Research Paper

EPRA International Journal of Economic and Business Review-Peer Reviewed Journal
Volume - 10, Issue - 9, September 2022 | e-ISSN: 2347 - 9671| p- ISSN: 2349 – 0187

SJIF Impact Factor: 8.302 || ISI Value: 1.433 || Journal DOI URL: https://doi.org/10.36713/epra2012

DO OIL PRICE SHOCKS MATTER TO CONSUMERS IN ZAMBIA? AN SVAR APPROACH

Stephen Chundama
School of Postgraduate Studies, University of Lusaka, Lusaka, Zambia

ABSTRACT

DOI No: 10.36713/epra11176 Article DOI: https://doi.org/10.36713/epra11176

This study investigated the impact of decomposed oil price shocks on household consumption in Zambia from 1985-2019. A structural Vector Autoregressive Model (SVAR) was used to measure the contemporaneous impact of oil price shocks on household consumption, and was complemented by Impulse Response Functions (IRFs), Granger Causality Tests and Forecast Error Variance Decompositions (FEVD). The existence of long-run relationships was determined by cointegration tests.

The findings revealed that oil price shocks neither had short-run nor long-run impacts on consumption at the 5% level. Notwithstanding, it was found that oil-specific demand granger-causes consumption and that oil-specific demand shocks were attributed for the largest variation in consumption i.e. 6.5%. The findings implied that historic fuel subsidies insulated consumers from the adverse effects of oil price shocks. Therefore, the Zambian Government should introduce smart, optimal energy subsidies which have a less distortionary effect on its fiscal position.

KEYWORDS - ***Oil Price Shocks, Structural Vector Autogressive Model, Forecast Error Variance Decomposition, Consumption, Impulse Response Functions, Granger Causality, Zambia***

1. INTRODUCTION

Through inflationary pass-through effects, oil price shocks are widely regarded as having an impact on household consumption. Lin *et al.* (2014) argued that higher oil prices affected the global economy through a variety of channels such as the transfer of wealth from oil consumers to oil producers; the rise in the cost of production of goods and services; its effect on inflation; consumer confidence; and financial markets by altering expectations. Unlike previous studies such as Kilian & Park (2009) and Hamilton (2003) which focused on the impact of oil price shocks on industrialized countries, this study was focused on household consumption in Zambia, a small open economy which imports all of the oil which it uses. Even among the numerous studies conducted, discussions on the impact of oil prices on macroeconomic indicators have not been exhausted since contradictions exist among the findings of numerous studies. Therefore, since a country-specific study focused on determining the impact of oil price shocks on household consumption had not been conducted for the Zambian case by decomposing oil price shocks, it was not known whether they affected household consumption in Zambia. Granted that there have been efforts to fill this gap by researchers such as Moyo (2019) who studied the vulnerability of Southern African Development Community (SADC) countries to oil price shocks using a pooled mean group estimator to determine the impact of oil prices on the GDP of 15 SADC countries. The author found that oil prices affected GDP through reduced trade since costs associated with the transportation of goods were the main hindrance to Zambia's exports. Similar studies were conducted by Chisadza *et al.* (2013) and Nkomo (2006) who used an elasticity approach to determine oil-vulnerabilities, and found that low-income countries and poorer households tend to suffer the largest impact of oil price rises. However, Kilian & Park (2009) showed the inadequacy of such approaches by proving that different sources of oil price shocks, such as aggregate demand, supply, and oil-specific demand shocks, affected macroeconomic indicators in different ways since they were qualitatively and quantitatively different. In addition to their homogenous treatment of oil price shocks, earlier studies used models which treated oil prices as exogenously determined and did not distinguish between short and long-run effects.

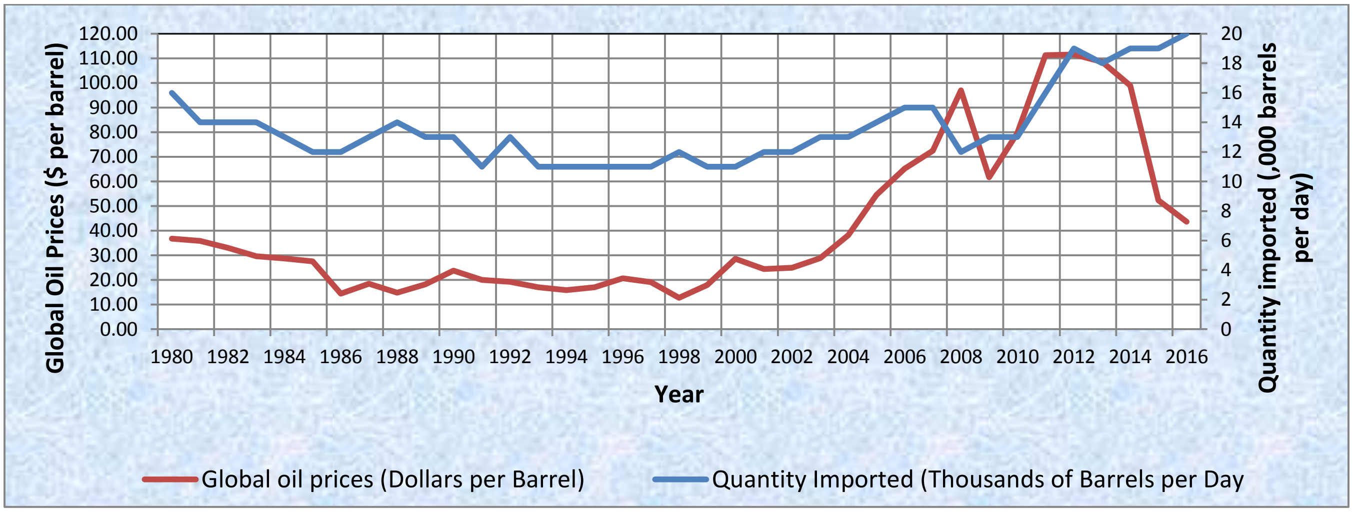
Consumption has long been recognized as one of the primary ways in which oil price shocks affect the economy. One of the most well-known transmission mechanisms through which this occurs is when an increase in oil prices induces an increase in the prices of its derivatives, such as gasoline. In that regard, Mehra & Petersen (2005) contributed to the literature by explaining the real-balance channel, which posits that rises in oil prices cause inflation, which in turn lowers real money balances held by consumers and firms in an economy, thus dampening aggregate demand through monetary channels. Moreover, when central banks tighten monetary policy in reaction to rising inflation, this channel becomes operational, thus further exacerbating negative output effects associated with oil shocks.

