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The impact of the effectiveness of fiscal and monetary policies on economic growth amid oil price fluctuations: An econometric study of selected Arab Countries

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***Abstract*---**This study aims to conduct an analytical econometric study on the impact of fiscal and monetary policies, as well as oil price fluctuations, on economic growth. The study focuses on the Algerian economy, comparing it with a sample of Arab countries in the North Africa and Middle East (MENA) region. The empirical study covers four countries: Algeria, Morocco, Jordan, and Egypt. The analysis uses Panel Data models applied to annual series for each country's real GDP, government expenditure, and money supply, as well as the series of oil price fluctuations over the period from 2004 to 2022. The data series on fiscal and monetary policies and economic growth were obtained from the World Bank Database (WDI), while oil price data were sourced from the U.S. Energy Information Administration (EIA). The findings indicate that both fiscal and monetary policies have a positive impact on economic growth in the Arab countries studied. However, the effectiveness of these policies in influencing economic growth varies depending on the nature of the economy. Monetary policy is effective in non-oil-producing Arab countries (Morocco, Tunisia, Egypt, and Jordan), while fiscal policy is more effective in oil-producing countries (such as Algeria) in promoting economic growth. The study also concludes that oil prices have a positive impact on economic growth in the selected sample of Arab countries.

***Keywords*---**Fiscal and Monetary Policy, Oil Market, Oil Prices, Economic Growth.

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Introduction

Economic growth is one of the most significant issues and topics that have consistently attracted the attention of economists, regardless of their different orientations, as economic growth is a primary goal of the economic policies of every country. Monetary policy holds a crucial position among other policies because it can play a major role in achieving the multiple objectives sought by economic policy. This is due to its impact on the growth of a country's GDP through its tools and mechanisms, such as maintaining price stability, ensuring the stability of the national currency's value, maintaining employment levels, and reducing unemployment and inflation.

Fiscal policy also holds a significant position among other policies because it can play a major role in achieving the various goals pursued by the national economy. This is due to its multiple tools, which are among the most important tools of economic management in achieving economic development and solving problems that hinder economic stability. In addition to the distributive and specialized effects of fiscal policy tools, there are stabilizing effects represented by the role of government spending and taxes in influencing aggregate demand and, consequently, overall economic variables.

Monetary policy is also one of the most essential tools of a country's macroeconomic policy due to its role in achieving economic stability in society through its instruments. These include maintaining price stability, ensuring the stability of the national currency's value, maintaining employment levels, and reducing unemployment and inflation. Monetary policy holds a fundamental place in most Arab economies, and its importance increases with the expansion of local and international trade in a global economic system. This is due to the policy's strong ability to respond to economic shocks and manage imbalances and oil price fluctuations that the world has witnessed recently.

The significant developments witnessed in the global oil market in recent years have had profound impacts on economic development in many Arab countries, particularly those that are oil-producing and exporting. Economies that rely heavily on oil exports have experienced fluctuations and shocks, the severity of which has varied from one country to another depending on each country’s economic circumstances. The more a country’s exports are concentrated on a single sector or commodity, the more economic burdens it imposes. The global financial crisis has cast its shadow over the world economy in general and the Arab economies in particular, making Arab economies among the most affected by the tremors of this global crisis. This impact was especially felt amidst the political and security changes that swept the region during the so-called Arab Spring. These tragic events inflicted substantial damage on the economies of some countries, such as Egypt, Tunisia, and Iraq, among others, due to the instability of the security situation and political conditions. All these events unfolded in the Arab region rapidly, within less than three decades, undoubtedly resulting in high economic costs. The negative effects of these events impacted not only the macroeconomic indicators of these countries but also directly affected their political stability, in addition to the welfare and living standards of individuals and societies in these countries.

Study Problem:

The study proceeds from the following main question:
What is the effectiveness of fiscal and monetary policies on economic growth amid oil price fluctuations in a group of Arab countries (Algeria, Morocco, Egypt, and Jordan)?

This main question branches into the following sub-questions:

- What is the impact of money supply, public expenditure, and oil prices on economic growth in the group of Arab countries under study?
- To what extent does economic growth respond differently to changes in money supply, public expenditure, and oil prices in the Arab countries under study?

Study Hypotheses:

To address the research problem, we have based our study on the following hypotheses:

- Money supply, public expenditure, and oil prices all positively affect economic growth in the Arab countries under study. This means that rising oil prices encourage economic growth in these countries, while a collapse in oil prices leads to a contraction in economic growth.
- There should not be a variation in the impact of monetary policy on economic growth among the Arab countries under study.
- The impact of oil prices on economic growth in the Arab countries under study varies. In oil-producing countries, oil prices positively influence economic growth, whereas in non-oil-producing Arab countries, the impact is negative. In other words, rising oil prices positively affect economic growth in oil-producing and exporting Arab countries, while they negatively affect non-oil-producing countries.

1. The Conceptual and Theoretical Framework of Fiscal and Monetary Policy and Economic Growth:

1.1 The General Framework of Fiscal Policy:

1.1.1 The Concept of Fiscal Policy:

Economists have provided various definitions of fiscal policy. Gaston Jeze defines fiscal policy as a set of rules that governments and public bodies must apply when determining public expenditures and securing the resources necessary to cover these expenditures by distributing their burdens among individuals (Aldaemi, 2010, p. 49). Milton Friedman describes fiscal policy as a set of programs adopted by the government in planning its public expenditures and in arranging the means to finance them, aiming to create conditions for achieving the optimal level of production and employment in both the public and private sectors (Kafi, 2015, p. 339). Others view fiscal policy as the studied and deliberate policies and procedures related to the level and pattern of government spending on one hand, and the level and structure of the revenues obtained on the other (Klein, 1973, p. 176).

