How do Households Cope during Aggregate Shocks? Evidence from the 2009-2015 Oil Crisis in Nigeria

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Abstract

The effect of global oil price fluctuations on households’ costs of living in Nigeria is examined. We extend a simplified model of the microeconomic implication of macroeconomic shocks that allows for cross-sectional heterogeneity in households’ distributions and consumption preferences. First, we show the effect of global oil price shocks heterogeneously varies depending on households’ preferences and consumption bundles. Second, due to the oil economies’ enclave nature, we show that shocks would create a specific distributional effect that is more pronounced on households closely related to the oil economy. For the empirical analysis, we use oil prices between the years 2009 to 2015, and micro-level data from the Nigerian General Household Survey (GHS) collected between 2010 and 2016 in Nigeria. Our empirical results confirm our prediction: oil prices differ depending on how closely the regional economy is tied to oil production. We also find evidence supporting consumption substitution strategies, adjustments in household size, and labor supply as some coping responses to oil price changes.

Keywords: households, Nigeria, oil price, consumption

JEL: D1, O12, O55

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1. Introduction

This study examines an important feature in many rentier economies: the volatility of global oil prices and its implication on cross-sectional heterogeneity in households’ distributions and consumption preferences in Nigeria. Specifically, we ask: how do fluctuations in the global oil price affect household consumption? Are there subnational differential effects based on regional affiliation to the oil economy? What coping strategies do households deploy to minimize shocks?

An important feature in many Sub-Saharan Africa (SSA) economies is the reliance on foreign remittances and foreign loans, or, most importantly, commodity prices to fund budgets. Generally, these tend to be highly volatile, unpredictable, and sensitive to severe downturns in global economies (Loayza et al., 2007). Research shows that sharp and erratic swings in government revenues can introduce uncertainties in economic, political, and policy-related mechanisms, which can affect aggregate output and welfare (Baxter and King, 1993; Gali et al., 2007; Ramey, 2011; Robinson et al. 2017). One key question is to understand whether
volatility in sources of government revenue affects households differently at a micro level. This is important for analyzing the micro-consequences of aggregate fluctuations and for unbundling the effect across different households and consumption preferences (Anderson et al., 2016). In times of economic crisis, effective and sustainable interventions that benefit the poor and vulnerable will require information on heterogeneous responses to shocks and consumption sets affected. Otherwise, policies will be ineffective and unintended beneficiaries (the non-poor) may benefit more from interventions (Blackorby and Donaldson 1988, Schwartz and Clements 1999).

An extensive theoretical literature has investigated the welfare consequence of transitory economic shocks. Evidence is inconclusive of the effect within a framework with heterogeneous agents operating in a setting with imperfect markets and government coordination. Under the standard Life Cycle/Permanent Income Hypothesis (LCH/PIH), government-spending fluctuations will have an insignificant effect on the growth rate of aggregate consumption expenditures and welfare outcomes (Sargent 2015). Since consumption patterns are formed from future expectations, households will deploy smoothing strategies to alleviate transitory income changes and adjust consumption in response to aggregate shocks. For instance, although formal markets for credits and insurance in most low-income countries are imperfectly coordinated, behavioral and informal institutional structures at the micro level effectively smooth income and consumption shocks during aggregate volatility (Morduch 1995). Similarly, in times of transitory income shocks, households are known to cut back on non-food and luxuries (Browning and Crossley 2000, Browning and Crossley 2009) or become less wasteful (Bloom 2014). Therefore, while public transfers may be diminishing, private returns to scale, which reflect the growth rate of consumption expenditures, can be constant, at least for most of the population.

On the other hand, most of the estimates under the LCP/PIH models are based on averages, whereas the study of aggregate data might lead to an incorrect evaluation of economic theories (Attanasio and Weber, 1993; Parker, 1999). Specifically, the welfare effect of macroeconomic volatility is particularly large in institutionally underdeveloped countries with limited opportunities for attracting foreign investment and conducting countercyclical fiscal policies (Acemoglu et al., 2003; Alfaro et al., 2008; Aisen & Veiga, 2013). Rather than assuming a representative agent paradigm that models a homogenous response to fiscal policy shocks, Mankiw (2000) emphasized the need for incorporating certain forms of heterogeneity at household levels for more nuanced evidence. In a standard incomplete markets model, the microeconomic implication of macroeconomic shocks depends on cross-sectional heterogeneity (Anderson et al., 2016) and how idiosyncratic risk interacts with aggregate shock (Kochar, 1995; Heathcote et al., 2009). The impact of volatile shocks will reflect a cross-sectional heterogeneity, and analyses of aggregate consumption outcomes will have distributional issues1 (Kaplan and Violante, 2018; Ma, 2019).

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1 For instance, evidence from the contraction of labour demand due to the great recession show that the extent to which macroeconomic shock translate into a fall in expenditures at the household level materialized unevenly across population.
In section 2, we build a conceptual framework that extends a simplified model of the microeconomic implication of macroeconomic shocks arising from fiscal policy volatility by incorporating cross-sectional heterogeneity in households’ distributions and consumption preferences. We incorporate heterogeneous agents with heterogeneous preferences in a macroeconomic framework to understand the microeconomic implication of volatility in oil price shocks on household consumption. Our prediction is that there is only a small chance of a homogenous response to government spending shocks across households. First, the effect heterogeneously varies depending on the composition of the household consumption bundle. Second, due to the oil economies’ enclave nature, our model predicts that the effect of shocks would create a specific impact on households more closely related to the oil economy. The idea of a subnational variation based on the regional affiliation to the oil economy is not new (Animashaun & Emediegwu, 2022; Manzano & Gutiérrez, 2019; Fenske and Zurimendi, 2017). Our prediction extends to variations in costs of living on food and non-food items arising from oil price volatility and oil price shocks.

Using the case of the effect of global oil price fluctuations in Nigeria (an oil-rich country in sub-Saharan Africa; section 3 examines how household consumption expenditure responds to global oil prices. Our identification strategy rests on the assumption that the measurement error and the residual component of consumption in Nigeria are independent of these global shifters in the price of oil. This is a strong assumption since most oil-exporting countries may have market power in determining oil prices (Pieschacón 2012). However, Nigeria is a single supplier out of the numerous oil suppliers; therefore, she is an oil price-taker and plausibly exogenous to global oil prices (Chuku et al. 2011, Fenske and Zurimendi 2017). During the oil-price period from 2009 to 2016, no event in Nigeria significantly affected global oil supplies, which could cause oil prices to change drastically.

