

Does Subsidy Removal Hurt The Poor?

*An Analysis Of the Impacts of Petroleum Subsidy
Removal On Poverty and Income Distribution in Nigeria*

A Proposal for the SAGA/SISERA Program

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1.INTRODUCTION AND PROBLEM STATEMENT

The study proposes to examine an aspect of Nigeria's energy policy that can have appreciable effects on its poverty alleviation drive: the pricing and subsidizing of petroleum products. Nigeria is rich but its people are poor (World Bank [1996]). This irony has made it imperative to assess the poverty implications of the government's activities. A greater urgency should be brought into this issue as the population of poor people is almost steadily growing: between 1980 and 1996 the population of poor people (living below the poverty line) doubled from 33% [18 million] to 66% [66 million] of the population. (DFID [2000]). Recent United Nations and Federal Government estimates for the year 2000 suggest that as at 2000 the trend had not changed. Furthermore, the severity of poverty more than doubled from .08 in 1980 to .207 in 1996. (Federal Office of Statistics [1999]). Thus the unfortunate trend of rapidly growing population of poor people is further exacerbated by the worsening of the conditions of living of poor people i.e. the poor are becoming poorer than they used to be.

The above measures refer to income poverty. Consumption poverty has also been on the increase. Between 1980 and 1996 real per capita private consumption grew at a very low annual mean of 1%. This growth rate does not take into account the inequality of income distribution which worsened almost linearly from 36.4% in 1980 to 5.2% in 1996.² When the growing income inequality is taken into consideration the 1% growth rate of real per capita private consumption may likely be a sizeable overestimation. It is clear that consumption poverty has been increasing as well. Poverty is caused and affected by both microeconomic and macroeconomic as well as socio cultural factors. We primarily aim to assess the possible impact of petroleum products pricing and subsidizing which has been the focus of much controversy with regard to poverty dynamics in Nigeria.

Inefficiency in the production and distribution of petroleum products and fiscal pressure on the government caused the federal government to announce that the acceptable price range for petroleum products will be reviewed periodically with strong consideration given to the financial and economic environment. The knowledge that petroleum product prices in Nigeria are relatively low compared to prices in surrounding countries has also encouraged calls for their review. The last reviews occurred in January 2002 and June 2003 with prices of all petroleum products increased. The increases in prices are achieved by removing the subsidies on both imported petroleum products as well as those produced in the country.

By doing this the twin problems of inefficiency in the sub sector and fiscal pressure are to be attended to. Subsidy removal will bring prices to an efficient level as well as make the sub sector more attractive to private local and foreign investors. Evidence from around the world has shown that government owned enterprises are not as efficient as privately owned and controlled enterprises. This has informed the view that government had better restrict its role to that of providing an enabling environment for the private sector operators to function. The gradual removal of subsidies is a step amongst many aimed at deregulating the subsector (PPPRA [2003]). Moreover the level of investment

in the sector is inadequate as the 4 refineries in the country are over aged and are able to produce only about 50% of their installed capacity and meet only about 40% of the daily 30 million litres domestic demand for petroleum products. Thus there is a need to stimulate investment in the sector. Also, the opportunity cost of subsidizing the products is substantial as the same funds can be channeled towards productive investments with long term benefits and used to avoid the government's persistent budget deficits.

The expected benefits of subsidy removal are increase in government revenue and investment and output in the sub sector as well as a possible reduction fiscal deficits and their inflationary effects.

1 Computed from Ajakaiye and Adeyeye (2001). In the absence of official statistics on consumption poverty, this serves as rough indicator of the level of consumption poverty. With the almost steady increase in income poverty the very low growth rate more likely than not means consumption poverty has been on the increase.

2 Measured by Aigbokan (1998) as the ratio of wage compensation to capitalist income in national income. Considering that wages account for a large fraction of the income of the poor as labour is their main asset (World Bank[2001], Agenor[2003]), this serves as a good proxy for income distribution between the rich and the poor.

These expectations, in as much as they are beneficial, are welcome as any policy to improve one or more sectors of the economy is needed as Nigerians have been experiencing declining average well being i.e. poverty measures. These envisaged benefits are sectoral and macroeconomic in nature. In a similar way previous studies on petroleum pricing in Nigeria focused on the macroeconomic effects. However, the failure of the Top-down approach has questioned the expected transmission of macroeconomic benefits to the household level and consequently their eventual effect on household poverty. Macroeconomic benefits therefore do not automatically lead to reductions in poverty level. While macroeconomic indicators look good, poverty indicators may be moving in the opposite direction.

Presently it is important to assess developments from a perspective of their macroeconomic as well as poverty impacts. The millennium development goals have been endorsed by Nigeria and Globally. These goals have poverty reduction as their focus. Moreover with Nigeria's recent, and hopefully, final freedom from Military rule there is a social need for the present government to deliver 'democracy dividends' in the country's new 4th republic. For the majority of the citizenry this translates into an expectation of tangible improvements in visible welfare indices for example the affordability of basic products and necessities. The implementation of such a 'gradual deregulation' of the petroleum sub sector therefore brings up certain issues pertinent to the country's drive towards growth with poverty reduction: Can we sufficiently monitor the impacts of this chosen pattern of efficiency-through-deregulation? Can we follow paths that minimize possible adverse effects? With cautious optimism the preceding questions can be answered in the affirmative. Certain pertinent questions arise from the above issues:

1. In spite of the possible positive macroeconomic effects, will the increases lead to higher poverty rates? What role will these increases play in the dynamics of poverty in Nigeria? Which socioeconomic groups and sectors will be most affected? Unless this is known it is plausible that as gradual subsidy removal is achieved other unanticipated adverse socioeconomic effects will follow. A strategic economy wide view of the subsidy removal is needed.
2. The price changes may lead to inflation, reduce sectoral labour income and sectoral growth (in some sectors) and reduce national growth. (Adenikinju [2000], Choucri and Lahiri [1984]). If they lead to inflation there will be a need for monetary management authorities to anticipate this. However, can policies such as government expenditure level and composition – e.g. increased expenditure on infrastructure Vs increased expenditure on transfers control be used to anticipate any adverse effects of the increases? By varying the composition of expenditure, government can carefully aim at using the increased total revenue arising from the subsidy removal to target expenditure compositions which can best counter negative effects in

particular and poverty in general. This will go a long way in carrying out the increases in ways that minimize or avoid the adverse effects.

