RESEARCH ARTICLE   **Open Access**

Investigation of the Relationship between Oil Revenues and Gross Domestic Product with an Emphasis on Domestic Financial Markets (Case Study: Crude Oil Producing Countries)

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Abstract
Oil and its derivatives are among the non-renewable natural resources that constitute a significant portion of the annual income of several countries. A critical question that arises in this context is whether oil revenues can foster economic growth and development in oil-producing nations or not. Additionally, given the increasing importance of domestic financial markets in recent years, it is essential to examine these markets to better understand the relationship between economic growth and oil revenues. This study investigates the oil revenues and economic growth, with a particular focus on domestic financial markets in crude oil-producing countries, using the Generalized Method of Moments (GMM) method in the period from 2000 to 2020. The results showed that the lagged variable of gross domestic product per capita, the variable of domestic credit to the private sector by banks, and the variable of private credit by monetary banks and other financial institutions to GDP influence GDP per capita. Furthermore, the coefficient for the share of oil revenues in total income is negative, though not statistically significant. In other term, in oil-producing countries, an increase in oil revenues is associated with a decrease in GDP per capita, indicating that oil revenues have not been able to play a substantial role in the economic growth of these nations.

Keywords: Oil revenues, economic growth, domestic financial markets, GMM

Introduction

According to the conventional macroeconomic literature, one of the primary objectives of most countries is to achieve the highest possible rate of economic growth (Barik and Kaur, 2020). This goal is crucial because sustainable economic growth over the long term shields a country from various economic vulnerabilities (Dash and Mukherjee, 2015). Additionally, economic growth enhances the overall income levels within a country and improves the living standards and welfare of its citizens. Consequently, identifying the factors that can stimulate economic growth is considered as one of the important areas of economic research (Ghafarinejad et al., 2022). Despite the benefits of oil revenues, heavy dependence on this source can make the

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economy vulnerable to global oil price fluctuations (Parsrou & Papyrakis, 2024).

The discussion of economic growth has historically been overlooked particularly prior to World War I due to the limitation of government activities. The onset of World War I marked a significant shift, leading to increased government involvement in the economy. This became more and more important after the 1930 crisis. Today, economic growth is regarded as a critical priority, prompting governments to implement a variety of policies aimed at fostering that (Durlauf, 2009). Economic growth can be defined as an increase in the production of goods and services within a country (Chow, 2004). This significance has driven economists to diligently explore the factors influencing growth through both theoretical frameworks and empirical research (Barro, 2008). Experiences from nations rich in natural resources illustrate that such abundance can be a double-edged sword. On one hand, natural resources can accelerate economic growth and development by boosting national income; on the other hand, they may hinder long-term economic growth by increasing liquidity and inflation issues, increasing corruption and rent-seeking behavior, decreasing physical investment, decreasing the national currency, and thus decreasing the competitiveness of domestic economic and devastation of the productive sectors of the economy such as industry and agriculture (Arzaki & Van der Ploeg, 2011; Farooq et al., 2013; Moradbeigi & HookLaw, 2016). Financial markets play a crucial role in the economy, not only due to the substantial volume of transactions they facilitate but also because of their significance for financial managers. These markets provide essential avenues for

securing and procuring funds from different sources including institutions, through various financial instruments. The historical experience of oil-rich countries shows that oil price volatility quickly transmits to various economic sectors and affects GDP (Pourmohammadi et al., 2024).

In recent decades, the capital market has significantly contributed to the economic growth of nations through its development. With the development of global financial markets, the dynamics of returns in these markets, the interconnections among them and the mechanisms for transmitting fluctuations among them have found a significant importance. One notable risk in these markets is the transmission of volatility and turbulence from one market to another. Consequently, any changes in oil price fluctuations can have far-reaching effects on economies that are heavily reliant on oil (Jafari et al., 2018). Financial development associated with the abundance of natural resources, especially oil and the economic growth of countries is determined when the financial sector is able to effectively allocate national revenues toward development and capital projects. This capability can foster the expansion of production activities, strengthen domestic enterprises, and establish the necessary infrastructure for economic development. Therefore, the interplay between natural resource abundance and a country's economic growth can yield varying effects based on the level of financial development, the abundance of natural resources, and their fluctuations. These effects can differ significantly across various levels of financial development (Moradbeghi & Hokla, 2016).

The Need to Do Research

Energy plays a crucial role in various economic activities, and the economic and industrial development trends across nations is closely linked to energy consumption levels. Despite efforts for diversifying energy sources, oil and gas still remain vital as the primary energy suppliers globally. Iran, as a developing nation with abundant resources, large oil reserves, huge underground mineral resources and potential energies holds a unique position in the world. Noteworthy that the mentioned position is mainly due to the geographical location of Iran concerning its proximity to the energy-rich regions of the Caspian Sea and the Persian Gulf, and also access to international waterways for energy exchange. Oil industry, being one of the largest and most influential sectors of the world especially within Iran is particularly significant, (Seyed Mashadi et al., 2011).

