salary levels, formalization can improve the quality of life for employees; it can boost economic efficiency by ensuring that all businesses compete on an even playing field with equal tax and regulatory burdens; it can boost growth by providing businesses with better access to financing; and it can strengthen civic engagement as citizens demand a say in how their taxes are spent. There are some of business indicators that can use to show the shadow economy in any economy like Number of unregister businesses, SMEs in the informal sector, Illegal trade volume and Customs evasion rate. **(Lahrlid, 2016)**

In the last decades, development of humanity led to increasing in the natural disasters and also climate changes, not only development of human but also the socio-economic instability and wars. Actions for humans have negative impacts on the environment, not only that but also endangering the survival of

the earth and the future generation. These conditions point to a more sustainable approach to managing resources, minimizing environmental harm. Responsible behavior that guarantees the long- term use of resources without compromising the needs of future generations is a key aspect of sustainable development; this concept emerged in 1970s and gained momentum in the 1980s. The concept of sustainable development is mainly based on the concept of needs, the concept of development and the concept of future generation. **(Klarin, 2018)**

The United Nations' journey towards sustainable development began with the 1972 UN Conference on the Human Environment, hosted in Stockholm, Sweden. This conference was the first major UN conference addressing environmental issues. It adopted the Stockholm Declaration and Action Plan, which outlined principles for the preservation and enhancement of the human environment along with recommendations for international environmental action. The conference also established the United Nations Environment Program (UNEP), the first UN program focused solely on environmental issues. **(UN, 2015)**[11]

Twenty years later, at the historic Earth Summit in Rio de Janeiro, Brazil, in 1992, the UN sought to help governments rethink economic development and find ways to stop polluting the planet and depleting its natural resources. The "Earth Summit," which lasted for two weeks, was the culmination of a process that began in

December 1989, involving planning, education, and negotiations among all UN member states, leading to the adoption of Agenda 21, a global consensus on development and environmental cooperation. The foundation of Agenda 21 was the acknowledgment that environmental protection requires international cooperation across borders. Agenda 21 aimed to reflect an international consensus to support and complement national strategies and plans for sustainable development. It called on all countries to participate in improving ecosystems and to manage and protect them better, taking responsibility for the future with a collaborative approach. **(UN, 2015)**

The Earth Summit also resulted in the Rio Declaration, which included 27 principles regarding new, equitable partnerships and development through cooperation among countries, social sectors, and individuals. It reflected humanity's responsibility for sustainable development, the right of countries to use their resources for their environmental and developmental policies, and the need for state cooperation to eliminate poverty and protect the environment. The idea was that nations should work in a spirit of global partnership to maintain and restore the Earth's ecological integrity. **(Klarin, 2018)**[12]

At the historic Rio conference, 172 governments (108 represented by heads of state or government) adopted three main agreements to guide future approaches to development: Agenda 21, the Rio Declaration, and the Statement of Principles for

Forests, a set of principles to support sustainable forest management worldwide. Additionally, two legally binding treaties were opened for signature at the summit: the United Nations Framework Convention on Climate Change and the Convention on Biological Diversity. Furthermore, negotiations began on the Convention to Combat Desertification, which was opened for signature in October 1994 and came into force in December 1996. The Rio Conference stood out from other UN conferences due to its size and the range of issues discussed. The UN worked in Rio de Janeiro to help governments rethink economic development, find ways to end the destruction of irreplaceable natural resources, and combat pollution.

In 1997, a special session of the General Assembly focused on the environment, also known as "Earth Summit +5," was held to examine the implementation of Agenda 21 and proposed a program for continued execution. **(UN, 2015)**

Three years later, in 2000, the Millennium Summit adopted the Eight Millennium Development Goals (MDGs). In 2002, the World Summit on Sustainable Development in Johannesburg developed a new action plan. In 2005, 2008, and 2010, the Millennium Development Goals were reviewed at high-level meetings in New York. This was followed in 2012 by the United Nations Conference on Sustainable Development, also known as Rio+20. After this event, the UN Environment Assembly was established to become the world's high-level

decision-making body on environmental matters. The Assembly meets to set priorities for global environmental policy and develop international environmental law. **(UN, 2015)**

In 2013, two years before the deadline to achieve the Millennium Development Goals, a special event was held in New York where member states agreed to hold a high-level summit in September 2015 to adopt a new set of goals that would build on the foundations laid by the Millennium Development Goals. Two years later, in 2015, the United Nations Summit for Sustainable Development issued the 2030 Agenda and the seventeen Sustainable Development Goals. **(UN, 2015)**

One of the challenges that stand in front of any country to achieve sustainable development goals is shadow economy. Shadow economy in any economy lead to unfair distribution of income which will lead to increase the poverty level and this will stand as a challenge in front of sustainable development and the impact of shadow on sustainable development will be discussed into details later.

On this chapter the researcher will discuss the following:

- Discover all definitions for sustainable development and there historical improvement though out international agreement and conventions.

- In addition, identifying the three dimensions that constitute the essence of this concept, and the three dimensions are economic, social and environmental.

- This chapter will focus also on the indicators measuring sustainable development that reflect the extent to which these dimensions are achieved, such as human development indicators and those related to environmental and social sustainability.

By focusing on these themes, this chapter aims to provide a comprehensive framework for understanding how to achieve sustainable development throughout the contemporary challenges facing countries, particularly in contexts witnessing an expansion of the informal economy.

After discussing the shadow economy variable and its indicators and also different ways to measure shadow economy in any country, let this study to discuss the second variable which is the dependent variable of the study sustainable development.

Sustainable development definitions:

Sustainable development emerged as a central theme at the United Nations Conference on the Human Environment in Stockholm in 1972. This concept was introduced to demonstrate that economic growth and industrialization could occur without harming the environment.

In the following decades, the idea of sustainable development evolved through various initiatives, including the World Conservation Strategy (1980), the Brundtland Report (1987), and the United Nations Conference on Environment and Development in Rio (1992). It also gained traction in national

government strategies and through the involvement of business leaders and non-governmental organizations.

Throughout this time, the definition of sustainable development transformed. The Brundtland Report described it as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." While this definition was somewhat ambiguous, it effectively highlighted two critical issues: the environmental degradation often linked to economic growth and the necessity of such growth to reduce poverty.

The essence of mainstream sustainability thinking has come to encompass three dimensions: environmental, social, and economic sustainability. **(Mohamed, 2020)**[13]

Nearly every national government in the United Nations now has a dedicated minister and department focused on environmental policy, and many regional and local governments have also established similar capabilities. Since the Rio Earth Summit in 1992, there has been significant growth in both the quantity and quality of environmental legislation at international, national, and local levels. International agreements, such as the Kyoto Protocol, have not only heightened awareness of environmental issues but have also begun to influence global policy changes.

