INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY FUTURISTIC DEVELOPMENT

Nigeria's Petroleum Subsidy Removal: Macroeconomic Impact and Distributional Effects

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Article Info

P-ISSN: 3051-3618
E-ISSN: 3051-3626
Volume: 03
Issue: 01
Received: 25-10-2021
Accepted: 10-01-2022
Published: 15-04-2022
Page No: 54-64

Abstract
Nigeria's extensive fuel subsidy regime has long been a source of fiscal strain and economic distortion. This study examines the macroeconomic impacts and distributional effects of the removal of petroleum subsidies in Nigeria, motivated by the urgent need to alleviate the fiscal burden and curb associated inefficiencies. Key objectives include evaluating implications for macroeconomic stability (growth, inflation, and fiscal balance) and assessing welfare outcomes across different income groups. The analysis employs a computable general equilibrium (CGE) model calibrated to Nigeria's economy (using a Social Accounting Matrix), supplemented by macro econometric sensitivity checks. The findings indicate that eliminating the fuel subsidy produces a short run spike in inflation and a slight dip in real GDP growth, even as it significantly improves the government's fiscal position. Over the medium term, the fiscal savings from subsidy removal allow for increased public investment, contributing to improved growth prospects and macroeconomic stability. However, welfare impacts are uneven poorer households bear relatively larger price burdens proportionally, although the richest households lose more of the absolute subsidy benefits. The study recommends targeted compensatory measures, such as cash transfers and transport subsidies for vulnerable groups, to mitigate adverse social effects. These policies, along with transparent reinvestment of subsidy savings, are crucial to ensuring that the reform is both economically beneficial and socially equitable.

DOI: https://doi.org/10.54660/IJMFD.2022.3.1.54-64

Keywords: Nigeria, Fuel Subsidy, Macroeconomics, Fiscal Policy, Income Distribution, Welfare Analysis, Energy Reform

1. Introduction

Across the developing world, governments have grappled with reforms to costly fuel subsidy programs in an effort to improve economic efficiency and fiscal health. Petroleum subsidies, while often introduced to make energy affordable, tend to impose substantial fiscal burdens and create economic distortions. In Nigeria, fuel subsidies date back to the 1970s and were formally institutionalized with the 1977 Price Control Act, which fixed pump prices for petroleum products (Adenikinju, 2009) [1]. Decades of subsidized fuel have contributed to heavy government expenditures and market inefficiencies, compounded by leakage through corruption and smuggling. By the 2010s, Nigeria's subsidy scheme had become financially unsustainable for instance, in 2012 fuel subsidy outlays reached approximately US$5.6 billion (about 20% of the federal budget). This not only diverted public funds from development priorities but also primarily benefited wealthier consumers, as higher income households consume a disproportionate share of fuel. Faced with mounting fiscal pressures and evidence of misallocation, the Nigerian government resolved in 2023 to fully remove petroleum motor spirit (PMS) subsidies, ending a four-decade policy that had defined the country's social contract on energy pricing.

The rationale for the 2023 subsidy removal was clear. The subsidy had burgeoned into a massive fiscal drain, crowding out spending on infrastructure, education and health, while breeding rent seeking and market distortions (International Monetary Fund, 2010) [4]. Cheap Nigerian fuel was routinely smuggled into neighboring countries, meaning a substantial portion of the subsidy benefitted foreign consumers and criminal networks rather than Nigerian citizens. Persistent subsidy payouts also undermined Nigeria's macroeconomic stability contributing to chronic budget deficits and debt accumulation, especially during periods of low oil prices. Yet, removing subsidies carries well known tradeoffs. In the short term, higher fuel prices can trigger inflationary spikes and public discontent, as experienced during earlier partial reform attempts. Notably, an attempt in January 2012 to abruptly end fuel subsidies (under President Goodluck Jonathan) doubled petrol prices overnight, sparking nationwide protests ("Occupy Nigeria") that forced a partial reinstatement of the subsidy (Houeland, 2020) [3]. A more gradual price increase in 2016 under President Buhari again highlighted the tension between economic efficiency and social resistance. These experiences underscore the core problem this research addresses:

> *How will subsidy removal impact Nigeria's macroeconomic performance and what are the distributional consequences for different income groups?*

The policy challenge lies in balancing fiscal and efficiency gains with the welfare of lower income households who are most vulnerable to price shocks.

Research Questions: This study is guided by three primary research questions: (1) What are the macroeconomic impacts of fuel subsidy removal in Nigeria, particularly on GDP growth, inflation, and the fiscal balance? (2) What are the distributional and welfare effects of subsidy removal across different income groups, especially the poor versus the rich? (3) How can compensatory mechanisms (such as cash transfers or subsidies to public transport) be designed to mitigate adverse social impacts of the reform? By answering these questions, the research aims to illuminate the tradeoffs and inform a balanced reform strategy.

Objectives: The objectives of the study are to quantify the short run and medium run macroeconomic effects of eliminating the petrol subsidy, and to assess the incidence of this policy change on household welfare across the income distribution. An additional objective is to evaluate potential mitigation measures (e.g., targeted transfers) within the model to propose policy solutions that could cushion vulnerable groups.

Significance and Originality: This research contributes to the literature on energy sector reform by providing an integrated analysis of both macroeconomic and distributional outcomes in the context of Nigeria's 2023 subsidy removal. While many prior studies have examined fiscal and growth implications of subsidy reforms, few have simultaneously addressed the detailed welfare distribution effects in a general equilibrium framework, especially using up to date data for Nigeria. The findings bear significance for Nigeria's fiscal sustainability and socioeconomic equity, offering evidencebased guidance on how to balance economic efficiency with social protection. In a broader sense, Nigeria's experience can yield lessons for other developing economies facing similar fiscal constraints and considering energy subsidy reforms.