Since rising oil prices increase uncertainty about the future price and availability of oil, they may also cause changes in household intertemporal decisions, such as the postponement of purchases of large-ticket consumption and investment goods (Bernanke, 1983). Hamilton (2003) made a similar argument in support of delaying the purchase of consumer products which need a lot of energy to manufacture. Also, the wealth transfer effect has also been recognized as a pathway through which oil price shocks impact consumption when wealth is transferred from net oil importers to net oil exporters. Considering that Zambia is an oil-importing country, it is logical to expect a drop in consumption due to an increase in the oil prices, which would result in a transfer of wealth from oil-importing countries to oil-producing nations. The rationale for this argument is that when income is transferred from an oil-importing country to an oil-exporting country, disposable income in the oil-exporting country increases while disposable income in the oil-importing country decreases, which has a negative impact on the consumption levels of an oil-importer. Notwithstanding the negative impact, Babatunde (2010) explained that compared to the real-balance channel, the wealth transfer effect takes longer to impact consumption since wages are stickier than prices in the short run.

1.1 Historic Oil Price Shocks and Oil Consumption in Zambia

According to Thurlow & Wobst (2004), “the slump in copper prices during the early 1970s eroded exports and reduced revenue available to the Government for investment”. Misconstruing that the slump was temporary, Government borrowed heavily to maintain investment levels, pay wages for a blotted public sector, and subsidize consumers and producers. Economic conditions were exacerbated by the oil crisis of the 1970s which caused skyrocketing oil prices, thus reducing growth and increasing inflationary pressure on the economy. In 1973, Indeni Oil Refinery was opened with a capacity of 1,100,000 Metric Tons per year, as Government continued its role of procuring petroleum products for the country (Yaluma, 2017). This was a period when oil prices were stabilizing after the Iranian Revolution, which started due to Iran’s defiance of the Arab oil embargo of 1973-1974. Figure 1 below highlights the main price changes of Brent Crude Oil from 1980-2018 as well as Zambia’s crude oil imports during the period.

Figure 1: Analysis of Global Oil Prices and Zambia's Oil Imports (1980 – 2018)



Source: World Bank (2020)

Figure 1 shows that oil prices fell from $27.5/barrel in 1985 to $14.91/barrel in 1988, which corresponded to an increase in Zambia's petroleum imports from 12,000 barrels per day in 1985 to 14,000 in 1988. According to Hamilton (2003), Saudi Arabia unilaterally reacted by closing 75% of its production capacity due to falling oil prices in order to create an artificial shortage on the global market, aimed at raising oil prices. The author argued that the Iran-Iraq war of 1980 led to a further reduction in production between the two countries which accounted for 6% of global production. These supply shocks caused a fall in the availability of oil on the global market, as evidenced by Zambia's reduction in its oil imports from 16,000 barrels/day in 1980 to 14,000 barrels/day in 1982. Hamilton explained that due to a drastic loss in oil revenue, in 1986, Saudi Arabia abandoned its strategy of raising prices by cutting production, thus increasing supply and further pushing down oil prices. The first Persian Gulf War, which was triggered by Iraq's invasion of Kuwait in 1990, caused Zambia to face challenges in sourcing enough oil for its growing economy. Therefore, Zambia's oil imports decreased from 13,000 barrels/day in 1990 to 11,000 barrels/day in 1991. Thereafter, economic indicators continued to deteriorate until Zambia adopted a multi-party democratic system and qualified for the Highly Indebted Poor Countries Initiative (HIPC) in 2005 by satisfying the commitments made in its Poverty Reduction Strategy Paper (PRSP).

2. LITERATURE REVIEW

According to Broadstock *et al.* (2014), oil price shocks can be transmitted to consumption spending through both a direct and an indirect channels. For instance, they exemplified that traveling in a personal car or taking a public bus as a passenger increase oil demand directly and indirectly, respectively. Therefore, a rise in the price of oil and its derivatives was argued to increase transportation costs and alter consumer demand for commodities that require physical transportation. Having said that, in studies which used disaggregated data, gasoline demand has been found to be inelastic. In that regard, Archibald & Gillingham (1980) conducted one of the earliest impactful studies on gasoline demand using disaggregated household-level data. They discovered that approximately three-quarters of the adjustment to gasoline prices was due to changes in vehicle miles traveled, while one-quarter was due to changes in the gasoline-efficiency of households. The authors explained that the indirect route can manifest itself by inflationary pressure and the subsequent reductions in disposable income, among others.

