MICRO-MODEL ANALYSIS OF FUEL CONSUMPTION, WELFARE AND DISTRIBUTIONAL IMPACTS OF FUEL SUBSIDIES REFORM IN NIGERIA

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Overview

The pervasive consequences of fuel subsidies have compelled the Nigerian government to make a continued effort to join other oil producing countries that have successfully deregulated fuel prices. A renewed effort was necessitated by the recent decline in oil revenue and the falling exchange rate of the Nigerian currency against the US dollar, which further supports the fact that fuel subsidies are very expensive to sustain. For several reasons, however, it is yet uncertain whether this ambitious plan of deregulation would help to achieve the desired result. First, important questions about the likely impact of the proposed deregulation on households' fuel consumption and the welfare effect have not been resolved. Poorer households may not benefit if the reform does not lead to significantly lower fuel consumption and, at the same time, feeds into unfavourable economic conditions such as a higher inflation rate. Second, and perhaps most importantly, there is controversy surrounding the distributional impact of abolishing fuel subsidies.

To better assess the effectiveness of fuel price deregulation in Nigeria, this study provides empirical evidence of the impact of removing subsidy fuel (kerosene, gasoline and electricity) consumption and, more importantly, the welfare (direct and indirect) and distributional impacts. This kind of study is crucial, as the existing literature on fuel price deregulation in Nigeria does not provide adequate and convincing evidence of such impacts. Most noteworthy studies employ a computable general equilibrium (CGE) approach that relies on macro data and finds macroeconomic benefits of fuel price deregulation. Assessing the welfare impact at the macro level, even if the study is well-conducted, may require some cautions in developing policy tools. This is because macro-level benefits may not necessarily translate to household level benefits, especially with the rising income inequality in Nigeria. Moreover, in order to undertake distributional analysis in CGE models, data are required on not only the differences in income sources across groups but also on different consumption patterns across income groups. These data are rarely available at the macro level for developing countries.

As far As far as we know, this study is the first rigorous empirical study to use micro data obtained from household budget surveys to estimate fuel consumption response to fuel price changes in Nigeria. Also, the study examines the welfare (direct and indirect) and distributional impacts of fuel price changes. The paper is organised as follows: After the introduction, the next section presents a background to the energy sector and price reform in Nigeria. Sections 3 and 4 present a review of relevant studies, and the theoretical and empirical framework respectively. The discussion of data and the empirical results can be found in section 5. The final section concludes with policy implications.

Methodology

First, we use a micro-model, Linear Approximation Almost Ideal Demand System (LA-AIDS), which considers the socio-economic backgrounds of the households to estimate own-, and cross-prices, and income elasticities for kerosene, gasoline and electricity for different income groups. This allows us to control for heterogeneity in the household responses to fuel price and income changes.

Second, we use the estimates from the first step with the household expenditure budget shares to provide estimates of the true changes in welfare and distributional impacts that may arise from charging a full fuel prices in Nigeria. The welfare impact reflects how much well-being in monetary terms the households will lose if the government implements the market price for fuel while the distributional impact categorises the welfare losses across various income groups and identifies the most vulnerable group. Moreover, the micro-data approach allows us to differentiate between the direct and indirect welfare impacts of fuel subsidy reform.

Results

We found that own price and income elasticities of fuel demand differ among household groups in Nigeria – the own price elasticities tend to increase with income levels. High-income groups are more responsive to changes in the prices of kerosene and gasoline while low-income groups are more responsive to changes in the price of electricity.

In contrast, income elasticities decrease with income levels for the three fuels – the income elasticities for low-income groups are greater than those for medium-income and high-income groups. Also and unlike gasoline, the income elasticities of kerosene and electricity are generally less than the counterpart own-price elasticities.

With regard to the potential welfare impact of the fuel price deregulation, the open market price (OMP) system would see the prices of gasoline and kerosene increase by about 111.4% and 18.6% respectively. The

increase in the kerosene price would cause the low-income groups to suffer a direct welfare loss equivalent to about 0.85% of their total expenditure while the high-income counterpart would only suffer about 0.50% direct welfare loss. For gasoline, the direct effects are relatively smaller for the three income groups. The indirect effects follow similar distribution to the direct effects but are significantly larger for the three income groups. The total direct and indirect welfare effects for households in the low-, medium-, and high-income groups are about 7.60%, 6.36% and 5.27% respectively.

Conclusions

Although the deregulation of gasoline price will reduce gasoline consumption, with the relatively higher income elasticities of gasoline, income tax will be more effective to reduce gasoline consumption. In contrast, kerosene price deregulation would be more effective than income tax in curtailing fuel consumption, protect the environmental and to raise fiscal revenue.

The generally lower own-price elasticities for the low-income groups implies that gasoline and kerosene price deregulation would eliminate the fiscal burden of the fuel subsidy but the fuel demand and ultimately the environmental impact from the low-income groups would remain high. In addition, the low-income groups would have to reduce other expenses to sustain their fuel consumption, which may worsen their standard of living.

The OMP arising from abolishing fuel subsidy suggests that the timing of the subsidy removal is very important in minimising the welfare loss and avoiding any public backlash. If subsidy removal is delayed until, the dwindling oil price recovers, the OMP will increase further and consequently, the welfare loss will be higher.

The conclusion drawn for the distributional impact of abolishing the kerosene subsidy in Nigeria is that the welfare loss is regressive. Although we found a progressive welfare effect from abolishing the gasoline subsidy, the effect-gap between the low- and high-income groups is small relative to the effect-gap from the deregulation of kerosene price, causing the low-income group to suffer a higher total welfare loss.

References

Baker, P., Blundell, R. and Micklewright, J. (1989). Modelling Household Energy Expenditure Using Microdata. *The Economic Journal* 99, 720-738.

Blundell, R. (1988). Consumer Behaviour: Theory and Empirical Evidence - A survey. *The Economic Journal* 98, 16-65.

Coady, D., El-Said, E., Gillingham, R., Kpodar, K., Medas, P. and Newhouse, D. (2006). The Magnitude and Distribution of Fuel Subsidies: Evidence from Bolivia, Ghana, Jordan, Mali and Sri Lanka. IMF Working paper WP/06/247.

Coady, D., El-Said, M., Gillingham, R., Kpodar, K., Medas, P. A. and Newhouse, D. L. (2006). The magnitude and distribution of fuel subsidies: Evidence from Bolivia, Ghana, Jordan, Mali and Sri Lanka, IMF working paper No. 06/247

Deaton, A and Muellbauer, J. (1980). Almost Ideal Demand System. *The American Economic Review* 70(3), 312-326.

Gundimeda, H. and Kohlin, G. (2008). Fuel demand elasticities for energy and environmental policies: Indian sample survey evidence. *Energy Economics* 30, 517-546.

[*Note: These are selected references of this study*]