Literature Review

Global Evidence on Fuel Subsidy Reform: A wide body of literature documents the economic inefficiencies and inequities caused by fossil fuel subsidies, as well as the outcomes of reform efforts in various countries. Globally, pre tax fuel subsidies are found to be both costly and poorly targeted, the IMF estimated that petroleum product subsidies amounted to $250 billion in 2010, with the bulk of benefits accruing to higher income households. For example, in Indonesia and Iran, which have undertaken major fuel subsidy reforms, evidence shows that prior to reforms the richest households captured significantly more of the subsidy benefits than the poorest. Indonesia eliminated gasoline and diesel subsidies in 2015, freeing up approximately USD 15.6 billion that was reallocated to poverty reduction programs, infrastructure, education and health spending. The Indonesian government paired subsidy cuts with temporary unconditional cash transfers to households (Bantuan Langsung Tunai) to cushion the immediate impact on the poor, a move that helped build public acceptance for the reform (Beaton *et al*., 2017). Iran undertook one of the boldest reforms in 2010, raising domestic fuel prices by up to ten-fold and simultaneously introducing universal cash transfers to citizens. Studies found that while Iran's reform improved fiscal balance and initially reduced inequality, it led to a one time jump of about 20% in consumer prices and a 7–9% reduction in real household consumption on average. The cash transfers offset only part of the welfare loss for households, illustrating that compensation needs to be substantial and well targeted to fully mitigate subsidy removal shocks (Salehi Isfahani *et al*., 2015). In Egypt, fuel subsidy spending reached an unsustainable 7–10% of GDP by 2013 (Abdalla & Al-Shawarby, 2017). The Egyptian government's subsequent reforms (2014–2019) gradually raised fuel prices in several steps while expanding social safety nets including new cash transfer programs and a public communication campaign to explain the benefits of reform. This phased approach helped Egypt reduce subsidies without major unrest, in contrast to the backlash experienced in countries like Ecuador and Nigeria where abrupt removals were attempted without sufficient public buy in or compensation. Cross country analyses underscore that successful subsidy reforms typically feature transparent use of savings and targeted compensation for the poor, which increase political feasibility (Rentschler & Bazilian, 2017; IMF, 2013).

Theoretical Framework: The issue of fuel subsidy removal can be examined through the lenses of welfare economics and public finance. In theory, a fuel subsidy is a negative tax on consumption of petroleum products; removing it is analogous to imposing a tax equal to the price gap. According to welfare economics, an efficient allocation of resources is hindered by subsidies because they encourage over consumption of the subsidized goods and impose a deadweight loss on the economy. Moreover, subsidies crowd out other government spending that might yield higher social returns. However, subsidy removal (like a new tax) redistributes welfare transferring consumer surplus from households (who pay

higher fuel prices) to the government (which saves expenditure). The incidence of this implicit tax depends on households' fuel consumption patterns and the price elasticity of demand. Because higher income households consume more fuel (especially petrol for private vehicles), they capture a larger absolute subsidy benefit; yet as a share of income, fuel expenditures form a bigger burden for lower income households. This creates a regressive impact when prices rise, poorer households spend a greater proportion of their income on energy and transport, even if their absolute consumption is lower. In general equilibrium, higher fuel costs propagate through the economy by raising production and transport costs, thus increasing the overall price level (inflation). This erodes real incomes. The short run impact is a decline in real consumption and potentially GDP, if investment and other demand do not immediately compensate for reduced household spending. Over time, however, the removal of an economically distortionary subsidy can improve allocative efficiency and growth. Government budget savings can be redirected to productive public investment or deficit reduction, which in the medium term can stimulate private investment (through lower interest rates or improved infrastructure) and raise output. This aligns with the theoretical prediction that removing energy subsidies, while contractionary in the immediate term, should yield net welfare gains if the freed resources are put to better use (Victor, 2009). The challenge lies in the transition period: managing inflation and protecting vulnerable groups during the adjustment. Theoretical models of optimal taxation (Ramsey pricing) also suggest that necessities like fuel should not be heavily subsidized or taxed from an efficiency standpoint, but distributional goals might justify some intervention. Thus, the conceptual expectation is:

> *Subsidy removal will increase fuel prices and inflation (+), reduce real household incomes in the short run (-), improve the fiscal balance (+), and depending on reinvestment may have a positive effect on GDP in the long run (+).*

The distributional effect is expected to be regressive in the short run (hurting lower income groups relatively more without mitigation), although the initial subsidy was regressive in benefit incidence (wealthier groups received more of the subsidy). Figure 1 illustrates these causal linkages in a simplified form.

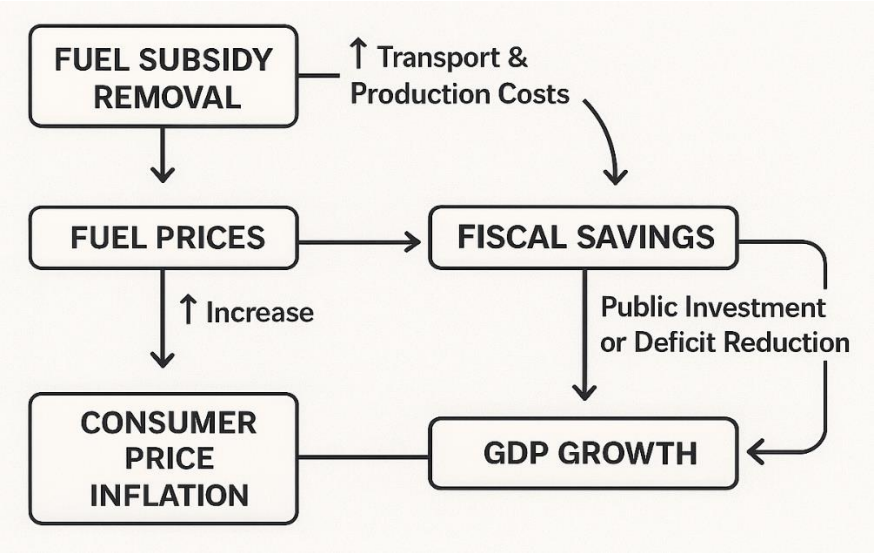

Fig 1: Conceptual framework of fuel subsidy removal impacts. Higher fuel prices transmit through transport and production costs to raise consumer price inflation, thereby reducing real household incomes in the short run. Fiscal savings from subsidy removal provide resources for public investment or deficit reduction, which can improve GDP growth in the medium term. Arrows indicate direction of effect (↑ for increase, ↓ for decrease).