These questions have to be answered in order to design a price deregulation process that does not end up being well intended *yet* having a negative net-effect in real terms on the welfare of the majority of Nigerians. This can be done by anticipating both the positive and negative impacts so that the former are consolidated and the later countered with appropriate policy. The study hopes to provide a basis for this by providing insights into the impacts.

2.OBJECTIVES OF THE RESEARCH

The specific objectives of the research are:

1. To investigate the effects of the changes in prices of the petroleum products: 'fuel' (premium motor spirit), Kerosene and diesel on income distribution and poverty levels of different socioeconomic groups;
2. To investigate the effectiveness of government expenditure level and composition—e.g. increased transfers Vs increased expenditure on infrastructure -- control in reversing or reducing negative effects that may arise as a result of the increases.

It is hoped that the light thrown by the study will provide a useful guide to policymakers in the implementation of the subsidy removal.

3.RESEARCH ISSUE

3.1 Scientific Contribution

Previous studies concerning Nigeria's Petroleum pricing focused on the macroeconomic / sectoral effects of the price increases. However, as economic history has shown, positive macroeconomic / sectoral effects do not always 'trickle down' evenly to households—i.e. the 'common men': it is possible for an economy to simultaneously experience growth and increasing poverty. In Nigeria's case, average annual growth rate of GDP at 1984 factor cost between 1980 and 1996 was 1.13%³ yet the poverty rates P0 and P2 doubled within the same period. Similarly between 1980 and 1996 the average annual growth of real per capita private consumption was 1% without accounting for growing income inequality. Within the same period as well, real state and federal government revenue grew at an average annual growth rate of 21.6%⁴ yet income and consumption poverty have been on the increase.

Ajakaiye and Adeyeye (2001) attribute this to inadequate participation of the poor in the growth process and inadequate consideration of the country's poverty profile in the poverty reduction efforts. It is safe to infer that not only poverty reduction efforts per se require consideration of the country's poverty profile. Policy making in general will benefit from such considerations. Such considerations will eventually increase the participation of the poor in the growth process. This study aims at quantifying the possible poverty impacts of subsidy removal with a view to acquiring useful information on how it can be made pro-poor. This is beneficial as it may be possible to remove subsidies in a pro-poor rather than 'anti-poor' way. Furthermore, no study has done this for Nigeria.

The study is distinguished in the following ways: First, it directly identifies the poverty effects of the changes in energy policy. By specifying various pathways through which the policy change affects household income distribution and poverty, it is able to do this. Second because it is a microsimulation model, it is able to overcome the potentially misleading representative agent hypothesis which characterizes previous studies and thus generates more reliable results about the impacts on household poverty and income distribution. This overcomes the ambiguity caused by the representative agent assumption. Third, the processed crude oil products sector is more disaggregated to separate Kerosene, Premium motor spirit and diesel. By disaggregating the refined petroleum

products sector to separately show the 3 products it is possible to run simulations where the prices increase individually as the subsidy is removed. In this way the impacts of the 3 price increases are noted separately. This gives more information and allows for more flexibility in decision-making. Finally, it specifies the relationship between different unique compositions of government expenditure and the poverty level in the country.

3. Computed by authors from Central Bank of Nigeria [2001]

4. Computed by authors from Central Bank of Nigeria [2000]

3.2 BRIEF LITERATURE SURVEY:

Two outstanding issues in the literature are those of general versus partial equilibrium modeling and actual versus representative households in models. Before discussing these issues a definition of the term subsidy is made.

[A] Subsidy Definition: Two types of subsidy are referred to in the literature : explicit and implicit subsidy. Explicit subsidy is used in the normal sense in which subsidy is used: it is the difference between production cost and selling price. Implicit subsidy on the other hand is the type of subsidy that is observed in the exploitation of wasting assets such as crude oil. It refers to the difference between the opportunity cost of a wasting asset and the present selling price. Actually this is what is usually meant when subsidy of oil products is involved. (Adenikinju [2000] , IMF [2003]) Implicit subsidy is important because of the implications for efficiency. For pricing in the sub sector to be efficient , prices should be equal to the Marginal Opportunity cost , MOC. For the petroleum sub sector this is the border or international price of the product(Adenikinju[2001], Hossain [2003]) . This is necessary so as to compensate future generations for the irreversible extraction of the product so that a foundation for continued growth even when the petroleum resources are exhausted is laid for future generations.

In Nigeria both types of subsidies apply. The 4 refineries in the country produce about 13 million liters of refined petroleum products daily . However daily domestic consumption is 30 million liters. The government imports the shortfall of 17 million liters so as to meet daily demand. The government does not sell the imported products at their full landed cost as it subsidizes it. In June 2003 the government stated that for each liter of petroleum products , ₦12 is spent as subsidy. This implies an explicit subsidy of ₦ 74 Billion or about 1.42% of GDP. Of course changes in the international price of petroleum products and the exchange rate cause the landed cost of the products to fluctuate.

The domestic prices of petroleum products in the country are much lower than what obtains in the neighboring countries . This has led to a thriving smuggling business. This difference is partly because the crude oil for producing products for domestic consumption is sold to the local refineries at a lower price per barrel. This therefore brings down the cost of production .In 1993 for example the export price of a barrel of crude oil was \$ 15 but the local refineries bought it for \$1. In 2002 , exported crude oil was sold at \$25 per barrel while crude oil barrels for local refining was sold at \$18 to the local refineries. The other reason prices in Nigeria are much lower compared those in neighboring countries is the subsidization of imports. The end result is that there is an implicit subsidy on petroleum products which is the difference between border prices and domestic prices. Hossain [2003] calculates the 2002 subsidy to be ₦94Billion or 1.8% of GDP . As at 1992 , the prices of petroleum products in Neighboring countries were at least 700% of those in Nigeria.(

Adenikinju[2001]). Presently , the domestic prices of refined petroleum products in Nigeria are still much lower than obtains in neighboring countries. We now address 2 main issues in the literature.

[B] Partial/General Equilibrium : Because of the economy wide use of petroleum products as both consumer and producer goods in virtually all sectors and households in the economy , impacts of changes in the prices of these products can best be analyzed in a General Equilibrium framework. It affects many sectors and the ultimate effects on any one sector depends on the response of other sectors to changes in the sector in question. It has been noted that ‘ treating the energy sector in isolation of the rest of the economy could be counter productive and lead to the adoption of measures that may even have detrimental effects in the short run. An overall energy/economy strategy is required’ . (Choucri and Lahiri [1984] . In other words the “ analysis of its effects must take into account the strong two way linkage with the economy” Choucri and Lahiri [1984].