Agenda 21 is a non-binding action program adopted by over 178 governments at the 1992 Earth Summit. While it lacks

the authority of international law, its adoption imposes a strong moral obligation for countries to implement its strategies. The fundamental belief behind this "global partnership" is that countries can protect the environment while still achieving economic growth.

When it comes to climate change, there is increasing awareness that its impacts disproportionately affect impoverished individuals who already live in vulnerable situations. Climate change exacerbates existing inequalities faced by these groups, threatening fundamental rights and potentially reversing progress toward internationally agreed development goals, including the Millennium Development Goals (MDGs). This raises global justice concerns, as those most affected by climate change have contributed the least to the problem. **(social watch report, 2011)**[14]

The concept of climate justice recognizes that wealthier nations, which have contributed most to climate issues, bear a greater responsibility to take action and do so swiftly. However, there are fears that any international agreements may further burden the poor and vulnerable. A growing number of social movements and civil society organizations worldwide are rallying around the climate justice agenda, with citizens from both the Global South and North motivated by their own experiences with climate impacts and concerns for their families and livelihoods.

The movement toward "greening" business has become a key aspect of corporate social responsibility for many global companies, although for some, it remains a minor concern rather than a driving force for structural change in core business practices.

Since the Earth Summit in Rio de Janeiro in 1992 and the World Summit on Sustainable Development in Johannesburg in 2002, sustainable development has gained prominence on the political agenda. Yet, actions have not kept pace with pressing challenges like climate change, poverty reduction, and biodiversity loss. Global inequality is increasing, and multiple crises make it more difficult to advance the sustainability agenda and foster genuine global cooperation on critical issues. **(social watch report, 2011)**

In response to the new and significant challenges facing sustainable development, many countries and stakeholders called for a new World Summit in 2012. This initiative led by Brazilian President Luiz Inácio da Silva, received support from various countries and stakeholders, culminating in a UN General Assembly resolution in 2009 that established a UN Conference on Sustainable Development for 2012 in Rio de Janeiro.

The 2012 Conference, held 20 years after the original Earth Summit, aims to "secure renewed political commitment for sustainable development, assess progress to date, identify remaining gaps in implementing the outcomes of major summits, and address

new and emerging challenges." Key themes for discussion will include a green economy within the context of sustainable development and poverty eradication, as well as the institutional framework for sustainable development. **(mohamed, 2020)**

The modern definition of sustainable development encompasses two fundamental concepts: intergenerational fairness and optimality. Sustainability is about achieving fairness among generations through the equitable and just distribution of productive capacity and well-being between present and future generations. Optimality, on the other hand, focuses on achieving the highest possible level of long-term social welfare. **(wasem, 2015)**[15]

There are lots of definitions that is confused with the definition of sustainable development. There are some of these definitions

Economic Development

Economic development refers to the sustainable and coordinated actions taken by policymakers and communities that contribute to enhancing the standard of living and economic health of a specific area. **(Eisa, 2016)**

Human Development

Human development is the process of expanding the choices available to individuals, which includes three main aspects: ensuring a healthy, disease-free life, increasing access to knowledge, and providing resources that enable individuals to achieve a decent standard of living.

Social Development

Social development involves a series of planned administrative processes aimed at achieving a set of goals that drive the energies and potentials of individuals to interact and be optimally utilized. **(Eisa, 2016)**

Comprehensive Development

Comprehensive development is a priority for the Arab region, where there is an urgent need for social protection policies and long-term developmental programs that target all members of society, particularly marginalized and at-risk groups, to eradicate poverty and mitigate inequality in all its forms. **(loay, 2022)**[16]

Integrated Development

Integrated development is a process that results in increasing the life opportunities for some people in a community without diminishing the life opportunities of others at the same time. It also leads to a noticeable increase in production and services. **(loay, 2022)**

Green Development

Green development encourages economic growth while minimizing pollution and greenhouse gas emissions, reducing waste as much as possible, sustainably managing natural resources, and preserving biodiversity. **(taher, 2022)**[17]

Intergenerational Justice

Intergenerational justice is a principle of international environmental law, which stipulates that meeting the needs of

present generations should not come at the expense of future generations.

Empirical part:

Methodology for Estimating the Hidden Economy

The methods for estimating the hidden economy are as follows:

Firstly, Indirect Measurement Methods: Since the hidden economy cannot be directly observed, its size and measurement must be estimated through indirect methods that rely primarily on macroeconomic indicators. These methods include:

- The discrepancy between national income and expenditure statistics method
- The discrepancy between official and actual labor force method
- The physical input or electricity consumption method
- The monetary transactions method
- The currency demand method
- The Multiple Indicators Multiple Causes (MIMIC) model method

The MIMIC model method is considered the most suitable approach for estimating the hidden economy due to the lack of tax audits and survey-based methods. Additionally, the methods based on statistical discrepancies and labor force discrepancies have limitations and weaknesses. Furthermore, the currency demand and electricity consumption methods consider only one indicator that reflects all the effects of the hidden economy.

The development of the hidden economy in Egypt has evolved rapidly. The figure indicates that the hidden economy in Egypt has developed from 1980 to 2022.
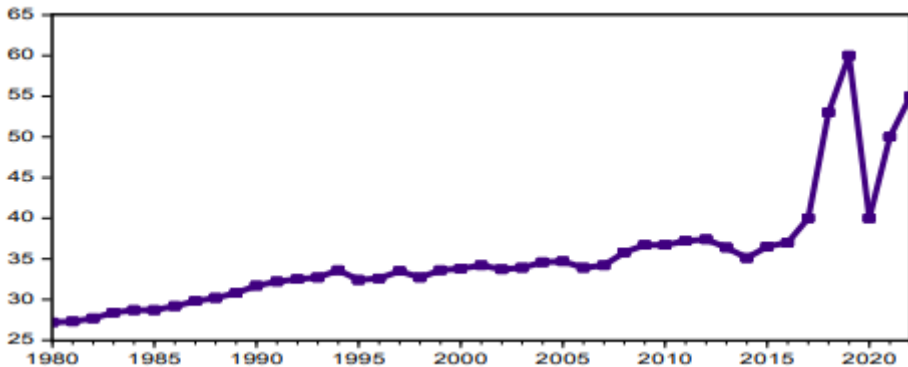
source: (WB, 2022)

Upon examination, we find that the hidden economy accounted for 27.2% of the gross output in 1980 and rose to 34.7% by 2005. It reached its peak during the study period, rising to 60% in 2019. The reasons for the emergence of the hidden economy can be attributed to several factors, including:

A. Institutional reasons: The hidden economy may arise and spread due to the legal and regulatory environment, as well as bureaucratic procedures. The hidden activity may emerge due to the density of regulations, multiplicity of legislative laws, exploitation of power through commissions and bribes, and the prevalence of corruption. As a result of bureaucratic procedures,

starting a business may take a long time, as illustrated by the following figure:

The time period required to start a business in days

- Licensing procedures
- Time to obtain a license
- Property registraion procedures
- time to register property

%٦ %٢ %١ %٣٩ %٥١ %١
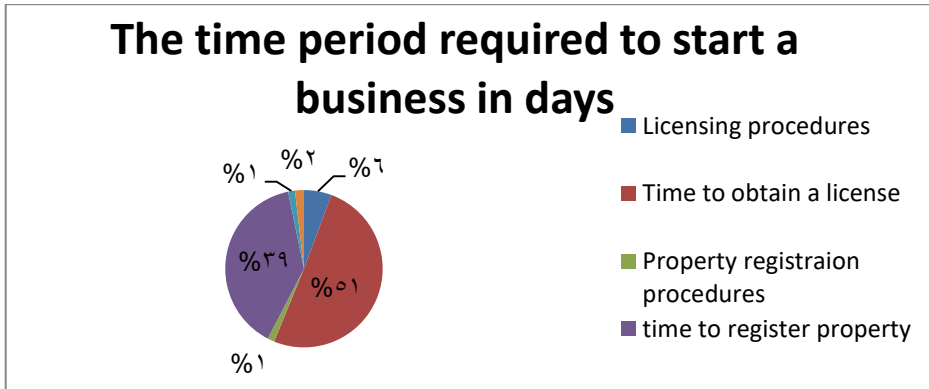
Source: (elsharkawy, 2018) [18]

B. Economic reasons: The high cost of entry and exit from the formal sector leads to easy entry into the hidden activity with lower costs and faster time.

C. Inefficient tax system: The tax system increases the tax burden and facilitates tax evasion, making it easier to conduct unofficial transactions in cash, which leads to an increase in the budget deficit. A study by (Elkohy, 2015) found that high tax rates and inflation rates explain 52% and 28%, respectively, of the variation in the hidden economy in Egypt.

The Shortage in labor supply from government institutions: The halt in the system of conscription for appointments has led to high unemployment rates, differences in the labor market

structure, the presence of informal labor, and its employment mostly in the agricultural sector with low wages.

J. Social reasons: At the individual level, the hidden economy emerges due to the problem of population growth, low income levels, high poverty rates, and declining rates of external and internal migration from rural to urban areas.

H. Cultural and educational factors: The emergence of the hidden economy in Egypt is also attributed to factors such as the quality of education, place of residence, age, parents' level of education, and main occupation, which are among the reasons for informal employment in Egypt.

Distribution of informal units

■ Distribution of informal units in Egypt by sector in 2015

■ percentage

other services	construction and labor	trade	Agriculture	industry
33%	15%	4%	47%	1%
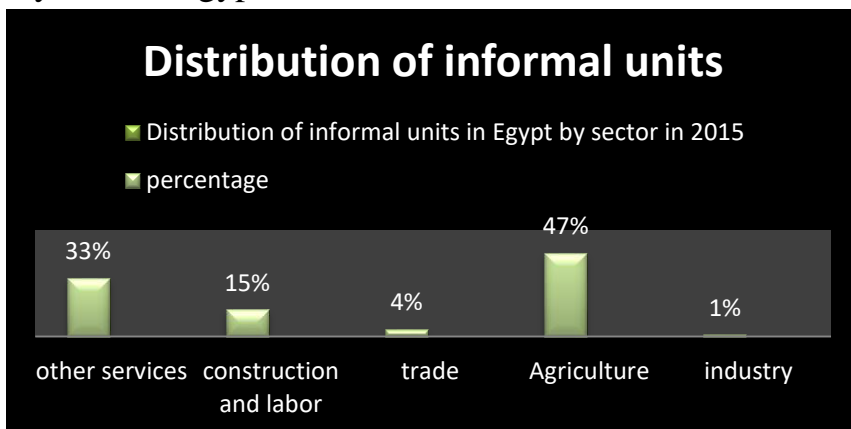
It is clear from the previous figure that the number of informal units is highest in the agriculture sector, with a significant proportion of 47%, while the lowest proportion of informal units is found in the trade and industry sectors. **(IMF, 2017)** [19]

Data Source:

The study analyzed time series data from World Bank statistics in Egypt from 2010 till 2022 and also from study for waleed Abdullah with title" Shadow Economy: its Measurement and it Impact on Economic Growth" from 1990 till 2010 this research in Asyout university in Egypt "faculty of commerce" in order to illustrate the dynamical interplay between the shadow economy, sustainable development, GDP, and financial stability. Sustainable development is a dependent variable, while the independent variables are foreign direct investment, GDP, the shadow economy, financial stability, and domestic lending to the private sector.

Study variables:

The dissertation uses a mixed method approach to demonstrate the effect of Egypt's shadow economy on sustainable development. To address the research question, both the qualitative and quantitative approaches are used. The paper's analysis is predicated on six variables. These include financial stability, GDP, FDI, sustainable development, the shadow economy, and domestic lending to the private sector.

Each of these variables will try to explain the effect of shadow economy on sustainable development.

Sustainable development:

This is the primary variable on the sustainable development index. There are five indicators in this index that is

used to calculate the average of sustainable development which are: Net national savings "which consider as one of economic aspect that was discussed before in chapter two", Education Expenditure as % of GNI "which consider as one of social aspect", Energy depletion "one of economic aspect", carbon dioxide damage " one of the most important variable of environmental aspects", Net forest depletion and mineral depletion.

The shadow economy

The term "shadow economy" which also known as "informal economy" or "underground economy" describes economic activity that takes place outside the official sector and is not subject to government regulations.

The "Multiple Indicator Multiple Causes" (MIMC) method is the most widely used approach for calculating the shadow economy, and it will be employed in this study to address the research topic.

The MIMC technique is primarily based on the use of a certain structural equation model and generally draws upon the works of Weck (1983) and Frey. They end up with statistical theory of unobserved variables, which takes into account a variety of causes and indicators of the phenomenon under study. Specifically, it takes into account the various factors that contribute to the emergence and expansion of the shadow economy as well as the various effects that the shadow economy

has over time. Both of them estimate SE of 162 nations worldwide using a specific kind of structural equation multiple Causes (MIMC) model.

Foreign Direct Investment:

It refers to selling an asset in another country. It's computed as a GDP percentage.