According to Bernanke (1983) this results in oil price shocks becoming more relevant to household consumption due to their impact on inflation, which motivates the central bank to respond with contractionary measures. The second type of indirect effect reveals itself as a substitution effect when consumers demand more of cheaper alternative energy sources, such as electronic vehicles (EVs). Mehra & Petersons' (2005) drew a sample of nine economies from the Asian region and examined the impact of oil price shocks on consumption using the Permanent Income Hypothesis (PIH) model, which is a frequently used macroeconomic specification for modeling consumer expenditure by assessing discrepancies between actual and planned consumption using an Error

Correction Model (ECM) that was modified to account for oil price shocks. The authors found that oil price shocks were a short-run transient occurrence which does not affect the long-run level of consumer spending. A sharp critique of the PIH is that, in reality, consumption is influenced by a variety of unforeseen factors which cause consumer spending to depart from its optimal (Campbell & Mankiw, 1989). According to Mehra & Peterson (2005), rather than acting as a predictor of short-run consumption behavior, household consumption shocks are a source of short-run deviation which does not fundamentally alter the anticipated long-run consumption levels.

Using vector autoregression (VAR) and its corresponding decompositions to identify how different consumption categories responded to changes in purchasing power caused by oil price shocks, Edelstein & Kilian (2009) demonstrated the existence of the "reallocation" effect, which claims that when faced with a new bundle of prices, people re-evaluate their consumption choices. They asserted that a 1% increase in oil prices would result in a net drop of 0.15% in consumption spending, and that the primary effect of high energy prices on the U.S. economy was a decline in consumer expenditure. They argued that changes in discretionary income, movements in precautionary savings, and changes in the operating costs of energy-consuming durables directly impacted real consumption. Odusami's (2010) analysis, on the other hand, permitted oil price shocks to determine the consumption-to-wealth ratio, thus implying that oil price shocks can cause optimal consumption expenditure levels to be disturbed. This argument was premised on the argument that households, when faced with oil price rises may change their consumption patterns, resulting in short-run disequilibrium. Moreover, Wang (2013) examined the impact of higher oil prices on personal consumption expenditures in open, industrialized countries by employing a logistic model. He found that the nexus between changes in oil prices and variations in personal consumption expenditures was nonlinear. While variations in the price of oil have a true balancing and smooth transition effect on personal consumption expenditures, it was widely accepted that rises in oil prices have a negative effect on personal consumption expenditures below a particular threshold. Wang argued that this served to feed subsequent price increases while also driving up personal consumption expenditures until a cost-driven inflationary spiral takes hold.

A study conducted by Kilian (2008) examined the economic consequences of energy price shocks, specifically how consumer expenditure increases energy prices, by calculating price elasticities of energy demand. Similarly, Puller & Greening (1999) used a panel of U.S. households to investigate the dynamics of their adjustment to variations in the real price of gasoline. By disaggregating gasoline demand into two components i.e. demand for vehicle miles driven and demand for household composite miles per gallon, they were able to determine how households react to changes in gasoline prices. They discovered that consumers initially responded to a price increase by reducing consumption by a significantly greater amount than indicated by the oil market's overall elasticity. Additionally, the authors contended that households responded to price changes by altering vehicle miles traveled.

To my knowledge, there hasn't been a research undertaken on the influence of oil price shocks on consumption in Zambia, so there was no relevant literature on the Zambian case. Having said that, Makashini *et al.* (2014) made a significant contribution by examining the effect of varied lifestyles on household energy use and awareness of energy efficiency in Kitwe, Zambia's second largest city. The authors found that among the current energy sources, wood fuel in the form of charcoal and firewood accounted for 79% of the total consumed energy, electricity accounted for 10%, 9% for petroleum products, and 2% for coal. Zambia purchases all its petroleum from other countries, mostly those in the Middle-East, despite being self-sufficient in all other energy sources. Regarding utilization, they argued that electricity was primarily utilized for lighting and cooking in Zambia, while kerosene, paraffin, diesel, open fires, torches, and solar energy were alternative lighting sources that are widely used.

3. METHODOLOGY

3.1 Sample

This study utilized quarterly data from 1985 - 2019. This period was sampled due to the availability data and the significance of the period after the mid-1980s as a period which was identified by renowned researchers such as Hamilton (2003) and later Kilian & Park (2009), as having witnessed significant changes in the global oil market and its governing dynamics such as the oil elasticity of demand.

3.2 Description of Variables and Sources of Data

3.2.1 Global Oil Production (woilp) **-** Global oil production data was obtained from the U.S. Energy Information Administration (EIA) and used to proxy global supply. The series was converted to its log form, and since it was non-stationary, it was transformed into its first difference, in accordance with Gujarati & Porter (2010).

3.2.2 Global Oil Prices (boilp) **-** Real Brent Crude Oil prices were used to proxy oil-specific demand since Brent Crude is the blend which is used by the Organization of Petroleum Exporting Countries (OPEC), and is the leading global price benchmark used to set the price of two-thirds of the world's internationally traded crude oil supplies. The data series was obtained from the World Bank and following Barsky & Kilian (2002), the nominal price of oil was deflated by the U.S. CPI available from the U.S. Bureau of Labor Statistics.

3.2.3 Global Economic Activity (bdi) **-** The Baltic Dry Index was used to proxy global economic activity. The rationale of using this index was that increases in dry cargo ocean shipping rates, given a largely inelastic supply of suitable ships, was indicative of higher demand for shipping services arising from increases in global economic activity. Klovland (2009) also reported that the total shipping freight volumes operates at near full capacity, so the supply curve of shipping becomes virtually vertical. In other words, as economic activity increases relative to shipping volumes, freight rates tend to increase. As shown by Kilian & Zhou (2018), this index is superior to other measures of global economic activity since measures such as the Organization of Economic Cooperation and Development (OECD) industrial production index exclude real economic activity from China, Brazil, India and other countries, who singularly and collectively account for a significant proportion of global demand.

