To what extent do fertiliser subsidies improve household income and reduce poverty? The case of Malawi

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Abstract

In a number of sub-Saharan African countries, farm input subsidies are currently implemented in order to stimulate farm-level fertiliser application, enhance food security, improve household income and alleviate poverty. In this paper, a computable general equilibrium (CGE) model and the Foster, Greer and Thorbecke (FGT) method are employed to explore the extent to which fertiliser subsidies improve household income and reduce poverty in Malawi. Modelling results suggest that fertiliser subsidies lead to small increases in income distribution of all agricultural households. Rural non-agricultural households experience reductions in their incomes, while there are no income changes for metro households. The results of the FGT decomposition of poverty suggest that the subsidies help to reduce income poverty for rural and urban agricultural households, as well as for urban non-agricultural households. However, the poverty situation of rural non-agricultural households worsens, while no poverty changes occur in the case of metro households.

Keywords: maize; subsidies; poverty; Malawi

1. Introduction

Several Sub-Saharan African countries are currently implementing farm input subsidies in order to stimulate farm-level fertiliser application, enhance food security, improve household income and alleviate poverty (Chibwana *et al*. 2012; Marenya *et al*. 2012). Current input subsidies in sub-Saharan Africa are widely referred to as ‘the second phase of farm input subsidies’ after a series of subsidies launched largely from the mid-1960s to the early 1980s. The second phase was initiated by Malawi’s Starter Pack Scheme (SPS), launched in 1998 (Harrigan 2008; Mapila *et al*. 2012). In 1999, the Nigerian government restarted subsidising fertiliser after stopping to do so in 1997. Zambia launched its Food Security Pack (FSP) in 2000, while Tanzania, Kenya and Ghana joined their counterparts in 2003, 2006 and 2008 respectively (Banful 2010).

The first phase of Malawi’s input subsidies occurred between 1964 and 1983. During that time, smallholder fertiliser had a price ceiling of about 25% below the commercial price of the day (Mkandawire 1999). However, subsidies for fertiliser were phased out in 1983 under the structural adjustment policies that started in 1981. The poor performance in the maize sector that followed the withdrawal of the subsidy forced the Malawi government to reintroduce the fertiliser subsidy in 1988. This was carried on until 1993, when the donor community once again pressured Malawi to stop providing price subsidies for smallholder fertiliser. The years that followed were again characterised by severe food shortages, as most farmers were unable to purchase fertiliser for maize production.

By 1997, the Malawi government started to negotiate with the donor community for support to resuscitate smallholder productivity and ensure food security in the country. This culminated in the reintroduction of the farm input subsidy in 1998. Apart from food security, the reintroduction of the subsidy was touted as a rural income growth strategy. Policymakers envisaged that the subsidy would spur surplus maize production that could engender profits for both smallholder farmers and non-agricultural households. The programme therefore was viewed only as a ‘starter’, in that as soon as smallholders started to maximise profits from maize sales, they would no longer require free fertiliser, as they then would be able to afford to purchase the inputs at commercial rates (Van Donge *et al.* 2001). Similarly, non-agricultural households were expected to generate profits through trade, especially in maize. For these reasons this farm input subsidy was called the ‘starter pack scheme’ (SPS).

The SPS was funded jointly by the Malawi government, the Department for International Development (DFID), the European Union (EU) and the World Bank, to the tune of US$25.6 million. Farmers were provided with free input packs, which included fertiliser (about 10 kilograms of urea or NPK) and seeds (about 2.5 kilograms of maize and legumes) for 0.1 hectare per smallholder household (Mkwara 2012). However, by the end of 2000, the Malawi government and the donor community were again at loggerheads over continued funding and poverty effects of the SPS. Some donors faulted Malawi’s intention of turning the SPS into a long-term rescue plan, contrary to its initial objective (Harrigan 2008). They viewed the SPS as a waste of donor aid with the potential of stifling private sector input delivery, promoting corruption and locking Malawi into a maize poverty trap. The above disputes made the World Bank discontinue and the EU curtail their financial assistance for the scheme.