1.1.2 Fiscal Policy Tools:

The government can influence the overall economic sphere by using its main tools, which include:

A. Taxes and Fees:

Taxes are the most important tools of fiscal policy and a source of state revenue. They include both direct and indirect taxes of all kinds, aimed at achieving specific objectives that serve economic policy (Raja, 2013, p. 71). Tax policy refers to the set of tax-related measures aimed at organizing tax collection to influence the economic and social situation according to the general economic orientations and to cover public expenditures (Abdel Majeed, 2006, p. 139).

B. Government Expenditure:

This refers to the financial allocations approved by the legislative authority and sanctioned in the general budget, executed by the central government, local authorities, public institutions, and state-affiliated public sector bodies, with the aim of achieving public benefit and meeting public needs (Bouakaz, 2015, p. 44). The importance of this tool lies in its use by the state through its economic policy to achieve its ultimate goals. It reflects all aspects of public activities (Abdul Lawi, 2017, p. 95). Accordingly, the elements of public expenditure can be summarized in three components (Mahrazi, 2010, p. 65):

- Public expenditure is a monetary amount;
- It is spent by a public entity;
- Its purpose is to achieve public benefit.

C. Public Debt:

This refers to the monetary amounts borrowed by the state or public bodies from individuals, private entities, national or foreign public entities, or international institutions, with the commitment to repay the borrowed amounts and their interest according to the loan terms (Abdul Ghafoor, 2009, p. 249). It is also a debt contract under which the state borrows money from individuals, banks, or local or international bodies, with a commitment to repay the loan and its interest to the creditors by the agreed repayment date as per the contract terms (Shahada & Zuhair, 2007, p. 236). The state usually increases public debt during times of inflation and does the opposite during times of recession (Rashid, 2010, p. 224).

1.2 The General Framework of Monetary Policy:

Monetary policy is one of the most important economic policies and is often utilized to combat inflation, protect the national currency from devaluation, and achieve economic expansion based on financing various productive activities.

1.2.1 The Concept of Monetary Policy:

Monetary policy can be comprehensively defined as the tools and procedures employed by the monetary authority to control the money supply based on specific economic objectives set for a given period. Monetary policy focuses on providing the necessary liquidity for the smooth functioning and growth of the economy while maintaining monetary and currency stability, as it relates to the money supply (Marc Labonte, 2008, p. 02).

1.2.2 Instruments of Monetary Policy:

A. Quantitative Instruments of Monetary Policy:

- **Discount Rate Policy:** The discount rate refers to the interest rate at which the central bank discounts securities that commercial banks hold to obtain new monetary reserves, which are then used for credit purposes

and to grant loans to their clients, including individuals and institutions (Mohammed, 2017, p. 98).

- **Legal Reserve Ratio:** The legal or mandatory reserve ratio is the proportion imposed by the central bank on commercial banks, which is held as a non-interest-bearing deposit with the central bank (Nizar Saad El-Din, 2006, p. 291). This ratio is determined based on the prevailing economic conditions of the country.
- **Open Market Operations:** Open market operations involve the central bank entering the money market to decrease or increase the money supply by selling or purchasing securities such as stocks and bonds. This method is the most common and widely used, especially in developed countries (Belazouz, 2006, p. 125).

B. Qualitative (Selective) Instruments of Monetary Policy:

Some of the key qualitative instruments include:

- **Credit Rationing Policy:** This policy involves monitoring and controlling the primary source of the money supply by setting a specific ceiling for the growth of loans. This ceiling varies depending on the type of loans distributed by banks to their clients. Any breach of these standards is penalized by requiring the provision of substantial additional reserves to the central bank, which leads to reduced profits (Latifé, 2006, p. 09).
- **Regulation of Consumer Loans:** Oversight of consumer credit involves the terms of loan repayment and the duration of loans for purchasing durable goods. This regulation requires a minimum down payment from the buyer and sets a maximum repayment period (Hail Ajami, 2014, p. 279).
- **Moral Suasion:** This refers to the central bank persuading and advising banks regarding their overall credit policies to ensure compliance with the monetary policy guidelines.
- **Interest Rate Policy:** The central bank may require commercial banks to adhere to specific interest rates on demand deposits, fixed-term deposits, regular loans, and different rates for loans in certain productive sectors. Through this policy, the central bank can encourage savings and direct them toward desired investment areas (Abdul Hakim, 2010, p. 210).

1.3 The General Framework of Economic Growth:

1.3.1 Definition of Economic Growth:

Economic growth is defined as the continuous increase in the quantity of goods and services produced by individuals in a specific economic environment. It is also described as an increase in national economic indicators, such as a real increase in the gross or net national product (Robert Pierre, 2010). Simon Kuznets defines it as the increase in per capita output or the share of labor in the volume of production (Daron Acemoglu, 2006). According to Kosoff, economic growth is the recorded change in the volume of economic activity (Qaddour, 2013). Growth also refers to the persistent (or continuous) increase in a country's production over a long period (or several periods), distinguishing it from mere expansion, which indicates a short-term increase in production (Mesai, 2012, p. 150).