3.2.4 Domestic Consumption (con) **-** Real consumption data for Zambia was obtained from the United Nations (UNData) and was interpolated into quarterly frequency using the Proportional First Difference Benchmarking approach proposed by Denton (1971), using quarterly consumer price index (CPI) data as the predictor variable since real consumption is a factor of inflation, as explained by Miles *et al.* (2012).

3.3 Specification of Short-Run Model: SVAR

In accordance with by Kilian & Park (2009), data analysis was done by the application of a recursively identified SVAR which measured the contemporaneous impact of disaggregated oil price shocks on consumption. Therefore, to estimate the SVAR and develop IRFs and FEVDs, the equation below was identified by imposing restrictions on the elements in matrix A.

$$Az_t = \phi_0 + \sum_{i=1}^{p} \phi_i \, z_{t-i} + e_t, \qquad (1)$$

Where A is a (4x4) matrix of contemporaneous relations among the endogenous variables and ϕ_i is a matrix of constants; e_t represents white noise i.e. serially and mutually uncorrelated structural innovations that are independent and identically distributed (iid) with mean 0 and variance $\sum_p$; z_{t-i} are lagged variables.

Kilian & Park (2009) explained that imposing restrictions to matrix A also means imposing restrictions on the inverse of matrix A. Multiplying the right and left hand sides of the SVAR by A^{-1} results in the reduced form VAR such that:

$$X_t = A^{-1} A Z_t, \qquad (2)$$

$$e_t = A^{-1} v_t \qquad (3)$$

of which the later explains the relationship between structural shocks and FEVD.

This model was selected because it allows for the treatment of oil prices as an endogenous variable, thus relaxing the pervasive assumption of exogeniety, as well as the structural decomposition of oil prices

Following the approach developed by Kilian & Park and later adapted by Lin *et.al* (2014) and other researchers, the recursively identified block design SVAR used the cholesky decomposition where $\frac{n^2-n}{2}$ exclusion restrictions were imposed, resulting in the following matrix representation:

$$e_t \equiv \begin{bmatrix} e_{1t}^{\Delta\, global\ oil\ production} \\ e_{2t}^{\Delta\, global\ real\ economic\ activity} \\ e_{3t}^{\Delta\, real\ price\ of\ oil} \\ e_{4t}^{\Delta\, in\ real\ consumption} \end{bmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{bmatrix} \varepsilon_{1t}^{oil\ supply\ shock} \\ \varepsilon_{2t}^{aggregate\ demand\ shock} \\ \varepsilon_{3t}^{oil\ specific\ demand\ shock} \\ \varepsilon_{4t}^{consumption\ shock} \end{bmatrix} \qquad (4)$$

The ordering of variables when constructing a SVAR is critical since different orderings may affect the results. For example, when one of the variables in the SVAR is struck by a shock, the model assumes that the other variables in the system are also affected depending on the level of correlation between the residuals (Brooks, 2008). For this reason, it is important to assume an ordering such that a potential impulse to the system affects the variables in a direction which is consistent with economic theory and logic. Therefore, the Cholesky decomposition or ordering of the variables in the system was motivated by economic theory and an understanding that demand from the Zambian economy has an infinitesimal contribution to global aggregate demand.

The first identifying assumption was that significant changes in global oil production represent oil supply shocks and that oil supply does not contemporaneously respond to changes in demand within the same period (contemporaneously exogenous), in accordance with Kilian & Park (2009. This argument was motivated by technological limitations and costs associated with unplanned increases in production, since oil supply is widely accepted to be inelastic in the short-run.

Secondly, it was assumed that changes in dry cargo ocean shipping rates represent global real economic activity changes. Therefore, significant changes in these freight rates represent aggregate demand shocks as explained by Kilian & Park (2009) and Klovland (2009).

Thirdly, it is assumed that changes in the price of oil which are not caused by oil supply and global aggregate demand factors are caused by oil-specific (precautionary) demand factors. With the aforementioned, the following equations describe the contemporaneous impact of decomposed oil price shocks on real consumption:

$$woilp_t = \text{Ɏ} + \sum_{i=1}^{k} \beta_i \, woilp_{t-i} + \varepsilon_{1t} \tag{5}$$

$$bdi_t = \alpha + \sum_{i=1}^{k} \beta_i \, woilp_{t-i} + \sum_{l=1}^{k} \psi_l \, bdi_{t-l} + \varepsilon_{2t} \tag{6}$$

$$boilp_t = \text{ɚ} + \sum_{i=1}^{k} \beta_i \, woilp_{t-i} + \sum_{l=1}^{k} \psi_l \, bdi_{t-l} + \sum_{m=1}^{k} \phi_m \, boilp_{t-m} + \varepsilon_{3t} \tag{7}$$

$$con_t = q + \sum_{i=1}^{k} \beta_i \, woilp_{t-i} + \sum_{l=1}^{k} \psi_l \, bdi_{t-l} + \sum_{m=1}^{k} \phi_m \, boilp_{t-m} + \sum_{n=1}^{k} \sigma_n \, con_{t-n} + \varepsilon_{4t} \tag{8}$$

where k is the optimal lag length; Ɏ, α, ɚ, and q are constants; β_i, ψ_l, ϕ_m, *and* σ_n are short-run dynamic coefficients; ε_{it} are residuals; woilp is the global oil production; bdi is the Baltic dry index; boilp is brent oil prices; and con is consumption.

4. EMPIRICAL RESULTS

4.1 Short-run impact of oil price shocks on consumption: SVAR

The significance of the contemporaneous impact of decomposed oil price shocks on consumption are reported in table 1 below.

