EXTERNAL SHOCKS AND ADJUSTMENT POLICY IN KENYA

Final Report

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by

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Contents

ABSRACT

The transmission of external shocks to the Kenyan economy has become more important over recent decades due to the economic and political reforms undertaken in Kenya that have deepened its integration into the global economy. This paper describes the impacts on Kenya's household incomes and expenditures as global food and energy prices rise. We use the MYGTAP model that differentiates six representative households based on rural-urban, and poverty characteristics. Our analysis both describes the effects of external shocks on households and explores possible roles for tariff reforms and household transfers as compensatory fiscal programs.

1.0 INTRODUCTION

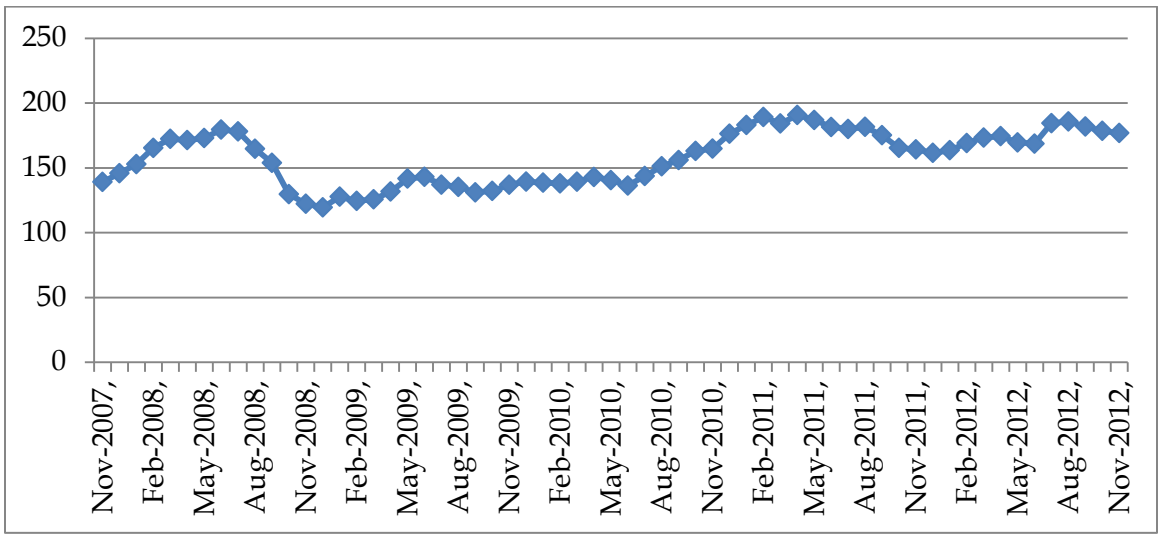
Kenya's economic growth has been both fluctuating and, at times, stagnating in the decades since its independence. This record is despite the numerous domestic and trade policy reforms undertaken by the Government to deliver the necessary and sufficient GDP growth to sustain an improvement in the living standards for the majority of Kenya's people. These reforms have increased Kenya's interconnectedness with the world economy and subsequently enhanced its vulnerability to external shocks and global economic disturbances. The erratic growth of the economy is therefore commonly attributed in part to external shocks.

Another challenge for Kenya is that poverty levels remain high with strong regional disparities in the distribution of incomes. According to the 2005/06 national household survey, the national poverty incidence stood at 46.6 per cent. In the survey, urban and rural poverty incidences were 34.4 and 49.7 per cent, respectively. The survey further showed that the lowest incidence of rural poverty was in Central province, where 30.3 percent of the population in this region earned less than one dollar a day. The incidence of poverty then climbs to 47.9 percent in Nyanza, 49.7 percent in Rift Valley, 51.1 percent in Eastern , 53.2 percent in Western, 69.7 percent in Coast, and an incredible 74 percent North Eastern province (Kenya National Bureau of Statistics, KNBS, 2007). Further, income inequality, measured by the Gini[1] coefficient was estimated at 39 percent in rural areas and 49 percent in urban areas. Income disparities in the rural areas went down between 1992 and 2006, while the disparities in the urban areas increased slightly.

This study is motivated by the growing role of external shocks in influencing the performance of the Kenyan economy and, therefore, household incomes and poverty, particularly during the dramatic increases in world food and energy prices since 2005. Two major crises have taken place in recent years, the first during 2007–08 and the second during the period 2010 - 2011 as shown in Figure 1.1. Between 2005 and 2007, the price of maize increased by 80%. Many other commodity prices also rose sharply over this period: milk powder by 90%, wheat by 70% and rice by about 25%.The recent food price hikes in 2010-2011, on the other hand, have not affected all key crops uniformly and are less severe.

[1]The Gini coefficient is a measure of inequality of income distribution—the higher the percentage the higher the level of inequality.

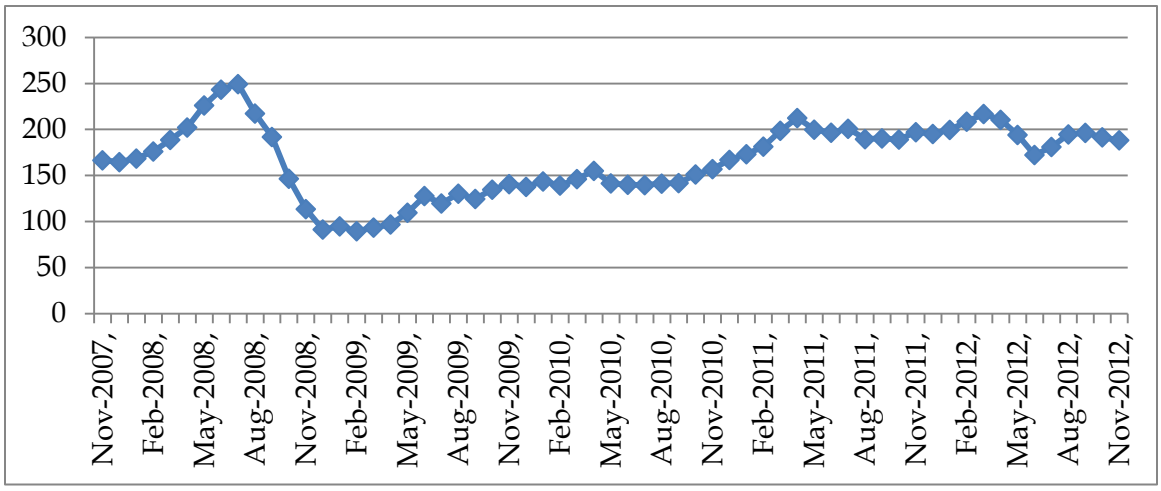
Figure 1.1: Global commodity food prices[2]



Source: IMF Databank, 2012

Similarly, crude oil prices increased from a low of $35 a barrel in late 2008 to a high of $120 a barrel in March 2012 (IMF, 2012). Since then, oil prices declined during the second quarter only to climb back during the third, albeit with some volatility as indicated in Figure 1.2 below.