Based on the previous definitions, economic growth can be understood as the continuous increase in the production of goods and services within a specific economy to meet the overall needs of society and exceed them.

1.3.2 Types of Economic Growth

Different types of economic growth can be distinguished, as follows:

A. Transient Growth:

This type of growth is most common in developing countries. It is characterized by its lack of stability and continuity, occurring due to the emergence of unexpected factors that soon disappear, taking the growth they induced with them. This growth happens in response to sudden and temporary situations, usually external, such as receiving foreign aid for a specific period or due to a sudden increase in the prices of products the country exports, leading to a rise in their prices on the international market. However, this increase quickly fades once the causes are removed (Abdel-Hakim, 2013, pp. 10-11).

B. Spontaneous (Natural) Growth:

This refers to growth that has occurred over specific historical and temporal paths, where societies transitioned from feudal to capitalist systems. This growth resulted from several factors, including:

- The prevalence of commodity production aimed at exchange and acquiring money.
- The accumulation of capital and the formation of markets, among others.

C. Planned Growth:

This type of growth results from comprehensive planning of a society's resources and needs. Its strength and effectiveness depend on the planners' capabilities and the realism of the plans. This type of growth is self-sustaining, and if it continues for more than a few decades, it transforms into economic development (Hamdani, 2009, pp. 8-9).

1.3.3 Economic Growth Indicators (Ali Waheeb, 2013, p. 46):

Economists have relied on various economic indicators to express economic growth, including:

A. Real Gross Domestic Product (GDP):

This represents the value of final goods and services produced within the geographic boundaries of a country over a specific period (usually one year), excluding the added value of all units operating in various production branches in an economy.

B. Average Real Per Capita Income from GDP:

Although the evolution of average per capita GDP may not fully represent the true goal of development, which is to raise the living standards of individuals, development literature still considers this indicator significant. Economic growth implies a continuous increase in the average per capita GDP over time.

C. Foreign Trade Indicators:

Foreign trade is often referred to as a growth driver and is considered a source for obtaining the necessary funding for growth. It is also a primary source for acquiring intermediate and productive goods required for the growth process. Foreign trade both affects and is affected by the structure of economic activity, depending on the nature of foreign trade relations and the resulting changes in exchange rates. Exports and imports play a crucial role in determining the exchange rate of the local currency, thereby influencing the balance of payments. Therefore, foreign trade indicators are important indicators that reflect economic growth.

2. Previous Empirical Studies:

The topic of fiscal and monetary policies, their role, and effectiveness in influencing economic activity outcomes has been and continues to be a subject of deep intellectual debate within the field of economic thought among various schools of thought. Given the importance of these theoretical implications for the economic reality and understanding the extent to which these intellectual views align with different global economies—considering their varying levels of development, systems of governance, cultures, traditions, climates, and economic structures—the subject of fiscal and monetary policies has attracted the attention of researchers and academics in many developed and developing countries alike. Here, we will attempt to present the most important empirical studies that have focused on examining the impact of fiscal and monetary policies on economic growth.

Study by (Muscatelli, Patrizio, & Treci, 2002): This study applied a VAR (Vector Autoregression) model to estimate the response of fiscal and monetary policy to macroeconomic objectives in a group of the seven most advanced European countries (G7). The study demonstrated that fiscal and monetary policies are used as complementary strategic policies.

Study by (Muscatelli, Patrizio, & Treci, 2003): Titled *"Fiscal and Monetary Policy Interactions: Empirical Evidence and Optimal Policy Using a Structural New Keynesian Model,"* this research aimed to examine the interaction between fiscal and monetary policy using a Dynamic Stochastic General Equilibrium Model (DSGEM) in the United States. The study found that contractionary fiscal policy negatively impacts GDP and welfare if it is not aligned with monetary policy.

Study by (Anna , 2011): Titled *"Oil Price Shocks and the Optimality of Monetary Policy,"* this study aimed to test the responsiveness of monetary policy to oil price shocks in the United States. This empirical study, which utilized a Dynamic Stochastic General Equilibrium Model (DSGEM), concluded that monetary policy negatively affects oil price shocks. The optimal monetary policy response to an oil price shock involves raising both the inflation rate and the interest rate.

Study by (Fetai, 2013): Titled *"The Effectiveness of Fiscal and Monetary Policy During the Financial Crisis,"* this study aimed to test the effectiveness of fiscal and monetary policies in influencing economic growth during financial crises in developing and emerging countries. The study concluded that contractionary fiscal and monetary policies are prevalent during financial crises, and fiscal expansion increases production costs, leading to higher product prices during financial crises.

Study by (Bryan , 2013): Titled *"The Impact of Government Policy on Economic Growth,"* this study provided a synthesis of various analytical studies focusing on the impact of fiscal and monetary policies on economic growth in the United States. The study found that most studies concluded that monetary policy has a greater impact on economic growth than fiscal policy in the United States.
Study by (Helmut Herwartza , 2016): Titled *"The Macroeconomic Effects of Oil Price Shocks: Evidence from a Statistical Identification Approach,"* this study aimed to

analyze the dynamic effects of crude oil price fluctuations in the United States, Europe, and China using an SVAR (Structural Vector Autoregression) model. One of the main findings of this study is the economy's response to both supply and demand shocks for oil, with the U.S. economy being more affected by oil price shocks than the economies of Europe and China.