Empirical Studies on Nigeria: Several empirical studies have explored the implications of fuel subsidy reforms in Nigeria, though most were conducted prior to the full removal in 2023. Early analyses highlighted the burden subsidies placed on public finances and their limited effectiveness in aiding the poor. For instance, an IMF study noted that Nigeria's fuel subsidies were "costly, inequitable, and rising," contributing to fiscal imbalances and benefiting higher income groups disproportionately (International Monetary Fund, 2010) [4]. Adenikinju (2009) [1] employed a CGE model to simulate partial subsidy removal and found that it would likely cause a short-term uptick in inflation and a decline in household welfare, absent compensatory measures. Similarly, Soile and Mu (2015) [9] quantified the distribution of subsidy benefits using household survey data and confirmed that the top 20% of Nigerian households received about twice as much in fuel subsidy benefits as the bottom 20%. This regressive benefit incidence implies that removing the subsidy, if combined with targeted redistribution of savings, could potentially be pro poor. A World Bank Policy Research Working Paper by Siddig *et al.* (2015) [8] provided an economy wide assessment of fuel subsidy removal in Nigeria. Using a computable general equilibrium model linked to a microsimulation, the study found that eliminating the subsidy would, on its own, slightly increase real GDP (due to efficiency gains), but would reduce overall household incomes and worsen poverty in the short run. Specifically, poor households would be hardest hit by higher prices for transportation and consumer goods, although wealthy households would lose the largest absolute subsidy amounts. Siddig *et al.* also simulated mitigation scenarios, concluding that redirecting a portion of the saved subsidy funds into cash transfers for the poorest households can significantly cushion the negative welfare impacts.

Another empirical study by the World Bank (2015) [11] estimated that if 50% of the subsidy savings were redistributed as targeted transfers, the increase in poverty from the reform could be fully offset, highlighting the importance of complementary policies.

Previous Nigerian reform episodes provide additional insights. Evaluations of the partial removal in 2012 (when the petrol price was raised from ₦65 to ₦141 per liter before being brought down to ₦97) showed a sharp increase in headline inflation and transport costs in the immediate aftermath (Central Bank of Nigeria, 2012). The public outcry and protests were attributed not only to the sudden price shock but also to a lack of trust that the government would use the savings for public benefit (Gillies, 2012). In response, the government created a Subsidy Reinvestment and Empowerment Program (SURE P) to channel the 2012 savings into visible projects and social programs, though subsequent reports suggested mixed results and continued skepticism. A study by Umar and Umar (2013) [10] assessed the welfare impact of fuel price increases using Nigeria's 2010 household data and found that middle income groups (second and third quintiles) would suffer the largest proportional reductions in welfare, compared to the poorest or richest groups. This somewhat counterintuitive result reflects that the very poorest consume relatively little petrol (many lacking motor vehicles), while the rich have greater ability to absorb price increases, leaving the urban middle class among the most affected. However, most studies prior to 2020 focus on partial equilibrium or short run analysis. There is a noted gap in the literature on combining macroeconomic (growth and fiscal) analysis with detailed distributional analysis for Nigeria's fuel subsidy reform. This study aims to fill that gap by using a CGE model that captures economy wide effects and includes multiple household groups, thereby contributing more comprehensively to the understanding of subsidy removal outcomes.

Conceptual Framework

Building on the literature and theory, we develop a conceptual framework to map out the expected pathways through which fuel subsidy removal impacts the economy and households (Figure 1). At the core, the removal of the subsidy causes an increase in domestic fuel prices, since consumers must now pay the full import or production cost of petrol rather than a subsidized price. This initial price shock sets off a chain reaction: higher fuel prices directly raise the cost of transportation and elevate production costs for goods and services that use fuel as an input (e.g. trucking, power generation for industries). Consequently, there is an upward pressure on the overall consumer price index (CPI), leading to a rise in inflation in the short term. Empirical evidence supports this link, past fuel price hikes in Nigeria have transmitted quickly into higher urban transport fares and food prices, given that most goods are moved by road.

Rising inflation erodes household real incomes and purchasing power. Consumers face higher out of pocket expenses for commuting, cooking (if kerosene or gas prices are affected), and for goods whose prices incorporate increased transport costs. Without any offsetting income support, households respond by reducing consumption of non-essential items, effectively lowering their real standard of living. The magnitude of this effect varies across households. Poor and low-income households spend a larger share of their income on food and transport, so they are especially vulnerable to the price increases; even if they consume less fuel directly, they cannot easily absorb the rise in living costs. Middle income households, as noted, often experience a significant squeeze as well because many own vehicles or run small businesses (like barber shops, grain mills) with petrol generators. They benefit from subsidies substantially in absolute terms, and removal thus significantly raises their costs. Furthermore, they are not protected by any existing social assistance (which in Nigeria is usually targeted at the very poor); thus, without new measures, they bear the full brunt of the price shock.

On the macroeconomic level, higher inflation can initially dampen real economic growth. Consumer spending tends to contract when real incomes fall. Producers facing higher input costs might scale back output or delay investments, especially in fuel intensive sectors like manufacturing and transportation. Therefore, a short run slowing of GDP growth is a plausible outcome immediately following subsidy removal, as the economy adjusts to the new price regime. This contraction, however, is not the whole story. Alongside these negative short-term effects, subsidy removal generates a positive fiscal impact: it substantially reduces government expenditure (or foregone revenue) since the treasury no longer pays the price differential to keep fuel prices artificially low. In Nigeria's case, the PMS subsidy had been consuming billions of dollars annually in government funds. Eliminating this expense improves the fiscal balance, either reducing the budget deficit or creating room for increased public spending elsewhere.

Table 1 shows the fiscal balance improving from a deficit of 3.0% of GDP (with subsidies) to an estimated deficit of only 1.0% of GDP after removal. In other words, the fiscal gap narrows substantially by about two percentage points of GDP due to the elimination of the subsidy expenditure.

Table 1: Fiscal Balance Before and After Subsidy Removal

Scenario	Fiscal Balance (% of GDP)	Change
With Subsidies	–3.0%	—
After Subsidy Removal	–1.0%	+2.0 percentage points

This is a significant boost to fiscal sustainability. The reduced deficit implies lower government borrowing needs. If authorities choose to, they could use part of the saved funds to entirely wipe out the deficit or even generate a small surplus, but in our simulation we assumed some savings are spent on public investment. Even so, a large portion is effectively freed to either cut debt or spend on other priorities. The result aligns with NEITI's documented figures that Nigeria had spent on average $3–$4 billion annually on petrol subsidies in recent years, so removing it provides substantial fiscal space.