Figure 1.2: Global energy prices[3]



Source: IMF Databank

Developments in the food and energy markets are interconnected, with spillover effects from energy markets into global food prices through two main channels: cost push due to the use of energy-intensive inputs such as ammonia-based

[2]Commodity food price index, 2005 = 100, includes cereal, vegetable oils, meat, seafood, sugar, bananas, and oranges price indices

[3]Commodity Fuel (energy) Index, 2005 = 100, includes Crude oil (petroleum), Natural Gas, and Coal Price Indicators

nitrogen fertilizers and demand-pull due to the diversion of crops from food to fuel production (IMF, 2012).

The relationship between external shocks and economic development in Kenya is important from multiple perspectives. First, food and energy-related products are important contributors to overall price trends. In Kenya, the two constitute the biggest weights in the consumer basket (KNBS, 2010). An increase in food and energy prices therefore reduces real incomes and household expenditures on other items, reducing the households' overall well-being.

The impacts of food and energy price shocks on poverty rates and the situation of particular households depend on various factors: income levels, the products that comprise the consumption basket, whether the households are net sellers or buyers, the share of food in total expenditure, the degree of price transmission from world markets to local markets and policy responses of governments (Cardwell and Barichello, 2008; Ivanic and Martin, 2008; World Bank, 2008).In general, poor agricultural producers may have net gains from higher food prices. For poor households who spend a bigger proportion of their incomes on food, a sharp rise in food prices increases hardship and may drive them deeper into poverty.

External shocks also have implications for the elements that are essential for macroeconomic stability, economic growth and balance of payments. According to Easterly W., et. al, (1993), external shocks are important in explaining the differences between actual and predicted growth rates and they influence policy variables and, hence, estimates of the impacts of policy.

While occurrences of externally instigated disturbances are now having greater impacts on Kenya, there is no clear understanding about how sharp rises in food and energy prices affect the living standards and conditions of various populations in Kenya. Thus, government policy responses have been rather ad hoc and generally not based on empirical evidence about the distributional consequences of such shocks. Hence, the objective of this study is to analyze the distributional effects across households that result from global food and energy price shocks. We focus on these two commodity categories because they constitute a large share of the consumer basket in Kenya.

The study uses a global computable general equilibrium model, combined with household survey data that subdivides six household categories according to their expenditure levels, and urban or rural locale. The study seeks to address the following questions:

(1) How do rising world food and energy prices affect rural and urban poor and non-poor households' incomes and expenditures in Kenya?

(2) What fiscal policy options could insulate the poor from negative effects of external food and energy price shocks?

This research is distinguished from the recent literature in three ways: First, we use MyGTAP, a new extension of the Global Trade Analysis Project (GTAP) model, which is a standard general equilibrium modeling framework designed to link global economic shocks to national economy-wide impacts. The MyGTAP model permits the disaggregation of household types, thus supporting the analysis of the distributional effects of external shocks. Second, previous studies of Kenya addressed external shocks and poverty separately. The studies on external shocks looked at the two major shocks on the Kenyan economy, namely the 1973 coffee boom and the 1979 oil crisis (Karingi and Siriwardana, 2003 and Alemayehu et al, 2005). The studies on poverty focused on the internal factors that influence poverty levels in Kenya as opposed to how external shocks influenced income distribution (Oyugi 2000; Mwabu et al, 2000).Finally, we explore the potential for two fiscal policies, trade policy reforms and household income transfers, to mitigate the effects of external price shocks.

2.0 LITERATURE REVIEW

The classical trade theories set out the basis for understanding the mechanisms through which fluctuations in the level of economic activity and prices in one country may spill-over into other economies. The Heckscher-Ohlin (H-O) model considers differences in factor endowments across trading partners as the basis for trade. According to the H-O theorem, a country has a comparative advantage in the good that intensively uses its relatively abundant factor. Building on the H-O model, Stolper and Samuelson (1941) describe the effects of a terms-of-trade shock. The Stolper-Samuelson theorem posits that an increase in the relative price of a good will increase the real return to the factor used intensively in that good, but will reduce the real return to the other factor. Hence, changes in relative world prices can have strong distributional consequences, making some people worse off and some better off (Feenstra, 2004).

In addition, international trade may reinforce or offset external shocks depending on the nature of trade between countries(Feenstra, 2004). For instance, when countries are engaged in inter-industry trade based on comparative advantage, there seems to be weak synchronization of their business cycles, so the transmission of shocks may be relatively small. In contrast, if trade is mostly intra-industry in nature - or trade in "differentiated products" - the countries' production structures tend to become similar. Greater trade integration is thus likely to strengthen synchronization and shocks in one country are likely to have greater impacts on the trading partners' economies.

Evidence of the link between trade and poverty is studied by Winters (2000). He identifies channels through which poverty might be affected by a global economic shock: (a) the consumer price and availability of goods; (b) factor prices and quantities employed; (c) government taxes and transfers influenced by changes in revenue from trade-related taxes; (d) the terms of trade and other

external shocks; (e) incentives for investment and innovation that affect long-run economic growth; (f) remittances; and (g) short-run risk and adjustment costs.

Several studies focus on the effects of global price shocks on household incomes and poverty. Arndt et al. (2008) analyze the rising impact of world fuel and food prices for rural/urban households in different regions in Mozambique. Their CGE-based analysis finds that price increases in international markets since October 2007 represent a substantial negative shock for Mozambique. In addition, a poor persons 'consumer price index (PCPI), developed for this analysis, indicates that the increase in the cost of the basket of commodities consumed by lower income households is similar to the increases registered for the average economy wide basket. Net benefit ratio analysis indicates that urban households are generally more vulnerable to food price increases, while the impact on the rural household is softened due to their net seller positions, particularly those in the middle of the income distribution.

Ivanic and Martin (2008) analyze the linkages between higher global food prices and poverty by calculating the first-order welfare changes of households covered in ten countries. These are Bolivia, Cambodia, Madagascar, Malawi, Nicaragua, Pakistan, Peru, Vietnam and Zambia. The results are mixed in the case of Pakistan. Increases in the prices of rice, dairy products and wheat by 10%, lower poverty in rural areas, but raise it in urban areas, and have very small impacts on national poverty rates. They argue that some households are net buyers and some are net sellers of the staple foods. Thus, there is the possibility that higher prices of staple foods lower poverty by raising the incomes of some poor farmers. At the same time there are adverse impacts on poor households that are net buyers of food.

Two recent studies assess the effects of world price shocks on the Kenyan economy. Karingi and Siriwardana (2003) carry out a simulation analysis using a CGE model of Kenya to study the effects of the oil price shock and the coffee boom facing Kenya in the mid-1970s. Using the Kenyan Economy General Equilibrium Model (KEGEM), the study results describe Kenyan economy's vulnerability to external shocks. Sanchez' (2011) CGE-based analysis examined the welfare effects of rising oil prices on oil-importing countries including Kenya, Bangladesh, El Salvador, Nicaragua, Tanzania, and Thailand for the period 2002-2005 and 2007-2008. According to the study, Nicaragua and Kenya were particularly affected because of their high share of oil in total imports i.e. 17 per cent and 20 per cent respectively and the transmission effects of higher production costs on the rest of the economy. Countries' trade balances deteriorated as a result of the oil price boom arising from the high import bills as well as higher production costs for exports. Finally, lower growths led to reduced demand for labour or increase in unemployment and welfare losses in the countries.