Study by (Fiorelli & Meliciani, 2017): Titled *"Economic Growth in the Era of Unconventional Monetary Instruments: A FAVAR Approach,"* this study aimed to analyze the role of monetary policy in the Eurozone using a VAR (Vector Autoregression) model. The study concluded that monetary policy is important and effective in achieving economic balance and financial stability.

Study by (Twinoburyo & Odhiambo, 2018): Titled *"Monetary Policy and Economic Growth: A Review of International Literature,"* this study aimed to survey various previous studies that addressed the impact of monetary policy on economic growth. One of the main findings of this study was that most prior research concluded that there is a positive impact of money supply on economic growth in both the short and long term in developed countries with advanced financial markets and independent central banks. In contrast, the relationship is weaker, and the impact is less significant between the money supply and economic growth in developing countries.

Study by (Baek & Miljkovic, 2018): Titled *"Monetary Policy and Overshooting of Oil Prices in an Open Economy,"* this study aimed to examine the impact of monetary policy on oil prices in the United States. The study found that monetary shocks cause changes in oil prices in the long term.

Study by (Toroubi-Abai & Ekere, 2019): Titled *"Fiscal Policy, Monetary Policy, and Economic Growth in Sub-Saharan Africa,"* this recent study aimed to analyze the impact of both fiscal and monetary policies on economic growth in a sample of 47 Sub-Saharan African countries from 1996 to 2016. The study concluded that both fiscal and monetary policies have a positive effect on economic growth in the sample of African countries studied. The most significant finding was that fiscal policy is more effective and impactful on economic growth than monetary policy in these countries.

Study by (Afonso, Alves, & Balhote, 2019): Titled *"Interactions between Monetary and Fiscal Policies,"* this study utilized Panel Data models on annual data from 1970 to 2015 for 28 European Union countries to examine how fiscal and monetary policies interact and impact economic growth. One of the main findings of this extensive econometric study was that governments increase their primary budget balances when faced with rising public debt. It also found that fiscal and monetary policies are substitutable for each other, and inflation has a direct impact on monetary policy.

Study by (Herrera, Karaki, & Kuma, 2019): Titled *"Oil Price Shocks and U.S. Economic Activity,"* the main objective of this research was to study and test the nature of the relationship between oil prices and economic growth in the United States. The study concluded that there is a direct linear relationship between oil prices and economic activity.

Study by (Egea, Hierro, & Angel, 2019): Titled *"Transmission of Monetary Policy in the US and EU in Times of Expansion and Crisis,"* this study aimed to analyze the effectiveness of monetary policy and its channels of impact in the United States and the Eurozone using a VAR (Vector Autoregression) model. The study found that in the United States, monetary policy was effective both before and after the financial crisis. In Europe, however, monetary policy was effective before the crisis but its effectiveness diminished during financial crises.

Study by (Mo, Chen, Nie, & Jiang, 2019): Titled *"Visiting Effects of Crude Oil Price on Economic Growth in BRICS Countries: Fresh Evidence from Wavelet-Based Quantile-on-Quantile Tests,"* this study aimed to examine the impact of oil prices on economic growth in BRICS countries. The study concluded that oil prices have a positive effect on economic growth in these countries, with a significant impact observed in Brazil and Russia, a relatively weaker impact in India and China, and a negative impact in South Africa.

A comprehensive review and thorough discussion of the empirical findings from these various studies reveal that most of the results align with economic theory, which generally assumes a positive effect of fiscal and monetary policy on economic growth. However, some discrepancies are noted. The effectiveness of monetary policy increases in developed countries and decreases in developing and emerging countries. Furthermore, monetary policy is found to be more effective than fiscal policy in developed countries, while the opposite is true in developing countries, where fiscal policies are the key components of economic policy. In these developing countries, fiscal policy is more effective and has a greater impact on economic growth compared to monetary policy. This discrepancy is attributed to the economic fragility of developing countries, their lack of advanced financial markets, and the limited independence of their central banks. In contrast, developed countries are characterized by highly sophisticated information systems, economic climates marked by transparency and competition, strong and advanced financial markets, and openness to foreign investment. Additionally, central banks in developed countries operate with independence and authority above government influence, whereas governments often intervene in central bank operations to justify their failures and budget deficits.

Moreover, most studies have concluded that oil price fluctuations have a direct impact on economic growth, whether in oil-producing and exporting countries or in oil-consuming and importing countries. However, the extent to which global economies are affected by oil price fluctuations varies between developed and emerging or developing countries.

3. Methodology, Variables, and Data

In this econometric study, we will attempt to apply econometric modeling using Panel Data models. Our aim is to estimate the impact of the effectiveness of money supply, public expenditure, and oil prices on the economic growth of a group consisting of four Arab countries: Algeria, Morocco, Egypt, and Jordan. The sample countries will represent the cross-sections in the panel dataset. The sample includes a mix of oil-producing and exporting countries, such as Algeria,

whose economy relies directly on oil revenues, and three non-oil-producing countries: Morocco, Egypt, and Jordan.