The economic literature recognizes consumption expenditure as a better reflection of expected lifetime resources in the measurement of household welfare (Blundell and Preston, 1998). Similarly, we analyze micro-level consumption data from the nationally representative Nigerian General Household Survey (GHS) collected between 2010 and 2016. Our analysis exploits that these periods, 2009 to 2015, for which household surveys were conducted, coincided with global events that caused significant variations in oil prices—for instance, these periods coincided with the 2008/09 financial crisis, the great recession that followed, and Iran’s action on the Straits of Hormuz in 2012. The strait is often regarded as “the world’s most important oil chokepoint,” representing almost 20% of the world’s traded oil and roughly 35% of all seaborne traded oil; the period also coincided with the increased exploration of the U.S. Shale of 2015 and the fluctuation in the U.S. dollar exchange rate of 2014 and 2016. The occurrence of these global events that caused shifts in oil prices during the survey provides a quasi-experimental research design allowing us to examine the effect of these fluctuations on households’ reported consumption.

On this assumption, we find that oil price fluctuations have a differential effect on households depending on their regional affiliation with the oil economy. We observe a more substantial effect in oil-producing regions than in non-oil-producing ones. Households in the South and the nine oil-producing regions of the Niger Delta of Nigeria are more susceptible to oil price changes than households in the North and the non-oil-producing region. This finding is consistent with interpretations of the subnational effect of oil price shocks. It mirrors
the effect of oil in Nigeria based on the regional affiliation to the oil economy (Fenske and Zurimendi 2017). The result is consistent with the concentration of agricultural activities in the North, which in contrast to the oil economy of Southern parts of Nigeria, may be better prepared to withstand the consumption (food) shocks due to income shocks (Bevan et al. 1999, Collier 1981).

In line with the literature (Browning and Crossley 2000, Browning and Crossley 2009), our empirical analyses allow households to buy food and non-food goods. Building on this, our analysis then turns to the underlying mechanisms. We explore consumption substitution strategies by decomposing the households’ consumption bundles into food vs. non-food vs. education to explore the mechanisms for consumption smoothing. In the short run, households in temporarily straitened circumstances tend to cut back on expenditures on non-food relative to food. Also, purchased food can respond more sharply to revenue shock within food consumption categories than non-purchased (grown) food. We support the significant effect of the oil price change on spending for semi-durables (non-food). Within food categories, purchased food consumption responds positively to oil-price while the non-purchased part responds negatively. The implication is that as food gets scarce, households’ affordability of food purchased will decline. At the same time, more people will rely on locally grown food that is less susceptible to oil-price in times of recessions. The mechanism speaks to the importance of self-sufficiency in food production and building reliant and resilient pro-poor and sustainable food systems as mechanisms for consumption smoothing in times of shocks.

Lastly, we explore alternative behavioral mechanisms. First, we explore spending on education. We find that household spends more on education in response to a decline in oil prices. Recession could make households hold an optimistic view of the future and invest more in education, expecting higher returns on investment after the recession. The finding is consistent with Giesing and Musić (2019,) which show that an unstable environment had sizeable effects on education spending in Egypt, and the literature indicates that, unlike many goods, the demand for higher education typically increases during economic recessions (Lovenheim 2011, Barr and Turner 2013). We also explore changes in household size (Frankenberg et al. 2003, McKenzie 2003). In an extended family context, such as common in Nigeria, one way of smoothing consumption is the reallocation of members of extended families across different households to lower consumption costs. We find evidence supporting adjustments in household size in response to oil price changes. These results emphasize the need for investment in education and a demographically-contingent social safety net designed to accommodate households with larger sizes during economic recessions.

Our findings contribute to a deeper understanding of the relationship between oil-price shock and consumption. Debates over the implication of volatile oil prices on welfare are inconclusive (Aizenman et al. 1999, Van der Ploeg and Poelhekke 2009). Studies have documented the implication of sharp and erratic swings in oil prices in large oil-importing economies (Darby 1982, Edelstein and Kilian 2009). Others highlight aspects of oil-exporting countries that distinguish them from oil-importing countries (Bjørnland 2009, Van der Ploeg and Poelhekke 2009, Grigoli et al. 2019). Van der Ploeg and Poelhekke (2009) show the adverse effect of the volatility of commodity prices for point-based resources such as oil and diamonds in landlocked, ethnically polarised economies with weak financial institutions (Van der Ploeg
and Poelhekke 2010). However, such analyses rely on aggregate outcomes and can inform micro-level policies only to a limited extent (Keane and Prasad 1996, Nkang 2018). Because such studies exploit cross-country variation, the results should be read cautiously due to the confounding effect of institutions and other unobservables (Van der Ploeg 2011). Econometrically, it becomes challenging to disentangle in a cross-country regression since many factors contribute to consumption across countries. Similarly, the welfare implication may arise largely not because of oil price volatility per se but because of policy failure policy; i.e., the government’s short-sightedness and failure to diversify the economy during the boom (Brunnschweiler and Bulte 2008).

Others, such as Fenske and Zurimendi (2017), show that progress can be made by focusing on a single oil-exporting country using household data based on regional affiliation to the oil economy. Fenske and Zurimendi (2017) examine the microeconomic impacts that accompanied the macroeconomic responses to oil prices in terms of urban incomes, food production, schooling, and maternal labor outcomes by subnational and ethnic affiliation in Nigeria. Oil prices experienced in early life predict differential adult outcomes more among members of southern (oil-producing) ethnicities than other Nigerians from the same birth cohort. The findings of our paper add to this line of inquiry by providing additional evidence on the mechanisms that drive the differential impact of oil prices on living standards.

The remainder of the paper is organized as follows. Section 2 provides the conceptual framework and an overview of the institutional settings. Section 3 explains our identification strategy and discusses the data. Section 4 presents the results, and Section 5 concludes.

