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Poverty and Growth Impacts of High Oil Prices: Evidence from Sri Lanka

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Abstract

The "twin shocks" of rising food and oil prices in 2007 and 2008 caused negative impacts on developing countries in terms of poverty reduction and economic growth. Many analysts believe that a similar crisis is looming on the horizon after the world food price index hit the 2008 peak in December last year and the oil price in the UK reached the price level it had two years ago in January 2011. However, there is a limited body of empirical evidence available from developing countries on the impact of high oil prices on growth in general and household poverty in particular. In this study, Sri Lanka is used as a case study and a computable general equilibrium (CGE) approach is adopted as an analytical framework to explore the growth and poverty impacts of high oil prices. The preliminary results suggest that urban low income households are the group most adversely affected by high global oil prices, followed by low income rural households. In contrast, estate low income households are the least affected out of all low income households. The energy intensive manufacturing sector and services sector are affected most compared to the agricultural sector.

JEL classification: C68; Q43; I32

Keywords: – poverty, oil prices, computable general equilibrium model, South Asia, Sri Lanka

1. Introduction

Oil and net-food importing developing countries were severely affected by food and oil price shocks in 2007 and 2008 creating negative impact on poverty, growth and inflation. Many analysts believe that these countries are currently under threat in a similar way after the rise of the world food price index to the December, 2008 peak last year and an increase in crude oil prices to a two-and-a-half-year high in March this year. Brent crude has risen by about 24 percent during the first quarter of this year.

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The sharp rise in global oil prices is likely to play a significant role in domestic energy inflation and food inflation in net energy and food importing developing countries, which would have dire consequences on household poverty. However, there is a limited body of empirical evidence available from developing countries on the impact of high oil prices on growth in general and on household poverty in particular (see for a limited number of examples Pradhan and Sahoo, 2000; Essama-Nssah *et al*., 2007; Kpodar and Djiofack, 2009; Chittiga *et al*., 2010; and Breisinger *et al*., 2010). Moreover, growth and poverty impacts are likely to be highly variable among developing countries depending on the stage of development, fiscal strength, trade openness, economic structure and the distribution of poor households.

The identification of the linkage between high oil prices and poverty in an empirical context is a complex exercise. Further complications come from the existence of different channels, which transmit impulses of oil price shocks towards individual households, and from the difficulty in isolating the high oil price impacts from impacts coming from numerous other policy induced or natural shocks. Therefore, case studies which use more comprehensive analytical frameworks such as the Computable General Equilibrium (CGE) framework would expect to shed more light onto this complex linkage between oil prices and poverty.

While the incidence of poverty varies across the globe, the South Asian region attracts more attention due to the presence of some of the world's most populated poverty-stricken countries. The region is home to approximately 43 percent of the total poor in the world. Amongst South Asian countries, Sri Lanka provides a very good case study due to a number of reasons. Firstly, it has been a net oil importing developing country throughout its history although it has called for tenders recently to explore the availability of offshore oil deposits. Therefore, Sri Lanka has been one of the hardest hit oil importing countries in the world. Secondly, Sri Lanka opened its economy to the outside world more than three decades ago in

1997 and it has been the most opened economy in South Asia. Thirdly, despite the implementation of open economic policies by successive governments, Sri Lanka still experiences a sizeable proportion of incidence of poverty, which is a major concern for the present government as alleviation of poverty has been the number one goal of the list of Millennium Development Goals (MDGs). Fourthly, the country is just recovering from nearly three decades of separatist war which ended in May 2009 and started the post-war economic development with a record 8 per cent growth in 2010. Any sharp increase in fuel prices will affect the economic recovery and reconciliation effort and would increase poverty in the war affected North and Eastern regions in the island. Finally, the link between high oil prices and poverty within the Sri Lankan context has hardly received any attention. Paying attention to this link is very important in terms of post-war growth and poverty reduction in Sri Lanka. Within the Sri Lankan context, understanding the poverty implications of the global oil price shock will be of great assistance in government policy making in general and poverty alleviation programmes in particular. Given the country had been battling a civil war for several decades until it ended in 2009, poverty has been a widespread phenomenon. Particularly, rural populations of war ravaged Northern and Eastern provinces, as well as other under developed regional areas, are engulfed with acute poverty. In this context, a global oil price shock is more likely to exacerbate this situation further as the majority of people heavily depend on oil as an energy source in terms of domestic activities and for transport.

To the best of our knowledge, no study has been carried out on this topic within an economy-wide framework to capture poverty impacts of an oil price shock in Sri Lanka. The main objective of this study is therefore to investigate the poverty and growth effects of the high oil price shock to the Sri Lankan economy and to make a useful contribution to the literature. In this study, two CGE models, the Global Trade Analysis Project (GTAP) model and a