As “ the indirect effects cannot be ignored , an economy wide specification which allows for interdependence between sectors is necessary”(Tongeren [1995]). CGE models are built to account for all sectors and households (with varying degrees of aggregation) in an economy and thus allow for intersectoral interactions. In this way changes in the productive sectors and factor incomes are linked to household incomes and expenditure and thus poverty . Partial equilibrium analysis - single equation models etc which hold variables in other markets and sectors constant cannot account for the intersectoral and indirect relationships through which the price changes will affect the economy and consequently , the poverty level. As a result of this limitation , partial equilibrium models often give potentially misleading results (Sadoulet and Janvry [1995] and Robilliard and Cogneau [2001])

This limitation of partial equilibrium models has made economy wide models to be used more frequently (Dervis [1982], Bandara [1991] , Sadoulet and Janvry [1995] Robilliard and Cogneau [2001] , McCulloch et al (2001), Robinson and Devarajan [2002], Lofgren et al [2002]) . This limitation is suffered by Hope et al[1995] and Hughes (1986) who use partial equilibrium models to asses the impact of rising oil prices and fuel taxes on an economy : it has been shown that where many sectors and households are affected economy wide models best capture both direct and indirect effects of economic changes. (Dervis [1982] , Bandara[1991] , Sadoulet and Janvry [1995] Robilliard and Cogneau [2001] Robinson and Devarajan [2002], Lofgren et al [2002]) . Hope et al[1995] assesses the effects on household welfare by estimating (using demand for oil functions) the losses in consumer surplus .Thus the study, as a partial equilibrium model , establishes no links between household income and the increases . To that extent the usefulness of the results in poverty assessments is limited. Hughes’ assessment of welfare effects was done using representative households to calculate indices of horizontal equity of fuel taxes. In line with .Decaluwe et al (1999a) , Cockburn (2001) , Thurlow and Seventer (2002) Robilliard and Cogneau (2001) and Agenor [2002b] he concludes with the caveat that his conclusions on income distribution are of limited use as the analysis was based on representative households and therefore assumes that within group variance remains constant in the model. The concept of ‘representative households’ is discussed below. Another study which assesses energy price changes in a more or less partial equilibrium framework is Lewington and Weisheimer (1995) .Through descriptive analysis and survey of firms in East Germany they examine the impact of rising energy prices on the firms’ profits and the process of technological change towards higher energy efficiency They did not consider income distribution and poverty issues.

[B] Actual/Representative Households: The second issue which stands out is that of the ‘representative household’ in modeling and how useful it is for policy analysis. Using a representative household means that all the households in the economy (as in Adenikinju[2000] and Choucri and Lahiri [1984]) or different socioeconomic groups of households (as in Agenor(2000a) are represented by one household alone or one household for each group respectively. By using only one household to explore the effects on households, the ability of a model to ascertain the effects of policy changes on poverty and income distribution is strongly limited. (Decaluwe et al [1999a and b] ,

Cockburn [2001]) , Thurlow and Seventer (2002) Robilliard and Cogneau (2001, Agenor [2002b], Hughes (1986))

This is because a single household cannot capture the countrywide and within group variations in household income. This limitation is stronger in models which represent all households in an economy with one household as the assumption of constant nation wide income variance in the face of economic changes is more unrealistic than that of constant within group income variance . At best both situations assume that mean household income changes as a result of the policy changes and that within group / nationwide income variance does not change as changes occur in the model. It has been discovered that the later assumption is negated by the facts – due to the heterogeneous nature of household assets and income and expenditure pattern, the variance of household income *does* often change as a result of policy / exogenous changes

. The employment of the representative household assumption biases the results because it ignores intra (socioeconomic) group income/poverty variance which contributes more to overall income/poverty variance and therefore contributes more to the poverty level than inter group income variance (Decaluwe et al (1999a and b) , Cockburn (2001) , Thurlow and Seventer (2002) Robilliard and Cogneau (2001)Agenor [2002 b].Hughes (1986)) . As can be inferred from the above , the bias is stronger when one household represents all households in the economy. The alternative to using representative households is using actual households through data on individual households from nationwide surveys – the kinds collected by national statistical agencies . This introduction of actual households gives rise to the CGE models known as CGE Microsimulation models .

Existing General Equilibrium Microsimulation models which have , by their nature ,overcome the limitation of the representative household assumption include those of Cockburn and Robilliard and Cogneau [Cockburn (2001) , Robilliard and Cogneau (2001), Bandara(1991), Bergman and Lundgren (1990) , Robinson(1989), Thissen(1999) , Robinson and Devarajan (2002) , Decaluwe et al (1999a) , Dervis et al (1982) , Agenor et al (2002) and Thurlow and Seventer (2002)] . However none of the studies analyses energy policy or energy subsidy removal issues. Neither do they address the issue of mixes of government expenditure components or the use of fiscal policy in policy making.

While there are other studies which have addressed the issues of expenditure level , monetary policy and fiscal policy (Agenor [2000 a and b] for example considers the issue of government expenditure composition) they are limited in the sense that they operate with the single household or representative household assumption. From these studies it is not possible to conclude unambiguously what the impacts of monetary and fiscal policy , for example will be with respect to poverty incidence .