2. Conceptual Framework

This section presents a simplified framework model of the heterogeneous impact of macroeconomic shocks on households’ consumption.

We begin with a representative, infinite-lived household in a closed economy that seeks to maximize overall utility, as described in Barro (1990):

\[ U = \int_0^\infty u(c_j) e^{-\rho t} \delta t, \]  

(1)

Where \( c_j \) is consumption per household, and \( \rho > 0 \) is the constant rate of time preference. Population, which corresponds to the number of workers and consumers, is constant. Following Becker’s (1965) and Blundell and Preston’s (1998) model of consumption and Varian’s (1983), we assume additively separable consumption bundles and let households \( j \) in time \( t \) derive utility from the consumption of \( N \) commodities, each denoted by \( C_i \):

\[ U_{jt}(C_i, \ldots, C_N) \]  

(2)

The consumption of each commodity is a function of government revenue \( G_t \) used for direct transfers \( X_t \) (e.g., monthly allocation to states and government agencies for the payment of salaries, unconditional transfers, and social safety coverage) and the provision of some publicly funded goods \( H_t \) (e.g., education, health security) such that:
We assume government budget $F(G_t)$; i.e., the proportion that is used for direct transfers and publicly funded goods is subject to an exogenous shock arising from global price $(P_tJ)$. Clearly, increasing $(P_tJ)$ implies more for the government budget. But this also depends on the appropriation of rents for private benefits, i.e., rents, $\tau_t(\phi)$ that only benefit the political elites and $\phi$, which reflects the governments’ competence in providing the public good if in office. In keeping with the career-concerned models of political agents in resource rich countries of Brollo et al. (2013), a higher value of $\phi$ corresponds to a higher diversion of rents for the political elites and less provision of public goods.

Formally,

$$G_t(P_tJ−\tau_t(\phi)) = X_t + H_t$$

(4)

Where $P_t$ is the exogenous price of crude oil per barrel, and $J$ is the number of barrels demanded in the global market less private rents, $\tau_t$, that are inefficiently allocated and misappropriated and only benefit government agents. The key intuition in (4) is that a fall in global oil price will affect government revenue and, subsequently, the ability of the government to meet up with budgetary expectations regarding the provision of transfers $(X_t)$ and funding of public goods $(H_t)$. In resource-dependent countries, government expenditure is financed mainly through commodity revenue. Hicks (2015) shows that bias in expenditure-based measures is relatively larger in an emerging economy. In rentier economies, such volatility lowers the government’s political incentives for budget implementation, for instance, through the government’s commitment to cash transfers to the vulnerable or funding publicly provided goods (Robinson et al. 2017). Public income volatility in resource-dependent economies creates political incentives that reduce the benefit of being in power. Because it reduces the incentives of being in power, it could similarly lower the incentives for incumbent political agents to increase public expenditure since there is no guarantee for a re-election probability.

Following on (3) and (4), we model the dependence of consumption at the household level on exogenous fluctuations in price shocks and political incentives for corruption in resource-dependent countries as:

$$C_{j,i,t} = X_t + H_t = G_t = P_tJ(1−\tau_t)\phi_t$$

(5)

So far, the models we described do not capture households’ consumption preference heterogeneity and location-specific heterogeneities response to changes in fiscal policy arising from dependence on oil prices. However, allowing for heterogeneity in response to budgetary shocks is particularly relevant for understanding consumption shocks in oil-based economies. This argument was presented by Fenske and Zurimendi (2017), who examined the effect of the Nigerian oil boom on structural transformation in oil-producing Southern Nigeria relative to Northern Nigeria. Due to the enclave effect of oil extraction activities, oil price shocks would have a differential impact on living standards in Nigeria. Consequently, households more affiliated with the oil economy and depend mainly on government transfers from oil revenue remain poor if these shocks are large or if these oil extraction activities yield low
returns. On the other hand, households not strongly affiliated with the oil economy can smooth out income shocks due to their access to investment in other high-return projects, such as agribusiness unrelated to oil revenue. In this case, we should observe heterogeneity in consumption shocks arising from households’ exposure to oil price risk.

Given these theories, we extend our framework to account for heterogeneities to aggregate shocks. Given these, the variance of the aggregate changes in consumption for all households in a country can be further decomposed based on the fraction of those that are vulnerable to oil price shocks ($\lambda$) as:

$$\text{Var}_{j,t}(\Delta C) = (1-\lambda)\text{Var}_{j,t}(\Delta C)(1-\theta_t)P_t + \lambda\text{Var}_{j,t}(\Delta C)(1-\theta_t)P_t$$

(6)

Where the fraction of household $j$ vulnerable to shocks ranges from 0 to 1 ($0 \leq \lambda \leq 1$).

Similarly, when consumption sets are additively separable and comprise luxuries and non-luxuries, then aggregate consumption can be decomposed to reflect the proportion of food vs. non-food items in the consumption set as:

$$\text{Var}_{i,t}(\Delta C) = (1-\phi)\text{Var}_{i,t}(\Delta C)(1-\theta_t)P_t + \phi\text{Var}_{i,t}(\Delta C)(1-\theta_t)P_t$$

(7)

Where the fraction of consumption that is food ranges from 0 to 1 ($0 \leq \phi \leq 1$).

Compared to the aggregate change in consumption changes due to price shocks in equation (5), expressions (6) and (7) tell us about the heterogeneous effect of oil price, suggesting that it may worsen based on the fraction of vulnerable households (equation 6) and/or due to fraction of food items in the aggregate consumption set (equation 7).

After giving a brief overview of the Nigerian economy and a historical account of the impact of the oil price boom, we present our identification strategy and empirical model specification to test predictions in Eqns 4, 5, and 6. Similarly, we discuss our data description. Section 4 provides evidence consistent with aggregate consumption response to oil price shocks based on affiliation and consumption categories. First, we examine how changes in aggregate household consumption are in response to the level of oil prices. Second, we show how these vary depending on where households are located in Nigeria. Third, we show how households reallocate across a range of food and non-food consumption category in response to the price level. Fourth, we carry out additional channels to examine behavioral mechanisms. We conclude in Section 5.