Regarding the analysis methodology, we will attempt to estimate three models of the static panel data model: the Pooled Regression Model (PRM), the Fixed Effects Model (FEM), and the Random Effects Model (REM). We will focus more on the Random Effects Model (REM), as it allows us to compare the effectiveness of monetary and fiscal policies and the impact of oil price fluctuations on economic growth across the countries under study.

3.1 Econometric Modeling of the Study

3.1.1 Identifying the Study Variables

In this study, we attempted to identify the key indicators that reflect the economic behavior of the phenomenon under investigation, considering both dependent and independent variables. This econometric study will be based on annual data from 2004 to 2022 for each of the countries under study, resulting in four cross-sections according to the countries. In the study model, the real gross domestic product (GDP) will be the dependent variable, while the explanatory variables in the model will be public expenditure (G), money supply or monetary aggregate (M), and oil price (P). Accordingly, the study includes the following indicators:

- **Dependent Variable:** Real Gross Domestic Product (GDP)
- **Independent Variables:** Public expenditure (G), money supply (M), and oil prices (P)

The data sources relied upon are the World Bank's WDI database for real GDP, public expenditure, and money supply, and the U.S. Energy Information Administration (EIA) for the oil price series.

3.1.2 Mathematical Formulation of the Model

After defining the dependent and independent variables and collecting the relevant data, the mathematical form of the econometric model was determined as follows:

$$gdp = f(m, g, p)$$

Where:

- **Gdp (rgdp):** Real Gross Domestic Product, which is the final monetary value of all goods and services produced within a specific area over a specified period.
- **M (m%Gdp):** Money supply, representing the total amount of monetary assets available in the economy during a specific period.
- **G (Gov. expenditure):** Public expenditure, representing the monetary amount spent by a public entity to achieve public benefit.
- **P (oil price):** Oil price, defined as the monetary value of petroleum products over a specified period, influenced by various economic, political, and climatic factors.

To make the study variables more homogeneous, we applied the natural logarithm to the variables, denoted by adding the letter L to each variable. Thus, the variables become LGDP, LG, LM, and LP. The model's equation will be formulated as follows:

$$LGDP_{ti} = c + b_1 LM_{ti} + b_2 LG_{ti} + b_3 LP_{ti} + \mu_{ti}$$

Where:

- **LGDP:** Logarithm of Real Gross Domestic Product.
- **LM:** Logarithm of the money supply.
- **LG:** Logarithm of public expenditure.
- **LP:** Logarithm of oil prices.
- **t:** Time factor ranging from 2005 to 2022.
- **j:** Cross-sections ranging from 1 to 4.

3.2 Statistical Analysis of the Results from Static Panel Data Models

3.2.1 Estimation of Static Panel Data Models

Using Stata software, we estimated the Panel Data Models, which assess the GDP equation for the four Arab countries under study, in terms of money supply, public expenditure, and oil prices. We applied various selection tests and statistical tests related to the model parameters, yielding the following results:

A. Estimation of the Fixed Effects Model (FEM)

Table (1): Results of the Fixed Effects Model (FEM) Estimation

```
. xtreg GDP m G p, fe

Fixed-effects (within) regression               Number of obs      =       120
Group variable: contry                          Number of groups   =         4

R-sq:                                           Obs per group:
     within  = 0.9054                                         min =        30
     between = 0.8720                                         avg =      30.0
     overall = 0.8812                                         max =        30

                                                F(3,113)           =    360.40
corr(u_i, Xb)  = -0.1960                        Prob > F           =    0.0000

------------------------------------------------------------------------------
         GDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           m |  -2.87e+08   8.29e+07    -3.47   0.001    -4.52e+08   -1.23e+08
           G |   6.901227    .288017    23.96   0.000     6.330614    7.471841
           p |   1.10e+08   4.95e+07     2.22   0.029     1.17e+07    2.08e+08
       _cons |   1.54e+10   6.28e+09     2.46   0.015     3.01e+09    2.79e+10
-------------+----------------------------------------------------------------
     sigma_u |  2.484e+10
     sigma_e |  1.269e+10
         rho |  .79312246   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(3, 113) = 95.11                     Prob > F = 0.0000
```

