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Macroeconomic Effects of Oil Price Volatility on the Economy: The Case of Morocco

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Abstract

Oil remains a valuable commodity in the world, accounting for approximately 3% of the global GDP. Recently, energy discussions have taken the central space in major global economic forums: major multi-national forums have focused on oil price trends and control, energy diversification, and environmental impacts of oil-based energy sources. There is no doubt that oil runs a proportionate section of the global economy. The purpose of this study is to assess the impacts of oil price volatility on Morocco's major economic variables, including inflation, trade, and GDP, based on data collected in the last two decades. A simple supply and demand model is applied to investigate and explain the relationship between oil prices and Morocco's crucial economic variables. The results show a direct correlation between oil price shocks and the country's major economic sectors: production, agriculture, and transport. The study found that crude oil price hikes have a significant impact on the GDP and a subsequent detriment to the country's economic growth. The Moroccan economy's high dependency on imported fossil fuels (petroleum, diesel, and oil products) could face notable destabilization in the event of a permanent upward oil price change. The long-term increase in the cost of importing oil induces gradual deterioration of major economic agents, lowering government income, savings, and exports. Additionally, the results of the study show that a gradual oil price rise could hike the prices of virtually all consumer goods, which would result in direct effects on household income and the population's purchasing power. The repercussions could trickle down to the budgetary balance, resulting in social and economic devastation.

Keywords: Oil Price; Inflation; Volatility; Economic Growth; Exchange Rate

1. Introduction

Oil is the most essential input in most production processes globally. It is so crucial that permanent price fluctuations are felt across all economic sectors. Global organizations have introduced multiple alternative energy sources, but none have matched fossil fuel. Oil demand is constantly rising as emerging economies such as China and Brazil rapidly expand their production and technology. The high cost of digging new wells has kept the maximum production capacity of some oil-producing countries fairly constant. Consequently, a rising global demand and a stagnant supply rate have contributed to the recent price volatility.

Oil accounts for approximately 3% of the global GDP (White, A., 2022). In the past two decades, the price of a barrel of crude oil fluctuated between a high of $111.26 in 2011 and a low $$11.26 in 2020. According to oilprice.com, the current price for a barrel of crude oil is fluctuating at around $68 for West Texas Intermediate (WTI) Crude, $72 for Brent crude, and $73 for Murban Crude. Major global economic sectors, including transport, production, and agriculture, are oil-dependent. Additionally, petroleum products are found in a variety of products, including plastic, fertilizers, protective equipment, and solvents. A significant increase in the cost of 3% of global GDP would notably affect people's purchasing power. Oil price shocks impact the cost of virtually all consumer goods. The effects are felt directly in various products that use oil as a raw material and indirectly through the cost of production and transportation of finished goods.

Morocco's energy sector is primarily dependent on imports, especially petroleum products and natural gas. As such, any disruption in the global supply and the price of fossil fuels could have a significant effect on Morocco's economy. An example of its vulnerability is the economic strain in 2020/2021 when a combination of the COVID-19 pandemic and the Russia-Ukraine war disrupted the global oil supply. Data from Trademap showed that importation and preparation of petroleum increased from 595USD/MT to 1,041USD/MT between 2021 and 2022, before falling to 854USD/MT in 2023. Additionally, Samir Refinery, Morocco's sole oil processing facility, has remained inoperative for the past decade. Since its closure in 2015, the country shifted from importing crude to refined petroleum products to meet its high domestic energy needs. The refinery could process 200,000 barrels of crude oil daily. It was shut down due to bankruptcy and has remained closed despite multiple attempts by the government to reopen or auction it (Jihane-

Rahhou, 2023). Although Morocco's oil exploration continues, its low domestic production and rising consumption have heightened its vulnerability to global oil price shocks.

Morocco has an oil-dependent economy. That position raised an interest in this study, investigating the effects of global oil price trends on the various macroeconomic variables and economic development. The research studies the direct impacts of high oil prices as a raw material in production and indirectly on other goods and services that rely on oil-based energy in production and transportation. The study adds to the country's literature by gathering precise information on oil as a key macroeconomic aggregate in the country's economic planning. The study analyses Morocco's current economic position in relation to the rising energy prices and suggests possible avenues to mitigate adverse effects on the vulnerable sectors.

The rest of the study is structured in the following order: following the introduction section, the literature review analyses the relevant theoretical framework linking oil price volatility to various economic variables. The third section analyses the data sources and the simple supply and demand model, with the findings presented in section four. The discussion and conclusion sections interpret the results, comparing them with previous studies.