Table 1: Results of SVAR

Response-Impulse	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Global Economic Activity - Oil supply	-1.607039	1.914555	-0.84	0.401	-5.359499	2.14542
Oil-specific Demand - Oil supply	2.221459	0.8808652	2.52	0.012	0.4949947	3.947923
Real Consumption - oil supply	0.6596009	0.429614	1.54	0.125	-0.1824271	1.501629
Global Economic Activity - Oil prices	-0.1788888	0.0392073	-4.56	0	-0.2557338	-0.1020438
Real Consumption - Global Economic Activity	-0.0207932	0.0200632	-1.04	0.3	-0.0601163	0.01853
Real Consumption - Oil Prices	0.0230375	0.0407338	0.57	0.572	-0.0567993	0.1028743

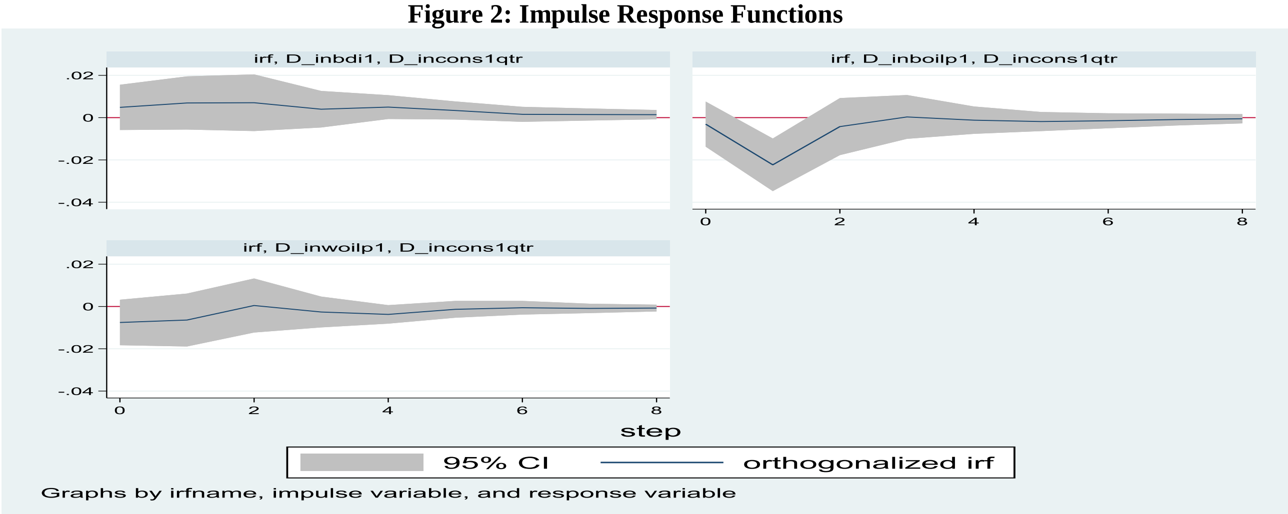
Author (2022)

The findings revealed that decomposed oil price shocks have no contemporaneous impact on consumption at the 5% level. This finding is further discussed below using IRFs, Granger Causality, and FEVDs.

4.2 Impulse Response Functions

IRFs describe the evolution of real consumption in response to shocks in oil supply, precautionary demand and aggregate global demand shocks, over a specified time horizon. As explained by Verbeek (2008) and other literature on VAR models, model coefficients provide limited information on the response of a variable to a shock from other variables. Therefore, IRFs are generated to fill the information gap by measuring the transmission of a one standard deviation innovation in one or more explanatory variables on the system. IRFs of decomposed oil price shocks on consumption are reported in figure 2 below.

Figure 2: Impulse Response Functions



Where: D_Inbdi1 is global aggregate demand; D_Inboilp1 is Oil-Specific Demand Shocks; D_Woilp1 is supply Shocks; and D_Incons1qtr is real consumption

Author (2022)

Notably, a unit shock in oil-specific demand appeared to show to that it negatively impacts consumption, although this result was insignificant at the 5% level, as shown in table 1. The impact of a shock appeared to reduce consumption by 2 percentage points until after 3 months when the effects of the shock diminishes before completely dissipating after 9 months. Conversely, a unit shock in global aggregate demand appeared to have a positive effect on consumption, although this result was insignificant at the 5% level. The shock appeared to increase consumption by 1 percentage point until 6 months when the effect of the shock diminishes before dissipating after 9 months. Conversely, a unit oil supply shock appeared to have a contemporaneously negative impact on consumption, although this result was insignificant at the 5% level. The shock appeared to reduce consumption by 1 percentage point then gradually reduces after 3 months, until after 12 months when it completely dissipates.

Moreover, the contemporaneous non-significance of the oil price-consumption nexus is explained by historic fuel subsidies which Zambian consumers have been enjoying since the second republic in 1973 (Cheelo & Masenke, 2018). It is widely agreed that fuel subsidies absorb the effect of oil price shocks on economic agents such as consumers and firms (Hamilton, 2009). According to the World Bank (2003), subsidies are often justified on the grounds that they make energy more affordable to poorer households and firms. Notwithstanding this benefit, the World Bank argued that poorer household usually consume relatively smaller amounts of subsidized energy resources, and are marginal beneficiaries of the subsidies. In addition, this finding is also explained by price controls which were introduced due to commodity shortages which plagued the Zambian economy from 1966 to 1992. According to Kyambalesa (2015), in order to foster integrated and balanced economic development, income distribution to all segments of society had to be more equitable by controlling the prices of key commodities as a means of ensuring that basic necessities were accessible to a larger portion of society. In that regard, the Third National Development Plan introduced uniform prices across the economy for important commodities such as oil products. Furthermore, the establishment of the Energy Regulation Board (ERB) in 1995, which is a statutory body in the Ministry of Energy, mandated to regulate the energy market, including the determination of fuel pump prices. The operations of this institution partially insulated consumers from short-run volatility in the global oil market by unintentionally creating lags between changes in the global oil market and the ERBs response by changing fuel pump prices.