GDP:

"The total market value of final goods and services produced within a country in a given period of time" is the definition of GDP.

GDP calculates the aggregate income of all members of the economy as well as the total amount spent on the production of goods and services by the sector.

GDP is calculated using the following formula:

$$GDP = C + I + G + Nx.$$

These components stand for: Nx Net Exports (Exports – Imports), G represents Government Purchases, I stands for Investment, and C stands for Consumption.

Financial Stability:

A reliable financial system can effectively distribute resources, evaluate and control financial risks, keep employment levels close to the economy's natural rate, and prevent fluctuations in the prices of real or financial assets that could impact monetary stability or employment levels. We calculate the mean score of governmental stability, corruption management,

bureaucratic quality, law enforcement, and democratic responsibility.

Domestic Credit to Private Sector:

This can symbolize the economic growth. It is calculated as the private sector's domestic credit relative to the GDP.

The model:

The following will be the proposed model that will be

$$SD_{it} = \beta_0 + \beta_1 SE_{it} + \beta_2 AI_{it} + \beta_3 DCPS_{it} + \beta_4 FDI_{it} + \beta_5 GDP_{it} + U_{it}$$

T= 1990, 1996,......, 2022.

Where;

SD is sustainable development, SE is Shadow Economy, AI is Average of institutional quality, DCPS is Domestic credit to private sector, FDI is Foreign Direct Investment, GDP is Gross Domestic Production

Empirical part

Graphical analysis
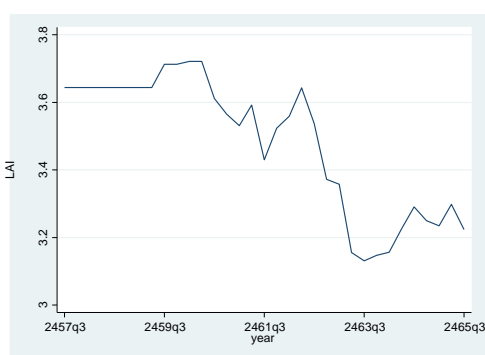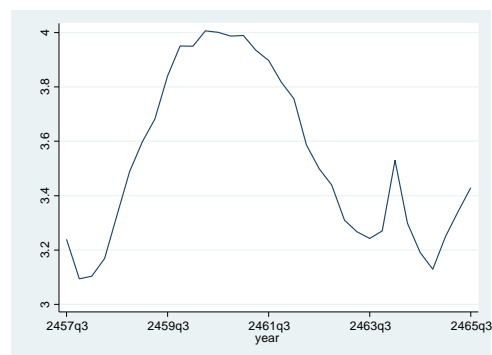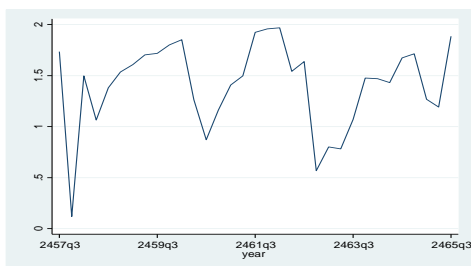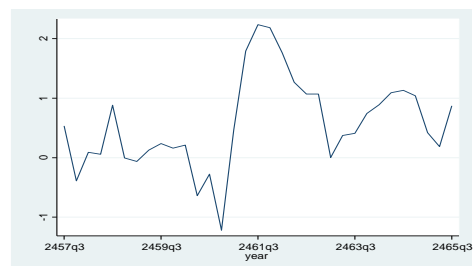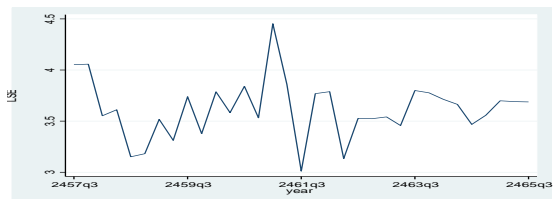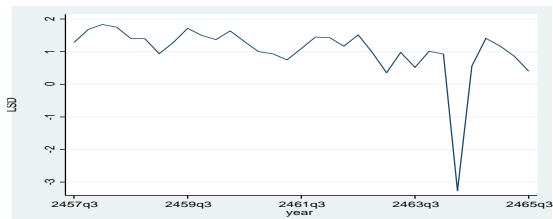
This is a graphical analysis for all variables which are "Sustainable development, Shadow economy, foreign direct investment, domestic credit for private sector, average of institutional quality and GDP". Those graphs show that some of variable may suffer from stationary problem like shadow economy graph, FDI graph and AI also.

Descriptive analysis:

```
Contains data
  obs:        33
  vars:        7
  size:       858

--------------------------------------------------------------
-------
-         storage  display  value
variable name  type  format  label    variable label

--------------------------------------------------------------
-------

year         int    %8.0g            year
SD           float  %8.0g            Sustianable Development (%
GDP)
SE           float  %8.0g            shadow economy as % of
GDP, according to Tanzi
FDI          float  %8.0g            Foreign direct investment, net
inflows (% of GDP)
```

```
GDP            float  %8.0g          GDP growth (annual %)

DCP            float  %8.0g          Domestic credit to private
sector (% of GDP)

AI             float  %8.0g          Average INS

--------------------------------------------------------------------
-------

Sorted by:  year
    Note:  dataset has changed since last saved
```

The main aim of descriptive statistics is to show the characteristics for the variables of the study and this will be through focusing on the minimum, maximum, mean and standard deviation. By getting the mean, this will be the average value that will be settled in the middle of the data.

The mean for sustainable development was 3.37 with standard deviation 1.3998 and the maximum value was 6.26 and its minimum value was 0.038. For the shadow economy, the mean is 38.86 and its standard deviation is 12.17, with minimum

value is 20.3and the maximum value is 85.91. For Foreign Direct Investment "FDI", the mean is 2.295 and the standard deviation is 2.22 with maximum value is 9.34 and minimum value is -0.204. The mean value of GDP is 4.42 and its standard deviation is 1.579 and the minimum value is 1.125 and the maximum value is 7.156. The mean for domestic credit to private sector "DCP" is 35.95 with the standard deviation is 11.508 and the minimum value is 22.058 and the maximum value is 954.93. The mean of Average of institutional quality "AI" is 33.097 with standard deviation 6.316 and the minimum value is 22.88 and the maximum value is 41.32.