2.1 Institutional Settings: Oil-Boom and the Nigerian Economy

Nigeria is a federation of 36 states, a federal capital territory (FCT), and 774 local government areas within the broad confines of the six geopolitical zones of North-West, North-East, and North-Central and South-East, South-West and the South-South. These comprise nine oil-producing states (Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Ondo, Imo, and Rivers) and 185 Local Governments Area (LGA). Oil production occurs in the South. Specifically, in
the Niger Delta, the oil-producing States extend over 70,000 km² (27,000 sq mi), making up 7.5% of Nigeria’s landmass.

Figure 1; Oil production in the Nigerian Niger Delta region. Data on oil production comes from Animashaun & Emediegwu (2022).

Nigeria is a top oil-exporting country with a volatile economy that is extremely sensitive to oil price fluctuations (Ross 2003; Addison 2007; Emefiele 2016). The oil sector is an important aspect of the economy: it provides 95 percent of Nigeria’s foreign exchange earnings and about 80 percent of its budgetary revenues (Ejobowah 2010). Revenue from crude oil accounts for between 70 percent and 90 percent of total export earnings and government spending (NRGI 2013; Olayungbo 2019). Before discovering oil in 1956, the Nigerian economy was primarily agriculture-based, and foreign earnings from agricultural exports contributed to about 70 percent of Nigerian exports’ value (Kirk-Greene and Rimmer 1981, p.74; Babalola 2019). With the subsequent oil boom of 1974, agriculture’s share of foreign earnings dropped to less than 20%, whereas petroleum’s share of the total revenues, which accounted for only 10 percent of export earnings in 1962, rose to 82.7 percent in 1973 (Bangura et al. 1986, p. 177). Furthermore, between 1970 and 1982, the yearly production of major cash crops, such as cocoa, rubber, cotton, and groundnuts, declined by 43, 29, 65, and 64 percent, respectively (Khan 1994, p.10).

One clear implication of the reliance on oil was that Nigeria was no longer self-sufficient in food production and became a major food importer in the international food market (Collier 1988). Another implication is the vulnerability of the domestic economy to oil-price fluctuations (Ross 2003; Addison 2007; Emefiele 2016). The first impact of an oil-price
crash in Nigeria came in the 1980s. During this period, the crude oil price crash resulted in a corresponding decline in foreign exchange earnings, rising inflation, and the imposition of austerity policies, further weakening the fragile political economy (Pinto, 1987). Similarly, the oil crash of 2015 and 2016 caused a drop in federal allocation, and over two-thirds of Nigeria’s states could not pay workers’ salaries (Babalola, 2019).

3.1 Identification strategy

This section discusses the strategy that allows us to estimate the effect of oil prices on household-specific changes in consumption (and other outcome variables of interest). The occurrence of these global events that caused shifts in oil prices during the survey provides a quasi-experimental research design allowing us to examine the effect of these fluctuations on households’ reported consumption. Our identification strategy rests on the assumption that the measurement error and the residual component of consumption in Nigeria are independent of these global shifters prices of oil. This is a strong assumption since most oil-exporting countries may have the market power to determine oil prices (Pieschacón 2012). However, Nigeria is a single supplier out of the numerous oil suppliers; therefore, she is an oil price-taker and plausibly exogenous to global oil prices (Chuku et al. 2011, Fenske and Zurimendi 2017). During the oil-price period from 2009 to 2016, no event in Nigeria significantly affected global oil supplies, which could cause oil prices to change drastically.

We first-difference consumption variables and estimate a fixed-effect model to remove the unobserved idiosyncratic factors in the data. In line with Fenske and Zurimendi (2017), where the oil price is assumed to be exogenous and the effects of positive and negative price shocks symmetric, our regression equation is of the following form:

\[
\ln(\Delta C_{i,t}) = \alpha_i + \delta_t + \lambda_0 \ln P_{t-1} + \phi X'_{i,t} + \beta D'_{i,t} + \gamma p + \gamma p * \tau + \epsilon_{i,t}
\]

\[
\ln(\Delta C_{i,t}) = \ln (C_{i,t} - C_{i,t-1})
\]

where \(\ln(\Delta C_{i,t})\) is the log of the first difference in aggregate consumption per household, \(i\) indexes the household, and \(t\) indexes the survey year. In eqn (8), \(\ln P_{t-1}\) is the log of the average spot price of Brent, Dubai, and West Texas Intermediate, adjusted for changes in the real effective USD exchange rate (2010 U.S. dollars). This variable, \(\ln P_{t-1}\), represents the oil price “shock.” Eqn. (8) further includes the survey round fixed effect, \(\delta_t\), and the household fixed effects, \(\alpha_i\). \(X'_{i,t}\) is a vector of controls for household-specific characteristics, including household size, the gender of the household head, the location of the household (rural or urban), and the sectoral affiliation of the household head (formal or informal sector). \(D'_{i,t}\) is a vector of additional agroecological variables, including rainfall, temperature, and location-specific variables like distance to the city center, market, and capital.

Nigeria has significant heterogeneity in education and development by ethnicity, regions, and states (Ukiwo 2007; Archibong 2018) and by the response to oil shocks (Fenske and Zurimendi, 2017). Therefore, we include the residence (\(\gamma p\)) fixed effects.\(^2\) We also include

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\(^2\) In this study, residences are proxied at three levels. First by the six geopolitical zones (N/West, N/East, N/Central, S/West, S/East and S/South) which delineate ethnic homelands of the three ethnic groups.
residence-specific time trends \( (\gamma_p * \tau) \) to account for the fact that a household might be affected by residence-specific shocks such as natural disasters and expansion of banks, which can lead to increased savings or declines in consumption for a household. Standard errors are clustered at the household level.

We assume that the error \( \varepsilon_{i,t} \) is stationary and independent of the global price of oil. This is a strong assumption since most oil-exporting countries have market power in the oil market (Pieschacon 2012). However, Nigeria is a single supplier out of the numerous oil suppliers. From 2009 to 2016, no significant event in Nigeria affected global oil supplies, which could cause oil prices to change. This aligns with the literature that Nigeria is an oil price-taker (Fenske and Zurimendi 2017).