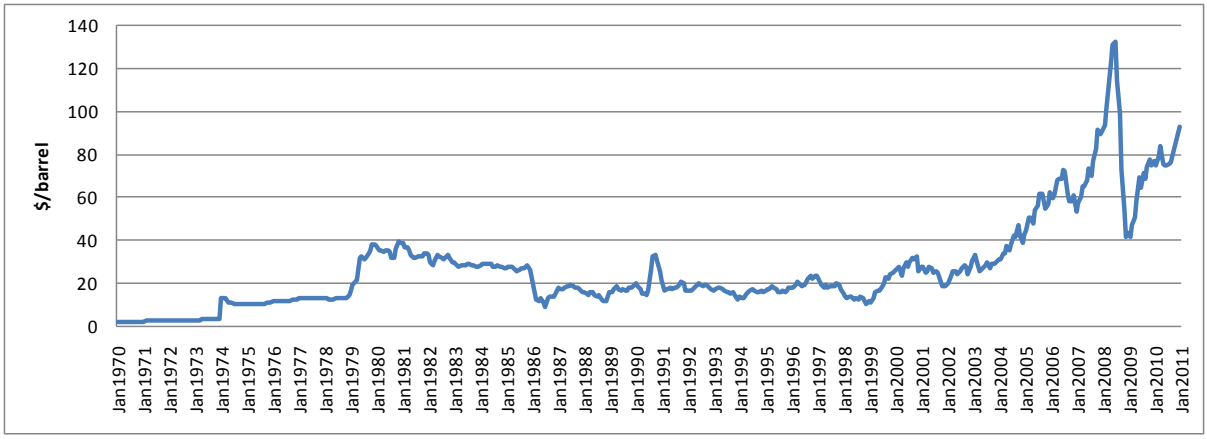
poverty-focussed Sri Lankan CGE model, are linked in the "top-down" mode to examine this linkage. Understanding the poverty impact of oil price shocks will help in designing better target and robust poverty reduction programmes in Sri Lanka as well as in other vulnerable developing countries.

The outline of the rest of the paper is as follows. Section 2 presents stylised facts on high oil prices, economic growth and poverty in Sri Lanka. Section 3 provides the details of the methodology and the database used in the study. Section 4 analyses the poverty and growth effects of the oil price shock. The final section presents concluding remarks and policy implications.

2. High oil prices, economic growth and poverty: stylised facts

The trend in global oil prices

Following the commodity price shock in 2007-2008 there was a sharp decline in global oil prices during the Global Financial Crisis (GFC) in 2008-2009. However, global oil prices have started to rise sharply in recent months as shown in Figure 1. Many observers believe that oil prices will remain high in the near future considering political unrest in a number of oil exporting countries in the Middle-East and North Africa and demand for oil from high growth economies in Asia. As mentioned in the introduction, crude oil prices hit a two-and-a-half-year high in March this year. Brent crude has risen by about 24 percent during the first quarter of this year.



Source: UNCTAD, UNCTADstat

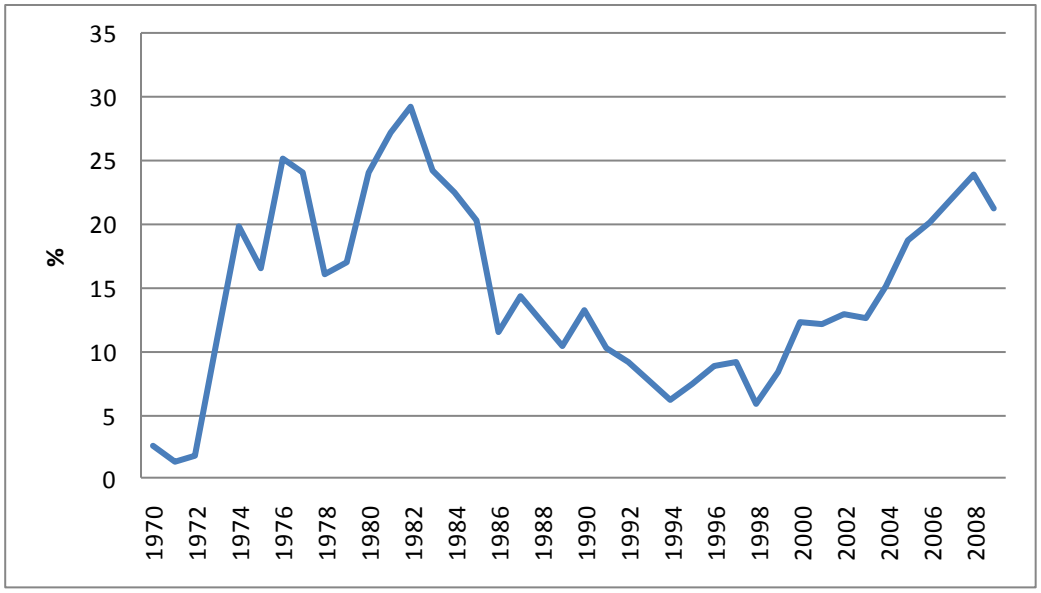
Figure 1. Annual average crude petroleum price of UK Brent (light)/Dubai (medium)/Texas (heavy) equally weighted ($/barrel)

Oil import trends in Sri Lanka

Historically, Sri Lanka has been one of the most vulnerable oil importing developing countries to high oil prices. The first oil shock in 1973 mainly contributed to an economic down turn and unprecedented level of unemployment in the mid-1970s which even led to a change in government. The second oil shock during the period of 1978-1982 also created some external and internal economic instability. The Sri Lankan economy experienced a severe external imbalance and high domestic inflation during the oil shock in 2007-2008 as well. Sri Lankan policy makers are worried about the current spike in oil prices particularly with regard to the post-war economic recovery in the country. The high cost of oil imports has been one of the main features of all episodes of oil shocks in Sri Lanka. As shown in Figure 2, the share of oil import cost in total imports has been very high during different episodes of oil price rises in the last four decades. This share has increased from a tiny 2 percent in 1972 to 22 percent in 2010 with some fluctuations with oil price shocks.