Correlation analysis

```
pwcorr LSD LSE LFDI LGDP LDCP LAI, sig

        |    LSD    LSE    LFDI   LGDP   LDCP    LAI

------------+-----------------------------------------------------

    LSD |  1.0000

    LSE |  -0.0498   1.0000

        |  0.7832

   LFDI |  -0.1766  -0.1244   1.0000

        |  0.3256   0.4905

   LGDP |  0.0280  -0.1838   0.4806   1.0000

        |  0.8772   0.3060   0.0046
```

```
LDCP |  0.1598   0.0484  -0.0020   0.3274   1.0000

     |  0.3743   0.7893   0.9912   0.0629

 LAI |  0.4861  -0.0635  -0.2710   0.1440   0.4830   1.0000

     |  0.0041   0.7254   0.1272   0.4241   0.0044
```

This table shows the correlation between sustainable development, Shadow economy, foreign direct investment, Gross domestic production, domestic credit for private sector and average for institutional quality. The correlation between sustainable development and itself is perfect positive linear relationship, which means if the shadow economy increases, sustainable development will decrease according to the negative correlation which is more realistic and following the theory. The correlation between the shadow economy and sustainable development is week negative relationship.

The correlation between foreign direct investment "FDI" and sustainable development is weak negative relationship, which means if the FDI increases, sustainable development will decrease and the correlation between FDI and shadow economy is weak negative relationship, this means also if the FDI increases, the shadow economy will decreases.

The correlation between GDP and sustainable development is weak positive relationship, which means if GDP increases, sustainable development will increase also according to the positive relationship. The correlation between GDP and

shadow economy is weak negative relationship, this also means if GDP increases, shadow economy will decrease because the negative correlation between them.

The correlation between GDP and FDI is moderate positive relationship. This means if GDP increases, GDP will increase also. The correlation between domestic credit for private sector and sustainable development, shadow economy and FDI is weak negative relationship. The correlation between average for institutional quality "AI" and sustainable development is strong positive relationship. This means if the Average institutional quality increases, sustainable development will increase also which follow also the theory. The correlation between AI and SE is negative weak relationship. The correlation between AI and FDI is negative weak relationship. The correlation between AI and GDP is positive weak relationship. The correlation between AI and DCP is moderate positive relationship.

Lag selection criteria:

```
varsoc LSD LSE LFDI LGDP LDCP LAI, maxlag(3)

Selection-order criteria

Sample: 1993 - 2022          Number of obs   =     30

+-------------------------------------------------------------------+

|lag |  LL    LR   df  p  FPE    AIC    HQIC    SBIC  |

|----+---------------------------------------------------------

| 0 | -66.6358         5.1e-06  4.84239  4.93204  5.12263 |
```

```
| 1 | 39.381 212.03  36 0.000 5.1e-08 .174602  .802159 2.13628*|

| 2 | 96.1486 113.54  36 0.000 1.7e-08 -1.20991 -.044445 2.43321

| 3 | 155.753 119.21* 36 0.000 9.7e-09* -2.78354* -1.08017* 2.54101

+--------------------------------------------------------------------+

Endogenous:  LSD LSE LFDI LGDP LDCP LAI

Exogenous: _cons
```

In order to make ARDL model, the lag selection must be settled first. From the previous table, the third lag captures the most significant test statistics.

Co-integration test – Johanson test:
- Johansen test with no constant:

```
vecrank LSD LSE LFDI LGDP LDCP LAI, trend(none)

              Johansen tests for cointegration

Trend: none                    Number of obs =     31

Sample: 2458q1 - 2465q3              Lags =     2

--------------------------------------------------------------------

                                    5%

maximum                        trace    critical

 rank   parms    LL    eigenvalue statistic  value

  0     36   7.4815627      .     123.2866  82.49

  1     47  31.458823   0.78710   75.3321   59.46

  2     56  53.035603   0.75143   32.1785*  39.89
```

3	63	61.935529	0.43684	14.3787	24.31
4	68	66.664845	0.26296	4.9200	12.53
5	71	69.065934	0.14351	0.1179	3.84
6	72	69.124866	0.00379		

From the table which is the co-integration test and it didn't include a trend or constant, when rank is 0 and 1, the track statistics is greater than the critical value, so the null hypothesis of no co-integration will be rejected. When the rank is 2 or more, the trace will be less than critical value, so the null hypothesis of no co-integration will be accepted.

After making Johanson test with three models. The first one, with no constant, the second one with unrestricted constant and the third one with restricted trend, the null hypothesis of no co-integration will be accepted.

- Johansen test with unrestricted constant:

```
. vecrank LSD LSE LFDI LGDP LDCP LAI, trend(constant)

            Johansen tests for cointegration

Trend: constant                 Number of obs =    31

Sample:  2458q1 - 2465q3              Lags =     2

-------------------------------------------------------------------------

                                 5%

maximum                      trace   critical

 rank   parms    LL    eigenvalue statistic   value
```

0	42	8.8808872	.	162.3103	94.15
1	53	33.288232	0.79292	113.4956	68.52
2	62	56.004339	0.76905	68.0634	47.21
3	69	75.691667	0.71921	28.6888*	29.68
4	74	84.10595	0.41891	11.8602	15.41
5	77	88.650954	0.25415	2.7702	3.76
6	78	90.036056	0.08549		

From the table which is the co-integration test and it include an unrestricted constant in the model, when the rank is 0, 1 and 2, the track statistics is greater than the critical value, so the null hypothesis of no co-integration will be rejected. When the rank is 3 or more, the trace will be less than critical value, so the null hypothesis of no co-integration will be accepted.

Johansen test with restricted trend in the model:

```
. vecrank LSD LSE LFDI LGDP LDCP LAI, trend(rtrend)

            Johansen tests for cointegration

Trend: rtrend                    Number of obs =    31

Sample: 2458q1 - 2465q3                  Lags =     2

--------------------------------------------------------------

                        5%

maximum                      trace   critical

 rank  parms    LL     eigenvalue statistic  value

  0    42   8.8808872      .      189.5808  114.90
```

1	54	37.918049	0.84639	131.5064	87.31
2	64	60.799222	0.77150	85.7441	62.99
3	72	81.085009	0.72985	45.1725	42.44
4	78	91.348041	0.48425	24.6464*	25.32
5	82	99.153068	0.39562	9.0364	12.25
6	84	103.67126	0.25286		

From the table which is the co-integration test and it include a restricted trend in the model, when the rank is 0, 1,2 and 3, the track statistics is greater than the critical value, so the null hypothesis of no co-integration will be rejected. When the rank is 4 or more, the trace will be less than critical value, so the null hypothesis of no co-integration will be accepted.