Two studies explore the effects of Kenyan policies on household incomes. Tyler and Akinboade(1992) used a CGE model to examine the allocative and distributional impact of the structural adjustment programme on the poor in Kenya. Policy simulations of devaluation, increased investment and agricultural productivity improvement are compared. The results indicated that all three policies decrease poverty, though income distribution remains stable. Semboja (1994) investigate the effects of energy taxes on the Kenyan economy. Simulations show that dramatic change in energy prices and consequent changes in domestic energy consumption generate sequential feedbacks in the production process and affect economic structures. The study results also indicate that the terms of trade deteriorate; the balance of payments deficit increases and national income falls.

Generally, the literature yields insights about the impacts of global food and energy prices in less developed and developing countries including Kenya. At the national level, changes in international prices lead to changes in demand and industry structures, and factor demands, and subsequently to changes in the terms of trade and national incomes. At the household level, changes in factor demands lead to changes in factor incomes and subsequently changes in household demands and expenditures. The effects on an economy depend on whether the country is a net supplier or consumer of energy and food products. At the household level, the impacts of food price shocks depend on whether households are net buyers or net sellers of the products.

3.0 THEORETICAL MODEL AND DATA

3.1 The MyGTAP Model

Following Walmsley and Minor, (2012), we use the MyGTAP CGE model in this analysis. The model extends the standard Global Trade Analysis Project (GTAP) CGE model of global trade, production and consumption (Hertel, 1997) to account for multiple households, multiple factors, intra-agent transfers, remittances, foreign aid and capital flows, and government fiscal balances.

In the MyGTAP model, perfectly competitive producers choose cost-minimizing inputs given the technical characteristics of production. The production function follows a constant returns to scale (CRS) technology with nested CES production functions, i.e., there is separability of primary factors from intermediate inputs. The demand for intermediate inputs is assumed to follow a Leontief formulation. This means that the elasticity of substitution is equal to zero i.e. holding output constant, prices do not influence input quantities.

Factors are assumed to be fixed in national supply and fully mobile across sectors. Demand for primary factors allows for substitution between factors. Producers demand labor and capital to the point where the marginal cost of each of these factors is equal to the corresponding marginal revenue product.

A three-stage final demand system assumes that products are differentiated by country of origin. Both final and intermediate demands for goods are satisfied by a nested composite demand function consisting of domestic output and imports by source. At the top level, private household demand in Kenya for the composite good is described by a household linear expenditure system (LES). The LES describes the minimum subsistence requirements and implies that average propensities to spend vary with income levels. The income and price elasticity parameters used in the LES differentiate between Kenya's urban and rural household preferences, and are drawn from Williamson and Shah (1981). For other regions in the model, consumer demand is described by the constant difference of elasticities (CDE) demand system assumed in the standard GTAP model. Composite demand by government and investment are described by Cobb-Douglas utility functions. At the second and third levels, a standard Armington CES aggregation function captures imperfect substitutability between imports and domestic market output, and among imports differentiated by source (Armington, 1969).

The MyGTAP model imposes equilibrium conditions that follow Walras law, i.e., all markets are in equilibrium, firms earn zero profits and households face budget constraints. In addition, the supply of particular commodities equals their demand (taking into account imports and exports); the revenue generated by a productive sector is exactly exhausted by the costs of inputs and taxes; the incomes of households are entirely used up in the consumption of goods and services, payment of taxes, transfers to other households or in savings; government revenue from direct and indirect taxes is equal to government consumption expenditure, transfers to households plus government savings; total savings (including foreign savings) equals total investment and finally the total current receipts of foreign exchange (including borrowing) equal total earnings.

Our version of the MyGTAP model employs the standard GTAP macro closure in which investment is determined by savings. Global investment flows respond to differences across countries in rates of returns, with the trade balance assumed to be endogenous. Factors are assumed to be fully employed with wages and rents adjusting to clear factor markets[4].Our model experiments adapt the model closure to specify fixed world prices in major global suppliers of energy and food products, which allows for the experiments to define changes in global energy and food prices.

[4]It is important to note that while the alternative, labour unemployment closure was not used, any upward/downward movement in wages in model results could also be interpreted as downward/upward changes in unemployment and underemployment.

3.2 Data

The initial values of the model's endogenous variables (except for factor quantities) are provided by the Social Accounting Matrix (SAM), drawn from the GTAP v8 database. The GTAP data base presents annual data for 2007 that describe 129 regions (including Kenya) and 57 sectors. It includes detailed bilateral trade, transport and protection data characterizing economic linkages among regions, and individual country input-output data bases that account for inter-sectoral linkages (Narayanan and Walmsley, 2008). For the purposes of this study, data were aggregated into 14 sectors[5]based on a mix of factors including contributions to GDP, income generation, importance in the consumer food basket and trade intensity. The global economy is aggregated into 11 regions, including Kenya, with the former defined to describe major global suppliers of food and energy products (Annex table 1).

The five factors of production in the GTAP data base are disaggregated into nine factors: land, agricultural workers, unskilled rural and urban labor, skilled labor, professional labor, agricultural and non-agricultural capital, and natural resources. Land is used only in agriculture. Agricultural capital is that capital used in food and agricultural sectors; non-agricultural capital is capital used in non-food and non-agricultural production activities. Agricultural laborers are workers employed in farming activities. Unskilled rural labor is employed in value-added food and agricultural industries; unskilled urban labor is employed in unskilled, non-agricultural occupations. Natural resources are resource endowments used in the "other agricultural and natural resource" production activity.

The GTAP Kenya data are aggregated to report GDP in 2007 from the both expenditure and income sides (Table 3.1). From the table, Kenya's 2007 GDP is $27.2 billion. Private consumption spending of $20.2 billion accounts for almost 75% of GDP, while government spending of $4.8 billion represents 18% of GDP. Kenya's current account deficit in 2007 totals $3.1 billion. Factor incomes in 2007 total $26.9 billion, while taxes account for about 12% of GDP.

[5]The 14 sectors are grains, fruits & vegetables, livestock, other agriculture, meat, vegetable oil, dairy products, other food products, beverages & tobacco, textiles & apparel, energy, other manufacturing, transport & communications, business services and other services.

Table 3.1 – Kenya macroeconomic data, 2007 ($US million)					
Consumption	Investment	Government	Exports	Imports	Total GDP
20,238	5,194	4,796	7,209	-10,271	27,166
Factor incomes	Taxes	Depreciation			
21,405	3,143	2,619			27,166
Source: GTAP v8.					

During 2007, consumers spent 66 of their budget on food items, primarily grains and fruits/vegetables (table 3.2). The "other services" sector accounted for the biggest share of non-food household spending. These services include expenditures on utilities (water, electricity), education and health. Household dependence on imports in consumption is relatively low, at 11 percent overall. However, imports account for notably large shares of household consumption of energy, vegetable oils and other manufactured products.