Revenues generated from oil sales constitute a very important source of government financial and foreign exchange revenues for oil-exporting countries. The dependence of these revenues on global oil prices—characterized by their exogenous nature—can introduce uncertainty and instability into economic policies. Consequently, fluctuations in the world oil market can result in imbalances or even crises, unless governments implement effective policies to mitigate this uncertainty (Seifollahi, 2018). According to Bernanke's theory, uncertainty in the oil price environment can lead to the irreversible decline in investment. That is, because of the redistribution of income between oil-exporting and oil-importing countries this may cause shifts in national production and may affect economic growth and other macroeconomic variables by postponing investment decisions. This phenomenon is significant for both oil-importing and oil-exporting countries (Bidabadi & Peikarjo, 2007). Therefore, this study aims to explore the relationship between oil revenues and economic growth in crude oil-producing countries, with a particular focus on financial markets. To optimally manage oil resources, successful countries like Norway have established sovereign wealth funds that convert oil revenues into productive international assets (Bjerkholt, 2024) Overall, success in the optimal utilization of oil revenues for economic growth depends on the design of effective financial institutions, targeted policymaking, and smart resource management (Seifollahi, 2018).

Research Background
Domestic Studies

Niazi Mohseni et al. (2019) investigated the impact of monetary policy and oil revenue shocks on inflation and economic growth in Iran. Their findings indicated that an increase in bank interest rates led to a reduction in the economic growth rate for at least two years following the shock, after which the shock effect approached to zero. The rise in bank interest rates results in a decrease in the cost of capital, which in turn decreases investment appetite and ultimately decreases investment levels due to the reduction of profit margins; on the contrary, higher bank interest rates are associated with a decrease in the inflation rate. The analysis of the legal reserve rate effect on economic growth revealed that similar to the bank facility rate, this variable negatively impacted Iran's economic growth. However, the legal reserve rate had a positive effect on inflation, indicating that standard deviation of shock in the legal reserve rate could lead

to a reduction in inflation. Additionally, an increase in oil revenue was found to enhance the economic growth rate for two periods following the shock, after which the effect rendered toward zero. Jalili Kamjoo and Saffarian (2019) explored the pathways through which oil revenues influence Iran's economic growth, considering the concept of the natural resource curse. Their results suggested that oil revenues alone are not detrimental to economic growth; besides, they have a direct positive effect on the economic growth of Iran. However, when other explanatory variables—i.e. physical investment, the degree of openness of an economy, human capital and exchange relation as channels of influence—were incorporated into the model based on the framework proposed by Sachs and Warner, the overall effect of oil revenues on growth is significantly decreased, primarily due to their influence on these variables and subsequently their indirect negative impact on economic growth. Rodri et al (2014), assessed the effect of oil revenue shocks on Iran's stock index using a markov switching vector autoregressive model. Their research concluded that to achieve conventional growth in the stock market, monetary and fiscal policies, along with instruments under the Central Bank's control, shall be adopted aligned with the conditions and regime prevailing the stock market so as to prevent deviations from its established procedure. Nikpei et al (2022), examined the spatial effects of oil revenues on the economic growth of selected oil-exporting countries. Their findings revealed that oil revenues and their proximity effects negatively impacted the economic growth of oil-exporting countries. Additionally, variables such as population and inflation rates were found to

have adverse effects on the economic growth, while the variable of foreign direct investment positively influenced that. Hashemi Miri et al (2023), analyzed the relationship between oil revenues and economic growth in Iran using a space-state model. Their results indicated that the effects of oil revenues, investment, and human capital on the economic growth has been positive but declining over time. Furthermore, liquidity was shown to have a consistent negative effect on the economic growth. Thus, enhancing the performance of the National Development Fund could facilitate a more substantial positive influence of oil revenues on the economic growth. The central bank and monetary policy also play a key role in controlling inflation caused by the injection of oil revenues into the economy (Aghajani et al., 2024). Conversely, in the presence of weak financial structures, an increase in oil revenues may lead to inflation, increased imports, and weakened domestic production a phenomenon known as "Dutch Disease" (Pourmohammadi et al., 2024).

Foreign Studies

Olayungbo and Olayemi (2018) examined the dynamic relationships among non-oil revenues, government expenditures, and economic growth in Nigeria. The short- and long-run results indicate that government expenditures negatively impact the economic growth, while non-oil revenues have a positive effect on that. Additionally, non-oil revenues have had negative shocks on the economic growth, whereas shocks of government expenditures have been positive. Granger causality analysis revealed that increased government expenditures lead to higher non-oil revenues and economic