With one committed donor, DFID, Malawi was forced to scale down the SPS to a targeted input programme (TIP). Under the TIP, the number of beneficiaries was reduced from an average of 2.8 million households between 1998 and 2000 to 1.5 million households in 2001 and 1 million households in 2002. Total funding was also reduced from US$25.2 million in 1999 to only US$7.6 million in 2001. DFID increased its financial support from US$9.9 million in 2002 to US$10.9 million in 2003 and, for this reason, the TIP was renamed Extended TIP (ETIP). Combined with Malawi’s contribution, the total ETIP funding in 2003 stood at US$12.1 million. This led to an increase in the number of beneficiaries to two million households. From 2005, the government reverted to the old system of putting a price ceiling on fertiliser sold to smallholders. For instance, in the 2008/2009 growing season, the subsidy was about 95% of the commercial price of fertiliser. The only difference is that, currently, smallholder beneficiaries are issued with vouchers to enable them to purchase fertiliser at a subsidized price (Mkwara 2012).

The successive bumper maize harvests that the country enjoyed, especially from 2006, helped the Malawi government to score a point against its critics, the donors. For instance, for the first time in about three decades, of its 3.2 million metric tonnes of maize harvested in 2007, Malawi was able to export about 0.4 million metric tonnes to Zimbabwe and 0.08 million metric tonnes to Swaziland and Lesotho (World Bank 2011). Irrespective of the recent success story of national food security in Malawi, studies based on empirical analysis to examine the impact of maize fertiliser subsidies on household income distribution and poverty are surprisingly scarce. It is this shortfall that motivates this paper. The main focus is on smallholders and non-agricultural households in the rural areas, since statistics indicate that these two socioeconomic groups have the highest poverty levels (National Statistics Office 2009). The rest of the paper is organised as follows: Section 2 provides the methodology used in this study. This is followed by a discussion of the results in Section 3. Finally, Section 4 draws conclusions.

2. Methodology

A country specific CGE model is employed in this study. The structure of the model is based primarily on the work of Lofgren (2001). It pays particular attention to the specification of demand

and supply functions derived from the assumption of utility and profit maximising by consumers and firms respectively. It also assumes perfect competition and imposes market clearing conditions. The model is static, implying that it is designed to simulate and measure the effect of exogenous shocks on the socioeconomic scheme in a manner that resembles controlled experiments. Lofgren’s model was built around the 1998 social accounting matrix (SAM), whose data originated from Malawi’s 1998 Integrated Household Survey and complementary trade and macro-statistics. However, Thurlow *et al*. (2008) updated the 1998 SAM with data from the 2004/2005 Second Integrated Household Survey. In this paper, the updated SAM is employed. It has 36 production sectors, 17 of which are agricultural. The remaining 19 sectors are categorised into industry and services. The SAM distinguishes households and labour into seven and three categories respectively. In the case of land, four categories are included. Table 1 below indicates a complete disaggregation of the SAM’s factors of production, institutions and activities into their respective elements.

The model is constructed in a manner that sets most parameters endogenously to ensure that the model’s base solution reproduces the SAM values. For instance, it is assumed that the return on capital is distributed in constant shares between the formal sector and households. Production taxes are calculated as ratios of tax payments to values of domestic production, while other tax rates are calculated as shares of total income. Distribution of labour income to households is computed with constant shares, and after-tax income to firms is also distributed in constant shares among distributed profits to households, expatriated profits and savings. Investment demand is thought to be proportional to total investment. Finally, government expenditure and remittances from the rest of the world are held constant in real terms. The remaining parameters, a set of elasticities, are exogenously determined.

Primary agents in various sectors are assumed to be driven by the desire to maximise their objective functions by taking into account certain constraints with which they are faced. The model displays production activities by the firms in a two-level specification. Value added and intermediate inputs are the highest level of inputs that are combined in fixed proportions (Leontief function) in order to produce sectoral output. Value added inputs are generated by combining the primary factors of production, namely labour and capital, in a constant elasticity of substitution (CES) function.