Unit root test:

```
dfuller LSD , trend regress lags(3)

Augmented Dickey-Fuller test for unit root      Number of obs  =   29

          ---------- Interpolated Dickey-Fuller ---------

           Test      1% Critical    5% Critical    10% Critical    Statistic      Value         Value
Value

----------------------------------------------------------------------------

 Z(t)      -3.555      -4.343       -3.584        -3.230

----------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.0338
```

```
-----------------------------------------------------------------------

D.LSD    |    Coef.   Std. Err.    t    P>|t|    [95% Conf. Interval]

-------------+-----------------------------------------------------------    LSD |

 L1. |   -1.7401   .4894194   -3.56   0.002   -2.752542   -.7276594

 LD. |   .7137608   .4071644    1.75   0.093   -.1285229   1.556044

 L2D. |   .4042379   .3117973    1.30   0.208    -.240764   1.04924

 L3D. |   .2788456   .216825    1.29   0.211   -.1696912   .7273823 _trend| -.0805935   .0311448   -2.59
0.016   -.1450214   -.0161656

 _cons |   3.183585   1.02627    3.10   0.005    1.060584   5.306587

-----------------------------------------------------------------------------
```

The null hypothesis of log of sustainable development, at the level of significant 5% hasn't a unit root, which means it is stationary because the p-value is 0.0338 is less than the significant level 0.05 and this means I can reject the null, which means this variable has not unit root. This means the data doesn't suffer from autocorrelation problem.

```
dfuller LSE , trend regress lags(3)

Augmented Dickey-Fuller test for unit root        Number of obs   =     29

         ---------- Interpolated Dickey-Fuller ---------

          Test      1% Critical    5% Critical   10% Critical    Statistic      Value       Value       Value

-----------------------------------------------------------------------------

 Z(t)      -2.871      -4.343        -3.584        -3.230

-----------------------------------------------------------------------------
```

```
MacKinnon approximate p-value for Z(t) = 0.1722

------------------------------------------------------------------------

D.LSE      Coef.  Std. Err.   t   P>|t|   [95% Conf. Interval]

------------+-----------------------------------------------------------

 LSE |

 L1. | -1.114378  .3881884  -2.87  0.009  -1.917407  -.3113493

 LD. |  .1186438  .3329569   0.36  0.725   -.5701301  .8074176

 L2D. | -.0019511  .2544276  -0.01  0.994  -.5282747  .5243724

 L3D. |  .1144438  .1869205   0.61  0.546  -.2722307  .5011183

 _trend |  .0076613  .0068581  1.12  0.275  -.0065259  .0218484

 _cons |  3.865188  1.375283   2.81  0.010   1.020199  6.710177

------------------------------------------------------------------------
```

The null of log of shadow economy, at the level of significant 5% has a unit root; this means the variable is not stationary because the p-value is 0.17 which is greater than the significant level 0.05 which means I cannot reject the null, which means the variable has a unit root. This means also, some variable may suffer from autocorrelation problem.

```
dfuller LFDI , trend regress lags(3)

Augmented Dickey-Fuller test for unit root     Number of obs  =  29

              ---------- Interpolated Dickey-Fuller ---------

           Test      1% Critical    5% Critical    10% Critical    Statistic      Value          Value
Value

-------------------------------------------------------------------------

 Z(t)      -2.597       -4.343        -3.584        -3.230

-------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.2813

-------------------------------------------------------------------------

D.LFDI   |    Coef.  Std. Err.    t   P>|t|    [95% Conf. Interval]

-------------+-----------------------------------------------------------

 LFDI |

 L1. | -.5531365  .2130006  -2.60  0.016  -.9937619  -.1125111

 LD. | .2898348  .2047993   1.42  0.170  -.1338248   .7134944

 L2D. | .3716297  .2109576   1.76  0.091  -.0647694   .8080287

 L3D. | -.025853  .2073184  -0.12  0.902  -.4547239   .4030178

 _trend | .0191637  .0148701   1.29  0.210  -.0115976   .0499249

 _cons | .0082955  .2545252   0.03  0.974    -.51823   .5348209

-------------------------------------------------------------------------
```

The null hypothesis of log of foreign direct investment, at level of significant 5% has a unit root, which means it is not stationary because the p-value is 0.281which is greater than 0.05 and this means I cannot reject the null, which means this variable has a unit root.

```
dfuller LGDP , trend regress lags(3)

Augmented Dickey-Fuller test for unit root     Number of obs  =   29

          ---------- Interpolated Dickey-Fuller ---------

          Test       1% Critical     5% Critical     10% Critical

          Statistic      Value           Value           Value

------------------------------------------------------------------------

Z(t)      -3.377       -4.343          -3.584          -3.230

------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.0446

------------------------------------------------------------------------

D.LGDP | Coef.   Std. Err.    t   P>|t|    [95% Conf. Interval]

-------------+----------------------------------------------------------

 LGDP |

 L1. | -.7644605  .2263945  -3.38  0.003  -1.232793  -.2961278

 LD. |  .3344844  .2092727   1.60  0.124   -.0984291   .7673979

 L2D. |  .3634063  .195176    1.86  0.075   -.040346    .7671586

 L3D. |  .1993587  .1605547   1.24  0.227   -.132774    .5314914

 _trend | -.0017757  .0070656  -0.25  0.804  -.0163919   .0128406

 _cons | 1.139135  .3623716   3.14  0.005   .3895124   1.888758
```

The null hypothesis of log of gross domestic production at level of significant 5% hasn't a unit root, which means it is stationary because the p-value is 0.0446 which is less than 0.05 and this means I can reject the null, which means this variable has not unit root.

```
. dfuller LDCP , trend regress lags(3)

Augmented Dickey-Fuller test for unit root      Number of obs  =   29

            ---------- Interpolated Dickey-Fuller ---------

            Test      1% Critical   5% Critical   10% Critical   Statistic      Value        Value        Value

------------------------------------------------------------------------

 Z(t)      -2.740      -4.343       -3.584       -3.230

------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.2197

------------------------------------------------------------------------

D.LDCP    Coef.   Std. Err.    t   P>|t|   [95% Conf. Interval]

-------------+----------------------------------------------------------

 LDCP |

 L1. |  -.19893   .0725918   -2.74  0.012   -.3490976  -.0487624

 LD. |  .2224589  .184375     1.21  0.240   -.1589498  .6038676

 L2D. |  .1206846  .1924379    0.63  0.537   -.2774035  .5187727

 L3D. |  .0271708  .1905411    0.14  0.888   -.3669936  .4213352

 _trend | -.0057122  .0028218  -2.02  0.055   -.0115496  .0001251

 _cons |  .8211388  .2851143    2.88  0.008    .2313349  1.410943

------------------------------------------------------------------------
```

