Estimating the Impact of Oil Prices on Inflation Dynamics: Evidence from Oil-Importing Economies - Middle East and North Africa

Dr. Esam Hadi Muhammad Al Salhi, Dr. Salam Anwar Ahmed

Kirkuk University, College of Administration and Economics

Department of Economics

Abstract

The study examines the effect of global oil prices on inflation in the economies of the Middle East and North African (MNA), focusing on Egypt, Tunisia, Jordan and Morocco in the period 1990-2024. By using world development indicators and annual data from the World Bank's world development indicators and OPEC databases, an analysis appoints a panel Ardl model to investigate both short and long -lasting dynamics. Unit root and cointegration chair prices, real GDP, business openness and inflation confirm the presence of a long balance conditions. The results show that real GDP and business openness are strong and important determinants for inflation, which corresponds to the total demand pressure and imported inflation mechanisms. Conversely, oil prices show a negative and slightly significant impact, explained by the presence of energy grants and state interventions that reduce the immediate passage of the global oil price shock for domestic prices. Short -term effects were largely insignificant, while the term miscorrections confirmed the moderate adjustment to the long balance. The impulse response analysis suggests that the inflation effect of the oil price shock is intensified in the long term, which reflects delayed transmission of external cost pressure. The study concludes that inflation in oil-door MNA economies is mainly induced by domestic development and external trade addiction, rather than fluctuating direct oil value. These conclusions emphasize the importance of structural reforms, including subsidy rationalization, energy diversification and dependence on imported oil, and reduce addiction to strengthen flexibility and ensure long -term value stability**.**

Keywords: *Oil Prices; Inflation; Panel ARDL; Trade Openness; GDP; MENA Economies*

1. Introduction

The relationship between oil prices and inflation is one of the most prominent financial issues that have equally won the attention of researchers and decision makers. Oil, which is a strategic object, is directly linked to the price level in most economies worldwide. Since the 1970s oil shock, their clear results have been equally clear on both inflation and economic growth in oil exports and oil-lying countries. However, development economies that import oil - such as Egypt, Tunisia, Jordan and Morocco - are the weakest for these shocks because of their heavy dependence on imports and limited flexibility in their production structures (cozy and Ünelnel, 2024; Ahmed et al, 2024). Recent studies in Latin America and South Asia indicate that oil prices are an important determinant for long -term inflation, while their short term effects seem limited due to state intervention and grant policy (Mishra et al., 2024; Bellaumi and Aljazia, 2024).

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Other studies have shown that the relationship between oil prices and inflation is neither linear nor symmetrical; Strong inflation effects occur than an increase in oil prices, as the UK, Saudi Arabia and Azerbaijan (Abubakar et al., 2024; Albahoth, 2025; Mustafav and Guliev, 2024). Meanwhile, research in Europe has highlighted the role of geopolitical shock as Russia -Sucrain War to increase the effect of energy prices on inflation (Marungoz, 2025). Regardless of this growing literature mass, research with a focus on arab-lying economies is relatively limited, as a lot of attention focuses on oil export countries or advanced economies. This raises a basic question: Do oil prices serve as a direct driver for inflation in these economies, or is their impact largely indirectly due to grant policy and important transparency? Against this background, the importance of the current study is rooted in filling this difference by checking the ratio of oil prices and inflation of four billion oil -lying countries in the period 1990-2024, including openness in GDP and business, which is in analysis to provide a greater extensive understanding of the dynamics of inflation.

The study aims to estimate the impact of oil prices on inflation in these countries using the Panel ARDL model, distinguishing between short- and long-run effects, and assuming the existence of a cointegrating relationship between oil prices, GDP, trade openness, and inflation. Three main hypotheses are proposed: oil prices have a limited effect in the short run but become more evident in the long run; GDP contributes positively to inflation through aggregate demand pressures; and trade openness increases the transmission of external inflationary shocks. The research relies on data from the World Bank and OPEC, and after testing for stationarity and cointegration, the Panel ARDL model was found to be the most appropriate. The empirical results revealed that economic growth and trade openness are strong drivers of inflation (with coefficients of 23.26 and 39.82, respectively).