Source: Outputs from Stata 15 statistical software

B. Estimation of the Random Effects Model (REM)

Table (2): Results of the Random Effects Model (REM) Estimation

```
. xtreg GDP m G p, re

Random-effects GLS regression                   Number of obs     =       120
Group variable: contry                          Number of groups  =         4

R-sq:                                           Obs per group:
     within  = 0.9053                                         min =        30
     between = 0.8730                                         avg =      30.0
     overall = 0.8821                                         max =        30

                                                Wald chi2(3)      =   1095.65
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000

------------------------------------------------------------------------------
         GDP |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           m |  -2.71e+08   8.14e+07    -3.33   0.001    -4.30e+08   -1.11e+08
           G |   6.861583   .2798848    24.52   0.000     6.313019    7.410147
           p |   1.10e+08   4.97e+07     2.20   0.028     1.21e+07    2.07e+08
       _cons |   1.46e+10   1.17e+10     1.25   0.213    -8.39e+09    3.76e+10
-------------+----------------------------------------------------------------
     sigma_u |  1.968e+10
     sigma_e |  1.269e+10
         rho |  .70648409   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Source: Outputs from Stata 15 statistical software

3.2.2 Comparison Between Models

After presenting the estimation results for the three static panel models, the next step is to compare the models. The Fisher F-test was used to compare the Pooled Regression Model with the Fixed Effects Model. For the comparison between the Fixed Effects Model and the Random Effects Model, the Breusch-Pagan test and the Hausman test were employed.

A. Comparison Between the Pooled Regression Model and the Fixed Effects Model:

The restricted Fisher F-test was conducted to compare the Pooled Regression Model and the Fixed Effects Model. The test results are shown in Table (1). From the table, it can be observed that the calculated Fisher value is **F stat = 95.11**, and the corresponding p-value is (0.0000), which is less than 5%. Therefore, we reject the null hypothesis and accept the alternative hypothesis, indicating that the Fixed Effects Model (FEM) is preferred.

B. Comparison Between the Pooled Regression Model and the Random Effects Model:

After obtaining the estimation results for the Random Effects Model, which are presented in Table (2), it is necessary to conduct the Breusch-Pagan test to compare the Pooled Regression Model with the Random Effects Model, as shown in the following table:

Table (3): Poolability Test Between the Pooled Regression Model (PRM), the Random Effects Model (REM) and Breusch-Pagan Test (Chow Test)

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        GDP[contry,t] = Xb + u[contry] + e[contry,t]

        Estimated results:
                         |       Var      sd = sqrt(Var)
                 --------+------------------------------
                     GDP |   5.06e+21        7.12e+10
                       e |   1.61e+20        1.27e+10
                       u |   3.87e+20        1.97e+10

        Test:   Var(u) = 0
                                 chibar2(01) =    696.59
                              Prob > chibar2 =    0.0000
```

Source: Outputs from Stata 15 statistical software

From the table above, the Breusch-Pagan test gives a value of **V(u) = 0**. The p-value for the test is (0.0000), which is less than 5%. This leads to the rejection of the null hypothesis (H0) and acceptance of the alternative hypothesis, indicating that the Random Effects Model (REM) is preferred. The results of the Breusch-Pagan test also show that the model does not suffer from cross-sectional correlation, ensuring the independence of residuals across the cross-sectional units.

C. Comparison Between the Fixed Effects Model and the Random Effects Model:

As mentioned earlier, the Hausman test was used to compare the Fixed Effects Model (FEM) and the Random Effects Model (REM). The results are shown in the following table:

Table (4): Hausman Test for Comparison Between FEM and REM

	Coefficients (b) fe	(B) .	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
m	-2.87e+08	-2.71e+08	-1.66e+07	1.56e+07
G	6.901227	6.861583	.0396442	.0679579
p	1.10e+08	1.10e+08	181517.2	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(2) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 0.50
Prob>chi2 = 0.7778
(V_b-V_B is not positive definite)

Source: Outputs from Stata 15 statistical software

The Hausman test gives a p-value of **(Prob = 0.77)**, which is greater than 5%. This leads to the acceptance of the null hypothesis (H0), indicating that the Random Effects Model (REM) is preferred, and the rejection of the alternative hypothesis (H1). This means that the optimal model for explaining gross income in terms of money supply, public expenditure, and oil prices in the group of Arab countries under study (Algeria, Jordan, Morocco, Egypt) is the Random Effects Model (REM). The results are estimated in Table (2). The model is expressed in the following form:

$$GDP_t = 1{,}50 + 4{,}68M_t + 4{,}09\ G_t + 4{,}20P_t$$

D. Estimation of Each Country's Equation:

Since our goal is to compare the impact of monetary policy, fiscal policy, and oil prices on economic growth in the group of Arab countries under study, we will focus specifically on the estimations of the Fixed Effects Model using the Least Squares Dummy Variable (LSDV) approach. We will estimate the fourth model, in which we assume that the parameters and constants of the model vary by cross-section (country). Through the panel data model, we will derive a partial model for each country separately. The results are shown in the following table:

Table (5): Estimation of Each Country's Equation

Source	SS	df	MS	Number of obs	=	120
				F(15, 104)	=	1321.19
Model	5.9936e+23	15	3.9957e+22	Prob > F	=	0.0000
Residual	3.1453e+21	104	3.0243e+19	R-squared	=	0.9948
				Adj R-squared	=	0.9940
Total	6.0250e+23	119	5.0630e+21	Root MSE	=	5.5e+09

GDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
m	4.68e+08	1.34e+08	3.49	0.001	2.03e+08	7.34e+08
G	4.093126	.3034973	13.49	0.000	3.491279	4.694972
p	4.20e+07	4.77e+07	0.88	0.380	-5.25e+07	1.37e+08
ind						
2	-3.50e+09	1.11e+10	-0.32	0.753	-2.55e+10	1.85e+10
3	-3.32e+10	6.11e+09	-5.43	0.000	-4.53e+10	-2.11e+10
4	-2.82e+10	1.20e+10	-2.35	0.020	-5.20e+10	-4.44e+09
ind#c.m						
2	-5.52e+08	1.61e+08	-3.43	0.001	-8.70e+08	-2.33e+08
3	2.05e+07	1.68e+08	0.12	0.903	-3.13e+08	3.54e+08
4	-5.71e+08	1.85e+08	-3.09	0.003	-9.37e+08	-2.05e+08
ind#c.G						
2	2.24909	1.503242	1.50	0.138	-.7318958	5.230076
3	-.1212062	.6159801	-0.20	0.844	-1.342718	1.100306
4	4.345856	.362671	11.98	0.000	3.626666	5.065047

Source: Outputs from Stata 15 statistical software

E. Testing the Model Parameters

The following table shows the test of the overall model parameters:

Table (6): Test of Model Parameters

```
. testparm c.m c.G c.p

( 1)  m = 0
( 2)  G = 0
( 3)  p = 0
      Constraint 2 dropped

      F(  2,    104) =    6.53
           Prob > F =    0.0021
```

Source: Outputs from Stata 15 statistical software

Based on the estimation of model (6), the Fisher value FFF is 6.53, with a probability of 0.002, which is less than 0.05. Therefore, the model as a whole is acceptable and statistically significant.