4.3 Granger Causality

Granger Causality tests were conducted to determine whether decomposed oil price shocks granger-cause real household consumption, where the former contains information that helps to predict the latter. The results of the

Granger Causality Test are reported in table 2 below.

Table 2: Results of Granger Causality Test

Equation	Excluded	chi2	df	Prob > chi2
Oil supply	Global Economic Activity	4.2162	2	0.121
Oil supply	Oil Prices	1.9539	2	0.376
Oil supply	Consumption	2.4091	2	0.300
Oil supply	ALL	11.958	6	0.063
Global Economic Activity	Oil supply	.9147	2	0.633
Global Economic Activity	Oil prices	1.1891	2	0.552
Global Economic Activity	Consumption	.17434	2	0.917
Global Economic Activity	ALL	2.5649	6	0.861
Oil prices	Oil supply	1.5111	2	0.470
Oil prices	Global Economic Activity	.59385	2	0.743
Oil prices	Consumption	1.0131	2	0.603
Oil prices	ALL	2.8935	6	0.822
Consumption	Oil supply	2.4355	2	0.296
Consumption	Global Economic Activity	4.7074	2	0.095
Consumption	Oil prices	17.449	2	0.000
Consumption	ALL	19.749	6	0.003

Source: Author (2022)

The findings show that oil supply and aggregate demand does not granger-cause consumption at the 5% level. Notably, oil-specific demand and the combined effect of all the variables in the system were found to granger-cause consumption at the 5% level. As Chinn (2008) explained, oil prices feed into transportation costs, so as transport costs rise, more goods become non-traded, leading to higher home-bias (reduced export orientation), thus higher consumer prices. Conversely, significant oil price drops could provide the impetus for globalization. In particular, an increase in oil prices affects households' purchasing power directly through higher prices for oil-based energy products (e.g., petrol, diesel, heating oil). This finding is consistent with Boman (2019) who found that there was a bidirectional granger-causality between oil prices and consumption due to inflationary pass-through effects. Thus, the magnitude of the effect depends on the price elasticity of oil demand and on the share of oil-products in the total consumption basket, which is 16% for Zambia (ZSA, 2020). Furthermore, due to the decline in household purchasing power due to inflationary pass-through effects, there are second-round effects when households demand higher wages, thus causing wage-pull inflation. In turn, this causes negative expectations about inflation (Bachmeier *et al*., 2008). Bachmeier *et al.* explained that this effect would be moderate if consumers expect the increase to be short-lived, thus causing rational consumers to smooth out their consumption by borrowing more and saving less, thus pushing interest rates upwards. However, if the impact of the increase is expected to be long-lasting, the effect would have adverse effects on unemployment and lead to changes in the industry's production structures. This would lead to lower returns for heavily oil-dependent industries, with firms adopting alternative production methods which use little or no oil products. This occurs due to labor and capital reallocations and changes in unemployment levels due to layoffs and hiring, thus altering disposable income held by consumers.

4.4 Forecast Error Variance Decomposition

FEVD determined the proportion of variation in consumption that was attributed to decomposed oil price shocks. The key results of the FEVD after 24 months of the initial shock are presented in table 3 below.

Table 3: Results of Forecast Error Variance Decomposition

Horizon	Oil supply shock (%)	Aggregate Demand Shock (%)	Oil Specific Demand Shock (%)	Other Shocks (%)
1	1.38	0.57	0.23	97.83
2	1.62	1.19	8.37	88.82
3	1.40	1.74	7.50	89.36
4	1.39	1.82	6.97	89.82
5	1.52	2.07	6.70	89.71
6	1.51	2.17	6.61	89.72
7	1.49	2.17	6.56	89.78
8	1.49	2.18	6.53	89.79

Source: Author (2022)

Compared to the other shocks in the models, oil supply shocks were attributed for the least variation in consumption, causing only 1.49% of the variation after 24 months. This was followed by global aggregate demand shocks which were attributed for 2.18% of the variation in consumption, while 0il-specific demand shocks were attributed for 6.53% of the variation.

The proliferation of South African retail chain stores over the last 15 years have contributed to the increase in household consumption of imported products, due the devaluation of the Zambian Kwacha which is caused by the deterioration of the terms of trade after an increase in oil-specific demand. The low variation attributed to global aggregate demand shocks can be attributed to Zambia's low levels of integration within the global economy, as argued by Kaela *et al*. (2001). The finding that consumption had the least variation due to supply shocks is explained by Baumeister & Peersman (2013) who employed a time-varying Bayesian VAR, and found a considerable decrease in the U.S. price elasticity of oil demand in the short-run since the mid-1980s, and that oil supply shocks accounted for a lesser fraction of oil price volatility compared to oil demand shocks.

4.5 Test for the long-run impact of decomposed oil price shocks on household consumption

Two time series are cointegrated when their linear combination creates a stationary time series. This study adapted the approach used by Johansen & Juselius (1990), from which the number of cointegrating vectors was determined and used to establish the presence of long-run relationships, with a view to create a VECM if cointegration requirements were satisfied (Brooks, 2008). When testing the null hypothesis of 'r' cointegrating vectors against an alternative of 'n' cointegrating vectors, the trace test is used, but when testing the null hypothesis of 'r' cointegrating vectors against an alternative of 'r+1' cointegrating vectors, the maximum eigenvalue test is used. The results of the Johansen Cointegration Test are when in Table 4 below.