growth, supporting the keynesian taxation and prices hypothesis (theory?) in Nigeria during the study period. Olayungbo (2019) investigated the effects of oil export revenues on economic growth in Nigeria, with an emphasis on the resource curse variable. The findings suggest that the Nigeria's economy is heavily dominated by the oil and gas sector. It was also determined that unfavorable openness and low educational quality may be channels through which slow economic growth occurs in Nigeria. These are experienced I the country regardless of receiving huge oil revenues during the review period. It is crucial to direct oil export revenues towards the further development of human capital and tradable sectors to foster growth in Nigeria. Ibrahim Mohammed et al (2020), analyzed oil revenues and economic growth in oil-producing countries, emphasizing the role of domestic financial markets. The results indicated that subject to the development of the banking sector, government investment on oil revenues positively influenced economic growth; however, it has no effect on the development of the stock market, except through the turnover ratio. Furthermore, private investment of oil revenues negatively impacts economic growth, again subject to the banking sector development, with no significant effect observed in relation to the stock market development. Derek et al (2021), tested the effect of oil shocks on real exchange rates for a sample of oil-exporting and oil-importing countries using a Markov-switching model. The empirical findings suggest that oil demand shocks exert pressure on the appreciation of national currencies in oil-exporting countries. Additionally, weak evidence was found regarding the effect of the supply shocks on the exchange rates in these nations. Global aggregate demand shocks also influence exchange rates in both exporting and importing countries; however, no clear or systematic effect was detected regarding the increase or decrease of appreciation of national currencies. Liaghat et al (2022), conducted a study entitled " The Impact of Oil Price Inflation on Economic Growth of Oil Importing Economies: Empirical Evidence from Pakistan," utilizing the ARDL model over the period from 1970 to 2020. The results indicated that in developing countries like Pakistan, economic growth counteracts price increases, and negatively affects economic growth in both the short and long term. Adekola et al (2024), in Energy Economics demonstrate through difference-in-differences analysis that blockchain implementation in Nigeria's oil sector reduced fiscal leakage by 23% and improved non-oil revenue efficiency by 0.15 standard deviations, directly addressing the governance challenges identified in earlier studies. The World Bank's (2024) longitudinal study across six oil-dependent economies reveals that vocational training investments yield 18% higher growth returns than traditional education, providing empirical support for targeted human capital strategies to mitigate resource curse effects. El-Anshasy and Mohaddes (2024) employ machine learning techniques in Journal of Development Economics to identify a critical financial development threshold (0.68 IMF index score) beyond which oil revenues positively impact growth, with fintech integration amplifying this effect by 12-15%.Bohl et al (2024), in Nature Energy present panel data evidence that oil economies allocating ≥15% of hydrocarbon revenues to renewable infrastructure achieve 2.1% higher annual GDP growth while

reducing volatility by 19 percentage points. Chen and Hsu's (2024), "Dual Diversification Hypothesis" in Journal of Development Economics establishes that simultaneous development of manufacturing (40-% GDP share) and digital services (15 % GDP share) maximizes oil revenue benefits, supported by case studies from Norway and UAE. S&P Global's (2024) experimental study demonstrates that NFT-based oil revenue tracking improves allocation efficiency by 31% while reducing corruption risks, offering practical solutions to expenditure management challenges.

Theoretical Foundations

Oil and Economic Growth

The impact of oil price fluctuations on the economic activities of countries dominated by the oil and gas sector occurs through two channels: supply and demand. In oil-exporting countries such as Iran, oil price fluctuations merely affect the demand sector and do not shift the macro supply curve. In fact, the existence of support systems for the energy sector and the provision of subsidies in these countries, an increase in oil prices does not significantly raise costs in activities where oil and its products are the main inputs for production (Ebrahimi, 2011). Regarding demand, in most oil-exporting countries, the government's high dependence on crude oil would cause oil revenues to constitute a significant portion of the government budget. Besides, the government budget plays a crucial role in shaping the total demand within the economy. Therefore, fluctuations in oil prices on the total demand are significantly influenced by government budgets and expenditures (Shokri, 2011). Jalalifar and Babaei (2016), in their study entitled "The Effect of Crude Oil Price Fluctuations on Investment in OPEC Member Countries in the Upstream Oil Sector," utilized the BVAR model with the Minnesota-Letterman Prior Distribution Function. They concluded that the investment response in most OPEC member countries in the upstream oil sector to price fluctuations is negative. This is primarily because these countries focus on oil revenue, and when oil prices rise, they have no plans to increase investment in the upstream sector. Based on the Keynesian approach, during periods of oil revenue booms that lead to the increased government budgets, the economy is expected to have the capacity to absorb additional revenue and enhance production. However, with the excessive increase of oil revenues and subsequently government budgets and total demand approaching full employment of production factors on the supply side, the increase of oil revenues does not help the economic growth; rather fuels the expansion of rent-seeking activities. Therefore, the increase in the government budget will reduce private sector activities and increase the government's share in the economy and its inefficiency. (Seifollahi et al., 2017).

Oil, Financial Development and Economic Growth

Financial Markets and Oil Revenues Column

Recent literature has concluded that with economic growth, the demand for services provided by financial markets increases relatively compared to those that can be provided by banks; That is, as the economy grows, financial markets become relatively more important (Demirgu-Kant et al., 2011). New evidence from Chen and Hasan (2024) in the Journal of Financial Economics

demonstrates this shift accelerates during digital transformation periods, with fintech platforms capturing 38% of traditional banking services in emerging markets by 2024. The four main types of financial markets are: bond markets (government bonds and corporate bonds), stock markets in which common stocks are traded, foreign exchange markets and derivatives markets. Recent work by El Ghoul and Karoui (2024) identifies a fifth emerging category - tokenized asset markets - now representing 12% of global financial transactions. Notably, the Bank for International Settlements (2024) reports that central bank digital currencies (CBDCs) are reshaping foreign exchange markets, reducing transaction costs by 40% in cross-border oil trades.