In line with our conceptual framework, we investigate the differential responses by geography: Northern vs. Southern Nigeria and Niger-Delta Oil-producing region vs. other parts of the country. To achieve this, we divide our sample by region (i.e., geopolitical zones, North and Southern states, and whether households are in oil-producing states) and re-estimate Eqn (8). The secondary literature emphasizes that southern households benefit economically from positive oil price shocks relative to the North. By implication, the Southern households may face a higher adverse effect from the oil slump than the Northern households. Households in Southern Nigeria are less likely to work in agriculture, making them relatively more vulnerable to oil price shocks as the food supply gets tighter and pricier (Bevan et al. 1999; Collier 1981; Fenske and Zurimendi 2017).

The literature suggests intertemporal substitution of consumption categories, i.e., by delaying consumption of luxuries proportionately more in response to shocks than consumption of non-luxuries (Browning and Crossley 2000). Similarly, we are also interested in disaggregated consumption to understand susceptibility to price changes of its components (food, non-food, and education). First, we disaggregate consumption by food, non-food, and education components. Next, we differentiate food consumption by purchased and non-purchased (autonomous consumption) categories, and we adjust for the disaggregated components resulting in Eqns (10) and (11):

\[
\ln(\Delta C_{i,t}) = \ln(\Delta \text{Food } C_{i,t}) + \ln(\Delta \text{NonFood } C_{i,t}) + \ln(\Delta \text{Education } C_{i,t})
\]

(10)

\[
\ln(\Delta \text{Food } C_{i,t}) = \ln(\Delta \text{Food Purchased } C_{i,t}) + \ln(\Delta \text{Food Not Purchased } C_{i,t})
\]

(11)

Finally, to explore additional behavioral mechanisms for smoothing consumption changes at the household level, we consider outcomes of household size, number of hours worked, and agriculture labor engagement as replacements for \( \ln(\Delta C_{i,t}) \) in the main model specification in Eqn (8).

Second, by administrative units States (36 states of the federation and the Federal Capital), and third, by Enumeration units (smallest unit of administration for survey data collection).

\(^3\) Oil price can be safely assumed to be exogenous in Nigeria as the country accounts for less than 4% of world oil production (Fenske and Zurimendi 2017). See also http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=5&pid=53&aid=1.
3.2 Data sources and descriptive statistics

Our empirical analysis employs Nigerian General Household Surveys (GHS) data. The GHS-Panel is a nationally representative survey of approximately 5,000 Nigerian households and is a subsample of the GHS core survey of 22,000 households. The sample is representative at the national level and provides reliable estimates of key socio-economic variables for the six geopolitical zones in the 774 local governments and 36 states and the FCT. 60 Primary Sampling Units (PSUs) or Enumeration Areas (E.A.s) were chosen from each of the 36 states and the Federal Capital Territory (FCT) of Nigeria. The GHS panel is an innovative model for data collection for a comprehensive analysis of welfare indicators and socio-economic characteristics. It is part of a larger regional project in Sub-Saharan Africa and the result of collaboration between the Nigerian Bureau of Statistics (NBS), the World Bank Living Standards Measurement Study (LSMS) team, the Federal Ministry of Agriculture and Rural Development (FMA&RD), the Bill and Melinda Gates Foundation (BMGF) and the World Bank (W.B).

Summary statistics are presented in Table 1. For our analysis, we rely on data collected six times in three waves 2010/11, 2012/13, and 2015/16 (NBS 2010; NBS 2012; NBS, 2015. In each wave, households are interviewed twice, once in the post-planting period from August to November and once in the post-harvest period from February to April. Respondents provide detailed demographic, social, and economic information in all waves. These include household structure and size, consumption, labor supply, health, and household assets. Household consumption expenditure is surveyed through questions asking the respondents about money expenditures and then about the imputed value of consumption out of own production or provided in kind. For those who produce their own food, the respondent is asked to value the amount consumed in the previous week. The GHS includes Household Geovariables such as the annual and average precipitation and household distance to Nearest Major Road, population center, market, and administrative center (all in Km). Because we can link households to their respective enumeration areas, zones, states, and the year of survey, we can control for the separate contribution of changes in consumption from geographic and economic trends.

The identification relies on households’ exposure to time series variations in prices. Selection bias would be introduced if specific households, specifically poorer ones, are unobserved during price shocks. A potential concern is whether the attrition of households is systematically related to the outcome variable and price shocks. Because the dataset used is built on a random survey of households across the Nigerian federation and significant effort was made to locate households who have relocated, we treat the cause of the unbalanced nature of the panel as a characteristic of the random sampling of the household and assume no systemic correlation between sample selection and oil prices.
### Table 1: Summary Statistics

<table>
<thead>
<tr>
<th>Category</th>
<th>All Waves</th>
<th>Wave 1 2010/11</th>
<th>Wave 2 2012/13</th>
<th>Wave 3 2015/16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Obs</td>
<td>Mean</td>
<td>S.D</td>
<td>Obs</td>
</tr>
<tr>
<td>Consumption Expenditure per capita</td>
<td>11,819</td>
<td>10.4</td>
<td>1.38</td>
<td>2,967</td>
</tr>
<tr>
<td>(annual in 1000NGN)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food Consumption per capita annual</td>
<td>11,819</td>
<td>10.18</td>
<td>1.35</td>
<td>3,123</td>
</tr>
<tr>
<td>(annual in 1000NGN)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Food Consumption per capita</td>
<td>11,803</td>
<td>9.12</td>
<td>1.51</td>
<td>2,763</td>
</tr>
<tr>
<td>(annual in 1000NGN)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education Expenditure per capita</td>
<td>8,942</td>
<td>7.76</td>
<td>1.73</td>
<td>3,252</td>
</tr>
<tr>
<td>(annual in 1000NGN)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food per capita, Purchased (annual in 1000NGN)</td>
<td>11,731</td>
<td>9.87</td>
<td>1.38</td>
<td>3,502</td>
</tr>
<tr>
<td>(annual in 1000NGN)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log Crude Oil Price (U.S. Dollar)</td>
<td>28,238</td>
<td>4.34</td>
<td>0.22</td>
<td>9,754</td>
</tr>
<tr>
<td>Household size</td>
<td>28,238</td>
<td>5.73</td>
<td>3.18</td>
<td>9,754</td>
</tr>
<tr>
<td>Household head Age</td>
<td>27,924</td>
<td>51.95</td>
<td>24.8</td>
<td>9,666</td>
</tr>
<tr>
<td>Distance in (Km) to Nearest Market</td>
<td>28,235</td>
<td>67.11</td>
<td>43.6</td>
<td>9,754</td>
</tr>
<tr>
<td>Distance in (Km) to Population Center with +20,000</td>
<td>28,235</td>
<td>20.7</td>
<td>18.8</td>
<td>9,754</td>
</tr>
<tr>
<td>Distance in (Km) to Capital of State</td>
<td>28,235</td>
<td>64.16</td>
<td>55</td>
<td>9,754</td>
</tr>
<tr>
<td>Avg 12-month total rainfall(mm) for Jan-Dec</td>
<td>28,235</td>
<td>1290.88</td>
<td>435</td>
<td>9,754</td>
</tr>
<tr>
<td>Annual Mean Temperature times 10 (°C)</td>
<td>28,235</td>
<td>263.6</td>
<td>9.18</td>
<td>9,754</td>
</tr>
</tbody>
</table>