2. Literature Review

In the past 25 years or so, oil prices have fluctuated exceptionally. The first three years of the 21st century recorded relative price changes. The rising demand between 2004 and 2008 caused a sharp price climb with a barrel of crude oil selling for up to $92. Because of the 2008 economic crisis, the price of oil fell 36.6% in 2009 compared to 2008 (Fouad, E. & Hayat, L., 2021). In the 5 years that followed, fluctuating demand and economic shifts raised the price per barrel to $91 in 2013 before declining to $40 in 2015. A similar decline was recorded in 2020 during the COVID-19 pandemic when governments closed down businesses and restricted travel. The global oil demand plummeted and left producers scrambling to store the excess supply. During this period, a barrel of Brent oil reached a decade's low of $9.12 on April 21 while WTI crude futures dipped to the negative side (U.S. EIA, 2021). The price of oil per barrel has gradually recovered to stabilize between $40-$60, which aligns with the Organization of the Petroleum Exporting Countries (OPEC)'s target (Table 1).

Table 1. *Crude Oil Price Fluctuations Since 2020.*

Crude Oil Prices - Historical Annual Data					
Year	**Average closing price**	**Year Open**	**Year High**	**Year Low**	**Year Close**
2025	71.75$	71.72$	80.04$	66.03$	68.28$
2024	75.83$	71.65$	87.01$	66.37$	71.87$
2023	77.64$	80.26$	93.84$	66.74$	71.33$
2022	94.53$	76.08$	123.70$	71.59$	80.51$
2021	68.17$	47.62$	84.65$	47.62$	75.21$
2020	39.68$	61.17$	63.27$	11.26$	48.52$

Source: Macrotrends (2025)

Demand and supply are the basic dynamics directly affecting the global oil market. When the total demand exceeds supply, the oil price increases, and the opposite is true. The demand and supply balance is influenced by more than the rise in everyday usage and consumer preference: natural disasters, geopolitical instabilities, environmental policies, and advancement in drilling technology can easily tip the scales. Notably, the demand for fossil fuels has grown sharply with the rising global population, industrialization, and technological advancement. As a result, increased oil prices per barrel have shaken some developing economies, especially in countries that import all or most of their oil needs. The economic impacts of the 1979 oil price shock led economists to link oil price volatilities to high inflation, low economic growth, and increased unemployment (Fouad, E. & Hayat, L., 2021).

The shifts in the global oil market have been linked to high cost of production, increased demand, and geopolitical conflicts. For instance, when the demand hit a decade's low in 2020 (during the COVID-19 pandemic), the price of a barrel of crude dropped to $11.26 and averaged $39.68. Since then, the gradual increase in demand has driven the prices up to an average of $71.75 in 2025 (Macrotrends.com, n.d.). From the regional stability front, Venezuela and Iran are not the only oil-producing countries facing geopolitical shake-up. The rising tension between Saudi Arabia and Iran, ongoing instabilities in Libya, Yemen, Iraq, and Syria have put uncertainties in the future of global oil supply. If the tension between Saudi Arabia (which supplies Morocco with over 70% of its oil needs) and Iran intensified, the resulting increase in oil prices would put Morocco at a disadvantage as its import partner. According to Worldometre.com, Morocco ranks 45th largest oil

consumer globally at over 300,000 barrels daily. Despite its high energy needs, Morocco only produces about 160 barrels per day domestically. Its transport and production sectors operate primarily on petroleum-based fuel.

High consumption and rising prices have grown Morocco's oil import expenditure in the past 20 years. According to World Integrated Trade Solution, Morocco imports from Saudi Arabia, Italy, UAE, Russia, Spain, and the United States. In 2022, its oil imports amounted to $3.36 billion from Saudi Arabia, $2.65 billion from Spain, and $2.58 billion from the United States. Imports from the United Arab Emirates doubled from 7.68 billion dirhams to 14.48 billion dirhams between 2018 and 2022, indicating a steady consumption growth. According to Enerdata (2023), Morocco's transport sector is its largest oil consumer, guzzling up to 44% of the total oil imports. The residential services sector consumes 30% while industries and power plants consume 17% and 5% respectively (Enerdata, 2023). Having that in mind, a significant surge in oil prices could exert extreme pressure on the operations of these sectors and slow down Morocco's economic progress.