Key production sectors in Kenya's economy are "other services", transport and communications, and "other foods," which includes processed food products. About 12 percent of Kenyan production is exported. The export share of production is highest in "other agriculture," which includes coffee and tea, forestry, and fishing, and the other manufacturing sector.

Table 3.2 : Structure of consumption and production in Kenya

	Sector	Share in total household consumption spending	Import share of household consumption spending	Sector share in total industry value added	Export share of production
1	Grains	11.1	1.9	5.4	1.7
2	Fruits/Vegetables	18.6	2.2	4.7	13.7
3	Meat/livestock/poultry	4.8	0.4	1.3	1.3
4	Other Agriculture	8.6	5.2	8.3	39.6
5	Veg. Oils	0.5	77.8	2.6	1.0
6	Dairy	4.0	1.8	3.3	7.9
7	Other Foods	9.2	0.0	1.5	3.6
8	Beverages/Tobacco	9.2	1.9	13.1	5.0
9	Textiles/Apparel	5.2	20.3	9.3	3.7
10	Energy	3.5	56.9	0.9	21.5
11	Other Manufacturing	11.3	58.3	6.2	22.7
12	Transport/Communication	2.6	17.6	16.5	18.7
13	Business Services	4.2	7.5	8.0	3.1
14	Other Services	18.4	1.8	18.9	12.9
	Total	100.0	11.1	100.00	12.0

Sources: GTAP v8, KIHBS 2005/06, author calculations.

We disaggregate data on the single representative household in the GTAP to describe the income and expenditure of six representative households. We use data from the 2005/06 Kenya Integrated Household Budget Survey (KIHBS) survey to define six rural and urban household types, each of which comprises hardcore poor, non-hardcore poor and non-poor. Definition of households' poverty characteristics is in accordance with the KIHBS, which measures poverty based on households' consumption expenditure and the Cost-of-Basic-Needs (GBN) method (KNBS, 2007). First, a food poverty line is defined as the cost of a food basket that meets basic caloric requirements. The over-all poverty line adds the additional costs of meeting minimum non-food consumption requirements. According to the KNBS report (2007), a household is considered poor if it is unable to meet its minimum basic consumption needs. It is defined as hard core poor if its consumption levels are inadequate to meet basic food needs alone, even if all non-food consumption were foregone.

The KIHBS sampled 13,430 households over a one-year period. Results from the 2005-06 KIHBS show that 46 percent of Kenyans are absolutely poor, and 19.1 percent are hardcore poor(KNBS, 2007). The distribution of income and expenditure within each classification of households (hardcore poor, poor and non-poor) is wide. Table 3.3 reports the mean level of annual total expenditure of surveyed households, their un-weighted per-capita expenditure, and the standard deviation in per capita expenditure within each household type.

Table 3.3 – Expenditure by Kenyan households

Household	Mean household expenditure (Kenyan shillings)	Average number of Persons per household	Average per capita expenditures by household (Kenyan shillings)	Standard deviation
Rural				
Hardcore Poor	42,482.7	7	6,531.01	2,527.42
Poor	74,619.41	6	12,311.50	2,917.57
Non-poor	134,527.10	5	31,647.95	23,423.81
Urban				
Hardcore poor	61,629.68	6	10,082.83	3,857.93
Poor	105,720.10	5	21,737.95	6,047.03
Non-poor	300,608.90	4	97,172.94	37,045.25

Source: KIHBS, 2005/06.

To disaggregate the income and expenditure of the six household types in the MyGTAP model, KIHBS data are used to develop shares that are applied to data on the single GTAP household, thus preserving the equality of aggregate household income and expenditure in the original balanced GTAP database. Three types of shares are developed. KIHBS data on occupations and income by household members are used to develop sectoral labor employment shares and households' factor ownership shares. Results indicate the diversity of labor income sources, with many rural households drawing income from non-agricultural employment and some urban households receiving income from agricultural employment (tables 3.4 and 3.5). Data are not available on households' ownership of land and capital; a larger share of these returns are assumed to accrue to non-poor households relative to poor and hard-core poor households.

Table 3.4 – Sources of Kenyan household factor income, by household type, 2007

Factor income source	Rural hardcore poor	Rural poor	Rural non-poor	Urban hardcore poor	Urban poor	Urban non-poor
Land	7.9	8.1	3.6	0.0	0.0	0.0
Natural resources	0.0	0.0	0.8	0.0	0.0	0.7
Rural unskilled labor	6.3	7.6	6.7	3.5	1.2	1.8
Urban unskilled labor	2.6	10.0	14.0	58.6	47.3	20.9
Agricultural labor	33.5	25.3	24.2	2.4	3.4	1.8
Skilled labor	0.1	1.1	2.2	1.8	5.6	7.8
Professional labor	0.1	0.6	2.6	0.2	1.8	14.6
Agricultural capital	49.7	47.3	46.0	0.0	0.0	0.0
Other capital	0.0	0.0	0.0	33.5	40.6	52.5
Total factor income	100.0	100.0	100.0	100.0	100.0	100.0

Source: GTAP v8 database, KIHBS and author calculations.

Table 3.5 – Industry shares in factor employment in Kenya							
	1 Grains	**2 Frt_Veg**	**3 MeatLstk**	**4 OtherAg**	**5 VegOils**	**6 Dairy**	**7 OthFoods**
Land	18.1	38.8	18.2	15.7	0.0	9.1	0.0
Natural resources	0.0	0.0	0.0	9.3	0.0	0.0	0.0
Rural unskilled	7.0	9.9	2.8	38.2	0.0	0.0	26.3
Urban unskilled	0.1	0.1	0.1	8.5	0.0	0.0	5.9
Agriculture labor	25.5	36.3	9.5	14.3	0.0	0.0	9.9
Skilled labor	0.4	0.5	2.4	0.9	0.7	1.4	13.2
Professional labor	0.3	0.3	0.2	0.3	0.0	0.0	3.6
Agricultural capital	4.2	5.3	9.6	7.6	0.9	3.6	36.9
Non-agric. Capital	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8 BevTob	**9 TexApp**	**10 Energy**	**11 OtherMfg**	**12 TransComm**	**13 BusServ**	**14 OthServices**
Natural resources	0.0	0.0	90.7	0.0	0.0	0.0	0.0
Rural unskilled	0.0	0.0	0.0	3.9	0.0	1.4	10.6
Urban unskilled	8.5	3.6	0.0	12.8	20.7	10.0	29.7
Agriculture labor	0.0	0.0	0.0	0.0	0.0	0.0	4.4
Skilled labor	5.0	1.7	0.2	4.8	15.4	4.7	48.7
Professional labor	0.3	0.5	0.0	3.9	7.2	17.7	65.6
Agricultural capital	32.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-agric. Capital	0.0	1.4	0.2	14.6	42.4	17.2	24.2
Source: GTAP v7, KIBS 2005-06 and author calculations.							

KIHBS data on households' expenditures by commodity are summed over the households within each of the six types, to develop budget shares for each of the 14 commodities in each of the six consumption baskets (table 3.6).Notably, expenditures on food comprise a larger share of total expenditure in poor than in non-poor households, and in rural than in urban households. The value of food expenditure accounts for the value of home-produced, un-marketed foodstuffs.