(Important at 1% level), while the effect of oil prices was negative and slightly important (at 10% level -5.78). This can be explained by the presence of subsidy policy that reduces the final consumer near the fluctuations in the oil price, but at the same time puts the burden on public budgets and affects economic growth, which in turn seems indirectly indirectly indirect (IMF, 2014; Sedravich in al., 2014). The term error correction further indicated that 24% of the short -term deviation caused by the shock is corrected per year, while impulse response analysis confirmed the limited short -term effect of oil price shock compared to the slow -growing effects in the long term. The conclusion of the study is thus that inflation in these economies works stronger than internal factors (growth and trade openness) than direct oil prize effects, and supplementary dependence of supplements to absorb oil shock, which can reduce immediate effects, but increases the tax burden in a long time. This emphasizes the need for structural reforms aimed at diversifying energy sources, reducing the dependence on imports and strengthening price stability (Nkoro & Uko, 2016; Pesaran et al., 1999).

2. Literature review

The relationship between oil prices and inflation is among the most extensively studied topics in economics over the past decades, given its direct and indirect repercussions on both oil-importing and oil-exporting economies. Methodological approaches have varied, ranging from time-series models (VAR, ARDL, NARDL) to panel data models (Panel ARDL, GVAR), as well as time-varying parameter models (TVP-VAR, TVP-VECM). In addition, several studies have integrated energy variables with monetary, fiscal, and trade factors. This section reviews the most relevant prior studies related to the current research topic, analyzing their directions and findings, and ultimately identifying the existing research gap.

2.1 Study in development and oil-long economies

Literature suggests that developing, oil -long economies are more weak for the shock of oil pricing due to their weak production structures and heavy dependence on imports. For example, Koss and ünel (2024) examined, using a structural model, the effect of oil and temperature on food prices in Latin America and concluded that the oil forms an important external determinant for inflation, with its effects for an extended period of time. Using a similar function, Ahmed et al. (2024) showed that oil prices are among the most important drivers for inflation in South Asia, while technological progress helps to reduce the pressure on this inflation. Researchers staff panel data that cover many countries in the period 1995-2022, and gave the findings broad explanatory power(Mohammed and Bakar 2025).

In a similar context, Mishra et al. (2024) indicated that global oil prices have an asymmetrical effect on food inflation in southern and southeast Asian economies. The results showed that some countries, such as Sri Lanka and Vietnam,

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were more affected, while other economies were more balanced. This suggests that institutional structures and government policy may explain variation in shock transfer.

In Jordan, as an oil-wage economy, al-Swa et al. (2025) analyzed the effect of the instability of oil on inflation using the answer model for a period 2000-2023. The findings showed that the oil shock forms the primary driver for both inflation and fiscal deficit, and delays negative effects on economic growth, while the effect of exchange rate U.S. The dollar was relatively limited due to the PEGs.

2.2 Study in Arabic Export Economies

Literature indicates that oil export countries show more complex ratios between oil prices and inflation, such as in view of the strong relationship with public finance and public spending. For example, Elsherif (2024), using the TVP wise model, investigated the ratio of oil prices and inflation in OAPEC countries and found that there is a variation in countries based on the system and trade opening, as well as the system of exchange rates and businesses, which postpone the dynamics and the time to this relationship(Al-Salhi, Ahmed, and Mohammed 2024).

In Saudi -Arabia, Albahoth (2025) using a non -linear Ardl model as an increase in oil prices causes more inflation effect, compared to declining prices, suggests the presence of an asymmetrical relationship. The study also found that the offer and exchange rate for money play an important role in broadcasting domestic inflation.

In Azerbaijan, Mustafayev and Guliev (2024) revealed that oil prices and monetary factor - especially the most important driver of money supply and exchange rate - inflation. He said that contraction policy helped reduce inflation after 2015, while detailed measures after 2021 controlled the pressure of inflation.

2.3 Study in advanced economies

In advanced economies, research has largely focused on inequality and the role of the financial market. Abubakar and Karimu (2024) demonstrated that inflation in the UK is more strongly affected by gas prices than oil prices, and that the ratio is asymmetrical - Preis has a greater impact than being low. The authors used the DS-Cardl model as well as Wavelet analysis to highlight this dynamic.

In Europe, Marangose (2025) found that Joint Energy with Geo -Political Disrocation as the Russia -Uukraine War contributes to the increasing inflation directly. The study emphasized that the reaction from European monetary policy was limited compared to the shocks of the shock.

In the United States, Aditokunbo and MIFRI (2024) discovered the relationship between oil prices, financial markets (green share) and uncertainty about economic policy. He concluded that oil prices act as an important channel for transferring inflation tremors through the financial sector.