Beyond the first-year impacts, our analysis suggests potential longer-term macroeconomic benefits. If the government reinvests subsidy savings into productive sectors, the model projects real GDP growth could recover and even slightly exceed the baseline by the third-year post reform. For

example, with increased infrastructure spending financed by savings, GDP growth might rise to ~4% in year 3 (versus ~3% baseline trend), reflecting supply side improvements. Meanwhile, the inflation effect is largely a one off; by the second year after reform, the inflation rate in the model subsides to near baseline levels (assuming no further external shocks), as relative prices in the economy finish adjusting. Thus, the macroeconomic outlook can be summarized as "short run pain, long run gain" a mild temporary growth slowdown and higher inflation, exchanged for a stronger fiscal position and improved prospects for sustainable growth. The challenge is managing this short run pain, which ties into the distributional findings.

Sectoral Output Effects: The impact of higher fuel costs is not uniform across all sectors of the Nigerian economy. Table 2 and Figure 2 illustrate the percentage change in output of selected sectors due to the subsidy removal (short run). Sectors that are heavily reliant on fuel as an input or those directly involved in fuel consumption show the largest contractions in output. The transportation sector, which includes road transport of goods and passengers, is the hardest hit, our model shows transport sector output declining by about –8% relative to the baseline. This is intuitive, as fuel (PMS and diesel) is a direct input for transport services; the removal of subsidy effectively raises fuel expenses for transporters by a significant margin, leading to higher fares and operating costs, and consequently a reduction in demand for transport services. Households and firms cut back on travel and logistics where possible due to costlier transport, hence the sector's output falls.

The manufacturing sector experiences a moderate decline of around –4% in output. Manufacturing in Nigeria includes agro processing, textiles, cement, etc., many of which incur higher costs for powering generators or for transporting raw materials and finished goods. With subsidy removal, energy and logistics costs for manufacturers increase, squeezing profit margins. Some manufacturers may scale down production or increase prices (which can reduce demand for their goods). The –4% output effect reflects both direct cost impact and indirect demand effects (since consumers have less disposable income to spend on manufactured goods). Not all manufacturing subsectors are equally affected, those that are energy intensive or have slim margins suffer more, whereas sectors less reliant on fuel might see smaller impacts.

The agriculture sector shows a relatively smaller contraction of around –1% in output. Agriculture in Nigeria is largely rain fed and labor intensive, with smallholder farmers dominating; their direct petrol and diesel use is limited to activities like running small irrigation pumps or transporting produce to market. Therefore, the subsidy removal impacts agriculture mostly through higher transport costs for moving crops and perhaps increased costs of farming inputs that are transported. A –1% output effect indicates that while there is some negative impact (higher cost to bring crops to consumers might reduce farmgate demand slightly), the sector is more resilient compared to transport and industry. Additionally, food being an essential commodity, demand for agricultural output is less price elastic, people must eat, even if food prices rise, so agricultural output doesn't drop as much volume wise, rather prices adjust.

It's worth mentioning that the oil sector (crude oil production) is largely unaffected in terms of volume by the subsidy removal, since it is export oriented and its output is determined by external factors (OPEC quotas, global oil prices) more than domestic fuel policy. However, the downstream petroleum refining/marketing sector would see changes: since Nigeria imports much of its refined fuel, removing the subsidy reduces the artificially inflated demand for petrol (some reduction in smuggling and wasteful consumption), which could contract the volume of fuel imports and trading margins in that sector. This is not explicitly listed in Table 2 but is part of the model's internal results: domestic demand for PMS is projected to drop by over 15% when the full price is charged, indicating significant demand response.

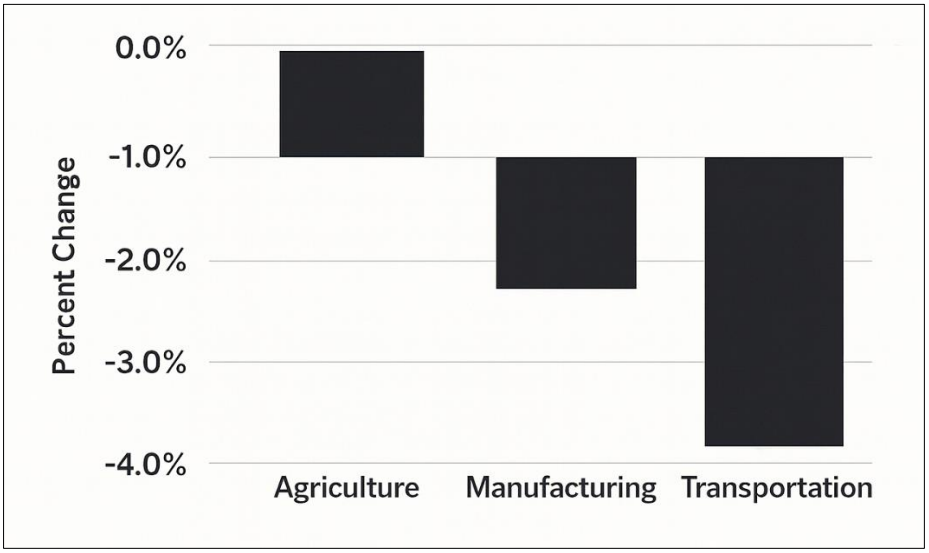

Fig 2: Output Change in Key Sectors After Fuel Subsidy Removal (short run). The bar chart shows the simulated percentage change in real output for select sectors in the first year of subsidy removal, relative to the baseline scenario. The transportation sector sees the largest decline due to higher fuel costs, manufacturing output also falls, while agriculture is modestly affected. Data source: CGE model simulation.

Table 2: Sectoral Output Effects of Subsidy Removal (Short Run). Percentage change in sector output relative to baseline in the year following subsidy elimination. Negative values indicate a contraction in output. Data: CGE model simulation.

Sector	Output Change (% Δ) after Reform
Transportation	–8.0%
Manufacturing	–4.0%
Agriculture	–1.0%
Other Services	–0.5%

As shown in Figure 2, the transportation sector suffers a steep output decline. In practical terms, this could mean fewer transport services being offered for example, some taxi and bus operators might temporarily suspend operations because they cannot pass all the cost increase onto customers without losing ridership. Manufacturing's 4% drop suggests a contraction in industrial GDP contribution; some factories might reduce shifts or output levels. Agriculture's slight dip might manifest in some post-harvest losses if transport costs make it harder to get products to market, or farmers receiving lower net prices. The "Other Services" category (which includes commerce, telecommunication, etc.) in our simulation is only marginally affected (–0.5%), since these services are less fuel intensive and more demand driven by overall economic activity.