Previous research in this area reveals a robust relation between oil price shocks and inflation. The severity of effects depends on a country's level of economic growth: less developed economies suffer more adversely, while established countries can offset or dull down the impact. While global oil price shocks affect both producing and importing economies, heavy importers like Morocco are more vulnerable to long-term fluctuations. Higher oil prices raise the economy's price level without necessarily benefiting economic growth. Moreover, anticipation of further price increases only exacerbates panic, causing the inflation to spiral further. Various studies recommend long-term fiscal policies over short-term measures in curbing oil price-induced inflation. Some studies indicate that money supply and changes in exchange rates linked to oil prices directly affect inflation and slow economic growth.

Choi et al. (2018) studied the relation between global oil volatility and inflation dynamics in developing and advanced economies using data between 1970 and 2015. The results showed that a 10% inflation in oil prices increased domestic inflation by 0.4%. The effect declined over two years largely due to the implications of positive monetary policies. The study showed that positive oil price shocks result in stronger impacts on inflation, while price drops had minimal impacts. In

the countries studied, transportation CPI and subsidies were the major factors used to explain the variations in the effects of oil price shocks.

Shang and Hamori (2021) analyzed how WTI crude oil affected foreign currency markets. They found that prior to COVID-19, changes in the price of WTI crude oil affected the exchange rates of importing countries substantially. The spillover effects of changes in WTI crude oil prices had more adverse implications for the exchange rates of countries that heavily rely on American oil.

Alam et al. (2019), using 5-minute data intervals, investigated a causal link between crude oil prices and exchange rates. Focusing on the US dollar against six major currencies, they found that the effects of crude oil prices on the money market intensified during periods of economic uncertainty. Ahmad et al. (2020), using high-frequency data, found a negative impact of oil price volatility on China's exchange rates.

Aziz et al. (2016) studied the effects of increased energy prices on the Pakistani consumer welfare. They used time-series data between 1987-2012 and found that electricity prices were significantly affected by global price changes. The study proposed that Pakistan's investment in electricity generation, coal, and fossil fuel could stabilize economic growth.

Bei Zhang et al. (2022) investigated the transmission mechanisms and impacts of oil price fluctuations on China's macroeconomy. Using the dynamic stochastic general equilibrium (DSGE) model on quarterly data between 1996 and 2019, they found that supply-driven oil price shocks resulted in inefficient resource allocation and restricted incentives for investment into new energy fields. Demand driven oil price volatility affected business investment and consumption, directly impacting output through the supply channel. They concluded that the resulting inflation affected economic balance, raised interest rates, and led to adjustment of monetary policies.

2.1. Theoretical Framework

As an import-dependent economy, long-term increases in oil prices affect Morocco through increased government spending on imports, fiscal strains, and increased cost of production. As a result, inflation intensifies as the level of output drops and economic growth is derailed. The

equations below show how oil price changes affect various economic aspects: supply and demand, government budget, exchange rates, and inflation.

2.2. Basic supply and demand

An ideal equilibrium price (P*) and quantity (Q*) exist where supply (Q_s) is equal to demand (Q_d):

$$\boldsymbol{Demand}\ (\boldsymbol{Qd}) = \boldsymbol{Supply}(\boldsymbol{Qs}) \qquad \textbf{(1)}$$

where, **Demand Function**:

$$\boldsymbol{Demand}\ (\boldsymbol{Qd}) = Base\ demand\ (a) - Demand\ Sensitive\ to\ price\ (bP)$$

Supply Function:

$$\boldsymbol{Supply}\ (\boldsymbol{Qs}) = \ Base\ Supply\ (c) + Supply\ Sensitive\ to\ Price\ (dP)$$

Thus;

$$\textbf{Ideal equilibrium Price}\ (\mathbf{P}*) = \frac{\text{Base demand (a)} - \text{Base Supply (c)}}{\text{Supply Sensitive to Price (d) Demand Sensitive to price (b)}}$$

$$\textbf{Quantity}\ (\mathbf{Q}*) = \text{Base demand (a)-Demand sensitive price (bP)}$$

From the equation, an increase in oil price due to external shocks like natural calamities or supply cuts reduces the supply (Q_s), driving up prices.

2.3. High Oil Price and Inflation (Cost-Push Inflation Model)

High oil prices affect Morocco's production cost both directly as a raw material for various products and indirectly through the cost of energy and transportation. High production cost inflates the final cost of consumer goods.

where:

π = inflation rate

π_0= base inflation

a = sensitivity of inflation to oil price, and

P_0 = price of oil,

$$\textbf{\textit{Inflation rate}}(\pi) = \textit{base inflation}(\pi_0) + \textit{Sensitivity of inflation to oil price}\ (P_0) \quad \textbf{(2)}$$

An increase in the price of oil (P_0) results in a higher inflation rate (π), raising the final cost of consumer goods and services.