Table 4: Results of Johansen's Cointegration Test

maximum rank	parms	LL	eigenvalue	Trace statistic	5% critical value
0	20	621.25348	.	47.1365*	47.21
1	27	630.42133	0.12442	28.8008	29.68
2	32	638.8755	0.11532	11.8924	15.41
3	35	643.61166	0.06634	2.4201	3.76
4	36	644.82172	0.01738		

Source: Author (2022)

Results in table 4 revealed that household consumption is not cointegrated with decomposed oil price shocks, so it was concluded that decomposed oil price shocks have no long-run impact on consumption. This finding is also explained by historic fuel subsidies and price controls which cushioned economic agents such as consumers from inflationary pass-through effects caused by oil price shocks (Cheelo & Masenke, 2018). This revelation is consistent with economic theory which explains that consumers are able to make intertemporal choices such as adjusting their consumption levels in order to hedge against the adverse effects of oil price shocks.

5. CONCLUSION

Unlike previous studies which focused on the impact of oil price shocks on economic growth of a few industrialized countries, this study was focused on Zambia, a small open economy which imports all of the oil which it uses. Since a country-specific study focused on determining the impact of oil price shocks on household consumption was not conducted on the Zambian case by decomposing oil price shocks, it was not known whether they affected household consumption in Zambia. Therefore, a SVAR model was used to measure the contemporaneous impact of oil price shocks on household consumption, and was complemented by IRFs, Granger Causality Tests and FEVDs, while the existence of long-run relationships was determined using cointegration tests.

The findings revealed that oil price shocks had no contemporaneous impact on consumption at the 5% level. Notwithstanding this non-significance, it was found that oil-specific demand granger-causes consumption and that the combined effect of all the variables in the system had a significant granger-causal effect on consumption. Notably, FEVD results showed that oil supply shocks were attributed for 1.5% of the variation in consumption, while global aggregate output was attributed for 2.2% of the variation, and oil-specific demand shocks for 6.5%. These findings were explained by Zambia's historic fuel subsidies, price controls, and the operationalization of the ERB. Cointegration tests showed that decomposed oil price shocks had no long-run impact on real household consumption in Zamia. This finding was also attributed to historic fuel subsidies, price controls and intertemporal choices by consumers.

REFERENCES

1. *Archibald, R., & Gillingham, R. (1980), "An analysis of the short-run consumer demand for gasoline using household survey data", The Review of Economics and Statistics, 622-628. Available at: https://www.jstor.org/stable/1924790*
2. *Babatunde, A. (2010), "The impact of oil exploitation on the socio-economic life of the Ilaje-Ugbo people of Ondo State, Nigeria", Journal of Sustainable Development in Africa, Vol 12 No. 5, pp. 61-84.*
3. *Bachmeier, L., Li, Q., & Liu, D. (2008), "Should oil prices receive so much attention? An evaluation of the predictive power of oil prices for the US economy", Economic inquiry, Vol 46 No. 4, pp. 528-539.*
4. *Barsky, R.B., and Kilian L. (2002), "Do We Really Know that Oil Caused the Great Stagflation? A Monetary Alternative", NBER Macroeconomics Annual 2001, MIT Press: Cambridge, MA, pp. 137-183. Available at: https://www.aeaweb.org/articles?id=10.1257/0895330042632708*
5. *Baumeister, C., & Peersman, G. (2013), "Time-varying effects of oil supply shocks on the US economy", American Economic Journal, Vol 5 No. 4, pp. 1-28.*
6. *Bernanke, B. S. (1983), "Irreversibility, uncertainty, and cyclical investment", The quarterly journal of economics, Vol 98 No. 1, pp. 85-106.*
7. *Boman, V. (2019), "The impact of oil price shocks on household consumption: the case of Norway". Available at: https://www.diva-portal.org/smash/get/diva2:1288967/FULLTEXT01.pdf*
8. *Broadstock, D. C., Wang, R., & Zhang, D. (2014), "Direct and indirect oil shocks and their impacts upon energy related stock", Economic Systems, Vol 38 No. 3, pp. 451-467.*
9. *Brooks, C. (2008), "RATS Handbook to accompany introductory econometrics for finance" Cambridge Books. Available at: https://ideas.repec.org/b/cup/cbooks/9780521721684.html*
10. *Campbell, J. Y., & Mankiw, N. G. (1989), "Consumption, income, and interest rates: Reinterpreting the time series evidence", NBER macroeconomics annual, Vol 4, pp. 185-216. Available at: https://www.journals.uchicago.edu/doi/pdfplus/10.1086/654107*
11. *Cheelo, C., & Haatongo-Masenke, R. (2018), "Blanket" Fuel and Electricity Subsidies Did Not Offer Much Benefit to Zambia's Poor". Available at: https://www.africaportal.org/documents/18682/Fuel_and_electricity_subsidies_.pdf*
12. *Chinn, M. (2008), "De-Globalization? Musing about Oil Prices and Trade Costs", Econbrowser. Available at: http://econbrowser.com/archives/2008/03/deglobalization.*
13. *Chisadza, C., Dlamini, J., Gupta, R. and Modise, M.P. (2013), "The impact of oil shocks on the South African economy", Department of economics, University of Pretoria, Working Paper No. 2013-11. Available at: https://repository.up.ac.za/bitstream/handle/2263/57142/Chisadza_Impact_2016.pdf?sequence=1*
14. *Denton, F. T. (1971), "Adjustment of monthly or quarterly series to annual totals: an approach based on quadratic minimization", Journal of the American statistical association, Vol 66 No 333, pp. 99-102.*
15. *Edelstein, P., & Kilian, L. (2009), "How sensitive are consumer expenditures to retail energy prices?" Journal of Monetary Economics, Vol 56 No. 6, pp. 766-779.*
16. *Gujarati, D. N., & Porter, D. C. (2010), "Econometría", McGrawHill, México.*
17. *Hamilton, J. D. (2003), "What is an oil shock?" Journal of econometrics, Vol 113 No. 2, pp. 363-398.*
18. *Hamilton, J. D. (2009), "Understanding crude oil prices", The Energy Journal, Vol 30 No. 2, pp. 179-206.*
19. *Johansen, S., & Juselius, K. (1990), "Maximum likelihood estimation and inference on cointegration—with appucations to the demand for money", Oxford Bulletin of Economics and statistics, Vol 52 No. 2, pp. 169-210.*
20. *Kaela, L. C., Cheelo, F., Momba, J. C., Kajoba, G. M., & Nchito, W. (2001). "Globalisation and Development in Zambia: Challenges and Prospects", Report of Zambia National Workshop. Available at: https://www.africaportal.org/documents/5272/zambia-2001.pdf*
21. *Kilian, L. (2008). "The economic effects of energy price shocks", Journal of economic literature, Vol 46 No. 4, pp. 871-909.*
22. *Kilian, L., & Zhou, X. (2018), "Modeling fluctuations in the global demand for commodities", Journal of International Money and Finance, Vol 88, pp. 54-78. Available at: https://www.econstor.eu/bitstream/10419/197857/1/1011560046.pdf*
23. *Kilian, L. & Park, C. (2009), "The Impact of Oil Price Shocks on the U.S. Stock Market", International Economic*