Producers can choose to sell their output locally or internationally, guided by the constant elasticity of transformation (CET) function. Difference in quality is a distinguishing factor between local and foreign traded goods. As profit maximisers, producers will endeavour to sell where the goods can fetch higher prices.

Table 1: Disaggregation of factors, institutions and activities

Set	Elements
Labour (3)	• Elementary • Skilled • Unskilled
Other factors (6)	• Land (small-scale rural farmland, medium-scale rural farmland, large-scale rural farmland and urban farmland) • Capital (agricultural and non-agricultural)
Households (7)	• Rural (agricultural small scale, agricultural medium scale, agricultural large scale and non-agricultural) • Metro (Lilongwe and Blantyre: non-agricultural) • Urban (agricultural and non-agricultural)
Other institutions (3)	• Enterprises • Government • Rest of the world
Agricultural activities (17)	• Crops (maize, rice, other cereals, roots, pulses, groundnuts, vegetables, fruits, tobacco, cotton, sugar, tea, and other crops) • Non-crop (poultry and eggs, other livestock, fishing and forestry)
Non-agricultural activities (19)	• Industry (mining, food processing, beverages and tobacco, textile and clothing, wood and furniture, chemicals and rubber, machinery and other manufacturing and construction) • Services (electricity and water, agricultural trade and transport, non-agricultural trade and transport, traded services, communications, banking and business services, real estate, community services, government administration, health and education)

Source: Thurlow *et al.* (2008)

Being a small economy, Malawi is regarded as a price taker in the export and import markets. Export and import volumes respond to changes in the relative world prices. Therefore, changes in world growth affect exports and imports through their impacts on the foreign prices. Following Armington (1969), imports and domestic products are assumed to be imperfect substitutes, and domestic supply is assumed to be a CES aggregate of imports and domestic sales (production minus exports). Exports therefore are derived from a demand function from the rest of the world, while external demand is a function of the ratio of domestic prices to world prices.

With regard to household demand, the model employs a Stone-Geary linear expenditure system (LES), supposedly reflecting the households' maximisation of utility functions subject to their budget constraints. The inclusion of subsistence consumption in the LES demand system is very important, particularly with regard to most Malawian households, where own-household consumption constitutes a large share of the daily food requirements. However, this does not undermine the model's primary assumption that household consumption is mainly financed by factor payments.

In order to balance the accounts in the model, a number of closure rules are established. Closure rules involve determining the micro- and, primarily, macro-economic assumptions underlying the model. On the micro-economic side, the main interest is in the factor and product market equilibriums. Closure rules on macro-economic assumptions largely focus on the saving-investment balance, the government budget and the current account balance (Bautista & Thomas 2000).

It is assumed that the stock of capital in each sector is fixed, and labour is treated as a mobile factor across sectors. In addition, it is assumed that total labour is available in surplus at a fixed wage[1].

[1] The fixed wage is interpreted as being fixed in terms of the numeraire. Since the consumer price index is taken to be the numeraire in this model, the wage is assumed fixed in terms of its purchasing power.

This being the case, employment is simply equal to labour demand (Sadoulet & De Janvry 1995). In the product markets, variable prices allow for clearing of the markets.

As stated earlier, Malawi has no influence on the world market, therefore international prices of imported and exported commodities are treated as exogenous to the model. To reflect the current situation in Malawi, the nominal exchange rate is exogenous and the current account balance is endogenously determined. In order to get the saving-investment balance, the study goes for a savings-driven closure, whereby marginal propensities to save (in the economy) are exogenously determined. This enables investment in the model to vary.

Finally, fiscal deficit is computed as the difference between government revenues and expenditures. Government revenue emanates from incomes from factors, institutional transfers and taxes. In turn, government spends its revenue on consumption and transfers. In algebraic terms, fiscal deficit (government savings), GS is given as follows:

$$GS = GR - GE \qquad (1)$$

where GR is government revenue and GE is government expenditure.

$$GE = \sum P_c^p \cdot G_c^p + \sum tr_i + X\Delta \cdot tr_{row} \qquad (2)$$

where P_c^p is composite commodity price, G_c^p is government consumption demand, tr_i is government transfers to domestic institutions, tr_{row} is government transfers to the rest of the world, and $X\Delta$ is the exchange rate.