Sri Lanka's expenditure on petroleum imports increased by about 39.3 percent in 2010 (an increase in expenditure on oil imports from US$ 2.2 billion in 2009 to US$ 3 billion in 2010). The average import price of crude oil has increased from US$ 63.93 per barrel in 2009 to US$ 79.52 per barrel in 2010 with a 24.4 percent price hike (Central Bank of Sri Lanka,

2011). The sharp rise in oil prices is currently affecting the Sri Lankan economy through both external and internal balances. The oil price rise will create an external imbalance exerting pressure on external reserves and the nominal exchange rate. On the domestic front, the effects depend on whether the government is allowing a full pass-through of high oil prices to domestic users of fuels. If a full pass-through is allowed, there will be an inflationary pressure in the domestic economy. On the other hand, if the government is absorbing the high oil cost using subsidised prices, it will widen the budget deficit leading to a high debt level, higher interest rates and crowding out effects in the economy.



Source: CBSL

Figure 2. Oil imports as a percentage of total import bill in Sri Lanka

Fuel price regime and fuel subsidies in Sri Lanka

Until recently the Ceylon Petroleum Corporation in Sri Lanka had the monopoly of importing crude oil to produce refined petroleum product. It managed to meet about 50 percent of domestic needs and the rest of the demand was met by direct imports. It had the monopoly of production, imports and distribution. However, the government has allowed the private sector to engage in the oil trade recently. For example, currently the Indian Oil Company (IOC) is actively participating in importing and distributing fuel in Sri Lanka. Similar to many other

oil importing developing countries, the successive Sri Lankan governments have maintained an administered fuel price regime by cushioning the effects of high oil prices through massive subsidies. In this way, they managed to keep domestic prices below the global price level. According to recent estimates the size of the gross fuel subsidy was 2.1 percent of GDP and the net subsidy was around 0.9 percent of GDP after taking into account 1.2 percent of indirect fuel tax revenue to GDP. In 2002 a monthly pricing formula was introduced to adjust fuel prices according to global fuel price changes with a Rs. 2 cap per month. However, the scheme was short-lived and was abandoned in 2004 (see Coady, et al, 2006 for details). The pricing regime moved back to an ad hoc price policy regime.

As Duma (2008, p.11) argues "oil subsidies have long curtailed the impact of oil prices and the exchange rate on consumer prices". Although the Sri Lankan government has been reluctant to pass increases in global oil prices to local oil users similar to many other developing countries, it has recently begun to slowly pass the oil price rises to users. The government has recently realised that cushioning the high oil price effects using subsidies is not a viable option. As shown in Table 1, it is apparent that the Sri Lankan government has been adjusting administered prices in line with the changes in global oil prices in recent years. This has been confirmed by other recent studies as well (see for example, Duma, 2008). As a response to the sharp rise in oil prices in recent months, the Sri Lankan government raised fuel prices by up to 7.5 percent as a one-off increase by passing the burden of high oil prices to the users in order to offset the high cost of oil imports. According to the latest price changes, the petrol price has risen to Rs.125 per litre while diesel, which is widely used by public transport, has risen to Rs 76 per litre. This recent one-off price adjustment also demonstrates that the Sri Lankan government is passing global fuel price rises to local users. Furthermore, the Central Bank of Sri Lanka has emphasised in its latest annual report, the need for restructuring loss-making public enterprises such as the Ceylon Petroleum

Corporation. This was done to better cope with external shocks such as the sharp rise in fuel prices and to adjust prices in line with international prices (Central bank of Sri Lanka, 2011).

Table 1:

Recent price changes in administrative fuel prices in Sri Lanka

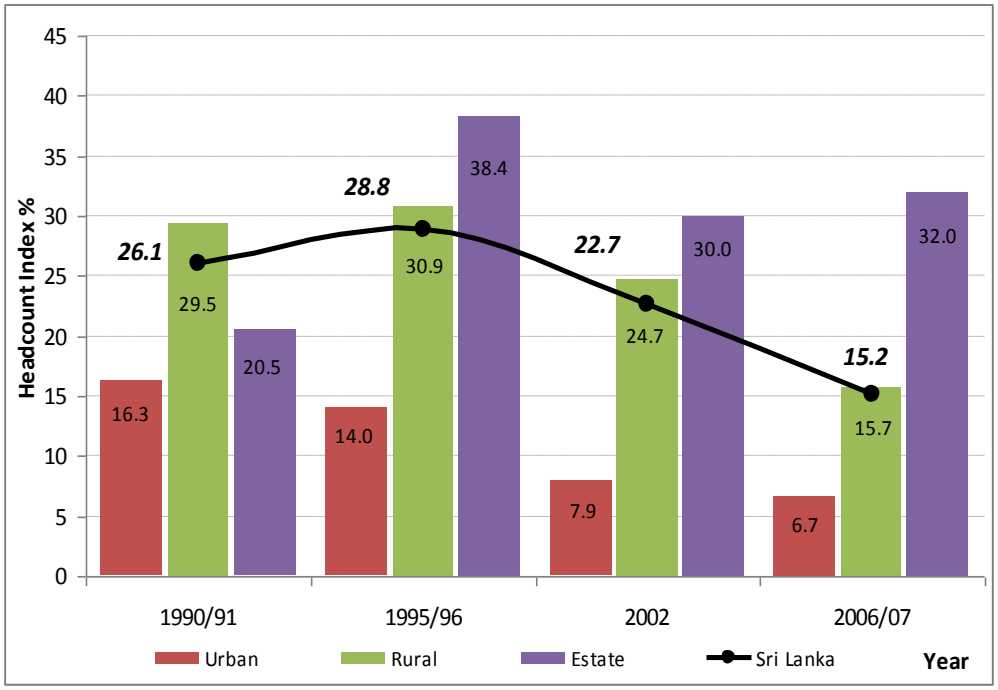
Year	Petrol (95Octane)	Petrol (90 Octane)	Auto Diesel	Kerosene
	Rs./Litre	Rs./Litre	Rs./Litre	Rs./Litre
1998	55	50	13.2	10.4
1999	53	50	13.2	10.4
2000	53	50	24.5	18.4
2001	53	50	26.5	17.4
2002	52	49	30	24
2003	56	53	32	25.5
2004	71	68	42	25.5
2005	83	80	50	30.5
2006	95	92	60	48
2007	120	117	75	68
2008	133	120	70	50
2009	133	115	73	51
2010	133	115	73	51
2011	143	125	76	61

Sources: Central Bank of Sri Lanka and Ceylon Petroleum Corporation for 2011 figures (with effect from 1st April midnight 2011)

The Poverty situation in Sri Lanka

Figure 3 illustrates recent trends in poverty in Sri Lanka. According to Figure 3, there has been a steady decline in poverty in Sri Lanka. The decline in the overall head count index of poverty has been a positive development in the country. However, it is important to highlight a number of important features related to poverty in Sri Lanka. Firstly, poverty in some sectors (such as estate and rural sectors) has still been relatively high in comparison with the decline in overall poverty. Secondly, the regional disparity in poverty reduction is a major concern in Sri Lanka. There are some backward regions in the country and poverty in some of these regions is still a problem. Although there are no proper estimations of poverty in war affected regions, anecdotal evidence suggests that poverty in those regions is much higher

than other regions in the country. Finally, a large number of people are living just above the poverty line. This has also been a main concern in recent years. For example, according to a recent report prepared for the International Labour Organisation (ILO) on "Sri Lanka's Working Poor" about a million employed Sri Lankans are poor (see Gunatilaka, 2010). In addition to people living below the poverty line, this group is vulnerable to external shocks like an oil price shock. Such a shock may easily push this group below the poverty line.



Sources: DCS (2008)

Figure 3. Poverty trends in Sri Lanka by sector

3. Modelling the poverty and growth impact of the oil price shock

As noted earlier, there are a number of channels through which rises in oil prices affect an economy and capturing such channels and effects is a complex task. The economy-wide CGE modelling framework is the most suitable tool for capturing such effects. In this study, two CGE models, the GTAP model (Hertel, 1997) and the poverty focussed Sri Lankan CGE

model (Naranpanawa, 2005) have been linked in "top down" mode to examine the linkage between high global oil prices, economic growth and poverty within Sri Lanka.

The GTAP model based on the version 7 database is used as the multi-country CGE model which captures the global impacts of high oil price shock. In order to perform policy simulations, the standard GTAP database with 57 sectors and 113 regions is aggregated to 20 regions (see Appendix Table A1) which represent Sri Lanka's main trading partners. The GTAP model based on aggregated database is used to run a simulation by first declaring world export price of oil as an exogenous variable and then implementing a shock of 100 percent increase. The GTAP model and the Sri Lankan CGE model are linked in a "top down" mode as the second step of the modelling exercise. There have been a number of studies which involve linking the GTAP model with single country CGE models. For instance, Horridge and Filho (2003) present a detailed theoretical and methodological overview of linking the GTAP model with a single country CGE model. In this study we adopt a simple method to link the two models. We exogenise the commodity level import prices and the export prices in the Sri Lankan CGE model and shock them using the endogenously generated import and export prices that Sri Lanka is facing in the GTAP model (see the GTAP results Shown in Appendix Table A2). In this linking process we adopt only a "top down" link assuming that Sri Lanka is a small country. Thus it cannot significantly affect global prices through any feedback effect.

There is a long tradition in applying CGE models to analyse policy issues in Sri Lanka (see Bandara, 1991 and Naranpanawa, 2005 for details). In this study a comparative static poverty focussed Sri Lankan CGE model is used to capture macro level, industry level and household level impacts of the high global oil price shock on the Sri Lankan economy. The theoretical structure of the core model closely follows the ORANI model (Dixon et al., 1982) with an extension to incorporate the social accounting matrix (SAM) following Horridge et al.