2.4. Effects on Exchange Rates (Purchasing Power Parity, PPP)

When oil prices go up, Morocco's demand for foreign currency increases, affecting the value of the dirham and the exchange rate (E) in the process.

Where,

E = exchange rate (value of the dirham)

E_0 = initial exchange rate

P_0* = global oil price, and

β = sensitivity of exchange rate to oil prices, then;

Exchange rate:

$$\mathbf{E} = \text{Initial exchange rate } (E_0) + \text{Sensitivity of exchange rate to oil prices (Price of oil } (P_0) - \text{Global oil price } P_0^*) \quad \textbf{(3)}$$

2.5. Constraints in the Government Budget

When the cost of importing oil increases, government subsidies increase G. This widens the fiscal deficit (FD) unless the government imposes higher taxes (T) or cuts spending in other areas.

where;

G = government spending (including subsidies)

T = tax revenue

Thus,

Fiscal deficit FD = Government spending (G)- Tax revenue (T) **(4)**

From the theoretical equations, volatile global oil prices impact Morocco's economy by lowering the value of the dirham and increasing inflation, hence, slowing down economic growth. Tax rate adjustments and government policies such as subsidies are crucial in offsetting the effects.

3. Methodology and Data Analysis

3.1. Data Sources

The study used Morocco's annual time series data from the last two decades. Data on Brent crude price in USD was used, sourced from the U.S. Energy Information Administration (EIA). Data on economic variables, including inflation, GDP, and exchange rate, were sourced from the World Bank database as indicated by the table below (Table 2).

Table 2. Economic variables, their abbreviations, and descriptions from the listed sources.

Variables	Source	Abbreviation	Description
Inflation	World Bank	LINF	Inflation measures how much or how quickly the general level of prices for goods and services is rising, and the resulting decline in purchasing power.
Brent spot price	U.S. Energy Information Administration	LBRENT	Brent spot price refers to the spot market's price of purchasing Brent crude oil, normally used as a benchmark for global oil prices.
Exchange rate	World Bank	LEX	Exchange rate refers to the value and strength of one currency for conversion purposes, to another. Reflects the stability of a country's economy.
GDP	World Bank	LGDP	GDP refers to the total monetary value of all finished goods and services produced in a country within a specific period. It represents a country's economic health.
Unemployment rate	World Bank	LUNEM	Unemployment rate describes the percentage of a country's active labor force that is without jobs and is seeking employment. It indicates the country's economic health.

Source: Authors

3.2 Simple Supply and Demand Method

This study explores how energy prices, mainly oil, affect Morocco's main economic variables. By employing a simple supply and demand model to understand the relationship between oil prices, stock prices, aggregate output, price level, and exchange rate in Morocco, the following specification is introduced;

$\boldsymbol{Y_t}=f(MASIt,\ OPt,\ CPIt,\ RERt)$, *where;*

Y_t is Morocco's output level at time *t*, $MASI_t$ the value of Morocco's All Shares Index (MASI) stock index at time *t*, OP_t is the price of oil at time *t*, CPI_t is the consumer price index at time *t*, and RER_t is the Moroccan dirham real effective exchange rate at time *t*. According to Upadyaya et al. (2017), a rise in stock price increases consumer confidence, raising aggregate demand and economic output, leading to economic expansion. The resulting investment boost raises the demand and price of stock. Therefore, a two-way causality between stock price, $MASI_t$, and aggregate output Y_t is to be expected.

From the equation;

Morocco's output level is a function of the value of Morocco's All Shares Index, the price of oil, the consumer price index, and the Moroccan dirham real effective exchange rate

Thus, changes in oil prices impact output through both demand and supply: an increase in aggregate demand (income level) results in higher aggregate demand for consumer goods. The rising demand also inflates oil demand as a crucial input in industries and the transport sector. On the supply side, higher oil prices increase the cost of manufacturing and agriculture, causing a negative shock to the aggregate supply.

Keynesian economics proposes that long-term oil-induced inflation can devalue the domestic currency. Although this depreciation can result in higher demand for exports, the price of imported inputs like oil increases. Higher demand for exports raises the demand for imported inputs and foreign currency, further devaluing the Moroccan dirham. Therefore, a two-way causality relationship exists between output Yt and real exchange rate, RERt

4. Results and discussion

The findings from this study cover the simple and demand method, descriptive data, correlation analysis, event study, and the cost-push inflation model.