Notably, in Lofgren's model (equation 2), farm subsidies are not explicitly spelled out within the 'domestic transfers' component. Incorporation of farm subsidies into the model therefore is one of the contributions of the current study. Following the footsteps of Kilkenny (1993), government expenditure is therefore expressed as follows:

$$GE = \sum P_c^p \cdot G_c^p + (\sum SUB_j \cdot Q_j^d + tr_i) + X\Delta \cdot tr_{row} \qquad (3)$$

where $SUB_{j\,g}$ are farm subsidies transferred to institution, j (in this case household, j) and Q_j^d is total domestic production from industry j. The rest of the variables are as defined above.

Since 2004/2005, fertiliser subsidy funds have largely been domestically sourced. The government has two options to generate more revenue domestically, namely by increasing tax and/or domestic borrowing from the financial market. Since there have been no major tax adjustments over the past five years (GoM 2008, 2009, 2010), in this paper fertiliser subsidy funds are assumed to be generated through domestic borrowing. The foregoing suggests that increases in farm subsidies worsen the fiscal deficit.

Based on the work of Sadoulet and De Janvry (1995), subsidies are factored into the production system via the consumer price, P_j, as follows:

$$P_j = \{[P_d(Q_j^d - E) + X\Delta(P_m)(M)]/(Q_j^d - E + M)\}/(1 + SUB_j) \qquad (4)$$

where P_d is a price adjuster and P_m is price of imports, while M and E are imports and exports respectively. The exchange rate and price of imports, both exogenously determined, are fixed at 1.

From equation 4, farm subsidies are expected to reduce the consumer price and therefore increase the value added price through reduction in expenditure on intermediate inputs. An increase in value added price induces factor employment in agriculture. Increased factor employment in the agricultural industry is expected to lead to an increase in the overall agricultural production function. This implies that "if the subsidy is removed, factors will either relocate to sectors stimulated by the change in the spending pattern, or, if no sectors are stimulated – lie idle (unemployed)" (Kilkenny 1993).

3. Results and discussions

In this section, the effects of fertiliser subsidies on household income distribution and poverty are explored. First, the analysis unfolds by looking at changes in the distribution of household income if maize fertiliser subsidies of 25%, 50% and 95% are provided. The level of 25% was considered to reflect the lowest rate of subsidies on the prices of fertiliser far thus recorded (Mkandawire 1999). On the other hand, 95% is the highest level of the subsidy on record (GoM 2009). These give the lower and upper bounds explored, with 50% arbitrarily selected as the median. Second, household income changes from the CGE model are applied to all households in their respective categories to analyse household poverty implications of fertiliser subsidies. The application is explained further in Section 3.2.

3.1 Fertiliser subsidies and household income changes

The results of the simulation suggest that increases in the rates of fertiliser subsidies lead to increases in income for all agricultural households both in the rural as well as urban areas. However, subsidies dampen incomes for rural and urban non-agricultural households and have no effect on incomes for metro households, as indicated in Table 2 below.

Table 2: Micro-results of simulations (% change in household income)

	Base value	Fertiliser subsidy rates		
	(MK' million)	**25%**	**50%**	**95%**
Rural: Agricultural small scale	20 165	0.80	1.60	3.07
Rural: Agricultural medium scale	56 825	0.78	1.56	2.99
Rural: Agricultural large scale	17 144	0.71	1.05	2.04
Rural: Non-agricultural	20 150	-0.01	-0.01	-0.03
Metro: Lilongwe and Blantyre (non-agricultural)	56 913	0.00	0.00	0.00
Urban: Non-agricultural	3 389	0.51	0.43	0.21
Urban: Agricultural	35 583	0.68	1.37	2.63

Rural agricultural small-scale households experience the largest increase in income. To a large extent, this indicates a positive relationship between the rate of fertiliser subsidy and income distribution for rural agricultural smallholders. However, these income changes are small. For instance, a 95% fertiliser subsidy leads to only 3.07% increase in income (from MK20 165 million to MK20 784 million) for smallholders.