(1995). A SAM constructed by Naranpanawa and Bandara (2006) was used as the database in the study. There are 5 household groups in the model, namely, Urban low income households, Rural low income households, Estate low income households, Urban high income households and Rural high income households, based on their geographical location and income levels. For the details of the full model see Naranpanawa (2005).

Another important feature of this model is the attempt to endogenise the poverty line within the CGE model. As general equilibrium framework permits one to endogenise prices, the change in monetary poverty line during a simulation can be endogenised within the CGE model. A recent development introduced by Decaluwe et al. (2001) demonstrates that a basket of commodities (volume) which reflects the basic needs of average households can be defined within the CGE model. The percentage change in prices of these commodities, in turn, provides the percentage change in the monetary poverty line for different household groups. This study adopts a variant of the above approach while keeping the conceptual basis intact[2].

Moreover, the Sri Lankan poverty focussed CGE model contains a sub-model that incorporates empirically fitted functional forms of income distributions for different household groups to derive poverty indices by giving due recognition to within-group income variability. Poverty impacts are captured by feeding the household level income results into the DAD/distributional analysis software (Duclos et al., 2002) specifically developed for poverty and inequality estimations (see Figure 4 for an illustration of the linking process).

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[2] For a detailed discussion of the method see Naranpanawa (2005).

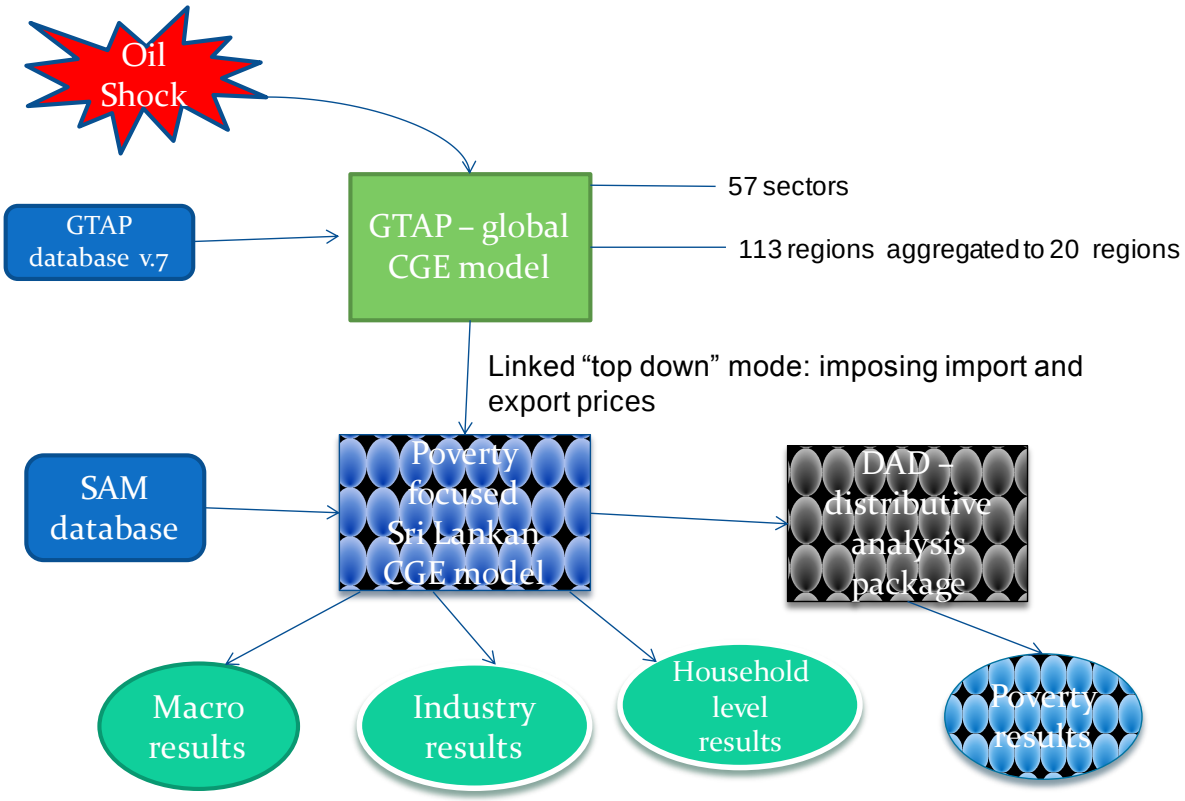

Figure 4 : Major components and the linking process of the GTAP model with poverty focussed Sri Lankan CGE model.