3.2.3 Summary of Statistical Results

- The coefficient of the money supply is significant at the 5% level.
- The coefficient of public expenditure is significant at the 5% level.
- The coefficient of oil prices is not significant at the 5% level.
- The overall adjusted coefficient of determination indicates that approximately 99.40% of the gross domestic product (GDP) can be explained by public expenditure and the money supply.
- The value of the Fisher statistic FFF shows that the model as a whole is statistically significant at the 5% level.
- There is a significant positive effect of the money supply on GDP in the group of Arab countries under study during the period (2004-2022).
- There is a significant positive effect of public expenditure on GDP in the group of Arab countries under study during the period (2004-2022).
- There is a non-significant negative effect of oil prices on GDP in the group of Arab countries under study during the period (2004-2022).
- The results of the LM test for the independence of cross-sectional data show that all probabilities are greater than 5%, indicating that the cross-sectional data are independent. Thus, the null hypothesis (H0) is accepted, as the cross-sectional data are independent with no correlations, and the alternative hypothesis (H1) is rejected.

3.3 Economic Interpretation of the Results from Static Panel Data Models

Based on the previous modeling and relying on statistical tests, the Fixed Effects Model was selected for both within and between groups. We also estimated the Fixed Effects Model using the Least Squares Dummy Variable (LSDV) approach under the fourth hypothesis (constants and parameters vary by cross-section). Since both models passed the statistical and econometric tests, we can use the estimation results of these models to interpret and analyze the effectiveness of monetary and fiscal policies in achieving economic growth and creating added value in the economies of the four Arab countries in North Africa and the Middle East upon which this empirical study is based. The interpretation can be summarized as follows:

- The model indicates that public expenditure in the Arab countries under study has a positive effect on GDP. Specifically, a 1% increase in public expenditure leads to a 4.09% increase in GDP. However, when examining the impact of public expenditure on GDP in each country individually, as shown in Table (4-5) above, there is a variation in the degree and intensity of impact. In Morocco, the effect was less intense, which can be explained by the strict austerity measures implemented in Morocco to halt the deterioration of the budget deficit during the study period.
- The model also shows that the money supply in the Arab countries under study has a positive effect on GDP. A 1% increase in the money supply leads to a 4.68% increase in GDP. However, when examining the impact of the money supply on GDP in each country individually, as shown in Table (5) above, there is a variation in the degree and intensity of impact, with the effect being more intense in Algeria compared to Morocco.
- The model also shows that oil prices in the Arab countries under study have a positive effect on GDP. A 1% increase in oil prices leads to a 4.20% increase in GDP. However, when examining the impact of oil prices on GDP in each country individually, as shown in Table (5) above, there is a

variation in the degree and intensity of impact, with the effect being less intense in Morocco and Jordan.

- Overall, both the money supply and oil prices have a significant positive effect on increasing GDP and achieving economic growth in the group of Arab countries under study. This indicates that monetary policy has a positive and significant impact on economic growth in the Arab countries under study. Oil prices also have a positive effect on economic growth, meaning that during periods when oil prices rise, the economies of these countries flourish, and the opposite occurs in cases of oil price collapse and volatility.
- By comparing the effectiveness of monetary policy and the impact of oil prices on economic growth across countries, we find that the elasticity of the money supply is lower in Algeria because it is an oil-producing and exporting country. This may explain the priority and importance of monetary policy in these countries. Non-oil Arab countries prioritize monetary policy within their economic policies, as the goals of monetary policy in these countries are more real and substantive rather than purely monetary. Their primary aim is to stimulate the economy and support economic activities, not just to achieve monetary stability. In contrast, in Algeria (an oil-producing and exporting country), the economy relies directly on oil revenues to finance development projects and infrastructure. This makes expenditure policies the main tool for government intervention in economic activities by funding infrastructure and development projects, which create more jobs and generate new added value in economic activities, thereby supporting economic growth. In such contexts, the importance of monetary policy is secondary, as its primary goal is only to achieve monetary stability, which reduces its significance and effectiveness in influencing economic growth.
- The impact of oil prices on economic growth varies across the North African and Middle Eastern countries under study. It can be observed that oil prices have a positive effect on economic growth in both Algeria and Egypt, where the elasticity of the logarithm of oil prices is positive and significant in both cases. In contrast, the models for Jordan and Morocco show a negative sign for oil prices, reflecting the negative impact of oil prices on the economic activity in these countries. This may be explained by the fact that the economies of Jordan and Morocco lack diversified income sources and rely directly on tourism and services, which makes them respond negatively to increases in global oil prices. For the other countries, the response of GDP to oil price fluctuations is positive. This is a logical outcome for Algeria, as an oil-producing country that benefits from rising oil prices to finance its projects and government investments. However, for the other non-oil countries, the result contrasts with most previous studies. This can be explained by the fact that the economies of these countries (Morocco, Egypt, and Jordan) are linked to global economic fluctuations. Thus, during periods of declining oil prices, their economies slow down, while they thrive during periods of global economic prosperity that are accompanied by rising oil prices.