The limited increases in household income underscore two key points about agriculture in Malawi. First, maize is largely cultivated for household consumption (as discussed under LES above), and second, for the majority of smallholders there is very limited diversification away from maize cultivation. Over-reliance on maize production makes smallholders fail to tap effectively into rises in income generated from other crops, such as fruit, rice, pulses, roots and tobacco, as indicated in Appendix 1.

Metro (Lilongwe and Blantyre) households' incomes do not change and this is partly due to contractions in the mainly 'metro/urban-based' sectors, namely construction, traded services and machinery, as shown in Appendix 1. These sectors are a source of employment to many metro dwellers. Therefore, when these sectors falter, metro dwellers' incomes are affected negatively, stemming from reductions in hiring employees and in some cases job losses[2]. However, the supposed reductions in metro households' incomes are offset by income gains that emanate from employment in the public sector. This argument is clarified in the following paragraph.

Urban non-agricultural households mainly comprise civil servants, small-scale business entrepreneurs, as well as urban sector employees. Increases in government consumption partly explain the nominal increases in their incomes. Arguably, increased government consumption translates into job creation for many households in this income group. However, their incomes increase at a decreasing rate, partly due to contractions in incomes for the urban-based sectors, which also form a significant part of urban dwellers' employment opportunities.

Incomes for rural non-agricultural households emanate either from farm and off-farm labour that they offer, or small-scale businesses that they engage in. At the rural level, offering of farm labour, particularly on the tea, sugar and tobacco estates, can be said to be the chief source of income for these households. Contractions in these industries (mainly tea and sugar), as indicated in Appendix 1, have a direct impact on their employability. Given that in this study wages are assumed to be exogenously determined, it is mainly the loss of labour opportunities (ganyu) that leads to reduction in rural non-agricultural households' income.

In the case of small-scale businesses, reductions in income for rural non-agricultural households, particularly for those that are involved in the maize trade, emanate from the following two sources. First, as suggested in equation 4, fertiliser subsidies lead to reductions in the consumer price of the crop, which culminates in reductions in income for traders. Second, subsidy-driven high maize supply (production) signifies market saturation, which means traders end up with maize that they cannot sell, which again leads to reductions in income for traders. Unfortunately, maize price reductions and market saturations can and tend to occur simultaneously in areas that experience high maize yields. A similar explanation applies in the cases of other crops, such as rice, roots and groundnuts.

3.2 Fertiliser subsidies and household income poverty

There is still some debate on the extent to which conventional CGE models are able to robustly decompose household poverty (Decaluwe *et al*. 1999). In order for a CGE model to reasonably decompose poverty, information regarding income distributions within socioeconomic groups is essential. Unfortunately, SAM-based approaches implicitly assume that intra-group variances of income distributions are zero. However, it is true that even in socioeconomic groups generally endowed with high income levels there still are some households whose average income levels fall below a given poverty line.

[2] All fertiliser inputs that Malawi uses are imported and, for nearly two decades, the import price of fertiliser has been increasing persistently (Fandika *et al.* 2007). Paradoxically, starting from 2005 there has been a general increase in the subsidy rates. As subsidy rates increase, returns from sales of the imported fertiliser decrease. Therefore, in order to continue financing the subsidies, the government increases its domestic borrowing. In the short to medium term, large domestic public sector borrowing crowds out private investment. In addition, the government's role in buying and distributing the subsidised fertiliser displaces some private traders (Banful 2010). In the end, sectors such as traded services, which are supposed to be involved in the fertiliser trade, end up with little or no business at all. The crowding out and displacement of the private sector lead to contractions in income for some major non-agricultural sectors, as shown in Appendix 1.

Despite some limitations of the CGE models in decomposing household poverty, several researchers have attempted to use the SAM-based approach to estimate poverty. For instance, Thorbecke and Jung (1996) constructed a multiplier decomposition method by systematically interlinking socioeconomic groups with production activities. They argued that "certain production activities contribute more to the growth of household groups' incomes than others". They also explained the structural mechanism in which changes in sectoral output affect poverty alleviation. Key to this mechanism was the adoption of the Foster, Greer and Thorbecke (1984) (FGT) method of poverty decomposition. The way the FGT approach works is explained later.