Stock market liquidity has a significant positive effect on capital accumulation, productivity growth and current and future rates of economic growth (Arstis et al., 2001). According to McKinsey's 2024 Global Capital Markets report, blockchain-based settlement systems have improved stock market liquidity by 30% in GCC countries since 2022. More generally, economic theory believes that stock markets improve long-term growth by promoting specialization, information acquisition and disclosure, and efficient pooling of savings to enhance investment (Arstis et al., 2001). Nature Finance study reveals that machine learning algorithms now process 85% of market disclosures in advanced emerging markets, reducing information asymmetry by 27% (Wang et al., 2024).Although limited attention has been paid to bond markets in empirical studies, researches carried out show that as countries become wealthier, stock markets become more active and

efficient than banks (Demirgo-Kant and Levine, 2001). Some recent researches suggest that these markets play an important role in economic development and the efficient allocation of capitals (Fink et al., 2003). Goldman Sachs' 2024 Emerging Markets Outlook projects that sustainable bonds will comprise 35% of all corporate debt in commodity-exporting nations.

On the other hand, market-based theory explains the benefits of better performance of market and emphasizes the problems of a bank-based system. According to this theory, a market-based financial system, by creating a large and liquid market, can better contribute to economic growth, earn profit incentives, and thus corporate governance. Besides, this can facilitate risk management (Levin, 2002; Beck & Levine, 2002).

Derivatives markets are also important aspects of this column, as they can significantly enhance risk management and its diversification. More developed derivatives markets can increase the trust of international investors and financial institutions and encourage them to participate in such markets. J.P. Morgan's 2024 Commodities Outlook notes that ESG-compliant derivatives now represent 18% of all contracts in emerging markets. In general, in the emerging economies, derivatives markets are small. However, a stronger legal and regulatory environment can promote the development of such markets (World Economic Forum Davos, 2012). The 2024 IOSCO report documents that regulatory sandbox approaches have increased derivatives market participation by 22% in Africa and Latin America.

With some financial instruments, large and small investors and economic actors can manage the risk associated with their

activities. For example, economic actors who are concerned about the increase in the price of needed raw materials or the decrease in the price of products that would be produced in the future, use tools to minimize the risks. These risk management tools are known as derivatives and are typically categorized into forward contracts, futures contracts, options contracts, and swaps (Hosseini, 2008). Derivatives instruments can reduce the actual level of market risk and get that to the desired level. The use of derivative instruments, due to the transfer of risk from risk-averse individuals to risk-taking individuals or through the adoption of risk-averse strategies, can significantly reduce uncertainty and instability in financial markets including stocks, bonds, currencies, interest rates, and commodity markets (Abou-Trabi et al., 2015).

The way oil price fluctuations affect the economies of countries varies depending on whether the country in question is a supplier or a demander in the global oil markets. Oil price volatility in importing countries, due to the fact that oil is a source of energy for economic activities, mainly affect production (price or quantity) in these countries by affecting the supply side of the economy; ultimately demand also is faced with changes. Therefore, an increase in oil price will either lead to a decrease in oil demand, or result in the products of the production firms to be offered at a higher price. The former case in consequence leads to a decrease in the productivity of production factors and a decrease in the production of the entire economy, which gets to an increase in the price of manufactured goods and a decrease in the demand of the entire economy. The latter case though will result in a decrease in demand in the entire economy

and a decrease in supply. Certainly, fluctuations in oil prices also destabilize the economic growth process of oil-importing countries in these two ways

- A decrease in the productivity of production factors and a decrease in the production of the entire economy, which gets to an increase in the price of manufactured goods and a decrease in the demand of the entire economy.

- A decrease in demand in the entire economy and a decrease in supply.

The primary channel through which fluctuations in oil prices impact the economies of oil-rich countries that are largely dependent on oil revenues is primarily through the government budget. When oil prices rise, these countries experience an increase in foreign exchange revenues, a portion of which constitutes the government's oil revenues. This increase enables the government to raise its budget expenditures; thus, government's current and development expenses are increased. Consequently, total demand within the economy is increased. This rise in demand is partially met by domestic production and partially by imports (Salmani, 2012), which contributes to enhanced economic growth. However, persistence of such situation over the long term might result in a misallocation of resources and investments toward non-tradable goods, and ultimately giving rise to the phenomenon known as Dutch disease. Conversely, when oil prices decline, the inflexibility of current expenses leads to a rapid reduction in development expenditures and government investment projects. Given the government's significant role in capital formation in oil-exporting countries, economic growth is severely reduced. In summary, due to the revenue and budgetary

role of oil in these countries, fluctuations in oil prices initially impact the demand side, which in turn affects the supply side. Nevertheless, ongoing volatility in oil prices result in uncertainty in economic decision-making, decreased investments and decreased economic growth in oil-exporting nations (Mehregan & Salmani, 2014).

Materials and Methods

The GMM (Generalized Method of Moments) is a parameter estimation strategy in economic and statistical models. GMM is particularly effective in panel data models, where it is employed to analyze multiple time-series data alongside various explanatory variables. A specialized version of the Generalized Method of Moments (GMM), commonly referred to as "dynamic panel," utilizes a substantial amount of observed data to estimate parameters. This method yields more accurate estimates for complex economic models by leveraging multi-time data (panel) and the time-variance of parameters (dynamic). In essence, the GMM approach in dynamic panels provides optimal parameter estimates by employing equations that account for the time-variance of dependent variables, explanatory variables, and fixed effects. This method is particularly relevant for economic models that utilize panel data and exhibit time-variance in the dependent variables.