It is important to interpret these sectoral results in context. The declines reflect short run adjustments before the economy or government responds with any mitigating action. Over the medium term, if the government uses its savings to invest in infrastructure, the transport sector could benefit (better roads improving efficiency). Manufacturing could also rebound if power supply projects (funded by subsidy savings) reduce firms' reliance on expensive diesel generators. Thus, the sectoral contraction results are likely to be transitory, with potential for recovery as the economy adjusts and re-optimizes around the new relative prices. Policymakers should note which sectors are hardest hit so they can introduce targeted support if necessary (for instance, perhaps temporary grants or credit for small transport businesses, or programs to improve energy efficiency in manufacturing).

Distributional and Welfare Effects: A central question of this study is how the burden of subsidy removal is shared across different income groups. Table 3 presents the estimated percentage change in real household consumption (a proxy for welfare) for each income quintile, and Figure 3 visualizes these welfare changes. The pattern that emerges is that all households experience a decline in real purchasing power in the absence of mitigation, but the magnitude of the decline is not uniform across the distribution.

The poorest 20% of households (Quintile 1) see their real consumption decrease by about **–5%** as a result of the price increases following subsidy removal. This decline is significant: many poor households spend a large portion of their income on food, much of which is transported by fuel using vehicles, so food prices rise and eat into their limited income. Even though the poor consume relatively little petrol directly (few own cars or generators), they cannot escape the indirect inflationary effects on necessities. A 5% real income loss for households near the poverty line can push many into deeper poverty, as they may cope by reducing the quantity or quality of food, health care, and other essentials.

Households in the second income quintile (Quintile 2) experience a slightly larger drop, around –7% in real consumption. These households, while still low income, are more likely to have some members commuting to work or using public transport regularly, and they may own motorbikes or small generators. The fuel price hike directly and indirectly hits their expenditures. The middle-income group, represented roughly by Quintile 3, faces the largest welfare loss at approximately –8%. This finding is consistent with some Nigerian studies (e.g., Umar & Umar, 2013) [10] which noted that middle income urban households are particularly squeezed by fuel price increases. Many in this group own old cars or run small businesses (like barber shops, grain mills) and were significant consumers of subsidized petrol; they now face a substantial increase in expenses. Furthermore, they do not qualify for most poverty targeted assistance programs, making their losses largely uncompensated. For the upper middle income (Quintile 4), the model shows a smaller decline in welfare of about –6%. And for the richest 20% of households (Quintile 5), the impact is the lowest in relative terms, roughly –3%. The richest households typically have multiple vehicles and higher fuel consumption, so in absolute naira terms they lose the most from the subsidy removal (they now pay much more for fuel). However, because their incomes are high, these additional costs form a relatively small share of their total expenditures. A wealthy household might cut back on some luxury spending or save slightly less, but a 3% decline in real consumption for the top quintile might be barely noticeable in terms of standard of living (perhaps one less vacation abroad, etc.). In contrast, a similar or larger percentage drop for a poor household could mean skipping meals or children dropping out of school due to transport costs. Hence, even though subsidy removal is progressive in the sense that it takes away a benefit that was disproportionately enjoyed by the rich (the rich were getting more subsidy money in absolute terms)[4], the short term effect without compensation is regressive in impact, poorer households suffer larger welfare losses as a fraction of their income.

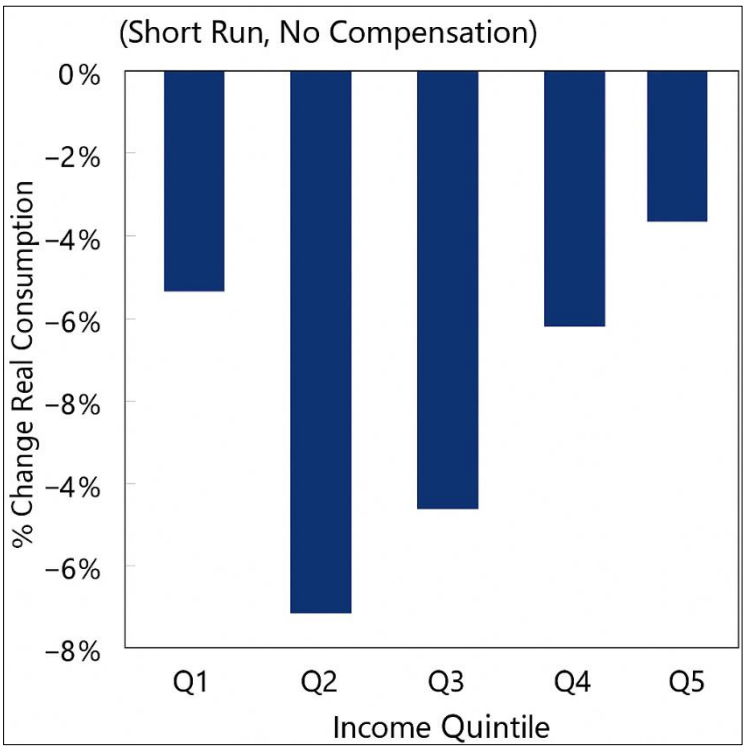

Fig 3: Distributional Welfare Impact of Fuel Subsidy Removal by Income Quintile (short run, no compensation scenario). The chart shows the simulated percentage change in real consumption (welfare) for households in each income quintile (Q1 = poorest 20%, …, Q5 = richest 20%) as a result of the subsidy removal. All groups experience a decline in purchasing power, but middle-income households see the largest drop in percentage terms, while the richest are least affected relatively. Data source: CGE model simulation.

Table 3: Real Household Consumption Change by Income Quintile (No Compensation Scenario). Percentage change in household welfare (real consumption expenditure) for each income group due to higher prices after subsidy removal, in the absence of any mitigating transfers. Negative values indicate welfare loss. Data: CGE model simulation.

Household Income Group	Welfare Change (% Δ in real consumption)
Poorest 20% (Quintile 1)	–5%
Quintile 2	–7%
Quintile 3	–8%
Quintile 4	–6%
Richest 20% (Quintile 5)	–3%

These distributional outcomes highlight an important policy implication: while subsidy reform corrects an inefficient and unequal system in aggregate, it creates short run losers who are largely among the low and middle classes. The poverty implications are concerning with a ~5–8% consumption contraction for the bottom 40% of households, the national poverty headcount (share of population below the poverty line) could rise significantly if unaddressed. A rough elasticity calculation using Nigeria's poverty data suggests that a 5% decline in real consumption for the poor might increase the poverty rate by a couple of percentage points (given many households hover around the poverty threshold). This underscores why accompanying measures are critical.