4.1 Descriptive Data Technique

According to Wooldridge (2019), descriptive statistics organize and summarize variables under study, enhancing interpretability. The information on the table below (Table 2), LBRENT mean and median of 3.72 and 3.78 respectively, reflecting a skewness coefficient of −0.06 and a proportionately flat distribution (kurtosis 1.59). The LGDP mean, median, and standard deviation of 24.97, 25.05, and 0.53, respectively, show a slight negative skewness coefficient of −0.22 and a kurtosis value of 1.44. The LINF mean, median, and standard deviation of −4.02, −4.11, and 0.86 present a positive skewness value of 0.06. The above values show no significant deviation from normality as indicated by a probability higher than 5%.

Table 3. Descriptive statistics

	LBRENT	LEX	LGDP	LINF	LTRADE	LUNEM
Mean	3.72	2.21	24.97	−4.02	−0.51	−2.19
Median	3.78	2.20	25.05	−4.11	−0.52	−2.21
Std.Dev.	0.69	0.09	0.53	0.86	0.24	0.17
Skewness	−0.06	0.45	−0.22	0.06	0.22	0.15
Kurtosis	1.59	2.72	1.44	2.18	1.80	1.36
Jarque-Bera	2.75	1.25	3.59	o.95	2.23	3.80
Probability	0.25	0.54	0.17	0.62	0.33	0.15

4.2 Correlation Analysis

The table below (Table 3) shows the correlation between higher oil prices, inflation, and a country's GDP. The study variables display a strong correlation of 0.89 between LBRENT and LGDP. At a 1% level, this figure shows a direct proportion between oil prices and GDP levels. However, LGDP shows a negative correlation to LINF (-0.52): this signifies that at 1%, an increase in inflation is consistent with a lower GDP. The negative correlation between LBRENT and LINF indicates that an increase in oil prices is likely to be associated with lower inflation.

Table 4. Correlation Analysis

VARIABLES	LBRENT	LEX	LGDP	LINF	LTRADE	LUNEM
LBRENT	1.00					
LEX	−0.36**	1.00				
LGDP	0.89***	−0.15	1.00			
LINF	−0.37**	−0.17	−0.52***	1.00		
LTRADE	0.89***	−0.15	0.92***	−0.30*	1.00	
LUNEM	−0.92***	0.28	−0.88***	0.42**	0.42**	1.00

Significant at 10%, ** significant at 5%, *** significant at 1 % Source: Authors

4.3 Event Study Analysis

The Moroccan economic sectors have been impacted by various global financial events, including the 2008 financial crisis and the COVID-19 pandemic in 2021-2022. Although the events of the 2008 financial collapse did not have a direct effect on the economy, COVID-19 disrupted the demand and supply balance of oil, irritating Morocco's import and production sectors. Morocco became the second most affected African country after South Africa, which impacted the stock market (Lhoucine B. et al., 2022). The government introduced policies,

including travel bans, school closures, and lockdowns, which destabilized trade and tourism. The oil and gas sector declined considerably, as shown by the pre-COVID-19 and post-COVID-19 stock data presented below. The Jarque–Bera test confirms the abnormal distribution of resources. The analyzed statistics include mean, standard deviation (SD), maximum (Max), minimum (Min), kurtosis, skewness, and median, visualized using a correlation matrix (Tables 4 & 5).

Table 5. Descriptive statistics for Morocco's Oil and Gas Sector Stock before COVID-19.

Oil & Gas Sector	**Mean**	**SD**	**Max**	**MIN**	**Kurtosis**	**Skewness**	**Median**
Pre-COVID-19	0.017	0.743	3.183	-3.719	3.940	-0.082	0.000
During COVID-19	0.026	0.543	1.695	-2.805	1.172	-0.845	0.009

Source : Authors

Table 6. Average return before and during COVID-19

Oil & Gas Sector	**Average Returns (%)**
Pre-COVID-19	0.017
During COVID-19	0.026
Variation*	0.917

$* \text{Variation} = (\text{Average return (During COVID} - 19) - \text{Average return (Before COVID} - 19)) * 100$

Source : Authors

According to data by the International Energy Agency, the global oil demand was dropping at the rate of 435 thousand barrels per day during the pandemic. This disequilibrium of demand and supply prompted OPEC to respond by cutting down supply. The oil import for Morocco declined from USD 4.3 billion in 2019 to USD 2.6 billion in 2020. Since COVID-19 started on January 2, 2020, in Morocco, the COVID-19 period for this study is considered to be between

January 2020 and December 2021. Table 5 indicates that while the onset of the COVID-19 pandemic in Morocco produced negative impacts in virtually every sector, the oil and gas sectors indicated a slight recovery with government financial interventions, as shown by the positive variation (0.917).