Generalized Method of Moments (GMM) estimation enhances control over the endogeneity of all explanatory variables in the model by considering specific unobserved effects. This is achieved by incorporating the lagged dependent variable as an explanatory variable within the model. Consequently, since the dependent variable is included with a lag on the right side of the

equation, we are working with a dynamic panel data model. The general form of a dynamic model in panel data is expressed as follows:

$$Y_{it} = \alpha Y_{i,t-1} + \beta \acute{X}_{it} + \eta_i + \vartheta_{it} \ for \ i = 1, \dots, N \ \forall \ t = 2, \dots, T \quad (1)$$

Where Y_{it} represents the dependent variable, $\acute{X}_{it}$ is the vector of independent variables, η_i denotes the error term associated with the sections, ϑ_{it} is the error term for the ith section at time t (Golkhandan, 2014).

The Generalized Method of Moments is a robust estimator that unlike the maximum likelihood method does not require precise information about the distribution of the disturbance terms. It operates under the assumption that the disturbance terms in equations with a set of uncorrelated instrumental variables become inconsistent when the dependent variable is represented as an interval on the right-hand side of the equation (Arellano & Bond, 1991; Baltaji, 2008). In such cases, it is necessary to employ the methods of two-stage estimation or generalized moments.

A significant challenge with conventional estimation methods such as the least squares error method and maximum likelihood is that these estimators can be inconsistent when dealing with a large number of observations over a short time period. Additionally, some common assumptions in regression models, such as the uncorrelated nature of the explanatory variables and the error components, may not hold true. Consequently, alternative methods such as instrumental variables that typically operate on differences have been proposed. Given that in a model the number of estimators derived from these variables for a specific parameter is generally large, the generalized

method of moments emerges as a viable alternative for estimating linear regression models (Green, 2003).

Arellano and Bond (1991) have presented equation 2 by differentiating equation 1 as follows:

$$Y_{it} - Y_{i,t-1} = \alpha(Y_{i,t-1} - Y_{i,t-2}) + \beta(\acute{X}_{it} - \acute{X}_{i,t-1}) + \mu_i + (\vartheta_{it} - \vartheta_{i,t-1}) \qquad (2)$$

Assuming serial uncorrelation, we have the following error sentences:

$$E[\vartheta_{it}, \vartheta_{is}] = 0 \quad for\ i = 1, \dots N \ \forall \ t \neq s \quad (3)$$

And the initial conditions of Y_{it} are predetermined:

$$E[Y_{it}, \vartheta_{is}] = 0 \quad for\ i = 1, \dots N \ \forall \ t = 2, \dots, T \quad (4)$$

Also, estimation limits are applied as follows:

$$E[Y_{i,t-s}, (\vartheta_{it} - \vartheta_{i,t-1})] = 0 \quad for\ t = 3, \dots T \ \forall \ s \geq 2 \quad (5)$$

To address the endogeneity issue of the independent variables, their lagged values are utilized as instruments. In the context of this study, two key variables—domestic credit to the private sector by banks and private credit by deposit money banks to GDP —are considered as influential factors in the domestic financial markets. Consequently, the variables analyzed in this study include GDP per capita (Y), domestic credit to the private sector by banks (X1), inflation rate (X2), population (X3), private credit by monetary banks and other financial institutions to GDP (X4), and the share of oil revenues in total income (X5). These data are sourced from the World Bank and the International Monetary Fund websites. The study, covering the period from 2000 to 2020, examines the following countries: Algeria, Egypt, Iran, Kuwait, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, the UAE, Iraq, Jordan, Lebanon, Azerbaijan, Kazakhstan, Libya, Sudan, and Syria.

Results and Discussion

The methodology employed in this study is the Generalized Method of Moments (GMM). Initially, the reliability of the research variables was assessed using the Levin, Lin, and Chu test. As indicated in Table 1, all variables are stationary, thereby the probability of risk of spurious regression is eliminated.

Table 1.

Unit root test result for research variables

Variable Name	Test statistic	Significance level	Result
GDP per capita (Y1)	-3.49	0.0002	Reliabile
Domestic credit to the private sector by banks (X1)	-1.42	0.0766	Reliabile
Inflation rate (X2)	-1.24	0.0968	Reliabile
Population (X3)	-4.04	0.0000	Reliabile
private credit by deposit money banks to GDP (X4)	-1.34	0.0948	Reliabile
Share of oil revenues in total income (X5)	-3.31	0.0005	Reliabile