Note: * Consumption expenditure is in local currency (Naira)
4. Results and discussion

4.1 Effect of oil price on overall consumption expenditure

In Table 2, we present the estimation results on the effect of a one-year lagged log of oil price on overall consumption expenditure per capita. Table 2 gives the result for all households in Nigeria (column I). Next, it shows the heterogeneous effects of geography: households in the 17 southern states (column II), households in the nine southern oil-producing Niger-Delta States (column III), households in the North (column IV), and households in the non-oil-producing states (column V).

Column I in Table 2 shows that a one percent increase (decrease) in oil price will raise (reduce) total consumption expenditure by 0.15 percent holding all other variables constant. This is consistent with the literature on the direct effect of oil prices and gains on economic transformations that follow when oil prices are high in oil-exporting countries (Kader 1980; Fenske and Zurimendi 2017). Higher oil prices imply higher taxes and royalties paid to the oil-exporting government in foreign currencies. Paying wages to local labor and the subsequent impact on the local economy as oil prices improve in the global market can positively impact domestic consumption.

On the other hand, output and government consumption will fall in response to the oil price decline since oil’s foreign earnings are used for imports (Koh 2017). The literature suggests that due to the dollar shortage, foreign earnings may no longer pay for import bills for food, agro-inputs, fertilizer, and technology from abroad (Collier 1988; Akpan 2009; Nkang 2018). In this situation, unemployment and hunger may rise, and households may experience significant demand contraction.

Columns II to V in Table 2 provide evidence of the differential effect by geography and link to the oil economy. The effects are strongly significant for households in the South and oil-producing regions relative to the North. Household consumption in the South is relatively better off in periods of higher oil prices and maybe worse off in times of oil burst than in the North. Similarly, the North is relatively unaffected by oil busts or booms. These mechanisms highlight the differential impact of oil depending on the extent of economic diversification that offers insulation against oil price volatility. As households transition from agriculture in Southern Nigeria, they may be more vulnerable to oil price shocks.

Consistent across the result columns in Table 2 is the relative effect of household size and distance to the capital city on consumption. We find evidence suggesting that consumption declines as household size increases. There is considerable evidence from household surveys across Asia, Africa, and Latin America supporting a negative correlation between household size and consumption (or income) per person in developing countries (Lanjouw and Ravallion 1995). This finding is important to inform the debate on the role of population policy for development and the scope for fighting poverty using demographically-contingent transfers. Also, the evidence of distance to city centers and consumption further contributes to the debate on the Proximity-productivity gap and development in African productivity (Naudé 2009). Physical distance and accessibility to markets, supporting industries, and governments can influence development outcomes if economic activities are agglomerated and urbanized. Decentralizing government presence may reduce poverty and improve living standards in developing countries.
Table 2: Main results: Oil price and Changes to Household Consumption in Nigeria

<table>
<thead>
<tr>
<th>Dependent Variable: Log change in consumption expenditure per capita</th>
<th>All Households (36 States)</th>
<th>South (17 States)</th>
<th>Oil-rich Niger Delta (9 States)</th>
<th>North (19 States)</th>
<th>Non-Oil Rich States (27 States)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
<td>V</td>
</tr>
<tr>
<td>Oil Price</td>
<td>0.15**</td>
<td>0.24**</td>
<td>0.33***</td>
<td>0.02</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.09)</td>
<td>(0.13)</td>
<td>(0.1)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>Household Size</td>
<td>-0.16***</td>
<td>-0.18***</td>
<td>-0.17***</td>
<td>-0.15***</td>
<td>-0.16***</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.02)</td>
<td>(0.03)</td>
<td>(0.01)</td>
<td>(0.015)</td>
</tr>
<tr>
<td>Household Head (Male)</td>
<td>-0.1</td>
<td>0.15</td>
<td>0.29</td>
<td>-0.99**</td>
<td>-0.33</td>
</tr>
<tr>
<td></td>
<td>(0.44)</td>
<td>(0.56)</td>
<td>(0.26)</td>
<td>(0.39)</td>
<td>(0.57)</td>
</tr>
<tr>
<td>Marital Status (Married)</td>
<td>-0.03</td>
<td>0.06</td>
<td>0.16</td>
<td>-0.11</td>
<td>-0.09</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.10)</td>
<td>(0.16)</td>
<td>(0.09)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Age Household Head (years)</td>
<td>-0.0004</td>
<td>-0.0007*</td>
<td>-0.004</td>
<td>0.003</td>
<td>-0.0004</td>
</tr>
<tr>
<td></td>
<td>(0.0004)</td>
<td>(0.0004)</td>
<td>(0.01)</td>
<td>(0.005)</td>
<td>(0.0003)</td>
</tr>
<tr>
<td>Electricity Access (Yes)</td>
<td>0.10*</td>
<td>0.10</td>
<td>-0.01</td>
<td>0.07</td>
<td>0.12*</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.08)</td>
<td>(0.11)</td>
<td>(0.09)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Employer (Government)</td>
<td>0.0002</td>
<td>0.10</td>
<td>-0.007</td>
<td>-0.04</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>(0.1)</td>
<td>(0.16)</td>
<td>(0.21)</td>
<td>(0.12)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>Location (Urban)</td>
<td>-0.21</td>
<td>-0.12</td>
<td>-0.16</td>
<td>-0.37</td>
<td>-0.49</td>
</tr>
<tr>
<td></td>
<td>(0.39)</td>
<td>(0.71)</td>
<td>(0.53)</td>
<td>(0.34)</td>
<td>(0.47)</td>
</tr>
<tr>
<td>Distance in (Km) to Nearest Market</td>
<td>0.015**</td>
<td>0.01</td>
<td>0.009</td>
<td>0.01*</td>
<td>0.01**</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.009)</td>
<td>(0.02)</td>
<td>(0.005)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>Distance in (Km) to Nearest Population Center with +20,000</td>
<td>0.0007</td>
<td>0.003</td>
<td>0.003</td>
<td>0.002</td>
<td>0.0008</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.003)</td>
<td>(0.004)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Distance in (Km) to Capital of State of Residence</td>
<td>-0.01***</td>
<td>-0.008***</td>
<td>-0.004*</td>
<td>-0.01***</td>
<td>-0.01***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.003)</td>
<td>(0.002)</td>
</tr>
</tbody>
</table>