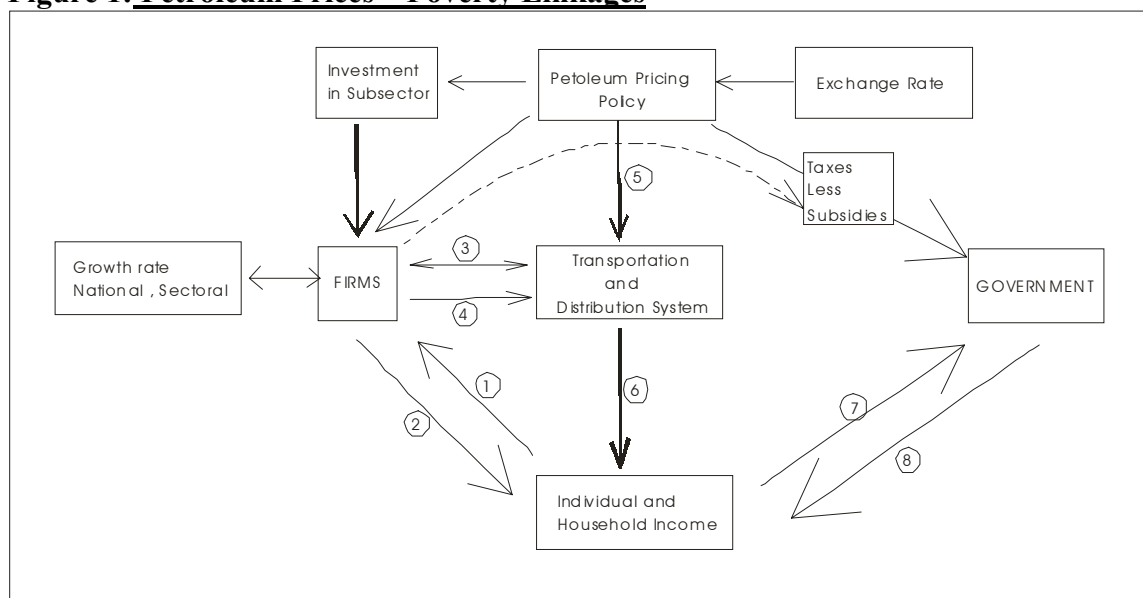
Studies which use a CGE model to asses the effects of different compositions of government expenditure are scarce as it is a fairly new approach introduced by Agenor (Agenor [2002a and b], Robinson and Devarajan [2002]). Presently we are not aware of a study that does so for the Nigerian economy. However the hypothetical analysis by Agenor (2000b) using hypothetical data and the study on brazil (Agenor [2002a])will be compared to the results of our study. All comparism will take into consideration the fact that the analysis of Brazil's economy was based on representative households and a socioeconomic setting different from that of Nigeria. Thorbecke and Jung (2001) asses the effects of government education expenditure on poverty but do not carry out a relative efficiency analysis of different compositions of government expenditure

Lofgren (1995) , Lofgren et al (2001) , Bergman (1990) , Adenikinju (2000) , Choucri and Lahiri(1984) , Bahn , O. and Frei , C. (2002) and Galinis and Leeuwen (1998) address energy policy issues in a General equilibrium framework but suffer from the limitations of the representative household assumption which , as stated earlier , gives ambiguous results whose reliability for policy making is limited. These studies pertain to Egypt , Malawi , Switzerland , Nigeria , Egypt , Sweden and Lithuania . These studies above may be discussed in the context of the diagram below which provides a framework for analyzing the impacts of petroleum pricing policy on poverty.

3 major channels account for the effects: (1) Impacts on firms (2) Impact on and off the distribution and transport system and (3) Impact on government income and expenditure. Firms are affected in three ways : firms energy bill increases for those that rely heavily on petroleum powered generators for energy ; the cost of intermediate inputs increase as a result of increased cost of transportation of individuals and goods; and increases in private investment in the sub sector are expected as it becomes more attractive. The impact on energy bills may be strong as , according to World Bank[2002] , a sizeable number of firms depend on petroleum powered generating sets for their energy supply as electricity supply is grossly inadequate and/or unreliable.

The first 2 effects on the firm translate into higher cost of doing business which will affect the cost of intermediate and finished goods. This increase in the cost of doing business will also affect the output level and profitability of firms as they operate within their budget constraint. In addition to private generating sets , the National Electric Power Authority (NEPA) also depends on petroleum products to carry out some of its operations so electric energy bills may also be affected. Adenikinju [2000] and Choucri and lahiri [1984] report increases in prices of almost all products as a result of petroleum price increases.

Figure 1: Petroleum Prices – Poverty Linkages



KEY:

1. Household consumption (of petroleum and other products)
2. Income (profit and wages) and employment
3. Intermediate goods
4. Finished goods
5. Impact on transportation cost
6. Finished goods for household consumption
7. Income taxes
8. Government spending (expansionary/neutral/contractionary) on infrastructure ,transfers etc

This is linked to the first 2 effects on firms. Finally the effects on the different firms behavior causes changes in the growth rate of the different sectors and GDP. The impact on growth rate is discussed below.

The second pathway through which the change in prices will affect households is the transportation and distribution network. This network is powered by Petroleum products and

consequently it has strong intersectoral linkages with the sub sector (Adenikinju [2000] , World Bank [1993]) .The existence of a strong linkage is supported by the findings of both Adenikinju[2000] and Choucri and lahiri [1984] : following a subsidy reduction the highest increases in prices are in the energy sector followed by the transport sector . As a result of this linkage , increases in the prices of the petroleum products leads to increases in passenger and goods transportation cost. If the country's railway system is functioning and well used this may not be the case. Ultimately , the increase in transportation cost results in further increase in the cost of intermediate and finished goods in addition to increases attributable to the cost of energy.

The 3rd pathway through which the change in prices affect the household is through their impact on government revenue and expenditure . Subsidy removal increases government revenue and therefore possible government expenditure . However subsidy removal also leads to lower revenue because of the slow down in growth rate which the increase in prices will cause. It has been noted that the increases lead to a slow down in growth of national income (Abel and Bernake[1992] , Adenikinju[2000] , Choucri and lahiri [1984]) Adenikinju [2000] reports a fall in real GDP due to a reduction in economic activities. This is related to limits imposed on firms by their budget constraints. Abel and Bernanke report that increases in Energy prices in the US due to external oil price shocks , led to reduced energy consumption and reduced output at given levels of capital and labour . Using labour income as an example , if unemployment results due to a reduced demand for labour , income tax will be reduced as well . In the same vein, a reduction in labour demand may also lead to downward pressure on wages. This will also lead to lower income taxes. Generally, as growth of national income is affected government tax revenue will also be affected due to changes in the tax base. On the expenditure side, Government spending on transfers , health investments etc can be increased due to greater revenue availability and this ultimately improves household welfare . If this is done without substantially increasing government expenditure it will have the advantage of not putting further pressure on aggregate demand and causing possible demand pull inflation.

Through these 3 pathways the ripple effects of the price increases reach households . What will be the effect of these rising prices? The answer is analogous to those of events that take place after trade liberalization : The direct effect of a trade liberalization [subsidy removal] will be to change prices . The effect of a single small price change on household welfare therefore depends on whether the household is a net supplier or net demander of the good or service in question. A price rise for something you sell makes you better off ; a price rise for something you buy makes you worse off. More precisely , the effect of a small price change on household welfare is proportional to the ratio of its net supply position to its total expenditure. (McCulloch [2001]) . In other words “ variations in the prices of energy products will affect resource allocation and equity in the economy . This will work through its effects on production , prices and demand for energy and non-energy products” . Adenikinju[2000]. Although the pricing in the sector will be more efficient , the poor will pay more for energy and other products that use energy as an input. This has a negative impact as the poor are net-consumers and not net-producers of the petroleum products.