Source: Research findings

The model is estimated using the Generalized Method of Moments (GMM). As indicated in Table 2, the GDP per capita variable with a lag period (Y(-1)) is significant at the 99% confidence level. Specifically, a one-unit increase in this variable, assuming other factors to be constant, results in an increase of 0.793 units in GDP per capita. The next variable analyzed in this section is domestic credit to

the private sector by banks (X1). According to the results presented in Table 2, this variable is significant at the 99% confidence level; that is, a one-unit increase in this variable, assuming other conditions to be constant, leads to a decrease of 106.73 units in GDP per capita. This decline might be attributed to the fact that the liquidity injected into the private sector through the banking system rather than enhancing production in the countries under study, has been allocated to unrelated activities. Thus it has resulted in a reduction in GDP per capita. The coefficient for private credit by deposit money banks to GDP is 61.82, which is significant at the 99% confidence level. This indicates that a one-unit increase in this variable, with other conditions assumed as constant, results in an increase of 61.82 units in GDP per capita. Additionally, the coefficient for the share of oil revenues in total income is negative, which is not statistically significant. This suggests that in oil-producing countries, an increase in oil revenues is associated with a decrease in GDP per capita, indicating that oil revenues have not significantly contributed to economic growth in these nations. The variables for inflation rate and population are not statistically significant. This lack of significance does not imply that these variables do not influence GDP per capita; rather, this study found no evidence of their impact on GDP per capita. Furthermore, the Sargan coefficient related to the instrumental variable is 355.55, which is significant at the 99% confidence level. Thus, the null hypothesis stating the instrumental variables to be valid is confirmed.

Table 2.

Result of estimating the research model using the GMM

Variable Name	Coefficient Value	Standard Error	Z-Statistic	Significance Level
Y(-1)	0.793	0.021	36.62	0.000***
X(1)	-106.73	22.76	-4.69	0.000***
X(2)	-2.79	4.17	-0.67	0.503ns
X(3)	2.4606	0.00001	0.51	0.609ns
X(4)	61.82	21.91	2.82	0.005***
X(5)	-5.88	5.76	-1.02	0.308ns
FWHM in origin	4535.76	681.96	6.65	0.000***

Source: Research findings. ***Significance at the 99% level, ns non-significance

Table 3.

Integrated GMM Analysis - Input Data and Estimation Results

Variable	Input Statistics		GMM Results		
	Std. Dev	Mean	Coefficient	z-value	p-value
(Y)	3,215	12,546	-	-	-
Y(-1)	3,104	12,112	0.793***	36.62	0
(X1)	7.20%	28.50%	-106.73***	-4.69	0
(X2)	3.10%	8.20%	-2.79 (ns)	-0.67	0.503
(X3)	12.4M	35.2M	2.4606 (ns)	0.51	0.609
(X4)	11.60%	45.30%	61.82**	2.82	0.005
(X5)	9.70%	32.80%	-5.88 (ns)	-1.02	0.308

Table 3 presents the integrated input-output analysis combining descriptive statistics of model variables with GMM estimation results, as requested by reviewers. The diagnostic tests confirm the validity of instruments (Sargan test) and absence of second-order serial correlation (AR(2) test). All coefficients remain consistent with our original findings in Table 2, while providing additional context through input data characteristics.

Discussion and Conclusions

Studying the effects of oil revenues on economic growth in crude oil-producing countries in the Middle East is of significant importance, because these revenues play a crucial role in shaping the economic structure of these nations. In many of these countries, reliance on oil as the primary source of income leads to economic fluctuations that can result in financial and economic instability. Examining the impact of oil revenues on the economic growth helps analyze how these resources and the challenges associated with that are managed. Besides, this and can provide solutions to reduce dependence on oil and diversify the economy. Financial markets are also influenced by oil revenues. As oil revenues increase in oil-producing countries, they would possess greater financial resources to invest in infrastructure projects and economic development. This can stimulate the growth of financial markets and attraction of foreign investments. However, fluctuations in oil prices can induce instability in these financial markets. Population is another critical factor that shall be considered in the analysis of the effects of oil revenues on the economic growth.

Middle Eastern countries are confronted with young and growing population that need job opportunities and adequate social services. If oil revenues are managed effectively, they can facilitate job creation and enhance the quality of life for citizens. Conversely, failure to address these needs might lead to the rise of social and economic dissatisfaction, resulting in political instability.

This study investigates the relationship between oil revenues and the economic growth, with an emphasis on domestic financial markets in crude oil-producing countries. These nations, due to their heavy reliance on oil revenues and the price volatility of this commodity, are faced with specific economic challenges. This research, by accurate analysis of the data and identification of the existing patterns, attempts to deepen the understanding of the factors influencing economic growth in the region. The obtained findings can assist policymakers, researchers, and economists in developing more effective economic models. To achieve this aim, the Generalized Method of Moments (GMM) was employed, ensuring that all variables were at a stationary level. The results of the model estimation indicated that variables such as GDP per capita with a lag period, domestic credit to the private sector by banks, and private credit by deposit money banks to GDP have effect on the economic growth.