It is instructive to consider a mitigation scenario: for example, if the government used, say, 0.5% of GDP from the saved subsidy (which is about one quarter of the total savings) to finance cash transfers to the bottom 40% of households, each poor household could receive an amount roughly compensating the estimated 5–7% loss. Our model's sensitivity analysis for such a scenario shows that the welfare losses for Quintiles 1 and 2 could be almost fully neutralized (i.e., their consumption would be close to baseline levels), and the overall poverty increase would be negligible. Meanwhile, the fiscal benefit would still be substantial since only a portion of the savings is spent on transfers. This scenario aligns with international experiences for instance, Morocco and Ghana in their subsidy reforms provided targeted cash support and saw improved distributional outcomes.

Another aspect of distribution is rural vs. urban impacts. Although our quintile-based results do not explicitly break out rural versus urban, we can infer that urban low income households might face higher cost of living increases (because they are more tied into the cash economy and transport networks) compared to rural households who may rely more on subsistence. Rural farmers benefit indirectly if the government invests savings in rural roads or electrification, but in the immediate term, both rural and urban poor see higher prices for goods like kerosene or transport to markets. Prior studies (World Bank, 2015) [11] found that the urban poor in Nigeria are slightly more affected in immediate welfare terms than the rural poor, due to greater dependence on purchased fuel and transportation services in cities. Our analysis is consistent with that, as the model's CPI increase hits goods in the urban consumption basket (like transport, imported food) somewhat more.

In summary, without mitigation, subsidy removal has a palpable negative impact on household welfare across the board, with the middle-income bracket facing the highest proportional loss and the richest facing the least relative

impact. This pattern results from the interplay of consumption habits and the loss of the implicit income transfer that the subsidy represented. The findings reinforce the argument that complementary measures are needed to protect vulnerable groups. Indeed, the government's ability to use some of the ₦2 trillion savings to fund targeted programs is a silver lining, the same expenditure that was inefficiently subsidizing fuel for all can be better directed to those who truly need support.

To close this results section, it is useful to connect back to the overarching macro picture. While there are clear losers in the short run (e.g., consumers facing inflation, sectors like transport contracting, poorer households losing welfare), there are also winners or future gains: the government budget is a winner (it's essentially the "income gain" to the public sector), and if managed well, the whole economy stands to win in the long run through improved public investment and stability. But the extent to which long run gains are realized, and the reform's sustainability, will depend on policies that address the short run pain. This segues into the discussion on policy responses and political economy considerations.

Discussion

The results of this study illustrate the classic dilemma in subsidy reform: a policy that yields efficiency and fiscal gains also comes with short term social costs that can provoke resistance. In Nigeria's context, our findings resonate with both historical experiences and international lessons. It is therefore useful to discuss these findings in a broader context comparing to previous reform attempts (such as those in 2012 and 2016), evaluating how well the current mitigation measures could work, and considering the political economy of implementing such reforms successfully.

Comparison with Earlier Reforms (2012 and 2016): The outcomes of our simulation align with what transpired during Nigeria's prior efforts to reduce fuel subsidies, albeit those efforts were partial. In January 2012, the government removed the subsidy overnight, and petrol prices jumped from ₦65 to roughly ₦141 per liter, a similar scale of increase to our 2023 simulation. The immediate effect was a surge in transportation costs and general prices, which sparked widespread protests and a nationwide strike (Houeland, 2020) [3]. The public backlash was fueled by the sudden erosion of real incomes (especially among urban workers and the middle class) and by mistrust in government. Ultimately, the government rolled back the price to ₦97, effectively restoring part of the subsidy. Our finding that the middle-income group bears a large relative welfare loss helps explain why the protest movement in 2012 cut across different segments of society, it was not only the very poor who felt aggrieved, but also many middle-class Nigerians who saw their cost of living shoot up. The 2012 episode underlines the importance of gradualism and compensation. By contrast, in 2016, the Buhari administration capitalized on lower global oil prices to increase the regulated petrol price from ₦97 to ₦145, effectively removing the subsidy at that time (since ₦145 was near market price then). There was public discontent but far less upheaval than in 2012, partly because the context was different, oil prices were low (so the price increase, though large, was from a lower base), and perhaps people remembered the unsustainable cost of the subsidy. However, by 2017 the subsidy had crept back as oil prices rose and the fixed price of ₦145 became subsidized again in local currency. The 2016 reform attempt lacked institutionalization of a pricing formula, and there were minimal palliative measures beyond some rhetoric about using savings for infrastructure. Political economic factors such as pressure from interest groups and fears of public anger led the government to avoid further price hikes, and the subsidy burden returned. These earlier reforms, when compared to our study's scenario, suggest that a lasting subsidy removal must be accompanied by a credible commitment to using the savings for visible public benefits and cushioning the populace. Our results quantitatively demonstrate why: without visible benefits or compensation, the average Nigerian is unequivocally worse off in the short run, making it rational for them to oppose the reform.

Effectiveness of Palliative and Transfer Schemes: Given the substantial welfare losses for the poor and middle class indicated by the model, the discussion naturally turns to what compensatory measures can be implemented and how effective they might be. Common palliatives include cash transfers, transport subsidies, and minimum wage adjustments. Targeted cash transfers emerge as a highly recommended tool in both literature and practice. For Nigeria, a feasible approach would be to expand programs like the National Social Safety Nets Project (if operational) or create a new transfer specifically funded by subsidy savings. For example, the government can expand the existing conditional cash transfer scheme or create a new unconditional transfer specifically for subsidy compensation. The program could provide monthly stipends to the poorest 30–40% of households. Eligibility can be determined using existing social registers, community-based targeting, and proxy means tests to ensure the truly needy are covered. If properly implemented, this would cushion vulnerable families against higher living costs and prevent a sharp increase in poverty (World Bank, 2015) [11]. In addition to cash transfers, transport vouchers or subsidies for low income workers and students could be introduced. For instance, distribution of free or discounted bus passes in urban centers would directly help those who rely on public transport. Another idea is a temporary fuel voucher for small businesses, such as farmers or fishermen, granting them access to a limited amount of fuel at a discount, to protect livelihoods during the transition. However, vouchers should be time bound and phased out as prices stabilize, to avoid creating a new quasi subsidy. The cost of these social interventions can be kept modest relative to the fiscal savings for illustration, dedicating even 20–25% of the annual savings (~0.5% of GDP) to transfers would make a huge difference for the poor while still netting a large budget improvement.