In order to compare the pre- and post-simulation absolute poverty, a range of poverty measurements are considered. The main measurements are the most popular money-metric poverty indices of Foster, Greer and Thorbecke (FGT) (Foster et al., 1984). The FGT Pα measure consists of a class of additively decomposable poverty measures and can be mathematically expressed as:

$$P_\alpha = \int_a^z \left(\frac{z-y}{z} \right)^\alpha dy$$

where z is the poverty line, a is the minimum income and α is the ethical parameter or poverty aversion parameter which differentiates members within the distribution. For α=0, Pα becomes the standard headcount ratio i.e., the proportion of households below the poverty line. However, Watts (1968) and Sen (1976) criticised the headcount ratio on the grounds that

it fails to capture the income distribution of the poor. For $\alpha=1$, $P\alpha$ becomes the income poverty gap in which relative importance is given to all individuals below the poverty line based on their income. In other words, it measures the average shortfall of income from the poverty line. However, this measure has a disadvantage, as it does not take the inequality among the poor into consideration. Thus, when calculating the income poverty gap it gives the same weight to those who are just below and far below the poverty line (Boccanfuso and Savard, 2001). Moreover, as Zheng (1997) pointed out, the usefulness of anti-poverty policies cannot be captured fully using the above given headcount ratio and income poverty gap. They often record those policies which lead to poverty elimination rather than poverty alleviation. In contrast, as the value for α increases, more importance is assigned to the poorest households, which measures the severity of poverty. In this study we have set $\alpha=2$, in measuring the severity of poverty.

To verify the robustness of the poverty indicators, a range of other poverty measures were computed using the percentage change in income and the poverty line generated by the CGE model, i.e., Watts index, Sen index and Clark, Hemming and Ulph's (CHU) index.

4. Assessing the effects of oil price shock on poverty and growth: Simulation results

A simulation experiment was carried out to identify the short run impact of oil price shock on macro variables, industry level variables and the household level absolute poverty. This simulation was carried out with the intention of quantifying the direction and the magnitude of the short run impact of a 100 percent increase in global oil prices (implemented in the GTAP model). As mentioned in Section 2, the Sri Lankan government pass-through high energy prices to consumers as a one-off price rise by making sure that the energy users are taking decisions on the basis of realistic fuel prices. Therefore, the current simulation can be justified even under the administered price system since the government is increasing domestic oil prices as a result of a rise in global prices.

The experiment was carried out within a short run macro environment (or closure). In the short run closure[3], all sectoral capital is exogenised and as we assume a slack labour market, the total employment is endogenised. Furthermore, balance of trade, sectoral rates of return, real investment expenditure, real private consumption and other real demands are also considered endogenous. In this simulation the nominal exchange rate, which is exogenous, is considered as the numeraire. The CGE model was solved using the GEMPACK software suite (Harrison & Pearson, 1998).

4.1 Macroeconomic and industry effects

The percentage change results of important macro variables and the poverty line over the base year values for the above simulation experiment are summarised in Table 2.

Table 2
Projections of percentage change in macro variables under high oil price shock

Macro Variable	Short-run Projection
Employment	-7.96
Real Imports	-8.45
Real Exports	2.85
Real Household Consumption	-5.55
Real GDP	-4.16
Terms of Trade	-10.10
Poverty Line	1.12

% change from the basecase

Given that Sri Lanka is a net oil importer and has less ability to substitute away from oil or oil intensive products, we could expect an increase in the oil import bill as a result of a 100 percent increase in global oil prices. In this simulation we impose not only the oil price but also all the other import prices which are affected by the high oil prices. Hence we observe a sharp decline in Sri Lanka's terms of trade, thus lowering real national income. As a result, we could observe a decline in demand for imported and domestic commodities (a 5.55

[3] The Following variables are assumed to be exogenous: agricultural land, all technological change, real wages, demand for inventories by commodity, all sales tax rates and commodity specific shifters, foreign prices of imports and exports, number of households and their consumption preferences and real unit cost of 'other cost tickets'(Production subsidies etc.)

percent drop in household consumption) and a fall in investment, leading to a reduction of real GDP by 4 percent. In this simulation we assume that government is passing the total price shock (100% increase) to the consumers, thus the fuel subsidy scheme is not going to buffer the adverse price impacts. Hence, the magnitude of the real GDP loss represents a worst case scenario. This result is consistent with a recent CGE study conducted on another net energy importing small island economy, Hawaii, where loss of gross state product was 3.7 (Coffman, 2008).

Higher oil prices in combination with associated higher import prices tend to increase cost of production leading to reduction of business profitability. In addition, this will unavoidably lead to higher inflation, which will in turn lower the purchasing power of consumers. Change of prices of basic needs commodities are given by the percentage change in the poverty line, which shows an increase of 1.12 percent, thus affecting low income households adversely. Hence, reduction of business profitability, together with a sharp decline in aggregate demand, results in a massive drop in employment of 7.96 percent.

One of the main advantages of the general equilibrium framework is its capacity to trace the sectoral implications of any policy or external shock. In terms of industry effects as a result of the oil price shock, it can be observed that high oil-intensive industries as well as high import-intensive industries are adversely affected. Industries such as *Transport*, *Trade*, *Public administration & defence*, *Fishing*, *Construction*, *Tea processing* , *Food, beverage and other textile* and *Electricity, gas and water* industries can be identified as heavily dependent on oil as an input in their cost structure. The twenty most negatively affected industries in terms of employment as a result of oil price shock are presented in Table 3.