Households are affected by the effects on their income and consumption. The slow down in national and sectoral growth will affect both labour income and capitalist income and therefore total household income. This occurs through changes in the incomes of firms which cause changes in household and individual income (profits and wages) and consumption . Income poverty may therefore change as a result of the price changes if incomes change to levels below or above the poverty line. Similarly , consumption poverty may change as the size of household consumption changes . Choucri and Lahiri [1984] report a decrease in total consumption as a result of the increases Consumption will likely fall as sectoral prices rise .It is possible that notable changes in consumption of both petroleum and non – petroleum products will be made due to a rise in the prices of goods the household consumes. This may go as far as pushing consumption below the consumption poverty line. This may be the case even when income is still above the income poverty line.

Government spending can have a positive impact on individuals and households through transfers and indirectly through investment expenditure which improve the earning ability of individuals in the long

run. Also, a neutral fiscal policy is positive in the sense that government spending does not contribute to demand pull inflation. A reduction or absence of fiscal deficit will have the opposite effect of reducing prices⁷. To this extent it keeps real income at a higher level. The exchange rate and international price of petroleum products play a role as they can widen the gap between border and domestic prices as well as increase the cost of importation.⁸ However they are treated as constants so as to allow a focus on the impacts of the domestic price increases.

Most of these studies mentioned above were more focused on the macroeconomic impacts of energy pricing. This emphasis on the macro rather than meso aspects of the policy may have been due to the top-down/trickle down approach to development which believes that if the macroeconomy is stabilized the households would assuredly and almost automatically be made better off in the course of time. Hence the focus on the macro effects – growth, domestic prices etc. Economic history has shown that the trickle down approach has serious constraints which cause benefits of growth etc not to trickle down all the time and automatically.

Hence the recent interest in combined top/bottom – bottom up or Macro/Micro approach, which simultaneously liberates the potentials of households in stimulating development and guides macro

5-8: observations by anonymous reviewers

variables to desirable levels. The emphasis on the macro aspect was also, in some cases due to data inadequacy or relatively less government/public concern about the poverty effects Vis-à-vis external sector/ domestic prices effects. Because of these and possibly other reasons they did not substantially ascertain the effects of the policy on household income distribution and poverty.

Choucri and Lahiri(1984) and Adenikinju (2000) who assess the macroeconomic impacts of energy price increases in Egypt and Nigeria represent households with only 1 household. This severely limits the information that can be obtained on the impacts of the increases on poverty. Adenikinju[2000], using 1985 Data (Social Accounting Matrix) does not disaggregate households by socioeconomic criteria. Neither does the study explicitly account for poverty changes in the economy. It, like the other studies above, focused on macroeconomic impacts. He concludes that the ratio of labour income to capitalist income in national income does not decrease as a result of the increases. This tells us nothing about the post- price changes distribution of income and poverty incidence amongst households and various socioeconomic groups and therefore provides no information which can be used for targeting purposes.

While the ratio stated above may not change as a result of the increases, the heterogeneity of labour households almost ensures that within group variations in income and expenditure will cause changes in the income distribution and poverty which cannot be accounted for by representing all households in the economy by one household. (Decaluwe et al [1999a and b], Cockburn [2001], Thurlow and Seventer [2002], Robilliard and Cogneau [2001], Agenor [2002b] and Hughes[1988]) The model also does not assess the possible use of expenditure composition and level to counter possible effects. It only assesses the effects of increasing transfers to households as an ameliorative measure. It cannot therefore shed light on the relative efficiency of different compositions (Infrastructure Vs Transfers for example) in reducing the poverty level. With respect to the 3 petroleum products in question, Adenikinju does not separate them into commodities on their own (all petroleum products are treated as one composite commodity) so it is not possible to observe the relative effects of increasing their prices. This composite treatment in the model limits the amount of information available for policy making: policy making will benefit from knowing the relative individual effects of the price changes.

From the survey we note that no comprehensive assessment of the impacts of and tools for dealing with impacts of the subsidy removal on poverty has been carried out. Also, no comprehensive assessment of government expenditure composition's impact on poverty in Nigeria exists. The use of

the data and general equilibrium micro simulation model described below is aimed at addressing these issues identified above.

4 DATA REQUIREMENTS AND SOURCES:

Data will be obtained from the following sources:

1. The 1996 (or later than that) National Consumer Survey by the Federal Office of Statistics (F.O.S)
2. The 1990 (or later than that) Input-Output Matrix (by F.O.S)
3. National accounts and annual reports by the Central Bank and F. O. S.
4. The 1996 (or later than that) General Household Surveys (by F.O.S)
5. Other surveys carried out on different sectors of the economy by the Federal Office of Statistics , Nigerian Institute for Social and Economic Research (NISER) and other agencies – Manpower planning board, the Central Bank, Government agencies, Private agencies, international agencies (UNDP, WORLD BANK,ILO ,UNIDO , IMF, etc) around the country.
6. The 1990 SAM compiled by the UNDP (UNDP [1995])

All data obtained will be used to build a 2003 Social Accounting Matrix (SAM) for Nigeria mainly based on the 1990 SAM by the UNDP. SAMs are conventionally used to build internally consistent dataset that represent the functioning of an economy and can be further used data for economy wide modelling purposes (Emini (2002), Jeffrey Round (2001,2003), Marzia and Wobst (2001) , Nielson C. P. (2002), Osten and Wobst (2001) , Robilliard and Robinson (2001) and Robinson et al (1998,2000) , Pyatt and Round (1985) , Van der Mensbrugge, D. (1994)and Warr and Azis (1997).The cross entropy method for updating SAMs will be used as it provides the advantage of being flexible enough to accommodate data and prior knowledge from many sources and different time periods (Robinson et al [2000]).The method is equally ‘information-efficient’ in the sense that it uses only and all data available (Robinson et al [2000]). The cross entropy method will be used to update the UNDP SAM using surveys and reports covering 1990 to 2002 from agencies listed above. It should be noted that once constructed the SAM, which provides an economy wide database, can be used to analyze and model several poverty related issues and scenarios. For the study, data analysis will occur in 2 stages: the use of acquired data to construct a social accounting matrix and running of the model using the SAM as the database.

5. METHODOLOGY

5.1 INTRODUCTION

The study employs a comparative static CGE model for the analysis⁹. We examine 2 shocks only: (1) Explicit and Implicit Subsidy removal (2). Reallocation of government expenditure. The model has 14 sectors which account for the major product (categories) consumed by Nigerian households as recorded by the Federal Office of Statistics ’ National Consumer Survey (NCS).Some of these products will be disaggregated to arrive at the 14 products using data from the NCS ¹⁰. The list of the sectors is shown below. Actual rather than representative households are used in the model. This makes the model a micro simulation model.