Table 3.6 – Budget shares in Kenyan household expenditure (percent)

	Rural			Urban		
	Hardcore poor	Non-hardcore poor	Non-poor	Hardcore poor	Non-hardcore pool	Non-poor
Grains	24	12	12	13	10	3
Fruits/vegetables	18	19	15	14	11	5
Meat/Livestock	5	6	6	3	5	3
Other Agriculture	2	2	1	1	1	1
Vegetable oil	4	4	2	3	2	1
Dairy	8	9	7	6	5	3
Other proc. Foods	11	11	7	9	7	3
Beverages, tobacco	3	3	3	2	2	2
Textiles, apparel	6	7	11	5	6	6
Energy	4	4	4	5	6	4
Other manufacturing	4	5	5	4	4	6
Transport, communication	2	3	7	2	4	10
Business services	1	1	0	0	0	2
Other services	11	16	20	35	38	53
Total food	73	66	54	50	43	20
Total	100	100	100	100	100	100

Source: KIHBS, 2005-06

3.3 Description of Experiments

Model simulations analyze the impacts of global food and energy price shocks on Kenya's economy. We carry out four simulations: The first simulation describes an energy price shock. The second simulation shocks foreign market prices for agricultural and processed food prices. The world price shocks used in the study are of magnitudes similar to those experienced during the period 2007-

2008, and are shown in table 3.6. The price shocks are applied to Kenya's major import sources for these commodities. The last two simulations describe two policy responses: an elimination of import tariffs on food and energy, and compensating household transfer payments targeted to rural and urban hardcore poor households.

Table 3.6: World Price Scenario 2007 - 08	
Commodity	**% price increase**
1. Energy	75%
2. Fruits and vegetables	40%
3. Grains	75%
4. Meat	40%
5. Other agriculture	40%
6. Dairy	25%
7. Other foods	40%
8. Beverages	25%

Source: FAO and World Energy Outlook, 2008

4.0 STUDY FINDINGS

4.1 External Price Shock Simulations

4.1.1 Energy price shock

This simulation describes a 75 per cent increase in energy prices in the "rest of world" region, which is a large energy exporter in the global economy. This leads to a 31% increase in the domestic market price of energy in Kenya.

Results show that an increase in energy prices leads to a general cut-down in aggregate household commodity consumption, especially of energy products (table 4.1.) There are mixed impacts on industry output. When the price of imported energy rises, households consume less imports and substitute towards the cheaper domestic energy good. Thus, domestic production of energy rises by 3.42 per cent. Likewise, domestic production of vegetable oils increases due to the shift from imports towards domestic sources – in this case due to Kenya's exchange rate depreciation, which makes the imported variety relatively expensive. Manufacturing, transport/communications and other services are the most energy-intensive sectors. Output of the latter two industries falls, but other manufacturing output rises due to a 3.2 percent depreciation in the real exchange rate and an increase in the sector's exports.

Table 4.1: Change in aggregate household demand and output– energy price shock (percent change from base quantities)

Commodity	Household demand	Industry output
Grains	-1.98	-1.3
Fruits/vegetables	-1.79	-0.77
Meat/Livestock	-1.78	-0.42
Other Agriculture	-6.14	3.01
Vegetable oil	-2.8	15.55
Dairy	-3.99	-2.46
Other proc. Foods	-1.45	0.4
Beverages, tobacco	-2.64	-0.95
Textiles, apparel	-4.32	-0.63
Energy	-11.25	3.42
Other manufacturing	-4.38	4.43
Transport, communication	-4.79	-0.53
Business services	-3.43	-0.86
Other services	-4.34	-1.17

Source: Authors' calculations

The changes in returns to factors due to an energy price shock are presented in Table 4.2. Returns to all factors fall, particularly for land and natural resources. The former is used in primary agriculture and the latter used mainly in "other agriculture", which includes forestry and fishing. Wages of professionals and of skilled workers decline, reflecting their employment in the energy-intensive service sectors.

Table 4.2: Change in factor returns following price shocks

Factor	Percent change in factor return
Land	-8.54
Natural resources	-7.12
Unskilled rural labour	-1.39
Unskilled urban labor	-3.15
Agricultural workers	-3.69
Skilled labor	-3.64
Professional labor	-3.97
Agricultural capital	-3.12
Non-agricultural capital	-3.36
Source: Authors' calculations	

The changes in household incomes due to the energy price rise are presented in Table 4.3. The results indicate slightly higher reductions in urban household incomes compared to rural households, but effects are generally uniform. The urban non-poor household incomes experience the biggest declines, reflecting the relatively large decline in professional wages and skilled labour, which are primary sources of their earnings. The rural hardcore poor experience the biggest declines among rural households, reflecting the relatively large decline in agricultural wages, which is their primary source of income.

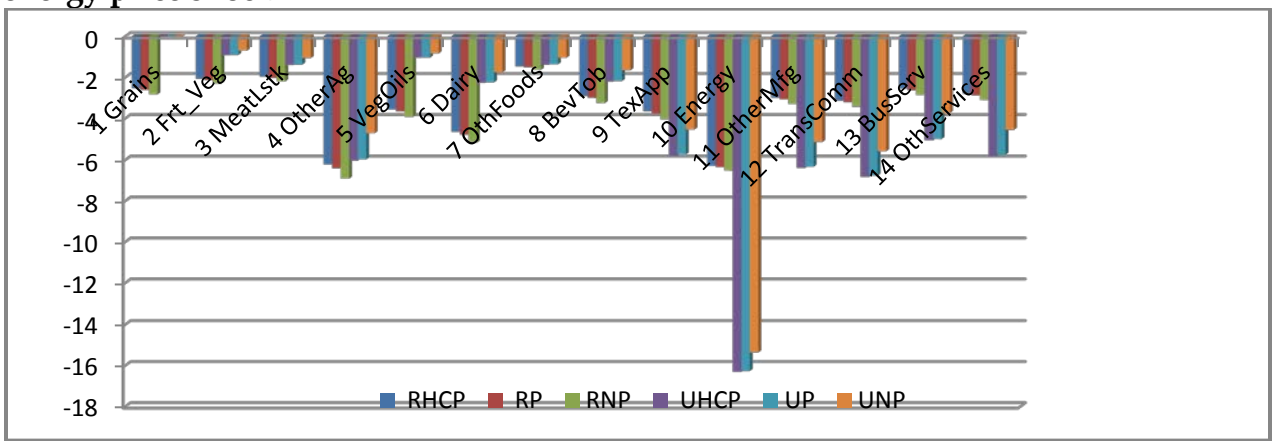
Table 4.3: Changes in household incomes – energy price shock	
Household Category	**% change from base**
Rural Hardcore Poor	-3.458
Rural Poor	-3.385
Rural Non-Poor	-3.385
Urban Hardcore Poor	-3.376
Urban Poor	-3.533
Urban Non-Poor	-3.675

Source: Authors' calculations

Figure 4.1below shows the changes in households' consumption quantities across the six household groups. The differences in the commodity impacts

across groups are fairly small, which is not surprising given that incomes fall across the board by similar amounts. However, one important difference is that among the rural households, the biggest changes occur in their consumption of other agriculture, energy and dairy , while the largest declines in consumption shares for urban households are in energy, transport services , other services and textiles. Generally, the largest reductions in food consumption occur amongst rural households, compared to urban households, while the largest reductions in non-food items occur among urban compared to rural households, reflecting the differences in their consumption bundles.