The null hypothesis of log of domestic credit for private sector, at level of significant 5% has a unit root, which means it is not stationary because the p-value is 0.2197 which is greater than 0.05 and this means I cannot reject the null, which means this variable has a unit root.

```
. dfuller LAI , trend regress lags(3)


Augmented Dickey-Fuller test for unit root      Number of obs  =  29

          ---------- Interpolated Dickey-Fuller ---------

                Test     1% Critical    5% Critical   10% Critical   Statistic    Value     Value      Value

-------------------------------------------------------------------------

 Z(t)      -2.874      -4.343       -3.584        -3.230

-------------------------------------------------------------------------

MacKinnon approximate p-value for Z(t) = 0.1709

-------------------------------------------------------------------------

D.LAI      | Coef.  Std. Err.    t   P>|t|   [95% Conf. Interval]

------------+---------------------------------------------------- LAI |

  L1. | -.4754934 .1654184  -2.87  0.009  -.8176875  -.1332993

  LD. |  .1868331 .193599   0.97  0.345  -.2136569  .5873231

  L2D. | .3299841 .1972009   1.67  0.108  -.0779569  .7379252

  L3D. | .1808271 .2027249   0.89  0.382  -.2385413  .6001954

 _trend | -.0098317 .0036454  -2.70  0.013  -.0173727  -.0022906

 _cons |  1.822898 .6371711   2.86  0.009   .504809   3.140987


-------------------------------------------------------------------------
```

The null hypothesis of log of average institutional quality, at level of significant 5% has a unit root, which means it is not stationary because the p-value is 0.1709 which is greater than 0.05 and this means I cannot reject the null, which means this variable has a unit root.

ARDL Model:

```
ardl LSD LSE LFDI LGDP LDCP LAI, maxlags(3) ec1 noconstant

ARDL(1,1,0,0,2,0) regression

Sample:  1993 -  2022              Number of obs  =      30

                          R-squared     =   0.8917

                          Adj R-squared =   0.8453

Log likelihood = -12.087479        Root MSE    =    0.4327

----------------------------------------------------------------------

   D.LSD |   Coef.  Std. Err.   t   P>|t|   [95% Conf. Interval]

-------------+--------------------------------------------------------

ADJ    LSD |

    L1. | -.7125712 .1237747  -5.76  0.000  -.9699749  -.4551676

-------------+--------------------------------------------------------

LR    LSE |

    L1. | -1.598322 .4278672  -3.74  0.001  -2.488121  -.7085236

    LFDI |

    L1. | -.1970203 .2289089  -0.86  0.399  -.6730624  .2790219

    LGDP |

    L1. |  .4716074 .5101906   0.92  0.366  -.5893921  1.532607
```

```
    LDCP |

    L1. | .6310253  .5525803   1.14  0.266  -.5181283  1.780179

     LAI |

    L1. | 1.127614  .574179    1.96  0.063  -.0664569  2.321684

------------+----------------------------------------------------------
SR     LSE |

    D1. | -.5500084  .2513358  -2.19  0.040  -1.07269  -.027327

    LFDI |

    D1. | -.140391   .1541328  -0.91  0.373  -.4609278  .1801458

    LGDP |

    D1. | .3360539   .3323881   1.01  0.324  -.355185  1.027293

    LDCP |

    D1. | 5.105763   1.002054   5.10  0.000   3.021877  7.189649

    LD. | -6.861463  .9702116  -7.07  0.000  -8.879128  -4.843797

     LAI |

    D1. | .8035051   .420478    1.91  0.070  -.0709269  1.677937

---------------------------------------------------------------------
```

An ARDL model is an ordinary least square regression based model that can be applied for time series data that is non-stationary and also time series with mixed order of integration. It includes lags of both dependent and independent variables as regressions in the model. In ARDL, the dependent and independent variables are related both at the present and also in the lagged values.

From the above table, the model as a whole is significant and R-square is 0.89 which means all variables can be explained by 89%. From the model , all variables can be describe the sustainable development by 71% when shadow economy increased by 1%, the sustainable development will decrease by 55% in the short run and by 159% in the long run. This means there is a negative relationship between shadow economy and sustainable development and this is according to the theory.

From the Foreign Direct Investment "FDI" perspective, when it increase by 1%, the sustainable development will decrease in the long run by -0.197 and by -0.14 in the short run. For the GDP, when it increased by 1%, the sustainable development will increased by 0.47 in the long run and it will increase by 0.33 in the short run. For domestic credit for private sector "DCP" when it increases by 1%, the sustainable development will increase by 0.63 in the long run and by 5.105 in the short run. For Average institutional quality "AI", if it increases by 1%, the sustainable development will increase by 1.12 in the short run and by 0.80 in the short run.

Summary for the Empirical Part:

- There is a strong negative relationship between shadow economy and sustainable development "the core of the study", which means if shadow economy increase by 1 %, sustainable development will decrease in the short run by 55% and in the long run by 159%.

- There is a week negative relationship also between Foreign Direct Investment "FDI" and sustainable development; not only sustainable development but also shadow economy. Because as increase on FDI by 1% will lead to decrease on sustainable development by 14% in the short run and by 19% in the long run.
- There is a strong positive relationship between GDP and sustainable development, if GDP increase by 1% then sustainable development will increase by 33% in the short run and 47% in the long run. On the other hand, GDP is negatively related to the shadow economy.

Conclusion:

Shadow economy can hinder a country's economic growth and sustainable development in multiple ways. It encompasses various illicit activities, including corruption, narcotics trade, smuggling, counterfeiting, and other crimes. Common practices in the shadow economy include unreported transactions, unofficial labor and tax evasion by individual and businesses. This allows companies to easily disregard environmental responsibilities by bribing officials, thereby undermining the rule of law and environmental protection. By using a time series data, for Egyptian economy from 1990 till 2022, the study found the following:

There are many aspects to study the impact of shadow economy like the economic aspects which contain "GDP per capita, unemployment rate, informal employment, tax burden, minimum wage, inflation rate and the level of expenditure" and

also the monetary aspect which contains "Cash V.s bank transaction, Bank account per capita, Black market exchange rate", not only that but also the labor market aspects like "number of unregister business, number of informal workers, add to this the business approach, demographic and political approach.

On the other hand, sustainable development has mainly four dimensions that can help anyone to assess the impact of any economic variable on sustainable development, which are "Economic dimensions, social dimensions, environmental dimension and institutional dimension". This study uses a variable from each dimension in order to calculate the average of sustainable development in Egypt. For example, the study calculate sustainable development as an average of net national savings "which is one of economic dimensions, Energy depletion and carbon dioxide damage "both of them environmental dimensions" and also education expenditure "one of social dimensions".