Measures by the Government Through the Central Bank (BAM) to stabilize the economy

Bank Al-Maghrib (BAM) led the efforts to stabilize Morocco's economy during the COVID-19 crisis. In the 2021 economic climate, most of the country's inflationary pressures sprouted from the high cost of imported energy, especially from high global oil prices. Bank Al-Maghrib maintained an accommodative monetary policy. The policy rates remained unchanged at their historical lowest level of 1.5 and maintained a required reserve rate of 0. In the years that followed, the Central Bank has maintained adjustable, data-dependent interest rates to address inflation resulting from volatile oil prices. In 2023, following the fading effects of supply shocks, Morocco's inflation gradually declined, and BAM paused the cycles of interest rate tightening (IMF, 2024). To achieve Morocco's financial resilience goal, the Central Bank has been transitioning to an inflation-targeting framework that would allow the dirham to adjust freely in response to external shocks, including oil price volatilities. Bank Al-Maghrib is transitioning gradually from conventional peg to pegged exchange rates within the horizon bands as interest rates stabilize with the support of the International Monetary Fund (Baksa, D. & Bulíř, A., 2023). BAM widened the fluctuation band for its local currency to +-2.5% in 2018 and later to +-5% in 2020.

4.4 Cost-Push Inflation Model

Oil price shocks have parallel impacts on the net exporter and the net importer. High price direct wealth transfer towards the oil-producing countries could incentivize further investment. The net importers, however, bear the burden of increased prices, which cascade into various economic sectors. The cost of oil is transmitted through three channels: the supply channel (affecting the production cost), the demand channel, and the interest rate channel.

The supply channel is the most direct channel affected by Oil price changes. Commonly, the rising cost of crude oil is associated with the cost of fuel like gasoline and diesel, but crude oil is

a raw material in products like solvents, plastics, and polymers. Zhang et al. (2022) conducted a study on the Transmission Mechanisms and Impacts of Oil Price Fluctuations using the DSGE Model. They built the DSGE model based on China's macroeconomic data between 1996 and 2019. According to their findings, lower crude oil prices in the short term resulted in positive output growth. As a raw material, positive oil price shocks raise the cost of production, resulting in declining profits and industrial investment. Moreover, long-term oil price fluctuations lead to cost adjustments in production factors, affecting effective resource allocation and eventually, the output. For industries using oil for energy, higher prices transfer to the final production cost of goods. The cost of transportation of the finished product through road or railway also rises as the final pump price of oil by-products increases.

The demand channel, based on the income transfer theory, high oil prices increase wealth transfer between the trading countries. Positive price changes trigger imported inflation, destabilizing the trade balance and exchange rate of the oil-importing countries (Zhang, B. et.al., 2022). With the high cost of imports and declining export demand, the intensifying inflation trickles down to the consumer. According to the market allocation theory, higher oil prices decline the purchasing power of earned wages. Increased cost of consumer goods shifts trade balance, and interest rates rise, affecting household consumption patterns and business investments (Bouakez, H., 2007).

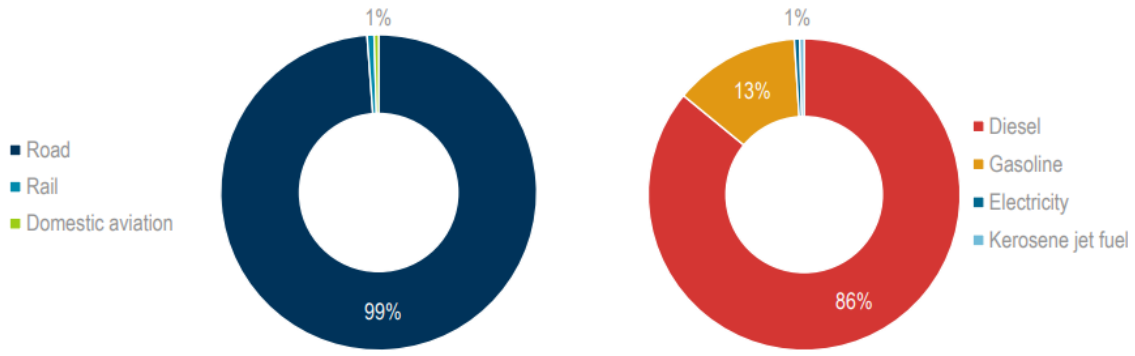
High oil prices have an indirect macroeconomic effect through the interest rate channel. Inevitably, the increased oil prices pass down to the end user as the government compensates by imposing higher oil taxes. Higher oil prices directly translate to high inflation as the cost of oil-related products soars. Oussama, R. and Abdellah, E. (2024) in a journal titled *Macroeconomic Effects of Raising Oil Prices: Insights from Morocco,* studied the correlation between global crude oil price hikes and inflation using the VECM model. The findings indicated a strong link between oil prices and inflation, with a 6.51 coefficient for oil prices (LBRENT): this suggests that a 1% increase in oil prices would translate to a 6.51% rise in inflation. At the end, the population's purchasing power and demand for consumer goods decline. By driving up inflation, high oil prices can prompt central banks to raise interest rates, lower the money supply, or establish tighter monetary policies to mitigate inflation. As the demand for money goes up and the effective interest