Poverty and income distribution will be measured using the poverty lines of the in the “ poverty profile of Nigeria 1980-1996 (Federal office of statistics [1999]”, the FGT poverty indices and common decomposable indices of income distribution. Subsidy removal will , most notably, affect the output of sectors in the economy directly and indirectly (through intersectoral linkages) . This will in turn affect the factor earnings of households as they earn income from different factors of production in different sectors. This will ultimately affect the poverty level. The simultaneous changes in

household income and product prices will affect household consumption level and therefore household consumption poverty. To measure consumption poverty, consumption poverty lines will also be calculated in consonance with the poverty lines in the poverty profile by the Federal office of Statistics [FOS] . Other channels of impact are discussed in section 3.2. Simulations will be carried out to observe the poverty effects of reducing subsidies .

The role of both government expenditure funded by revenue ‘saved’ from subsidy removal and other revenue is analyzed in the model. This is done by observing the role of different levels and compositions of expenditure on the poverty level. To do this the model specifies the links between government investment expenditure and the poverty level. Government expenditure on, Health, education infrastructure and other infrastructure (capital) affect the capital available for production in the economy (Agenor [2003]) .

⁹ As a comparative static model, it is not “specific about the time horizon of the adjustment or how the adjustment is sequenced. In other words, the model cannot determine whether adjustment from the base to a new equilibrium occurs over any particular length of time, or whether a large part of the adjustment takes place in a particular year.” (Thurlow and Seventer [2002])

¹⁰ .See , for example , Hossain [2003] for desegregation of household expenditure to indicate kerosene expenditure using data from the National Consumer Survey .Also see World Bank [1992,1993] for examples of disaggregated estimates of petroleum products consumption.

The model also allows for a reduction of deficits with the ‘saved’ funds. By reducing deficits the pressure on aggregate demand and prices is lowered. Therefore real income may rise due to the anti-inflationary impact. This off course depends on whether the government curtails spending after removing subsidies. Simulations will be carried out to observe the poverty effects of eliminating the subsidies and increasing other non-subsidy government expenditure with alternate mixes of component parts of the later.

The model has 14 productive sectors and products (which roughly correspond to the National Consumer Survey expenditure categories), 14361 households and 6 factors of production. The households in the model are actual households in the national consumer survey (NCS) which is a nationally representative household survey. If the 1996 NCS is used (the latest NCS will be used) there will be 14,361 households. The 14 sectors and commodities are (broadly): 11 urban sectors (P) and 3 rural sectors (A_i). These are shown in detail as follows:

Urban Sectors (P)	Rural Sectors (A_i)
1. Drinks and Tobacco	1.Tradeables (AT)
2. Manufacture of household goods	2.non tradeables (AN)
3.Transportation	3. Fuel wood.
4.Other manufactures	
5.Other services	
6.Housing	
7.Manufactures – Petrol	
8. Manufactures – Kerosene	
9. Manufactures – Diesel	
10.Electricity and natural gas	
11. Government (G)	

TABLE 1: MAIN SECTORS IN THE MODEL

By introducing a large number of actual households (rather than representative – average- households) into the CGE model , we carry out a micro simulation exercise which is more reliable as it accounts for within (socioeconomic) group variations / distribution of income .Following the method of Cockburn

(2001) and Cloutier and Cockburn(2002) we allow for the calculation of the F-G-T poverty indices i.e. poverty headcount, depth and severity index and inequality indices after each simulation. Cockburn (2001) shows how a CGE Microsimulation model (CGEMM) can be used to capture the poverty effects, in terms of the F-G-T poverty indices of policy shocks in an economy. This would involve using a standard equivalence scale to convert the households into individuals and then calculating the indices. This will be done using DAD and STATA software. In effect the CGEMM allows us to obtain ‘data’ we would have obtained from surveys if we carried out another survey after subsidy removal is implemented and government expenditure compositions are changed.(see Cockburn [2001]). The 6 factors of production are land, energy, skilled labour, unskilled labour, and capital (public and private). The model’s main features are described below.

5.2 MAIN FEATURES OF THE MODEL

PRODUCTION

To account for the differences in production between rural areas and urban areas , production is broadly divided into rural and urban production. For all sectors , output is modeled using the leontiff production function which aggregates value added and intermediate inputs. Rural output consists of 2 products : tradeable (AT) and non tradeable (AN) products .Value added in the rural sector is a CES function of composite input (R_k) and unskilled labour. R_k is a CD function of public capital and land. The urban sector consists of urban private sectors (P) and a government sector (G) . Value added in the urban private sector is a CD function of labour , capital and energy. In this sector labour is a CES function of skilled and unskilled labour and capital is a CES function of private and public capital. The Value added in the government sector (G) is the same as in the urban private sector except that public capital replaces capital. Output of tradeable sectors is allocated to export and domestic markets via a CET function.

SUBSIDY

Explicit and implicit subsidies are captured in the model. Domestic consumption of petroleum products is met through importation and domestic production. Prices of imported products are subsidized up to the explicit Subsidy rate , ESR , so that final sales price of imported products are a fraction of the full cost of import . The ESR is the ratio of the explicit subsidy to the final sales price of imported products. Implicit subsidy , the difference between border price and domestic price , is bridged by the Border Price Equalizer. This is a factor which is used to multiply the domestic price and equates it to the border price .The final sales price for domestic consumption of petroleum products in the economy is the composite price amplified by the BPE. Like the ESR it is an exogenous variable. The BPE is calculated as the ratio of implicit subsidy to the final domestic prices. Border prices are exogenous in the model.¹¹ .The explicit subsidy is part of government expenditure. When the BPE is non-zero it raises the final domestic sales price to the border level and removes the implicit subsidy¹². As the domestic prices of the products increase, the profit level in the sub sector increases and government revenue through taxes increase as well.

INVESTMENT AND SAVINGS

Investment in the private sector is a function of infrastructure capital (+), inflation level (-), net returns to capital relative to the exogenous cost of capital (+) and the ratio of foreign debt service payments to tax revenue (-). Evidence exists that the last term is an important determinant of investment (Agenor [2003]). Foreign debt service payments are assumed constant and exogenous. Price increases in the petroleum subsector will increase the net returns and therefore investments in the sub sector. Also as tax revenue from the petroleum subsector increase the size of the ratio of foreign debt service payments to tax revenue will reduce and thus stimulate investment. Private capital stock is determined by initial stock plus investment.