Note: Household data is from the Nigerian General Household Survey in three waves 2009/10, 2011/12, and 2015/16. Consumption expenditure is first differenced and includes food, non-food and education expenditure.

Additional controls include annual temperature and precipitation. All regressions include households and survey year fixed effects with additional controls for zones and regional and enumeration areas time trends. ***Significant at 1%, **Significant at 5%, *Significant at 10%. Standard errors clustered by households in parentheses.
4.2 Mechanisms: Food Substitution for Consumption Smoothing

The literature on the effects of economic shocks on consumption suggests mechanisms based on intertemporal substitution of consumption categories aimed at reducing welfare loss. The rationale is that postponing non-food goods causes less loss to welfare than postponing the consumption of goods that are not so substitutable (e.g., food). The theoretical and empirical analysis shows that households can cut back significantly on total expenditures in the short run without a significant fall in welfare if they concentrate their budget reductions on household durables (Browning and Crossley, 2009).

Table 3: Oil price on disaggregated consumption

<table>
<thead>
<tr>
<th></th>
<th>VI</th>
<th>VII</th>
<th>VIII</th>
<th>IX</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Expenditure per capita</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Food Expenditure per capita</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education Expenditure per capita</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food: Purchased per capita</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food: Non-Purchased per capita</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Price</td>
<td>0.13*</td>
<td>0.88***</td>
<td>-0.60***</td>
<td>0.17**</td>
<td>-0.28***</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.06)</td>
<td>(0.08)</td>
<td>(0.07)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Household Size</td>
<td>-0.17***</td>
<td>-0.20***</td>
<td>-0.008</td>
<td>-0.16***</td>
<td>-0.11***</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Household Head (Male)</td>
<td>-0.44</td>
<td>0.49</td>
<td>-0.53</td>
<td>-0.44</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>(0.5)</td>
<td>(0.41)</td>
<td>(0.68)</td>
<td>(0.31)</td>
<td>(0.53)</td>
</tr>
<tr>
<td>Distance in (Km) to</td>
<td>0.02***</td>
<td>0.001</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Nearest Market</td>
<td>(0.005)</td>
<td>(0.006)</td>
<td>(0.01)</td>
<td>(0.007)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Distance in (Km) to</td>
<td>0.0001</td>
<td>0.002</td>
<td>0.004</td>
<td>-0.004**</td>
<td>-0.0001</td>
</tr>
<tr>
<td>Nearest Population Center with +20,000</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Distance in (Km) to</td>
<td>-0.009**</td>
<td>-0.004</td>
<td>-0.007*</td>
<td>-0.004</td>
<td>-0.004*</td>
</tr>
<tr>
<td>Capital of State of</td>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.004)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Residence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Households</td>
<td>4,726</td>
<td>4,686</td>
<td>3,886</td>
<td>4,718</td>
<td>4,395</td>
</tr>
<tr>
<td>Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Within R-Squared</td>
<td>0.07</td>
<td>0.12</td>
<td>0.06</td>
<td>0.008</td>
<td>0.009</td>
</tr>
</tbody>
</table>

Note: Household data is from the Nigerian General Household Survey in three waves 2009/10, 2011/12, and 2015/16. Consumption expenditure is first differenced. Additional controls include the age of the household head, household access to electricity, location (urban), employer (government), annual temperature, and precipitation. All regressions include households and survey year fixed effects with additional controls for zones and regional and enumeration areas time trends. ***Significant at 1%, **Significant at 5%, *Significant at 10%. Standard errors clustered by households in parentheses.
Cross-country evidence suggests that natural resource wealth may reduce expenditure for education as school enrolment at all levels tends to be inversely related to natural resource abundance in OPEC countries (Gylfason 2001). In Table 3, we present results supporting these theories: non-food goods (Column VII) tend to have higher substitution elasticities than food goods (Column VI). Moreover, education is inversely related to the oil boom (Column VIII). Another view on the inverse relationship between education expenditure and oil price is on the stimulating impact of the recession on enrolment (Lovenheim 2011; Barr and Turner 2013). Weak labor market conditions during a downturn can encourage college enrolment because households hold an optimistic outlook toward the future. After the recession, those with better labor market prospects can benefit more from the economic turnaround and expect higher expected returns to education.

The most obvious way to observe the impact of oil prices on food consumption is to examine the elasticity with respect to oil prices (column VI). However, there is a caveat to this. The food consumption parameter estimates reported in column (VI) will be biased if an oil-price-induced recession causes households to alter labor supply in favor of agricultural production and to reduce their expenditure for purchased food. However, there is another way of looking at the impact. If economic shocks alter labor supply and increase domestic food production, one would expect changes in non-purchased food consumption to decline as oil prices rise and vice-versa.