rate increases, they push up the interest rate in anticipation of further inflation. Oil price volatility directly affects Morocco's key economic sectors, namely transport, agriculture, and production.

4.5 Transmission Through the Transport Sector

Morocco's transport sector consumes close to half of its imported oil. Despite efforts to substitute fossil fuel with renewable energy sources, oil has remained the predominant energy source for the fast-growing transport system (International Energy Agency, 2019). As of 2017, road transport accounted for 99% of its transport energy while rail and domestic flights shared 1% (**Fig. 1**). The energy consumption for the transport sector grew 58% between 2007 and 2017, and more than fourfold since 1990. The rising energy need was linked to the urban sprawl and Morocco's goal to be the region's centre for the automotive industry.

Fig. 1 : Morocco's transport energy demand - transport mode and fuels 2017.



Source: *IEA (2019)*

According to the International Energy Agency study on Moroccan energy policies (2019), the country's steady growth in total vehicle stock reflected its growth in GDP per capita. Due to its dependence on imported oil, fluctuations in global oil prices cause direct and indirect impacts on the transport sector. The higher transport inflation tends to cause a ripple effect on the consumer price index. The cost of transporting goods and people increases, adding to the economy's overall inflation. Indirectly, high fuel prices at the pump exacerbate inflation in other oil-dependent

sectors: the high cost of transportation of finished goods trickles down to the consumers, diminishing their purchasing power.

4.6 Oil Price Shocks on the Cost of Production

The high oil prices affect Morocco's production sector both directly as a raw material and indirectly through the cost of energy. Morocco's industries use oil and electricity as their major sources of energy. As of 2017, Petroleum-based fuel accounted for about 68% of the total industrial energy consumption, followed by electricity at 27% and biofuel and waste at 3%. Mining and quarrying, and non-metallic mineral industries consumed up to 60% of the total energy in the sector. The cement industry alone accounted for a third of the industry's total energy use in producing clinker, mainly in the form of petroleum coke. The phosphate rock mining and chemical processing, which contributed to 50% of Morocco's GDP, consumed 20% of the total energy allocated to industries (International Energy Agency, 2019). Long-term high oil translates to a higher cost of operation across all industrial sectors, reducing the final output and profit. The high cost of production eventually inflates the final price of goods, lowering the value of wages and purchasing power.

4.7 Oil Price Shocks Impacts on Agriculture

Agriculture is a crucial sector in the economy of Morocco. By 2017, the agricultural sector accounted for 13% of the GDP and employed over a third of the Moroccan population (World Bank, 2017). As the sector expands quickly to cater to the growing exports in cotton products, fruits and vegetables, its energy consumption has gradually increased. As of 2017, the sector's energy use (including value addition) was 1.2 Mtoe with oil taking up 74% and electricity 26% (World Bank, 2018). In 2024, the use of petroleum products (diesel and Butane) in agriculture had become more dominant at 87.1% while electricity use had decreased to 12% (N'gouari & Lahcen , 2024). Increased cost of production would affect the price of agricultural goods and cut into the exports. A rise in the cost of consumer products against constant wages affects both the consumption patterns and household spending ability.

4.8 Simple Supply and Demand Method

Imbalance in the global oil demand and supply dynamics often results in complex effects on the growing economies. A good example is when the global demand for crude oil outpaced supply in 2021-2022 and the price per barrel exceeded $100. Morocco's fuel bill was anticipated to more than double to MAD 47.7 billion from MAD 21 billion in 2021 (Jihane-Rahhou, 2022). The price of gasoline and diesel reached a record high at MAD 17.78 ($1.75) and MAD 16.57 ($1.67) per liter, respectively, exposing the economy's vulnerability.