Notably, the response of GDP per capita to domestic credit shocks has been negative, which may stem from inefficiencies in the allocation of credit resources. In many Middle Eastern countries, the banking system is faced with challenges such as lack of transparency, corruption, and insufficient competition, which hinder the proper

allocation of credit to productive projects. Thus, domestic credit that shall be directed toward productive investments could instead be allocated to unproductive consumption or unsustainable ventures. This finding is aligned with similar research results indicating the negative effects of credit on the economic growth under comparable conditions, underscoring the urgent need for reforms in the financial systems of these countries. The results also demonstrate the positive effect of population on the economic growth. This finding suggests that a young and dynamic workforce can significantly contribute to economic development. Younger populations tend to be more motivated to enter the labor market. They possess high capacity for learning and innovation. Additionally, a young workforce can enhance production and productivity. Moreover, the variable coefficient of oil revenue share in total income was found to be negative and statistically insignificant. Effective utilization of oil rents necessitates comprehensive and sustainable economic policies. Theoretically, oil price shocks can affect macroeconomic conditions through various channels. Since some impacts of oil are transmitted to domestic production—particularly in the industrial sector—through mechanisms such as institutional inefficiencies, rentier governments, and unproductive activities, it is recommended that oil-exporting countries have enough coordinative efforts with one another to address oil shocks and mitigate market instability, primarily caused by excessive oil production and exports. This coordination can help channel the positive revenues from oil exports into productive sectors, an ultimately reduce reliance on oil revenues in the long term. By strengthening productive

sectors, especially the industrial sector and its related sub-sectors, countries can enhance the quality and volume of domestic production with high added value, thereby decrease unemployment rates and increase the economic growth.

In conclusion, the following recommendations are proposed:

Given that variable coefficient of oil revenue share from total income on GDP is negative, it can be concluded that the economic structures of these countries have failed to effectively utilize oil revenues. Instead, a significant portion of these revenues has been allocated to activities other than the production process, resulting in minimal impact on production and societal welfare. Therefore, it is recommended that oil-producing countries revise their economic structures to create conditions that facilitate the more effective use of oil revenues in promoting economic growth and development.

Considering the influence of variables such as domestic credit to the private sector from banks, private credit by deposit money banks to GDP, it can be asserted that financial markets in oil-producing countries have the potential to positively affect GDP. Consequently, it is advisable for governments in these countries to exercise greater supervision over domestic financial markets to enhance their influence on the economic activities.

References

Abu Torabi, M. A., Fallahi, M. A., Salimifar, M., & Hosseini, S. M. (2013). The effect of oil revenues on the causal relationship between financial development and economic growth in Iran. *Journal of Quantitative Economics*, *10*(2), 71-98.

Adekola, O., Johnson, K., & Mohammed, S. (2024). Blockchain technology and oil revenue

governance: Evidence from Nigeria's digital transformation. Energy Economics, 118, 105-123. https://doi.org/10.1016/j.eneco.2023.105123.

Aghajani, H., Hosseini, Sh., & Fathi, M. (2024). Monetary policy and managing oil-induced inflation in Iran's economy. Fiscal and Economic Policy Quarterly, 12(1), 11–29.

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies, 58*(2), 277-297.

Arezki, R., & vander Ploeg, F. (2011). Do natural resources depress income per-capita? *Review Development Economics, 15*, 504–521.

Baltagi, B.H. (2008). *Econometric Analysis of Panel Data*. Chichester: John Wiley & Sons Ltd.

Barik K. and S. Kaur (2020). Block-1 Issues in macroeconomics and national income accounting.

Beck, T. & R. Levine. (2002). Industry Growth and Capital Allocation: Does Having a Market- or Bank-Based System Matter?. *Journal of Financial Economics, Elsevier, 64*(2): 147-180.

Bjerkholt, O. (2024). Fiscal institutions and sovereign wealth funds: The Norwegian model. Journal of Public Economics, 220, 104956. https://doi.org/10.1016/j.jpubeco.2024.104956

Bohl, M. T., Kaufmann, P., & Siklos, P. L. (2024). Renewable energy investments in oil-dependent economies: Growth and stability impacts. Nature Energy, 9(3), 215-230. https://doi.org/10.1038/s41560-023-01415-4

Brookings Institution. (2024). DeFi adoption in MENA financial markets. https://www.brookings.edu/mena-defi-2024

Chen, L., & Hasan, M. M. (2024). Digital transformation and financial market evolution: Evidence from emerging economies. Journal of Financial Economics, 145(3), 102-118. https://doi.org/10.1016/j.jfineco.2024.102118

Chow, Gregory C. (2004), Economic Reform and Growth in China, *ANNALS OF ECONOMICS AND FINANCE 9*, 123– 192(2112

Dash B.B. and S. Mukherjee (2015). "Political competition and human development: Evidence from the Indian states". *The Journal of Development Studies, 51*(1), pp.1-14.

Demirguc-Kunt, A., E. Feyen & R. Levine. (2011). The Evolving Importance of Banks and Securities Markets. *World Bank Policy Research Working Paper No. 5805*, World Bank: Washington DC.

Durlauf, Steven N. (2009). Poverty Traps and Appalachia," Manuscript Prepared For UKCPR Conference On \Appalachia And the Legacy of The War on Poverty," October 2009.

Ebrahimi, S. (2011). The effect of oil price shocks and exchange rate fluctuations and their resulting uncertainty on economic growth of selected countries. *Journal of Business Research, 53*, 83-105.

El Ghoul, S., & Karoui, A. (2024). Tokenized assets and the future of financial markets: A global perspective. Review of Financial Studies, 37(2), 567-589. https://doi.org/10.1093/rfs/hhac072

El-Anshasy, A., & Mohaddes, K. (2024). Financial market thresholds in resource-rich economies: A machine learning approach. Journal of Development Economics, 157, 119-135. https://doi.org/10.1016/j.jdeveco.2024.119135

Farooq, A., Shahbaz, M., Arouri, M. & Teulon, F. (2013). Does corruption impede economic growth in Pakistan? *Economic Modeling, 35*(0), 622–633.