The investment impact of increases in infrastructure capital will be observed by comparing model results before and after the shock of increasing (decreasing) public capital. Private Investment occurs only in the urban sectors.

Household and firms savings rate are adjusted by an endogenous scaling factor so as to equate total savings with investment. Government savings is determined by its revenue less expenditure. Foreign savings is endogenous. The equality of savings and investment is thus achieved through the endogenous scaling factor. This specification is a modification of some IFPRI model method of scaling the Marginal Propensity to Save in order to equate savings and investment in an investment driven fashion (Lofgren et al [2002] Thurlow and Seventer [2002])

11 Though changes in the exchange rate and international prices will change border prices and landed cost of imports, they are kept exogenous and constant so as to focus on the ripple effects of domestic changes in the prices.

12 In the model

$$P_s M_p = P M_p (1 - \text{ESR})$$

$$P_B D_P = P D_P (1 + \text{BPE})$$

For imported petroleum products, the final price of imported products is the subsidized price, $P_s M_p$. Where ESR, the subsidy rate, is the ratio of subsidy to landed cost per unit of imports and $P M_p$ is the Domestic currency price of petroleum imports.

For petroleum products, the final domestic (output) sales price ($P_B D_P$) depends on the endogenous domestic sales price ($P D_P$) and the Border price equalizer BPE. The BPE is the ratio of (Boarder price less domestic price) to domestic price. Thus when it is non-zero it serves to equalize both prices. It is an exogenous variable controlled by the government.

HOUSEHOLDS AND POVERTY

Household income is made up of (a) wages (b) profits (c) transfers and (d) other income. Using the microsimulated incomes of the 14361 households, poverty rates are measured in terms of the F-G-T indices and inequality indices. Removal of Subsidy on the energy products will ultimately affect the product market and factor markets. These in turn cause changes in the sizes of the above components of household income. Labour incomes and distributed profits in particular will change as the output in the product markets change. This is because factor incomes are based on the marginal revenue products of labour and capital. When the incomes of more households rise (fall) above (below) the income poverty line, the income poverty level (P0 or headcount) increases (decreases). Thus through household income the 2 major policy shocks in the model may affect poverty level.

Households consume 13 categories of goods and services: non-tradable rural output, housing, Kerosene, Petrol, Diesel, Electricity and natural gas, drinks and tobacco, manufactures (household goods), transportation, fuel wood, other manufactures, government output and other services. Household consumption will change as the prices of the 13 products consumed by households change. Consumption poverty will be measured in a similar way using the consumption poverty line. The expenditure categories are roughly the same as those recorded in the national consumer surveys. Household consumption of the 13 categories of products is modeled with the Linear expenditure system. Both consumption and income poverty lines will be based on the poverty lines used in the Federal Office of Statistics' "Poverty Profile of Nigeria: 1980 – 1996". Households pay income tax to the government.

LABOUR MARKET

The 2 types of workers in the model are skilled and unskilled workers. While the former are employed in the urban market alone, the latter is employed in both markets. Total supply of both workers is fixed in the model. Workers in the traded agricultural sector usually receive higher wages than workers in the non-traded agricultural sector so the 2 are modeled separately. Employment of skilled and unskilled labour in the government sector is exogenously determined. Wages serve to equate demand and supply of labour.

EXTERNAL TRADE

There are 10 exportable sectors (Drinks and Tobacco, manufactures of household goods, transportation, other manufactures, other services, Manufactures – Petrol, Manufactures – Kerosene, Manufactures – Diesel, Electricity and natural gas and traded agricultural output.(AT) There are 9 import competing sectors (Drinks and Tobacco, manufactures of household goods, transportation, other manufactures, other services, Manufactures – Petrol, Manufactures – Kerosene, Manufactures – Diesel, and non traded agricultural output.(AN).The AT sector is fully exported .Domestic consumption specification is based on the armington hypothesis . The exchange rate is an exogenous variable in the model. Exports are to be modeled using an export demand function so that demand for exports is determined by the relative price of exports and the elasticity of demand for exports

GOVERNMENT

Government revenue is made up of import taxes on the 9 imports, indirect taxes and income taxes . Total government expenditure is made up of 4 parts: Government investment expenditure and consumption expenditure (G) ; Transfers to households (T) ; interest payments and debt service payments on loans and; expenditure on explicit subsidization of imported petroleum products. G is made up of investment in infrastructure capital, health, and education and consumption expenditure . The component parts of G are determined exogenously. Government investment in education refers to education infrastructure – school buildings, facilities etc. Investment in health refers to hospitals and other related social investments. Infrastructure capital refers to roads, bridges, equipments for utilities etc.

In the model, government controls the size of the budget deficit (or government savings) by controlling its expenditure (G). It should be noted that the government has persistently experienced budget deficits since independence. The stock of public capital is a double stage CES function of infrastructure capital and (education and health capital). Government investment expenditure in these 3 areas increases their respective capital stock and therefore public capital employed in production. Increases in infrastructure capital also increase the level of investment as described above. In this way government investment expenditure has effects on the economy and household.

EQUILIBRIUM CONDITIONS

The demand for labour = supply of labour

Demand for each composite good= supply of each

Demand for exports = supply of exports

Total investment= savings

5.3 KEY EXOGENOUS VARIABLES

I_H	Investment in health
I_E	Investment in education
I_{INF}	Investment in infrastructure
G_C	Government consumption
ESR	Explicit Subsidy rate
BPE	Border Price Equalizer

5.4 POLICY EXPERIMENTS

3 Major policy scenarios are analyzed: changes in government expenditure level, reallocation of revenue increase arising from subsidy removal and reallocation of all government expenditure. Experiments 2 to 6 are carried out after subsidy removal has been effected.

[A] Changes in Government Expenditure Level:

1. Completely remove both implicit and explicit subsidy and ; .
2. Increase the level of Government expenditure by :
 - [a] Maintaining a budget deficit - Using increased revenue from subsidy removal to increase government expenditure components proportionately.
 - [b] Eliminating / reducing the budget deficit – using the increased revenue to reduce/eliminate deficit and the balance to increase expenditure components proportionately
3. Constant level of government expenditure: allocate savings to deficit reduction/elimination with no increase in government expenditure and thus allow a possible budget surplus.
4. Decrease in government expenditure: Eliminate deficit and cut all expenditure proportionately by 15% thereby allowing a budget surplus.