Figure 4.1: Changes in quantities consumed, by commodity and household – energy price shock



4.1.2: Agricultural and processed food price shock

This scenario describes a set of price shocks for all agricultural and processed food commodities. Price shocks described in table 4.1 are applied by fixing and shocking prices in the North American region, which is a major world exporter of agricultural products.

There are increments in household demand in all sectors except the business services and other services sectors (table 4.4). The largest increments in household demands are in dairy sector. Other sectors with notable increments in demand are vegetable oils, other agriculture grains and textiles & apparels.

Generally, increases in food prices result in increased prices and output in primary agricultural sectors. Thus, output of grains, fruits/vegetables, meat/livestock and dairy products increase. However, these products are also inputs into other sectors and higher input prices result into the decline in output of the processed food product industry. Real exchange rage appreciation of 2.7 percent also influences demand and output. The substitution toward imported vegetable oils, causes output of that product to decline. And, a decline in export

demand causes output of the export-oriented "other agriculture," and manufacturing sectors to fall.

Table 4.4: Change in aggregate household demand and output – food price shocks(percent change from base quantities)		
Commodity	**% change in household demand**	**% change in industry output**
1. Grains	1.44	3.22
2. Fruits/vegetables	0.88	1.17
3. Meat/Livestock	0.63	0.5
4. Other Agriculture	1.58	-0.12
5. Vegetable oil	1.85	-1.97
6. Dairy	2.42	2.12
7. Other proc. Foods	0.47	-0.13
8. Beverages, tobacco	1.09	0.07
9. Textiles, apparel	1.42	-0.05
10. Energy	0.2	-0.33
11. Other manufacturing	0.23	-2.06
12. Transport, communication	0.07	0.06
13. Business services	-0.4	-0.53
14. Other services	-1.12	-0.63

Source: Authors' calculations

The changes in returns to factors following food price increases are presented in table 4.5. There is a significant increase in return to land and agricultural workers, gains that are driven by the increase in demand for and production of domestic food products. In addition, returns to rural unskilled labour and natural resources are also positive. However, the real returns to skilled labour, urban unskilled labour, non-agricultural workers and professionals are negatively affected, reflecting the declines in output of the industries in which they are mainly employed.

Table 4.5: Change factor returns following food price shocks	
Factor	**% Change in real returns**
Land	9.80
Natural resources	18.84
Unskilled rural labour	3.69
Unskilled urban labor	0.26
Agricultural workers	8.62
Skilled labor	0.65
Professional labor	-0.1
Agricultural capital	4.65
Non-agricultural capital	-0.4

Source: Authors' calculations

In contrast to energy price shocks, food price shocks raise the incomes of the rural poor relative to other household types, mainly reflecting the importance of rising agricultural wages in their household incomes. The rural hardcore poor households experience the largest increase in incomes, followed by the rural poor and rural non-poor. Higher world agricultural prices generally benefit rural Kenyan households more than those of the urban households (table 4.5), reflecting the formers' position as producers and suppliers of agricultural products. However, urban households also realize marginal increments in incomes.

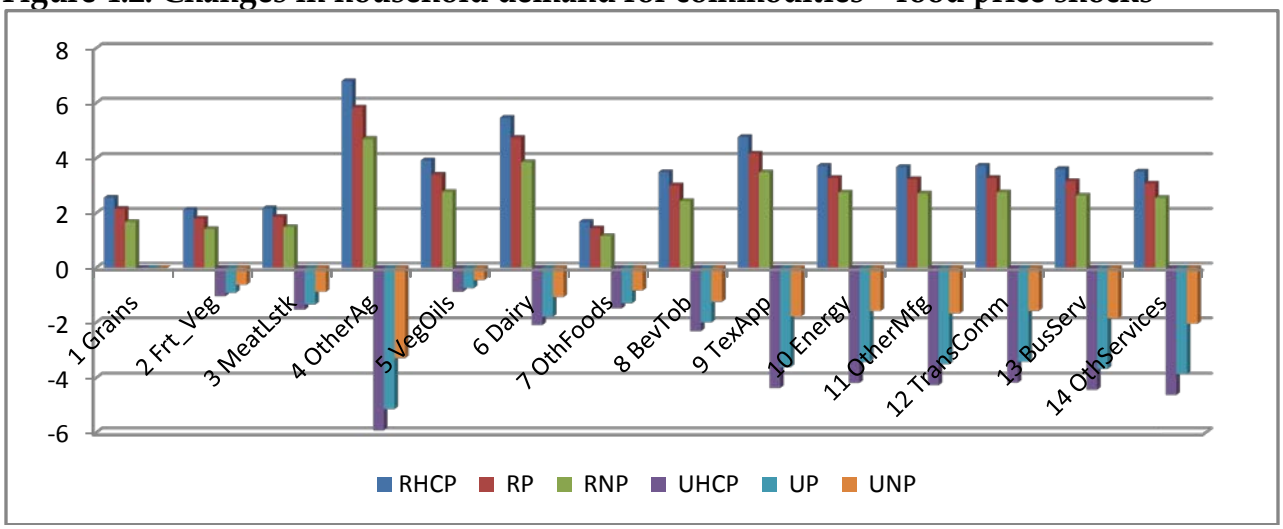
Table 4.5: Changes in household incomes – food price shock

Household Category	% Change from base
Rural Hardcore Poor	6.83
Rural Poor	6.07
Rural Non-Poor	5.40
Urban Hardcore Poor	0.39
Urban Poor	0.34
Urban Non-Poor	0.07

Source: Authors' calculations

In terms of household demand for specific commodities, the quantities demanded by urban households declined for all commodities. On the other hand, the demand rural households increased in all product categories. These results are presented in Figure 4.2 below.

Figure 4.2: Changes in household demand for commodities – food price shocks



4.2 Policy Response Simulations

In this section, we simulate two policy responses to the combined price shocks in food and energy. The first is a tariff reform scenario, in which tariffs are removed on all food and energy imports, which reduce the domestic market price of these commodities. Energy tariffs are already relatively low, averaging 3.4 percent across all import sources. Food import tariffs are comparatively high, with a low of 6 per cent on average for grain imports, and about 33% on average for dairy imports. The second policy response is the provision of transfer payments to urban hardcore poor households, and to all urban poor, that are sufficient to maintain their pre-shock level of utility[6].

The results from the first policy experiment indicate the importance role that trade policy could hold in ameliorating, although not offsetting, the effects of significant terms of trade deterioration on household consumption.