Review, Vol 50, pp. 1267-1287. Available at: https://repec.cepr.org/repec/cpr/ceprdp/DP6166.pdf

24. *Klovland, J. T. (2009), "New evidence on the fluctuations in ocean freight rates in the 1850s", Explorations in Economic History, Vol. 46 No. 2, pp. 266-284.*
25. *Kyambalesa, H. (2015), "Nationalisation, Price Controls & Food Security", Lusaka Times. Available at: https://www.lusakatimes.com/2015/11/09/nationalization-price-controls-and-food-security/*
26. *Lin, B., Wesseh,P., Appiah,M. (2014), "Oil price fluctuation, volatility spillover and the Ghanaian equity market effectiveness: Implication for portfolio management and hedging", Energy Economics, Vol. 42, pp. 172-182. Available at: https://www.sciencedirect.com/science/article/pii/S0140988313003009*
27. *Makashini, L., Ng'ombe, A., Abanda, H., Malama, A., & Mudenda, P. (2014). "Household lifestyle, energy related practices and perceptions of energy efficiency: Evidence from Kitwe, Zambia", AIMS Energy, Vol 2 No. 3, pp. 276-294.*
28. *Mehra, Y. P., & Petersen, J. (2005), "Oil prices and consumer spending", FRB Richmond Economic Quarterly, Vol 91 No. 3, pp. 53-72.*
29. *Miles, D., Scott A., Breedon F., (2012), "Macroeconomics: Understanding the Global Economy", John Wiley, United Kingdom.*
30. *Moyo, A. (2019), "Evaluating the impact of global oil prices on the SADC and the potential for increased trade in biofuels and natural gas within the region", WIDER Working Paper, No. 2019/36. Available at: https://www.econstor.eu/bitstream/10419/211267/1/1665712023.pdf*
31. *Nkomo, J. C. (2006), "The impact of higher oil prices on Southern African countries", Journal of Energy in Southern Africa, Vol 17 No. 1, pp. 10-17.*
32. *Odusami, B. O. (2010), "To consume or not: How oil prices affect the co-movement of consumption and aggregate wealth", Energy Economics, Vol. 32 No. 4, pp. 857-867.*
33. *Puller, S. L., & Greening, L. A. (1999), "Household adjustment to gasoline price change: an analysis using 9 years of US survey data", Energy economics, Vol 21 No. 1, pp. 37-52.*
34. *Thurlow, J. & Wobst, P. (2004), "The road to Pro-Poor Growth in Zambia: Past Lessons and Future Challenges", International Food Policy Research Institute, Discussion Paper No. 16. Available at: https://ageconsearch.umn.edu/record/60169/files/dsgdp16.pdf*
35. *Verbeek, M. (2008), "A guide to modern econometrics", John Wiley & Sons, United Kingdom. Available at: https://www.researchgate.net/profile/Tihana-Skrinjaric/publication/331463785*
36. *Wang, Y. S. (2013), "Oil price effects on personal consumption expenditures". Energy Economics, Vol 36, pp. 198-204. Available at: https://www.sciencedirect.com/science/article/pii/S0140988312001776*
37. *World Bank (2003), "India: Access of the Poor to Clean Household Fuels", Energy Sector Management Assistance Programme (ESMAP), no. ESM 263/03. World Bank, Washington, D.C. Available at: http://documents.worldbank.org/curated/en/612631468771668053/india-access-of-the-poor-to-clean-household-fuels*
38. *Yaluma C. (2017), "Ministerial Statement on Oil and Gas Exploration in Zambia", National Assembly. Available at: https://www.parliament.gov.zm/node/6409 on 21st August 2020.*
39. *Zambia Statistical Agency (2020), "February 2020 Monthly Bulletin". Available at: https://www.zamstats.gov.zm/index.php/publications on 3rd April 2021*