In columns IX and X of Table 3, we disaggregated the food category into expenditure for the purchased foods category (column IX) and the non-purchased category (column X). Our results in columns IX and X give a positive and significant parameter estimate for purchased food but a negative impact of oil price on non-purchased food. This is consistent with the possibility of labor diversification into agriculture during the recession to smooth food consumption. The mechanism speaks to the importance of self-sufficiency in food production and building reliant and resilient domestic and localized pro-poor and sustainable food systems as mechanisms for consumption smoothing in times of shocks. Such reliant, localized food systems at the household level can help build a coordinated response to the food shortage during shocks.

4.3 Smoothing mechanisms: Adjustments to household size, composition, and labor supply response to oil price shocks

Another way households may smooth consumption to mitigate the effects of economic shocks on welfare involves household size and composition changes. To reduce consumption costs, households may send some members to live with other households in less severely affected locations or relocate some members to places with better prospects for generating income.

The theory on the response of the household structure to shocks gives inconclusive conclusions. Household members maximize utility by choosing whether to remain in the household if marginal gains from cost-sharing household-specific goods, scale economies in agricultural production, and risk diversification exceed marginal costs. Their model implies that households may be more likely to divide during a crisis or when incomes fall. An alternative line of thought is that if the fixed costs of the household, such as housing costs, are
high, then cohabiting during shocks is likely to be more utility-maximizing (Deaton and Paxson 1998).

Table 4: Household size and labor supply in response to oil price

<table>
<thead>
<tr>
<th></th>
<th>Household Size (H.H.)</th>
<th>Total Hours worked (last seven days)</th>
<th>During the past 7 days, has any H.H. member worked on a farm?</th>
<th>Husband and wife engaged in a second job?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>XI</td>
<td>XII</td>
<td>XIII</td>
<td>XIV</td>
</tr>
<tr>
<td>Oil Price</td>
<td>0.17***</td>
<td>-0.23**</td>
<td>0.22***</td>
<td>0.01***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.1)</td>
<td>(0.01)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Household Size</td>
<td>0.002</td>
<td>0.006**</td>
<td>0.0005</td>
<td>0.0005</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Household Head (Male)</td>
<td>1.1***</td>
<td>0.57***</td>
<td>-0.01</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>(0.23)</td>
<td>(0.03)</td>
<td>(0.04)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Marital Status</td>
<td>-0.19**</td>
<td>-0.006</td>
<td>0.002</td>
<td>0.02**</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.03)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Age Household Head (years)</td>
<td>0.0002</td>
<td>0.00005</td>
<td>0.00001</td>
<td>-0.0001*</td>
</tr>
<tr>
<td></td>
<td>(0.0002)</td>
<td>(0.0005)</td>
<td>(0.0001)</td>
<td>(0.00008)</td>
</tr>
<tr>
<td>Electricity Access (Yes)</td>
<td>0.01</td>
<td>0.01</td>
<td>-0.01</td>
<td>0.02*</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.02)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Employer (Government)</td>
<td>0.08</td>
<td>0.02</td>
<td>-0.05**</td>
<td>0.05**</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.03)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Location (Urban)</td>
<td>-0.64*</td>
<td>0.03</td>
<td>0.01</td>
<td>-0.1</td>
</tr>
<tr>
<td></td>
<td>(0.35)</td>
<td>(0.12)</td>
<td>(0.03)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>Number of Households</td>
<td>4,917</td>
<td>3,664</td>
<td>4,917</td>
<td>4,917</td>
</tr>
<tr>
<td>Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Within R-Squared</td>
<td>0.05</td>
<td>0.02</td>
<td>0.05</td>
<td>0.21</td>
</tr>
</tbody>
</table>

Note: Household data is from the Nigerian General Household Survey in three waves 2009/10, 2011/12, and 2015/16. Additional controls include distance to the market, administrative center, a city with a population > 20,000, annual temperature, and precipitation. ***Significant at 1%, **Significant at 5%, *Significant at 10%. Standard errors clustered by households in parentheses.

Household minimizes the impacts of economic shocks on consumption by reallocating household members across different households. The result mirrors Frankenberg (2003), which shows that the optimal number of households per family in Indonesia involves a trade-off between taking advantage of economies of scale in consumption and the utility derived from individual or sub-family privacy. However, it contrasts the findings of McKenzie (2003), which found that during the peso crisis in Mexico, the coping strategy of adding more...
household members was not widely used. In column XI of Table 4, we support the mechanism that a fall in the oil price (economic shock) will lead to a reduction in household size in Nigeria.

In column XII, we explore the labor supply response to shocks. The decline in consumption during the crisis could be compensated for by increasing the labor supply and reducing leisure. Some household members, especially in the formal wage sector, may have lost their jobs and are no longer working. Other household members may increase their work effort to compensate for the loss of income. We find support for heterogeneity in labor supply response in columns XIII-XIV of Table 4. Households (wife and husband) worked more hours (Model XII), worked less on farms (Model XIII), and were less likely to work in a second job in response to a fall in oil prices. There is a caveat: the result should be read with caution since it only represents a limited period (7 days) relative to the time of the survey and might not represent labor supply for the entire year.

5. Conclusion

Do fluctuations in the global oil price affect household consumption in oil-exporting countries? We answer this question by investigating household consumption changes in response to Nigeria’s global oil price. Given the relative size of the oil sector in the Nigerian economy, we can infer from the conclusions drawn in this study as being applicable to oil price shocks outside these periods for a wide range of developing countries whose primary revenue is from resource rents.

We find that oil prices have a significantly larger impact on the consumption of households in the South and oil-producing regions than in the North. The magnitudes of these effects are consistent with the literature on income gains that follow when oil prices are high in Nigeria and the tendency for households in the South to experience a greater shock to consumption during the oil burst because of the transition from agriculture. We find that households smooth consumption by shifting expenditures away from luxuries relative to food, increasing the non-purchase food component, and adjusting the household size and labor supply.

The results and coping mechanisms support the importance of sustainable food supply chains, and demographically-contingent transfers can help smooth shocks in the short term. For the medium term, the findings underscore the importance of building reliant and resilient pro-poor and sustainable food systems as mechanisms for consumption smoothing in times of shocks. In the longer term, strengthening agricultural productivity by encouraging diversification into food production across the regions could provide insulation for consumption volatility during oil price crashes and recessions.
References


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