Table 3
Projections of percentage change in industry employment under high oil price shock

20 most negatively affected industries	% change from the basecase
Chemicals and Fertilisers	-32.2
Tea Processing	-24.6
Construction	-22.8
Electricity, Gas and Water	-13.5
Transport	-12.4
Miling	-11.6
Hotels and Restaurants	-8.8
Wholesale and Retail Trade	-8.3
Paper and Paper Products	-7.9
Other Personal Services	-6.4
Rubber Processing	-5.7
Public Administration and Defence	-5.5
Post and Communication	-5.3
Tea Growing	-5.0
Garments	-4.8
Tobacco	-3.8
Non Metalic and Other Mineral Products	-3.8
Fabricated Metal Products	-3.7
Food, Beverage and Other Textiles	-3.0
Coconut Processing	-2.7

It can be observed from the negative percentage change in industry employment presented in Table 3 that the majority of industries that are adversely affected are manufacturing and service industries. In contrast, it can be observed that agricultural industries except *Tea growing* and *Tobacco*, are less affected compared to other industries.

There are eight occupation groups specified in the Sri Lankan model. Table 4 presents the percentage change in aggregate employment (persons) among different occupation groups. It is evident from the results that most negatively affected occupation categories are employed predominantly in the manufacturing and service industries (eg. *Production and related transport equipment operators & labourers, Other workers, Sales workers and Service*

workers). In contrast, agricultural workers are relatively the least affected occupation category among all occupation groups. These results are consistent with the industry effects presented in table 3.

Table 4
Projections of percentage change in aggregate employment (persons) among different occupation groups

Employment by occupations	Short-run projection
Professional, technical and related workers	-6.39
Administrative and managerial workers	-5.09
Clerical & related workers	-5.63
Sales workers	-7.74
Service workers	-6.81
Agricultural, animal husbandry, fisheries and forestry workers	-3.34
Production and related transport equipment operators & labourers	-13.47
Other workers	-11.53

4.2 Household level effects

The impact of oil price shock at the household level can be traced from the CGE results, whereas the effects on poverty could be tracked from the income distribution module and the DAD distribution analysis package. The CGE model captures the changes that occur among the occupational labour categories through the differential impacts observed at industry level and the associated derived demand for occupational labour categories (see Table 4). Similarly, the household income flows of different household groups are determined by taking into account the changes of wage income, government transfers, other transfers, gross operating surplus and other sources of household income. Furthermore, inflationary effects which would impact the purchasing power of low income households are traced through the endogenously determined poverty line within the CGE model.

As identified in Fofana (2009) there are two main channels through which external price shocks such as oil price shock could be transmitted towards households, i.e., consumption or cost of living effects and income effects. Cost of living or consumption effects can be traced

through direct effects coming from household purchase of oil or other oil products and indirect effects resulting from household purchase of other high oil-intensive goods or services. As a result of high prices, purchasing power of consumers would decline. Income effects can be traced through the factor payments. Due to high oil prices and associated import prices, many industries, particularly industries which are heavily dependent on oil or oil products as intermediate inputs and also industries which are heavily import-intensive, will have to face an increase in cost of production. Similarly, as a result of consumption effects, there will be a decline in demand for domestic and imported commodities as well as investment commodities. The overall effect would be a decline in profit margins of affected industries, which would result in a contraction of output of those industries. As a result, factor prices would fall and industries would shed labour to minimise cost of production. This will ultimately affect the household income resulting in more low income households being pushed into poverty.

In order to measure the poverty impact of high oil prices FGT poverty measures have been estimated for low income household groups. These FGT indicators are compared with the base case and the percentage changes from the base case are reported in Table 5. Thus, a positive change of the FGT index denotes an increase in absolute poverty. Furthermore, three types of FGT indices capturing headcount ratio, poverty gap and poverty severity are reported. In this simulation it can be observed that the headcount ratio, poverty gap and poverty severity are expected to increase among all low income household groups, which indicate high oil prices would exacerbate poverty among low income groups in Sri Lanka. Among all low income household groups, urban low income households showed a comparatively high incidence of poverty as a result of the price shock, where headcount ratio, poverty gap and poverty severity increased by 10, 17.3 and 16.4 percent respectively. As urban low income households are predominantly employed in the manufacturing and services

industries which are negatively affected by this price shock, decline in factor income plays a crucial role in pushing them into poverty. These results are consistent with a recent study conducted by the International Monitory Fund (IMF, 2008) on the impact of food and oil price shock, which concludes, "within countries, the urban poor are the most affected by high food and fuel prices".

The rural low income households who are predominantly employed in the agricultural sector are affected next with an increase of headcount ratio, poverty gap and poverty severity by 6, 14.2 and 14.1 percent respectively. Interestingly the least affected household group out of all low income household groups is the estate low income group who are mainly employed in the export-oriented plantation agricultural sector. However, in all three groups, the poverty gap and the poverty severity measures have been increased more than that of the headcount ratio, which indicates that extremely poor households are affected most within all three groups.

In order to evaluate the robustness of the FGT poverty measures, a range of popular poverty measures (Watts index, Sen index and CHU index) are computed, based on the changes in nominal income distributions and poverty lines generated from the CGE model (see Table 6). Interestingly, these poverty measures are consistent with the FGT poverty indicators, thus indicating that urban low income households are the group most adversely affected by high global oil prices, followed by low income rural households. In contrast, estate low income households are the least affected out of all low income households.