2.4 Studies in Other Emerging Economies

In Kazakhstan, Talimova et al. (2025) found that oil prices have a direct and significant impact on inflation, and that the relationship between inflation and industrial production is bidirectional. By contrast, the effect of agricultural production was only short-term, reflecting the limited capacity of the agricultural sector to mitigate inflationary pressures(Ahmed, Mohammed, and Algburi 2024).

In Ghana, Yeboah et al. (2025) showed that commodity prices, including oil, are asymmetrically related to both inflation and the exchange rate. The results revealed mutual causal linkages between certain commodities and the exchange rate, underscoring the complexity of these relationships in economies dependent on primary exports.

2.5 New trends in literature

Some recent studies have emphasized the role of behavior and institutional factors. Fu et al. (2024) showed that inflation expectations and consumer feelings play an important role in designing the relationship between energy prices and inflation, which contains asymmetrical effects in both short and long periods.

Other studies, such as ASAB (2025), examined global dynamics of inflation and concluded that the supply shock - especially in oil prices - remembers the primary driver of inflation worldwide - while fiscal and monetary policies have only limited effects in the short term.

3.   Data, model and economic function

The study model is presented in equation (1). The dependent variable is inflation (INF), which is measured by the consumer price index (CPI). Independent variables include global oil value (LNOIP), represented by the Opec curve value; Real GDP in Continuous 2010 US dollars (LNGDP); And business openness is measured as the ratio of GDP. In equation (1) I represent countries in the cross -sectional unit, tee represents time, β is a continuous concept, and ε is an error word.

INFit = β0 + β1LnGDPit + β2LnOIPit + β3LnOPTit + εit.........(1)

In this model, annual data was used for the period 1990-2024, which covers oil pilgrims in the Middle East and North Africa, IE Egypt, Tunisia, Jordan and Morocco. All statistical data were obtained from the World Bank's world development indicators and the Opec database. The independent variables were converted to logarithmic values and analyzed Evises 13 were performed using software. In addition to checking the inflation effects of oil prices, the model wants to identify the contribution from GDP and business openness, both are widely employed in literature to explain inflation.

4.   Econometric Methodology

This study has a planned Ardl model for projection approach. As the first step, before using other financial techniques, it is necessary to perform the unit's root samples to verify the stability of the variable. For panel data, empirical studies have recommended use of rat tests of panel units developed by Levin, Lynn and Chu (2002), IM, Pesaran and Shin (2003) and Breiteung (2000).

T is worth noting that the panel unit route the test determines the relevant function used. For example, when there is a mixture of stability on variables in (0) and on the first difference in (1), the Panel Ardl model is considered suitable for use (Emeka & Kelvin, 2016). In the second phase, we test the existence of a coincidence between the variables using panel cointegration tests such as CAO (1999) test (Beloomi and Aljajia, 2024). After installing chance, the Ardl model is estimated, followed by an IRF (IRF Response Function (IRF) analysis.

5.   Results and Discussion
5.1 Panel Unit Root Results

Table (1) IM, Pesaran and Shin W-Stat testing and promoted Dickey-Fuller Fisher-Type Tests Presents the results of variable root samples that were examined using both types of tests, under two specifications: only with cutting, and with cutting and trends. The results suggest that the inflation rate (INF) is stable at level I (0), as the disabled hypothesis of a unit route was rejected by 1% importance level. In contrast, real GDP, crude oil prices and LNOPT were found to be non-stagnant at level, but stabilized after separation first, ie in (1). Consequently, it can be concluded that the sample contains a mixture of variables that are stable at level I (0) and variables that are stable on the first difference in (1).

Table 1. Panel Unit Root Tests Results (P-values)

Variables	Level & 1st Diff.	Intercept/trend	IPS	ADF	Decision
INF	Level	Intercept	0.00333***	0.004324***	I(0)
INF	Level	Intercept & trend	0.05078*	0.02499**	
Ln GDP	*Level*	Intercept	0.14848	0.08654*	I(1)

		Intercept & trend	0.99673	0.961447	
Ln GDP	*1st diff.*	Intercept	0.0000***	0.0001***	
		Intercept & trend	0.0002***	0.0005***	
Ln oip	*Level*	Intercept	0.4789	0.6937	I(1)
		Intercept & trend	0.6231	0.7897	
	1st diff.	Intercept	0.0000***	0.0000***	
		Intercept & trend	0.0000***	0.0000***	
Ln opt	*Level*	Intercept	0.2110	0.1640	I(1)
		Intercept & trend	0.0254**	0.0417**	
	1st diff.	Intercept	0.0000***	0.0000***	
		Intercept & trend	0.0000***	0.0000***	

Note: *, **, *** indicates 10%, 5% and 1% respectively

5.2 Functional implication

In (0) and in (1) the presence of a mixture of variables (with the absence of someone in (2) variables) makes the Panel ARDL model the most appropriate method of the most appropriate method of analysis tools.