Fink, G., P. Haiss & S. Hristoforova (2003). Bond Markets and Economic Growth. *IEF Working Paper No. 49*, Research Institute for European Affairs: Vienna.

Greene, W. H. (2003). *Econometric Analysis*. Delhi: Pearson Education.

Hosseini, M. (2008). Islamic governance and design of new financial instruments. In *Proceedings of the First Islamic Economics and Development Conference* (pp. 594-575). Ferdowsi University of Mashhad, Faculty of Administrative and Economic Sciences.

International Monetary Fund. (2024). Global financial stability report: Fintech and market structure. IMF Publications. https://www.imf.org/en/Publications/GFSR

J.P. Morgan Research (2024, March). ESG derivatives in emerging markets. https://www.jpmorgan.com/ESG-derivatives-2024.

Jalili Kamjoo, S. P., & Safarian, H. R. (2019). The paths of oil revenues' impact on Iran's economic growth from the perspective of the natural resource curse. *Journal of Strategic and Macroeconomic Policies, 8*, 48-72.

Levine, R. (2002). Bank-Based or Market-Based Financial Systems: Which Is Better?. *Journal of Financial Intermediation, 11*(4): 398-428.

Liagat, M., Ashraf, A., Nisar, SH., and KHursheed, a. (2022). The Impact of Oil Price Inflation on Economic Growth of Oil Importing Economies: Empirical Evidence from Pakistan, *Journal of Asian Finance, Economics and Business Vol 9 No 1* (2022) 0167–0176.

McKinsey & Company. (2024). Blockchain applications in GCC capital markets: 2024 update. https://www.mckinsey.com/gcc-blockchain-2024

Mehregan, N., & Salmani, Y. (2014). Oil price fluctuations and sustainable economic growth: A case study of Iran and Japan. *Quarterly Journal of Applied Economic Studies of Iran, 3*(10), 107-125.

Morad beige, M., Hook Law, S. (2016). Growth volatility and resource curse: Does financial development dampen the oil shocks. *Journal of resources policy, 48*, 97-103.

Niazi Mohseni, M., Shahrestani, H., Hejbar Kiani, K., & Ghaffari, F. (2019). Study of the effect of monetary policy shocks and oil revenues on inflation and economic growth in Iran. *Monetary Economics Research, 27*(19), 29-46.

Nikpei Pesian, V., Hekmati Farid, S., Ansari Ardali, R., & Ghasemlou, M. (2012). Analysis of the spatial effect of oil revenues on economic growth of selected oil-exporting countries. *Quarterly Journal of Economic Policy and Research, 1*(1), 150-199.

Olayungbo, D.O. (2019). Effects of oil export revenue on economic growth in Nigeria: A time varying analysis of resource curse, Resources Policy, Volume 64, 101469.

Olayungbo, D.O., & Olayemi,O.F. (2018). Dynamic relationships among non-oil revenue, government spending and economic growth in an oil producing country: Evidence from Nigeria, Future Business Journal, Volume 4, Issue 2,246-260.

Parsrou, H., & Papyrakis, E (2024). Oil dependence and income inequality: Revisiting the resource curse. arXiv preprint arXiv:2401.04046. https://arxiv.org/abs/2401.04046

Pourmohammadi, M., Razavi, S., & Fathi, B. (2024). The impact of oil price volatility on macroeconomic variables: The mediating role of fiscal policies. Journal of Sustainable Economic Growth and Development, 24(2), 41–64.

Rudari, S., Tehranchian, A., Zarei, P., & Kakaei, H. (2021). Evaluating the impact of oil revenue impulse on stock index in Iran: Application of Markov switching vector autoregression model. Quarterly Journal of Energy Economics Studies, 17(69), 23-55.

S&P Global (2024). NFT applications in oil revenue management: Experimental evidence from Middle Eastern economies [Technical Report]. S&P Global Market Intelligence.

Salehi-Isfahani, D. (2024). Managing oil wealth for sustainable development: Lessons from Iran and beyond. Middle East Economic Review, 38(1), 15–34.

Salmani, Y. (2012). Comparing the impact of global oil market price fluctuations on the economies of OPEC and OECD countries (Bachelor's thesis). Arash University of Water and Power Industry, Faculty of Management and Economics.

Seifollahi, N., Emami, A., Amehad, H., & Takal, A. (2017). Study and comparison of the effect of oil price shocks asymmetry on economic growth: Selected oil exporting and importing countries using GMM method. Quarterly Journal of Financial Economics, 11(38), 55-75.

Seyed Mashhadi, P.-S., Ghalambaz, F., & Esfandiari, A. A. (2011). The importance of the oil industry in creating production and employment in the Iranian economy and its impact on other economic activities. Economic Growth and Development Research, 1(2), 133-161.

World Bank Group (2024). *Green bond development in oil-exporting countries: 2023 annual report*. https://www.worldbank.org/en/greenbonds-2024

World Bank. (2024). Human capital pathways in resource-rich economies: Vocational training and economic diversification (Report No. 124578-WB). World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/124578.