The main result of the study is that there is a weak negative correlation between shadow economy and sustainable development; this means if shadow economy increase, sustainable development will decrease. According to the empirical part, if shadow economy increase by 1 % sustainable development will decrease by 55 % in the short run and by 159% in the long run. The main reason behind that is, increasing the level of shadow economy will end up with getting wrong

indicators for the economy as a whole like decreasing in the level of education expenditure, decreasing the level of GDP, increase the level of corruption and all of that will end up with decease the level of sustainable development, all of this is according to the world bank report, 2023.

Not only that but also, the correlation between GDP and sustainable development is positive which means when GDP increases, sustainable development will increases also. From empirical side, if GDP increases by 1 %, sustainable development will increase also by 47% in the short run and also by 33% in the long run. The main reason behind that is, the main components of GDP is consumption, Government expenditure, Investment and net exports and all of that is consider as main indicators for sustainable development. This means if the government expenditure increase will lead to increase the level of education and this is one of social aspects for sustainable development. Also increase in the level of investment, will lead to increase in the level of legal employment and decrease the level of unemployment which will affect positively in sustainable development.

The correlation between GDP and shadow economy is strong negative relationship which means if shadow economy increases, GDP will decreases. The reason is, when the productivity "GDP per worker" increased in any economy will lead directly for better allocation of economic resources and all

of that will end up with low level of shadow economy and the opposite also is right.

The correlation between shadow economy and foreign direct investment "FDI" is negative, which means that if shadow economy increases, FDI will decreases. The main reason behind that is Increasing the level of shadow economy will lead to decrease the public revenue and affecting the affecting the quantity and the quality of goods and services.

Recommendations:

 The author recommends the following:

1- Egyptian economy should focus on shadow economy problem because it considers as a big problem that stand in front of the Egyptian economic progress.

2- Other researcher can focus on shadow economy and its impact on other economic variables to show the impact of shadow economy from different aspects.

3- The tax authority should establish clear and specific bases and criteria for taxing each activity separately, in accordance with the nature and size of each activity, and in light of the principle of social justice.

4- The government should simplify administrative procedures for transitioning from the informal to the formal sector, reduce bureaucracy, eliminate red tape, and work to remove all obstacles

5- Increasing the tax exemption threshold to match the rising cost of living and prices

6- Reducing the tax rate on small individual businesses in the country to a flat rate of 10% of annual net profit, regardless of the type of activity, to achieve the principle of tax fairness.

7- Any economy should try to attract returning migrants by offering specialized training programs and recognize skills acquired abroad, this approach can help leverage the experience gained by the migrants during their time abroad, supporting their migration into the workforce.

References

[1] IMF. (2018, January)." Shadow economies around the world: What did we learn over the last 20 years?" international Monetary fund. 12/ 15 https://www.imf.org/en/Publications/WP/Issues/2018/01/25/Shadow-Economies-Around-the-World-What-Did-We-Learn-Over-the-Last-20-Years-45583

[2] Schneider, F. (2010, July). Shadow economies all over the world: New estimates for 162 countries from 1999 to 2007, policy research working paper No.5356, The World Bank Development Research Group Poverty and Inequality   Team. https://documents1.worldbank.org/curated/en/311991468037132740/pdf/WPS5356.pdf

[3] World Bank. (2011, December). "Labor institutions and their impact on shadow economies in Europe".Doi http://documents.worldbank.org/curated/en/444591468249302087

[4] IMF. (2019, December 13). "Explaining the shadow economy in Europe: Size, causes and policy options". International Monetary Fund, Working Paper No.2019/278.

https://www.imf.org/en/Publications/WP/Issues/2019/12/13/Explaining-the-Shadow-Economy-in-Europe-Size-Causes-and-Policy-Options-48821

[5] Schneider, F. (2016, September) "Estimating the size of the shadow economy: Methods, problems and open questions". Research Gate Journal, 1515/openec-2017-1, DOI 10.1515/openec-2017-0001

[6] SEDMÍKOVÁ, E. (2021)"Energy consumption in assessment of shadow economy". European Journal of Interdisciplinary Studies, Vol.13 E63; DOI : http://doi.org/10.24818/ejis.2021.12

[7] Mihaela, M. (2023, July 30). Estimation methods for the shadow economy: A systematic literature review. Brazilian Journal of Business V.5n.3 (2023), DOI, https://doi.org/10.34140/bjbv5n3-010

[8] Rubin, M. (2011, September) "The practicality of the top-down approach to estimating the direct tax gap". Majesty's Revenue and Customs, United Kingdom https://www.irs.gov/pub/irs-soi/11rescontaxgap.pdf

[9] Schneider, F. & ILO. (2016, December) "Nature of the relationship between minimum wage and the shadow economy size: An empirical analysis for the case of Romania". IZA Institute of Labor Economics No. 11247 https://docs.iza.org/dp11247.pdf

[10] Schneider, F. (2010, March)." The shadow economy and work in the shadow: What do we (not) know?" Forschungsinstitut zur Zukunft der Arbeit Institute for the Study of Labor DP No. 6423, DOI https://docs.iza.org/dp6423.pdf

[11] United Nations. (2015, September 25). "A resolution adopted by the General Assembly on September 25, 2015". European Environment Agency https://www.eea.europa.eu/policy-documents/resolution-adopted-by-the-general

[12] Klarin, R. (2018, march 30). "Taxation and the shadow economy. paper|no". WPS 8391 Washington, D.C. World Bank Group. DOI, http://documents.worldbank.org/curated/en/497071522428886160

[13] - Mohamed Fathy abdelgany, 2020 "the development of the concept of sustainable development, its dimensions and results in Egypt"DOI 10.11648/j.ijefm.20231102.12

[14] OECD. (2017, September 29). "Shining light on the shadow economy: Opportunities and threats". OECD website DOI https://doi.org/10.1787/e0a5771f-en

[15] Wageh, W. (2015). "Environmental efficiency and its relationship with sustainable development in Egypt 2030". Ministry of Planning and Economic Development,
https://mped.gov.eg/Files/Egypt_Vision_2030_EnglishDigitalUse.pdf

[16] - Loay Taha, (2022, December)" the concept of development, Integrated and sustainable rural development", Research Gate, DOI, 10.35950/cbej.v22i96.8896

[17] Pham, M.H. (2024, February). "Economic complexity, shadow economy, and income inequality: Fresh evidence from panel data". International Economic Journal 38(3):1-23 DOI,
http://dx.doi.org/10.1080/10168737.2024.2311704

[19] IMF. (2017, January)." Shadow economies around the world: What did we learn over the last 20 years?" international Monetary fund. 12/ 15 https://www.imf.org/en/Publications/WP/Issues/2018/01/25/Shadow-Economies-Around-the-World-What-Did-We-Learn-Over-the-Last-20-Years-45583