The results obtained in this research largely align with the theoretical background of monetary policy and its impact on economic growth, as well as with previous

empirical studies regarding the effects of monetary and fiscal policies and oil price fluctuations on economic growth.

Conclusion

In this study, the impact of the effectiveness of fiscal and monetary policies on economic growth was estimated amidst oil price fluctuations in Algeria and compared with other Arab countries: Jordan, Morocco, and Egypt, during the period 2004-2022. A set of variables was identified based on previous studies and economic theory.

This study examined the main macroeconomic indicators of the countries under study. We presented the study variables, primarily public expenditure, money supply, oil prices, and gross domestic product (GDP). We tracked their development during the study period and then proceeded to the econometric section by estimating panel data models: the Pooled Regression Model, Fixed Effects Model, and Random Effects Model. Through statistical tests to compare the three models, we found that the Fixed Effects Model is the most suitable, aligning with the assumptions of economic theory and previous studies, leading to the following key findings:

1- Attempting to model the integration between fiscal and monetary policies in Algeria revealed a weak degree of integration between the fiscal and monetary authorities. This is due to the obstruction of monetary policy by the fiscal policy often implemented by the Ministry of Finance, which hampers the effectiveness of the monetary policy executed by the monetary authority. Public expenditures have contributed to inflationary pressures, where a structural shock of one unit in public expenditures will generate inflationary tendencies throughout the response periods, showing the Bank of Algeria's inability to control monetary expansion and stabilize prices.
2- Economic growth relies on various determinants and sources that can propel growth to higher levels. These include traditional sources focusing on labor, physical resources, and technological progress, and modern sources highlighted by the principles of endogenous growth theories. These modern sources include trade openness, foreign investment, knowledge, a focus on the human aspect, and the emergence of governance or what is known as good governance. All these factors are considered modern sources that contribute to increasing economic growth.
3- Monetary policy has a positive impact on economic growth in the Arab countries under study. This reflects the significant role monetary policy plays in supporting economic activity, creating added value, and achieving economic and monetary stability. However, the impact of monetary policy on economic growth varies among the Arab countries studied. This key finding aligns with the general orientation of economic theory and with most previous empirical studies.
4- Oil prices have a positive impact on economic growth in the Arab countries under study. This reflects the connection between these countries' economies and global economic fluctuations, which are directly mirrored by changes in global oil prices. During periods of rising global oil prices

(boom periods for the global economy, especially for industrialized countries), growth rates increase in the Arab countries studied, whether they are oil-producing or non-oil-producing. The opposite occurs during global economic slowdowns and oil price collapses.

5- The effectiveness of monetary policy in influencing economic growth varies among the Arab countries under study, depending on the degree to which their economies are tied to the oil sector. In non-oil-producing countries (Morocco, Egypt, and Jordan), monetary policy is more effective than in oil-producing countries (Algeria). GDP is more responsive to monetary expansion in non-oil-producing countries and less responsive in the oil-producing and exporting Arab countries included in the empirical study.

6- By applying panel data models to the study sample, it was found that the Random Effects Model is the best model for explaining the impact of the effectiveness of fiscal and monetary policies on economic growth amidst oil price fluctuations in the Arab countries under study. It was also found that the model parameters are not fixed and are random, varying by country. This can be explained by the specific characteristics of each economy in the Arab countries (Algeria, Morocco, Egypt, Jordan).

7- The results from the static panel model indicated that both fiscal and monetary policies had a positive effect on real GDP in the group of Arab countries studied. In other words, both fiscal and monetary policies positively and significantly impact economic growth in these Arab countries. Additionally, oil prices have a positive effect on economic growth, meaning that the economies of these countries flourish during periods of rising oil prices and suffer during periods of oil price collapse and volatility.

8- The nature of the impact of oil price fluctuations on economic growth varies from one country to another. In Algeria, as an oil-producing country, the impact was positive, while in Jordan, Morocco, and Egypt, the impact was negative.

9- Oil prices have a positive impact on fiscal policy in Algeria. When oil prices rise, the government expands its public expenditure. Conversely, an oil price shock has negative effects on public spending after several years. This encourages the initiation of investment projects that require substantial funding, leading to an increase in the size of government expenditure. However, in the event of declining prices, as occurred in 2014, there was a decrease in government spending by halting and freezing investment projects in 2015 through urgent directives from the General Directorate of the Budget. This was due to the significant drop in oil prices, which is considered the mainstay of Algeria's national economy.

10- In the case of Egypt and Morocco, fluctuations in oil prices do not have a direct impact on their economic growth, particularly in Egypt. This may be due to the nature of their economic structures, which heavily rely on tourism as a primary source of income. Additionally, other variables significantly influence economic growth, such as political instability and the rise in government debt in recent years in the Egyptian economy, as well as reliance on agricultural revenues and manufacturing industries in the Moroccan economy.

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