Table 5
FGT poverty indices

FGT Poverty Measure	Urban low income households			Rural low income households			Estate low income households		
	Before	**After**	**% Change**	**Before**	**After**	**% Change**	**Before**	**After**	**% Change**
Short-run projections									
Head count ratio ($\alpha = 0$)	0.397	0.437	**10.0**	0.506	0.537	**6.0**	0.854	0.876	**2.6**
Poverty gap ($\alpha = 1$)	0.165	0.193	**17.3**	0.216	0.247	**14.2**	0.371	0.417	**12.4**
Poverty severity ($\alpha = 2$)	0.100	0.116	**16.4**	0.133	0.151	**14.1**	0.213	0.245	**15.2**

Table 6
Poverty indices (other than FGT)

Poverty Measure	Urban low income households			Rural low income households			Estate low income households		
	Before	**After**	**% Change**	**Before**	**After**	**% Change**	**Before**	**After**	**% Change**
Short-run projections									
Watts Index	0.291	0.339	**16.5**	0.385	0.440	**14.1**	0.610	0.695	**13.9**
Sen Index	0.228	0.258	**13.3**	0.298	0.328	**10.0**	0.484	0.530	**9.4**
CHU Index (epsilon=0.5)	47.426	52.352	**10.4**	60.535	64.284	**6.2**	100.594	104.999	**4.4**

5. Conclusions and policy implications

In this study, two CGE models, the Global Trade Analysis Project (GTAP) model and a poverty-focused Sri Lankan CGE model, were linked in the "top-down" mode to examine the poverty and growth impacts of high oil prices on the Sri Lankan economy. The results suggest that in the short run, high oil prices would have an overall negative impact on Sri Lanka's economic growth and also exacerbate poverty. Furthermore, results suggest that urban low income households are the most adversely affected group followed by rural low income households who are predominantly employed in the agricultural sector. In contrast, estate low income households are the least affected out of all low income households. Moreover, energy intensive manufacturing and services sectors would be affected most compared to the agricultural sector.

The overall results suggest that it would be necessary to implement complementary policies that would ease out the burden of high oil prices on low income groups in the short run. These complementary policies should include the continuation of the currently operating fuel subsidy scheme, better targeting vulnerable low income groups. The IMF has also been advocating this argument in recent weeks (see The Island, April 5, 2011). There is a need for a proper fuel pricing policy and targeted subsidies within the context of post-war development and poverty alleviation in Sri Lanka.

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Appendix

Table A1: GTAP regions

GTAP Regions
Australia
NewZealand
Srilanka
China
India
Singapore
Malaysia
Indonesia
Thailand
Iran
Pakistan
Canada
HongKong
Korea
ROW
USA
Japan
EU
RussianFede
WestAsia

Table A2: World import and export prices for Sri Lanka determined from the GTAP model (% change from the basecase)

GTAP Commodities	World price of composit imports	Aggregate export price index
Paddy rice	-2.92	-2.76
Wheat	2	2.05
Cereal grains nec	-7.09	-1.65
Vegetables, fruit, nuts	1.47	-3.28
Oil seeds	1.95	-0.37
Sugar cane, sugar beet	-0.51	-0.48
Plant-based fibers	4.78	2.27
Crops nec	-0.39	-1.51
Cattle,sheep,goats,horses	2.35	-3.42
Animal products nec	5.12	-4.09
Raw milk	2.71	-1.65
Wool, silk-worm cocoons	1.65	1.92
Forestry	-3.44	-4.7
Fishing	1.6	-6.74
Coal	0.99	-1.45
Oil	96.09	100
Gas	-6.77	-2.74
Minerals nec	5.74	-0.04
Meat: cattle,sheep,goats,horse	1.92	-1.39
Meat products nec	4.07	-2.58
Vegetable oils and fats	2.04	-1.02
Dairy products	4.15	-1.33
Processed rice	5.27	-2.62
Sugar	4.35	-0.61
Food products nec	1.93	-0.99
Beverages and tobacco products	4.65	-2.27
Textiles	3.85	0.78
Wearing apparel	1.5	1.64
Leather products	2.6	-0.78
Wood products	4.3	1.74
Paper products, publishing	3.89	5.14
Petroleum, coal products	75.89	47.39
Chemical,rubber,plastic prods	11.35	8.77
Mineral products nec	7.84	2.91
Ferrous metals	8.77	33.09
Metals nec	3.64	11.62
Metal products	4.91	8.16
Motor vehicles and parts	3.21	4.65
Transport equipment nec	1.95	3.59
Electronic equipment	3.81	6.03
Machinery and equipment nec	4.2	5.91
Manufactures nec	3.55	5.9
Electricity	6.65	30.75
Gas manufacture, distribution	-13.58	-2.8
Water	2.88	-0.92
Construction	3.93	-1.14
Trade	3.97	-0.93
Transport nec	15.93	7.41
Sea transport	16.64	5.83
Air transport	21.04	10.85
Communication	1.86	3.72
Financial services nec	1.56	-2.84
Insurance	2.29	-2.33
Business services nec	2.48	-2.32
Recreation and other services	3.45	-0.23
PubAdmin/Defence/Health/Educat	2.14	-1.33
Dwellings	-3.48	-3.48