This model is allowed to check dynamic ratios between the variables in both short and longer, even when variables are integrated into different orders.

The results also emphasize the importance of the operation of chance tests (for example, CAO) to confirm the existence of a long balance conditions before considering the model.

5.3 Kao Residual Cointegration Test

Table (2) KO reports remaining coincidence results, which were used to verify the existence of a long -lasting relationship between the variables. The value of the ADF statistics was -1,8763 with a uniform option (p -him) of 0.0303, lower than 5% of the importance level. Based on this, the disproportionate hypothesis (H0) is rejected by no coincidence, while the alternative hypothesis (H1), a coincidence between the variable reflects the existence of the ratio, is accepted.

Table 2: Kao Residual Cointegration Test Result

Statistic	Value	P-value
ADF	-1.8763	0.0303*

* Statistically significant at 5% level.

This result indicates that the variables during the study move together for a long time, which means that there is a long living balance relationship between them. Consequently, any short -term deviation will be corrected over time and restore the system in balance. Methodically, this searches the search panel The use of the Ardl model, as it allows for an estimate of short-term dynamics, as well as involving them in a long-term relationship supported by chance.

5.4 Long-Run Analysis

The results suggest that the actual GDP has a positive and statistically significant effect on inflation (coefficient = 23.26, significant at 1%). This indicates that the economic development of the sample during the study is associated with high -value levels in the long term, which corresponds to the literature connecting the economic expansion to gather the demand pressure for the price, especially in development economies (NKORO & UKO, 2016).

In contrast, crude oil prices (LNOIP) showed a negative and slightly significant impact of 10% level (coefficient = -5.78). Although this result may seem unconventional for oil -long countries, it is more understandable when the guidelines for energy supplements are taken into account. During the study, the country (Egypt, Tunisia, Jordan and Morocco) uses separate degrees of energy diets, which partially isolates domestic consumers by assessing in global value. As a result, increase in oil prices can translate more into economic recession (through high tax load and increasing production costs) instead of direct inflation pressure, which allows negative and slightly significant coefficients (IMF, 2014; Sedravich et al., 2014).

For business openness, the effect was positive and statistically important at 1% level (coefficient = 39.82). This indicates that larger trade openness leads to high inflation, which can be explained by the fact that development economies are more dependent on imports. As a result, increased transparency exposes them more to the transfer of external inflation pressure, that is, imported inflation (Pesaran et al., 1999).

Table 3: ARDL Model Results (Dependent Variable: D (INF))

Long-Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Long-run (Pooled) Coefficients				
LnGDP	23.2678	6.3537	3.6621	0.0004***
LnOIP	-5.7865	3.2498	-1.7806	0.0775*
LnOPT	39.8293	11.4272	3.4855	0.0007***
C	-720.7393	193.2237	-3.7301	0.0003***
Short-Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ	-0.2442	0.1417	-1.7232	0.0876*
D(INF(-1))	-0.3787	0.1403	-2.6991	0.0080***
D(LnGDP)	-25.3520	39.3185	-0.6448	0.5204
D(LnGDP(-1))	36.6140	59.7313	0.6130	0.5411
D(LnGDP(-2))	-18.1975	16.7463	-1.0867	0.2795
D(LnGDP(-3))	-34.6349	35.3031	-0.9811	0.3287
D(LnOIP)	1.1877	1.5041	0.7896	0.4314
D(LnOIP(-1))	-1.7039	1.3469	-1.2650	0.2085
D(LnOPT)	2.7651	5.6166	0.4923	0.6235
D(LnOPT(-1))	1.3372	7.9007	0.1692	0.8659
D(LnOPT(-2))	-1.7914	3.8305	-0.4677	0.6409
D(LnOPT(-3))	-6.1311	6.5067	-0.9423	0.3481

Note: *, **, *** indicates 10%, 5% and 1% respectively

5.5 Short -term analysis

Error correction term (Cointeq = -0.2442) was found to be negative and statistically significant at 10% level. This result confirms the existence of a long -term balance ratio between the variables and indicates that about 24% inequality caused by a low shock to restore the balance is corrected annually. This suggests a moderate adjustment rate in response to the economic shock, indicating the partial market flexibility (Pesaran et al., 1999).