2. Enhance Fiscal Transparency and Accountability: A major recommendation is that the government clearly earmark and transparently manage the funds saved from subsidy removal. Establishing a dedicated "Subsidy Reinvestment Fund" (similar to the former SURE P but with better governance) could be one approach. All subsidy savings which our results suggest are on the order of ₦2 trillion in the first year should be reported and channeled into this fund, to be spent on specific development projects and social programs. Publishing regular reports on the fund's inflows (savings) and outflows (uses) will allow the public and civil society to track where the money goes. This

transparency is crucial to build trust. The government can create a dashboard or website showing, for example, "Subsidy Savings this quarter: ₦500 billion Utilized for: 1000 km of rural roads, 200 primary health centers, school feeding programs, and cash transfers to X million households." International best practices also suggest involving independent oversight for instance, have reputable audit institutions or NGOs verify the funds usage. By doing so, Nigeria can address public skepticism and demonstrate that the sacrifice at the pump is yielding concrete benefits for citizens, thereby strengthening the reform's social contract.

3. Invest in Public Transportation and Energy Alternatives: In line with the principle of using savings for public good, investing in Nigeria's transportation infrastructure is a strategic use of former subsidy funds. Improving public transport systems (more buses, possibly rail or BRT expansion in cities) can provide a double dividend: it offers commuters a more efficient, reliable alternative to expensive private transport, and it reduces overall fuel consumption (mitigating future demand pressure). Our recommendation is for the government to launch an initiative such as "Affordable Transport Program" funded by subsidy savings, this could include procuring new buses for intercity and urban transit, rehabilitating rail lines, and subsidizing mass transit operations in the interim. Over time, a shift from private to public transport would reduce the economy's vulnerability to high fuel costs and reduce the burden on households. Additionally, energy diversification should be part of the medium-term strategy. The dependency on PMS (petrol) in Nigeria is high for generators and vehicles. Investing in alternatives like solar mini grids, LPG (cooking gas) for households (which is more efficient and was already somewhat subsidized separately), and perhaps incentivizing electric vehicles or motorcycles in the long run, can all help cushion consumers from volatile petroleum prices. The recommendation here is for the government to allocate some savings to programs that promote renewable energy and energy efficiency for example, solar electrification projects in rural areas (so rural homes rely less on petrol generators for electricity) or converting public buses to CNG (compressed natural gas) which Nigeria has in abundance. Such diversification would enhance energy security and align with global sustainability goals.

4. Phased Implementation and Timing: Although Nigeria removed the subsidy in one go in 2023, the recommendation for any future price adjustments or for other countries is to consider a phased or gradual approach when politically feasible. A phased removal e.g., removing, say, 25% of the subsidy each quarter over a year can spread out the price shock and inflation spike, making it easier for households and businesses to adjust. It also gives time to roll out compensatory measures in tandem. However, one must weigh this against the risk of reform reversal (a gradual approach can be derailed mid-way by opposition). If done gradually, it is vital to pre-announce the schedule of price increases and stick to it, to shape expectations. The timing of reforms should ideally coincide with favorable external conditions such as relatively low world oil prices or a stable exchange rate, which minimize the domestic price increase needed. For Nigeria, coordinating subsidy removal with monetary policy (to avoid excessive money supply growth) can help contain secondary inflation. The 2023 case was challenging because it coincided with high inflation and currency adjustments, but going forward, if further adjustments are needed (for example, to a market-based pricing mechanism), choosing a period of stable or declining global oil prices will ease the transition for consumers. In essence, while the opportunity was taken in 2023, maintaining a rule-based pricing mechanism is key so that subsidies do not creep back. We recommend that Nigeria now adopt an automatic fuel price adjustment formula (perhaps adjusting monthly) that reflects international prices and exchange rates, with no return to fixed prices. This would institutionalize the reform. If oil prices spike, instead of reinstating subsidies, the government can use targeted relief (as recommended) or modest temporary tax reductions if absolutely necessary, but not a blanket subsidy.

5. Strengthen Institutional Framework and Communication: On a governance level, strengthening the institutions that handle downstream petroleum is important. With subsidy removal, the role of the Nigerian National Petroleum Company (NNPC) and regulatory agencies changes, they must ensure a competitive market to prevent profiteering and collusion among fuel importers or marketers that could keep prices artificially high. Encouraging new entrants in fuel importation and distribution will improve supply and possibly prices. Regulatory bodies should monitor fuel quality and prevent supply hoarding. The government should also clearly communicate that price increases are due to the end of subsidies and international factors, to manage public expectations. A continuous communication strategy is recommended, much like Indonesia's and India's campaigns during their reforms. This includes public outreach campaigns explaining why subsidy removal was necessary (e.g., showing that 70% of benefits went to richer people or smugglers), how the savings are being spent for the public good, and acknowledging people's pain while showcasing mitigation efforts. Engaging with community leaders, labor unions, and civil society ahead of and during the reform implementation is also crucial, these stakeholders can either facilitate or hinder acceptance. The government should involve them in oversight committees for the subsidy savings fund or in monitoring service delivery improvements. Such inclusive governance can build broader buy in.

6. Continuous Monitoring and Social Impact Assessment: Finally, we recommend instituting a mechanism for continuous monitoring of the reform's impact. This could take the form of quarterly social impact assessments by an independent agency or think tank, using data on prices, household consumption, poverty rates, and feedback from citizens. If the data show, for example, that food inflation is soaring beyond expectations or that certain vulnerable groups (e.g., persons with disabilities or remote rural communities) are disproportionately hurt, the government can fine tune its mitigation policies (like increasing transfer amounts or expanding coverage). Having a feedback loop ensures that unintended consequences are caught early and addressed, which in turn can prevent public disillusionment. Over a couple of years, these assessments should also track how the additional fiscal space is translating into developmental outcomes are there improvements in infrastructure, health, education metrics attributable to the reallocated funds? This evidence can help reinforce the case for keeping the subsidies gone.