[B] Reallocation of Increase in Revenue :

- 5.Reduce / eliminate deficit and ;
 - a) Allocate all additional revenue to investment in infrastructure
 - b) Allocate all additional revenue to investment in health
 - c) Allocate all additional revenue to transfers

[C] Reallocation of Expenditure

6. Reduce/ eliminate deficit and allocate exogenous government expenditure such that the following ratios exist between the expenditure categories below

	Investment in infrastructure capital	Investment in health	Investment in education	In Transfers
a	4	2	2	2
b	2	4	2	2
c	2	2	4	2
d	2	2	2	4

The model analyses the poverty effects of subsidy removal by effecting changes in the prices of petroleum products. In all the above experiments , implicit subsidy is removed by setting domestic prices of petroleum products to equal border prices. Explicit subsidies are removed by setting price of imported petroleum products equal to their full landed cost. Both are carried out as set out in section 5.2. These changes affect poverty through the channels discussed in section 3.2 and 5.2. The impact of subsidy removal on poverty is identified when prices are increased and poverty and income distribution indices are calculated .

To asses the use of government expenditure level in countering possible negative effects , experiments in [A] above are carried out. Experiments [B] and [C] are carried out to asses the effects of government expenditure composition. It is expected that a reduction in the deficit will have appreciable effects on inflation. As indicated earlier, the reduction in the deficit is carried out by controlling exogenous government expenditure.

The key interest here is to ascertain : whether subsidy removal will (1) increase the national poverty level and (2) have substantially different effects on different households thus leading to some being more affected than others and ; if different government expenditure compositions and levels will have different impacts on poverty and income distribution and to note which have the greatest

positive impacts. The competing government expenditure categories are – education, health, infrastructure capital and transfers. As we run different simulations using different government expenditure compositions (i.e. budget components) the impacts on poverty and income distribution will be noted. The impacts of different compositions of all government expenditure are analyzed by varying their ratios. The removal of subsidies gives rise to more revenue due to savings from explicit subsidy removal on imported products and higher tax revenue from the higher prices arising from the removal of implicit subsidy on domestic sales of the products. The impacts of alternative uses of these increased revenue are also examined.

For each experiment, the poverty and inequality indices for the different socioeconomic groups e.g. households in the rural northern zone, households in the rural southwest zone , households in Lagos state , households in the poorest states e.g. sokoto state , households whose main income is from the other manufactures sector , transport sector etc will be calculated. In this manner impacts of subsidy removal and government expenditure level and composition changes (i.e. different relative shares of educational, health, transfers etc expenditure) on the different groups will be noted. The calculation of income distribution indices will be done using indices such as the gini index and other decomposable inequality indices.

6.EXPECTED RESULTS:

Early in 2002 when the federal government announced its intentions to increase prices the general reaction of the public was that of unbelief. When eventually the prices were increased with plans to carry out further increases the general public strongly opposed the increases. The opposition was strong enough to cause the Nigerian Labour Congress (NLC) to declare a nation wide strike that paralyzed economic activities in the country for 2 days. It was after this that negotiations, which led to a reduction in the magnitude of the planned increases, occurred. Again a further increase in 2003 was met with a popularly endorsed 10 day halt in economic activities including banking activities with violent losses lives and property . Presently the lower chamber of the legislature has resolved to prevent further increases by the executive arm of government. The interest of the NLC and the general public was basically to prevent price increases, which may cause inflation , affect production activities and consumption in the economy and increase the level of poverty in the country. The Petroleum Products Pricing Regulatory Agency (PPPRA) was cautioned to take into consideration the effects of the increases on the poor. It is hoped that the study will shed light on these effects and other indirectly but equally important effects.

It is intended that the results of the study will be published in local journals such as the Central Bank of Nigeria Economic review, The Nigerian Journal of Economic and Social Studies (published by the Nigerian Economic Society), The Nigerian Economic Summit Group (NESG) economic indicators, Journal of Economic and Social Rights (published by the Shelter Rights Initiative) , Journal of Economic Management (published by the National Center for Economic Management and Administration, NCEMA) and others as well as in foreign journals. Also, it is intended that the results will be presented in a conference on regulatory reforms and /or price deregulation in which key stakeholders will be invited to participate. These key stakeholders include appropriate officials in the Economic Policy Coordinating Committee , EPCC (office of the Vice President), Petroleum Products Pricing Regulatory Committee (PPPRC) , Federal Ministry of Finance, the Central Bank, the PRSP Team, the Budget Monitoring and Price Intelligence Unit , BMPI(office of the president) , National Poverty Eradication Programme (NAPEP), the National Planning Commission, Senate committee on the petroleum sub sector and the Nigerian Labour Congress. In addition, the results of the study will be released to some reputable periodicals that occasionally publish study findings by the World Bank etc e.g. Business day. Also, the results will be discussed in other conferences/ in-house seminars organized by other parties for example appropriate conferences and seminars organized by any of the above

named institutions or other parties concerned with poverty reduction and/or price deregulation or reform.

It is expected that the study may be used to:

- Prompt greater paying of attention in compensatory or socially protective policy design to socioeconomic groups whose incomes will be most reduced by the increases
- Prompt the authorities to pay closer attention to the use of monetary and fiscal policies to anticipate and control the inflationary, growth and poverty effects of the price increases.
- Prompt greater paying of attention in policy design to sectors whose growth will be more stunted by the increases
- Encourage research into the different ways prices could be deregulated without the negative macroeconomic and poverty effects as well as;
- Provide a recent database (Social Accounting Matrix) for the analysis of other poverty related issues in particular and economy wide analysis in general.
- Stimulate discussions on the subsidy removal's impact on poverty reduction so that this can be factored in amongst the factors that may cause increases in the poverty level.
- Provide an assessment of the relative efficiency of different compositions of government expenditure in reducing the poverty level in general and thus provide guidance on choosing expenditure compositions.

7.PROJECT TIME LINE

ACTIVITY	MONTHS
Data Acquisition and Data Analysis – SAM construction : updating of the 1990 UNDP SAM ; Seminar on the SAM (in the institute)	3.5
Data Analysis - Model development and calibration; working paper on the SAM.	3.5
Execution of various tests on the model, preliminary solution of the model / interim report; Seminar on the preliminary solution (in the institute).	1.5
Solution to the variants of the model; working paper on the preliminary solution	1.5
Preparation of draft report and brain storming	1
Revision and submission of draft final report and dissemination of results in a conference; Seminar on final solution (in the institute)	1
Total	12

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