About the layered inflation (D (inf (1)), the effect was negative and important at a level of 1%, reflecting the presence of a self-reform mechanism. In other words, high inflation in the previous period puts the pressure on today's inflation. This discovery corresponds to the variants of literature, which suggests that inflation may be a cyclical component that decreases over time over time as a result of monetary policy and fiscal policy (NKORO & UKO, 2016).

In contrast, changes in real GDP (D (LNGDP), crude oil prices (D (LNOIP), and Trade openness (D (LNOPT)) were not statistically important. This suggests that the effect of these variables on inflation is not immediately visible, but

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becomes more pronounced in long term. Energy supplementation schemes and state interventions, which reduces the short effects of oil or trade shock at domestic prices.

5.6 Impulsive reaction function analysis

The results of impulse response analysis indicate that the effect of positive shock in oil prices on inflation is limited in less time. This can be explained by the presence of government policy as energy supplements and intervention mechanisms that reduce direct transmission of ups and downs at the level of domestic value. Over time, however, gradually spreads and becomes more pronounced in the long term, as the changes in oil prices are eventually reflected in production and transport costs, and as a result in total price levels. This performance pattern indicates, on the one hand, the importance of macroeconomic policies to absorb external shock, and on the other hand sheds light on the fact that maintaining such policy can be expensive for fiscal budget in the oil revenue countries if oil prices continue to rise.
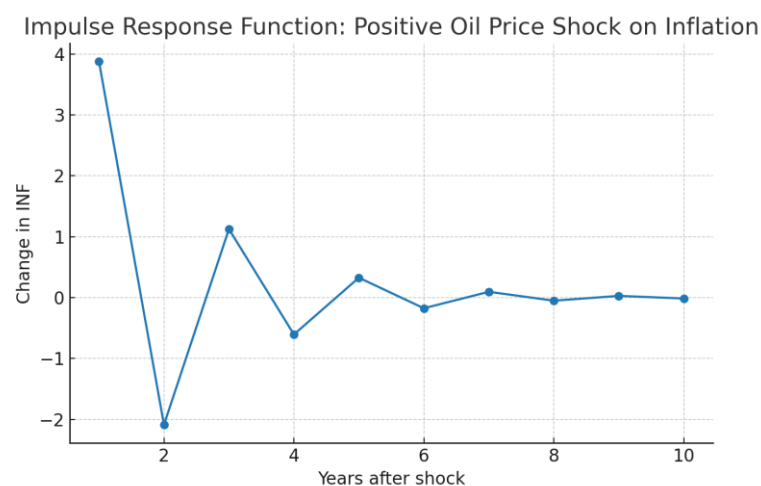

Figure 1: Impulse Response Function Analysis

Consequently, the analysis highlights the following main points:

The short -term effect of oil prices is limited due to state intervention.

The effect is sharp in the long term when indirect pressure accumulates in the economy.

In order to reduce the dependence of imported oil, it is important to diversify energy sources and use alternative strategies such as developing domestic alternatives.

6.   Conclusion

The study has investigated the ratio of oil prices and inflation in the oil-oil countries in the Middle East and North Africa-that is, Egypt, Tunisia, Jordan and Morocco panels using Ardl frameworks for a period 1990-2024. Empirical results confirm the presence of long -term links between oil prices, GDP, business openness and inflation. Conclusions suggest that economic growth and trade openness are the most important drivers of inflation, with strong positive and significant effects, while the direct effect of oil prices on inflation was found to be negative and weak significantly. Some extent unconventional results for oil -based countries can be explained by extensive energy supplementary schemes and state interventions that reduce immediate passages of global oil prices in domestic prices.

In a short time, the effects of oil prices on inflation were limited, reflecting the protective role of the supplementary and stabilization mechanisms. However, impulse response analysis suggests that these effects accumulate and become more pronounced for a long time, as high oil prices are eventually translated into increased production and transport costs, which is reflected in normal price levels. This means that although the government's intervention can adapt to consumers in the short term, they also use an important fiscal strain that can compromise long -term macroeconomic stability.

Overall, the study emphasizes three main conclusions: first, short -term insulation of inflation from oil shock due to supplementation and intervention; Secondly, the intensity of prolonged inflation pressure through indirect channels; And thirdly, significant requirements for structural reforms.

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