4.2.1 Elimination of food import duties and energy products tariffs

Table 4.6: Impact of price shocks plus tariff reforms on aggregate household demand (percent change from base quantities)

Product	HH demand due to combined price shocks	HH demand with price shocks plus tariff reform
Grains	-0.45	-0.33
Fruits/vegetables	-0.85	-0.56
Meat/Livestock	-1.09	-0.71
Other Agriculture	-4.41	-1.55
Vegetable oil	-0.96	0.64
Dairy	-1.52	-0.63
Other proc. Foods	-0.93	-0.45
Beverages, tobacco	-1.48	-0.83
Textiles, apparel	-2.93	-1.9
Energy	-11.14	-9.02
Other manufacturing	-4.19	-2.87
Transport, communication	-4.58	1.18
Business services	-3.71	1.34
Other services	-5.3	1.85

Source: Authors' calculations

[6] In the combined price shock scenario, rural hardcore poor and rural poor households achieve a net benefit from the rise in food prices, despite the rise in energy prices, so compensating transfers are therefore not needed.

In terms of household categories, the results indicate that overall, tariff reforms provide greater benefits to urban poor and non-poor households compared to the others, in terms of their consumption(table 4.7). Given the sizes of our assumed shocks, this results occurs because rural household incomes still rise relative to urban incomes in this scenario, due to the dominating effects of agricultural price increases relative to energy price increases. However, the removal of tariffs tends to shift demand from domestic to imported commodities, hence somewhat diminishing some of the income gains incomes to rural households.

Table 4.7: Impact of price shocks plus tariff reforms on household demand

	RHCP	RP	RNP	UHCP	UP	UNP
Grains	0.17	-0.17	-0.81	-0.01	-0.01	-0.01
Fruits/vegetables	0.18	-0.09	-0.61	-1.21	-1.12	-0.85
Meat/Livestock	0.29	0.03	-0.48	-1.8	-1.66	-1.24
Other Agriculture	1.99	1.17	-0.4	-5.99	-5.41	-3.64
Vegetable oil	2.06	1.6	0.71	-0.63	-0.53	-0.24
Dairy	1.22	0.61	-0.56	-2.44	-2.23	-1.56
Other proc. Foods	0.38	0.18	-0.2	-1.61	-1.47	-1.04
Beverages, tobacco	0.72	0.31	-0.46	-2.67	-2.44	-1.74
Textiles, apparel	0.85	0.38	-0.53	-6.27	-5.73	-4.07
Energy	-3.09	-3.37	-3.91	-15.15	-14.72	-13.43
Other manufacturing	0.42	0.06	-0.62	-6.82	-6.29	-4.65
Transport, communication	0.28	-0.08	-0.76	-7.16	-6.63	-5.01
Business services	0.9	0.53	-0.17	-5.68	-5.13	-3.45
Other services	0.62	0.26	-0.43	-6.33	-5.79	-4.14

Source: Authors' calculations

4.2.2 Government Transfers to Urban Households

The MyGTAP model solves endogenously for the size of the compensating transfer that is required to maintain the initial utility of households. The first income transfer experiment involves a transfer program limited to urban hardcore poor households, which are the most vulnerable to the food and energy price shocks. This would require a transfer program of $99.6 million dollars annually to maintain their current initial level of utility. In this experiment, there are real consumption gains by the urban hardcore poor households, as expected (table 4.8).

Table 4.8:`Impacts on household consumption due to combined price shocks and transfers to urban hardcore poor households

	RHCP	RP	RNP	UHCP	UP	UNP
Grains	0.16	0.13	0.10	0.01	-0.00	-0.00
Fruits/vegetables	0.13	0.11	0.08	1.90	-0.06	-0.05
Meat/Livestock	0.13	0.11	0.08	3.01	-0.10	-0.07
Other Agriculture	0.40	0.33	0.25	12.04	-0.38	-0.29
Vegetable oil	0.24	0.20	0.16	1.92	-0.05	-0.04
Dairy	0.32	0.27	0.21	4.67	-0.14	-0.10
Other proc. Foods	0.10	0.09	0.07	3.03	-0.09	-0.07
Beverages, tobacco	0.21	0.17	0.13	4.96	-0.15	-0.11
Textiles, apparel	0.28	0.24	0.19	11.88	-0.31	-0.21
Energy	0.15	0.13	0.10	8.84	-0.24	-0.17
Other manufacturing	0.21	0.18	0.14	11.72	-0.32	-0.22
Transport, communication	0.22	0.19	0.15	11.65	-0.29	-0.19
Business services	0.23	0.19	0.16	12.11	-0.30	-0.19
Other services	0.21	0.18	0.15	11.82	-0.30	-0.20

Source: Authors' calculations

In the second experiment, a transfer program is designed to include all urban poor. Given the sizes of the price shocks assumed in our experiments, this would require $228.6 million annually i.e. $103.2 million and $125.4 million to urban hardcore poor and urban poor households, respectively. The results indicate that transfers increase the real consumption of all household categories, except the urban non-poor whose situation worsens marginally (table 4.9).

Table 4.9:`Impacts on consumption due to combined price shocks plus transfers to all urban poor households						
	RHCP	**RP**	**RNP**	**UHCP**	**UP**	**UNP**
Grains	0.35	0.29	0.22	0.01	0.01	-0.00
Fruits/vegetables	0.28	0.24	0.18	1.88	1.75	-0.10
Meat/Livestock	0.29	0.24	0.18	2.99	2.78	-0.16
Other Agriculture	0.86	0.72	0.54	11.97	11.12	-0.64
Vegetable oil	0.51	0.44	0.34	1.92	1.78	-0.09
Dairy	0.69	0.59	0.45	4.66	4.33	-0.23
Other proc. Foods	0.22	0.19	0.14	3.02	2.80	-0.16
Beverages, tobacco	0.45	0.38	0.29	4.94	4.59	-0.25
Textiles, apparel	0.61	0.52	0.41	11.92	11.08	-0.47
Energy	0.33	0.29	0.22	8.85	8.22	-0.38
Other manufacturing	0.45	0.38	0.30	11.75	10.92	-0.48
Transport, communication	0.47	0.41	0.32	11.72	10.90	-0.42
Business services	0.49	0.43	0.34	12.18	11.33	-0.43
Other services	0.47	0.40	0.32	11.87	11.04	-0.45

Source: Authors' calculations

5.0 DISCUSSION AND POLICY IMPLICATIONS

5.1 Discussion

This study attempted to shed light on the linkages between external shocks to global energy and food prices, and their distributional effects on household incomes in Kenya. Using the MYGTAP model and the KIHBS household surveys for 2005/2006, the impacts of rising global food and energy prices among six household types were assessed.

Specific simulations using energy and food price shocks of magnitudes similar to those experienced in the mid-2000's were carried out to establish the would-be

impacts on household incomes and expenditures. In addition, policy response simulations targeting the most affected households was done to provide an indication as to the most effective measures to be undertaken by the government in dealing with possible future crisis.

The results of the energy price shocks indicate declines in income for all households, with relatively higher reductions in urban household incomes compared to rural households. The simulation results for food price shocks indicate increases in the real returns to rural unskilled labour and natural resources, while the real returns to skilled labour, urban unskilled labour and professionals are negatively affected, thereby benefitting rural relative to urban households.