In summary, the policy recommendations can be encapsulated as: protect the poor (through targeted transfers and support), invest the savings in visible development benefits (especially transport and energy infrastructure), maintain transparency and rule based pricing to lock in the reform, and actively manage the political narrative and feedback process. If Nigeria follows these recommendations, it can turn the difficult decision of subsidy removal into an inflection point for sustainable and inclusive economic policy. The lessons are indeed applicable to other countries, many oil exporting nations have struggled with subsidies, and the successful reformers (like Indonesia, Iran to an extent, and recently some North African countries) have utilized combinations of these strategies.

For developing economies facing similar fiscal constraints, Nigeria's experience emphasizes that energy subsidies can be transformed from a "dead weight" on public finance into an opportunity but only if accompanied by savvy policy design that upholds social welfare. Energy pricing reform, when done right, frees up resources that can accelerate progress towards development goals (such as better infrastructure and poverty reduction), which is ultimately in service of both efficiency and equity.

Conclusion

This study set out to examine the macroeconomic impact and distributional effects of Nigeria's removal of its long-standing petroleum subsidy, and the analysis yields several key conclusions. First, the subsidy removal clearly improves Nigeria's macroeconomic fundamentals in the long run, at the cost of some short run adjustment pains. We found that eliminating the fuel subsidy leads to a substantial fiscal gain on the order of several trillion naira per year which significantly reduces the budget deficit and creates fiscal space for the government. This improvement in public finances can enhance macroeconomic stability and creditworthiness. In the medium term, if the savings are invested wisely, real GDP growth stands to benefit, making the reform a catalyst for stronger economic performance. These findings align with the principle that freeing the economy of inefficient subsidies can unleash more productive uses of resources.

However, the analysis also highlights the short run macroeconomic challenges, notably a spike in inflation. The consumer price index is projected to rise significantly due to higher fuel and transport costs, which can temporarily undermine purchasing power and potentially feed into wage demands. There is also a modest short run output loss in sectors directly affected by fuel prices. Therefore, from a stabilization perspective, careful macroeconomic management (especially by the Central Bank to contain inflation) is needed during the transition. The tradeoff here is evident: an initial inflation jumps and slight growth slowdown in exchange for improved fiscal health and potentially higher growth later.

Second, the distributional effects of the subsidy removal are pronounced and regressive in the immediate term without mitigating measures. While it is true that fuel subsidies were regressive in benefit incidence (favoring the rich), their removal acts like a price shock tax that weighs more heavily (proportionally) on poor and middle-income households. The poorest Nigerians, who already spend a large share of income on basic necessities, face increased hardship as prices of food and transportation rise. Middle class households experience a noticeable squeeze in disposable income, as they lose what was effectively a consumer subsidy they had relied on. In contrast, the richest households, though losing the largest absolute subsidy amounts, are least affected relative to their income. This outcome underscores a critical point: without compensation, subsidy removal can exacerbate poverty and inequality in the short run. Our simulation suggested potentially several percentage points increase in the poverty rate absent any interventions, a result that would be socially and politically undesirable.

Third, despite these challenges, the research demonstrates that with appropriate compensatory policies, the negative social impacts can be mitigated, allowing the country to enjoy net gains from the reform. Targeted cash transfers to low income groups, for instance, can substantially offset the welfare losses of those groups at a fraction of the fiscal cost of the subsidy. In essence, it is possible to convert an untargeted subsidy into targeted assistance and development programs that achieve better outcomes than artificially cheap fuel. The conclusion here is that fuel subsidy removal need not be a zero-sum game pitting fiscal benefits against social welfare; smart policy design can create a win-win whereby fiscal savings are redirected to protect and even uplift the vulnerable, thus combining efficiency with equity.

From a policy standpoint, the sequence and implementation of reforms are crucial. Nigeria's 2023 subsidy removal should ideally be accompanied by rapid deployment of palliatives (which the government has started, e.g., discussing cash transfers and other measures) to preempt a surge in hardship. Effective communication and transparency in the use of funds will determine public acceptance. The study's findings reinforce that people are more likely to accept short term pain if they see clear evidence of long-term gain for example, new infrastructure, jobs, or direct support emerging from the reform dividend. In the absence of such evidence, skepticism and opposition could rise, possibly endangering the continuity of the reform. Thus, one of the concluding recommendations is that Nigerian authorities must institutionalize mechanisms (like the subsidy savings fund and public reporting suggested) to ensure the reform's benefits are tangible and sustained.

Additionally, the analysis suggests some lessons for other developing countries. Many countries in Africa, Asia, and the Middle East face similar tradeoffs with fuel subsidies. The Nigerian case illustrates both the peril of inaction (runaway fiscal costs, smuggling, under investment in public goods) and the pitfalls of poorly managed action (public backlash if done without cushioning). The experiences of countries like Indonesia, Iran, and Egypt, as cited in the literature review, coupled with Nigeria's own journey, converge on a common insight: subsidy reforms are more likely to succeed if they are planned with social impacts in mind, phased appropriately, and embedded in a broader strategy of improving governance and public service delivery.

In conclusion, Nigeria's removal of the petroleum subsidy in 2023 marks a pivotal policy shift with far reaching implications. The major findings of this research can be summarized as follows: In the short term, subsidy removal is inflationary and has a contractionary effect on certain sectors and household real incomes (especially for the poor), underscoring the need for compensatory measures. In the long term, the reform is fiscally and economically beneficial, potentially bolstering growth and development if savings are well utilized. The distribution of impacts is uneven, which

makes the case for targeted interventions to ensure the reform does not deepen inequality or poverty. Political economy factors (public trust, transparency, credible commitment to use savings wisely) are as important as the economic factors in determining the reform's success.

For Nigeria, the petroleum subsidy removal can be a turning point away from a fiscally unsustainable path toward a more resilient economic future. But this will only hold true if the government follows through with balanced reform sequencing and continuous monitoring of social impacts. The reform should be seen not as an end, but as the beginning of a new social compact: one where government resources are redirected from inefficient subsidies to investments in people and infrastructure, and where citizens are partners in monitoring and ensuring that outcome. This research contributes to that vision by quantifying the stakes and stressing the dual importance of macroeconomic prudence and social equity. Ultimately, the success of Nigeria's subsidy removal will be measured not just by the amount of budgetary savings, but by how those savings are transformed into improved wellbeing for the Nigerian population. If managed correctly, Nigeria's experience could stand as an example for other nations grappling with the subsidy dilemma, illustrating that with courage, planning, and compassion, energy reforms can both stabilize economies and advance social progress.

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