Our research matches the findings of Bei Zhang et al. (2022), who found that demand and supply imbalance led to high oil prices. As a result, resources are allocated inefficiently in subsidies, restricting investments in other areas, including alternative energy sources. The two studies agree that oil price volatility directly affects consumption. In agreement with the findings by Choi et al. (2018), rising global oil prices raise domestic inflation. However, the studies show that the effect declines gradually as the government introduces supportive monetary policies such as oil tax rate cuts and subsidies.

Morocco is focused on reducing its fossil fuel dependency by substituting with renewable energy sources. Currently, alternative energy sources have a minimal contribution to their energy needs. When the global oil prices surged in 2013, the country's fuel subsidies became unsustainable, after rising to 6.5% of its total GDP. Additionally, the energy resource allocation was imbalanced as 75% of the subsidies went to 20% of the population. Since then, Morocco has introduced policies to gradually phase out its energy subsidy burden. In addition to extensively educating on renewable energy, Morocco has set social protection policies to cushion its most vulnerable population. Phasing out energy subsidies has propelled the country towards a greener economy and stimulated the development of renewable energy projects like the Noor Ouarzazate Concentrated Solar Power Complex (The World Bank, 2017)

5. Conclusion

Looking at the discussed macroeconomic variables, it is clear that Morocco's economy is vulnerable to long-term oil price volatilities. A balanced interplay between the cost of imports and revenue from exports is crucial in stabilizing a country's trade. Higher cost of global oil over a long period raises the import bill for Morocco's energy and results in budget deficits. Additionally, higher oil prices increase the cost of production, resulting in lower output for Morocco's exports. The resulting trade deficit can indirectly cripple the economic health and prompt the government to increase borrowing (Oussama, R. & Abdellah, E., 2025).

Long-term oil price shocks necessitate governments to intervene financially. If oil subsidies are introduced to cushion businesses and consumers, then the government absorbs the high cost of importing oil. The budget allocated to subsidies is pulled from other development projects like infrastructure and job creation. The consequent economic imbalances and trade deficit hold back the country's economic growth. Without the subsidies, the high cost of production would lower output and decline consumption. The ripple effect declines tax income for the government and further aggravates budget deficits. Additionally, the high demand for foreign currency to pay for the expensive oil stretches the foreign exchange reserves, jeopardizing the government's financial position. Depleted foreign currency reserves depreciate the value of the Moroccan dirham and further compromise its importing power. According to Suleman and Opoku (2023), as cited in (Oussama, R. & Abdellah, E., 2025), high global oil prices for net importers induce inflation in the food CPI, transport CPI, and energy CPI both in the short and long run. As it is, Morocco's import burden outweighs its export income. According to CEIC data, Morocco's total imports reached $7.2 billion in December 2024 compared to $3.5 billion in exports. A higher import burden would worsen the existing $2.4 billion trade deficit.

The study results align with the findings of Choi et al. (2018) and Aziz et al. (2016), who found a direct correlation between high global oil prices and domestic inflation for both developing and advanced economies. As with Choi et al. (2018), this study indicated that these effects declined gradually as the governments intervened with positive monetary policies. Alam et al. (2019) and Shang & Hamori (2021) studied the effects of global oil price on the value of various currencies

against the US. dollar. The findings were consistent with our study; positive oil price shocks affected the exchange rates of importing countries.

Morocco has poor domestic oil production. To mitigate the effects of oil price shocks on the economy, it should focus on expanding its alternative energy generation. Promoting energy efficiency initiatives, education on alternative energy resources, and incentivizing the private sector to develop green energy projects would reduce its dependency on expensive imported oil. Fostering policies that sustain healthy foreign exchange reserves can buffer the economy from the impacts of global oil shocks. According to the study, the transport and industrial sectors suffer directly when oil prices increase. The two are crucial in determining the final cost of output on both consumer goods and exports. As such, employing alternative energy solutions in these two sectors would contribute to a more stable economy. Where this is not possible, fiscal policies, such as energy subsidies and budget adjustments, could mitigate the effects on the final cost of goods.

There are limited studies on the impacts of global oil price changes on the Moroccan economy. While various studies have assessed the implications on different economies, only a few have studied the Moroccan economy. Of those, only a fraction narrowed down from the effects of energy at large and focused on the direct implications of oil prices on the economic variables. Although the World Bank, Organization of the Petroleum Exporting Countries, and the IMF have published global oil price trends, direct data on Morocco in the past two decades is scarce and scattered. The findings of this study contribute to the country's literature resources by providing aggregated, recent data. The study is documented in a simplified format for easy interpretation by readers with no background in finance and economics. Going forward, studies could focus precisely on sectoral analysis of global oil price shocks in Morocco's economy and long-term measures to maintain the country's fiscal stability.

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