Two policy responses targeting the most negatively affected households by either the food or the energy price shocks are conducted. The first is a tariff reform scenario, in which tariffs are removed on food and energy imports, which reduce the domestic market price of these commodities. The second policy response is the provision of transfer payments to urban hardcore poor households, and to all urban poor, that are sufficient to maintain their pre-shock level of utility. Under the food price shock scenario, rural hardcore poor and rural poor households achieve a net benefit from the rise in food prices, despite the rise in energy prices, so compensating transfers are therefore not needed

5.2 Policy Implications

Based on the above simulation results, the following policy measures are suggested for Kenya in dealing with external, global price shocks:-

1) Direct cash transfers targeting all urban poor households which are the most vulnerable from the simulation results. Such a programme would help to smooth inter-household differences in the impacts of price shocks and would maintain household expenditures, hence enhancing domestic demand and production in the economy. With the given price shocks assumed in our study, a transfer program limited to urban hardcore poor households, would require an estimated $99.6 million dollars annually to maintain their initial level of utility. An expansion of this program to include all urban poor would require $228.6 million annually i.e. $103.2 million and $125.4 million to urban hardcore poor and urban poor households, respectively.

2) Targeted elimination of tariffs on food and energy products. Tariff elimination would reduce consumer prices and help raise expenditures of poor households. However, caution should be taken since greater imports of food and energy products as a result of tariff elimination are also known to discourage domestic supplies and put pressure on the balance of payments.

This risk is especially critical because rural households constitute the bulk of the population below poverty.

5.3 Scope for further Research

This study has attempted to establish the impacts of external shocks on household demand amongst various household categories. However, the study has not precisely analyzed the implications of the changes in household demand on poverty levels amongst the various household. Hence, there is need for further research to establish the implications of external shocks on poverty. It is well-known that model closure assumptions directly influence model results. A sensitivity analysis of our closure rules, particularly with respect to the balance of trade and foreign investment inflows, would also be an informative extension of this research.

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ANNEXES

Annex table 1: Countries and commodities in the CGE model (US$)

	Oceania	EastAsia	SEAsia	SouthAsia	N. america	LatinAmer	EU_25	MENA	SSA	RestofWorld	Total
1 Grains	1,487.2	2,245.0	5,848.3	4,398.6	28,707.4	9,203.3	16,538.6	864.3	724.5	8,444.1	78,461.1
2 Frt_Veg	2,588.5	6,359.8	5,219.7	2,819.0	36,024.0	29,649.5	37,612.3	5,333.3	5,058.1	11,676.0	142,340.3
3 MeatLstk	11,921.6	4,716.2	2,521.2	1,373.3	23,617.6	18,339.8	62,056.4	961.1	1,640.4	4,038.3	131,185.8
4 OtherAg	7,346.8	5,457.4	11,058.4	6,812.8	15,536.0	23,407.9	34,190.8	1,667.2	13,120.5	15,333.1	133,930.9
5 VegOils	599.6	801.6	20,837.1	2,509.5	6,285.3	18,626.2	14,452.0	1,091.1	619.2	4,999.5	70,821.1
6 Dairy	8,673.5	407.6	891.1	457.4	3,214.0	2,011.8	42,871.2	565.6	278.8	4,556.4	63,927.2
7 OthFoods	5,256.0	28,605.6	24,470.2	5,444.7	36,414.9	22,592.7	128,130.1	3,919.1	7,189.5	26,551.3	288,573.9
8 BevTob	4,192.0	3,129.3	1,912.6	434.1	10,805.7	6,881.4	70,010.	619.6	1,910.0	5,526.6	105,422.0

							7				
9 TexApp	2,051.8	220,048.0	40,362.0	50,398.1	28,800.4	15,644.0	160,399.9	13,727.9	5,223.8	44,873.5	581,529.4
10 Energy	65,764.4	75,176.4	113,851.2	37,124.3	188,012.7	181,194.4	192,486.1	162,872.6	169,415.4	889,048.8	2,074,946.3
11 OtherMfg	73,975.3	2,248,977.8	538,470.2	94,228.2	1,338,227.4	209,004.8	3,715,522.8	35,730.4	82,412.9	618,050.3	8,954,599.9
12 TransComm	21,717.7	177,261.9	62,011.1	18,117.5	113,202.3	39,264.5	442,946.1	26,367.5	14,526.2	113,638.8	1,029,053.6
13 BusServ	11,218.1	100,869.9	48,600.5	50,107.1	191,396.9	26,983.8	607,067.5	12,556.0	7,578.2	103,780.1	1,160,158.2
14 OthServices	11,345.6	56,563.6	16,677.6	6,766.1	119,012.4	16,074.3	190,001.9	8,814.7	9,414.4	64,346.6	499,017.2
Total	228,138.1	2,930,620.1	892,731.2	280,990.6	2,139,257.0	618,878.3	5,714,286.3	275,090.2	319,111.9	1,914,863.3	15,313,966.9

Annex table 2: Fiscal Accounts in Kenya, 2007 ($US millions)

		REVENUES					EXPENDITURES (Subsidies)		TOTAL
		Sales Tax	Import tariffs	Export tax	Factor Use Tax	Income Tax	Production	Consumption	
1	Grains	1.2	0.8	0.0	-	-	-57.8	0.0	-55.8
2	Fruits/Vegs.	3.9	7.2	0.0	-	-	-69.9	0.0	-58.8
3	Livestock	0.1	0.1	0.0	-	-	-16.0	0.0	-15.8
4	Oth. Agriculture	1.8	7.8	3.1	-	-	-87.7	-0.3	-75.3
5	Meat	0.1	1.4	0.0	-	-	-41.1	0.0	-39.6
6	Veg. Oils	4.1	8.8	0.0	-	-	-52.3	0.0	-39.4
7	Dairy	0.0	4.5	0.0	-	-	-23.8	0.0	-19.3
8	Other Foods	0.7	109.0	0.0	-	-	-219.5	0.0	-109.8
9	Beverages/Tobacco	1.4	7.7	0.0	-	-	-120.6	0.0	-111.5
10	Textiles/Apparel	11.0	104.2	29.0			-70.0	-0.1	74.1
11	Other Mfg.	358.9	489.7	108.3	-	-	-273.1	0.0	683.8
12	Transport/Communication	4.0	0.0	0.0	-	-	-69.0	0.0	-65.0
13	Business Services	0.1	0.0	0.0	-	-	-45.7	0.0	-45.6
14	Other Services	0.8	0.0	0.0	-	-	-374.7	-3.9	-377.8
	Land	-	-	-	12.9	34.5	-	-	47.4
	Unskilled	-	-	-	196.9	1,697.0	-	-	1,893.9
	Skilled	-	-	-	55.1	475.9	-	-	531.0
	Labor	-	-	-	250.2	666.7	-	-	916.9
	Capital	-	-	-	2.6	0.0	-	-	2.6
	Land	-	-	-	-	7.0	-	-	7.0
	TOTAL	388.1	741.2	140.4	517.7	2,881.1	-1,521.2	-4.3	3,143.0