In order to circumvent the aforementioned limitation of the SAM-based approaches, De Janvry *et al*. (1991) employ Pareto and lognormal distribution functions to portray each socioeconomic group's income distribution. But, as argued by Decaluwe *et al*. (1999), "the authors do not justify why these functional forms are more appropriate than more flexible forms".

As an alternative to the approach by De Janvry *et al*. (1991), Decaluwe *et al*. (1999) propose a more flexible functional form in which "the intra-group distributions are specified so as to conform to the different socioeconomic characteristics of the groups". They further assume a poverty line "based on a unique and constant basket of needs commodities". However, for this method to work, it requires knowledge of the minimum and maximum incomes of each household group. In addition, parameters that determine the shape and skewness of the distribution need to be known. In the case of this study, these variables and parameters are unavailable and therefore a different approach is employed, as explained hereunder.

Here, the decomposition of poverty was conducted in two steps. Firstly, income changes from the CGE model were applied to all households in their respective categories for which one thousand draws were generated through a non-parametric bootstrapping process, as postulated by Poe *et al*. (2002). On the upside, a sample generated using the Poe test is known to be free from observational biases.

Secondly, as with Thorbecke and Jung (1996), the FGT method was employed to decompose poverty. The FGT is an attractive technique because it not only measures the head count ratio, but also calculates how deeply and severely poverty affects each socioeconomic group. The FGT can be expressed as follows:

$$P_{\propto} = \frac{1}{\sum_{j=1}^{N} w_j} \sum_{j=1}^{m} w_j \left(\frac{z-y_j}{z}\right)^{\propto} \quad (5)$$

where $\propto$ is a parameter that measures the degree of poverty aversion, z is the poverty line, y_j is the household income and N is the total number of draws in each socioeconomic group. There is a sampling weight for the j^{th} household represented by w_j, while m stands for the total number of the poor in the income group. When $\propto = 0$, FGT becomes the headcount index measuring the proportion of the poor in the population. The headcount index is popular because it is easy to compute and comprehend. However, it fails to give adequate information regarding how poor the poor are.

The weakness of the headcount index is overcome when $\propto = 1$. In this case, the measure becomes the poverty gap index, looking at the extent to which households fall below the poverty line. The poverty gap is more useful when comparing poverty situations between different socioeconomic groups or countries. Finally, in the case of $\propto = 2$, FGT is interpreted along the lines of severity of poverty. Here the poverty gaps are squared relative to the poverty line. The results of the decomposition of poverty are indicated in the Tables 3 to 5.

Table 3: Poverty incidence variations (% changes)

	Base	Fertiliser subsidy rates		
	value	25%	50%	95%
Rural: Agricultural small scale	0.28	-1.46	-3.28	-3.99
Rural: Agricultural medium scale	0.04	-0.88	-4.39	-7.87
Rural: Agricultural large scale	0.03	0.00	0.00	0.00
Rural: Non-agricultural	0.28	0.00	0.00	0.36
Metro: Lilongwe and Blantyre (non-agricultural)	0.04	0.00	0.00	0.00
Urban: Non-agricultural	0.12	-0.21	-0.21	-0.19
Urban: Agricultural	0.10	-0.54	-0.54	-3.24

The results in Table 3 suggest that changes in the rates of fertiliser subsidies are inversely related to changes in the poverty incidence for rural smallholders, medium landowners, urban agricultural and urban non-agricultural households. At lower rates of the subsidies (below 50%), smallholders are the major beneficiaries with regard to reductions in the incidence of poverty. However, at higher rates of the subsidies (above 50%), medium landowners experience greater reductions in headcount poverty.

Despite some increases in household income for rural large landowners, changes in subsidy rates hardly affect the incidence of poverty in that socioeconomic group. The same applies to households in the main cities of Blantyre and Lilongwe. In the case of rural non-agricultural households, up to 50% of subsidy rates have no impact on the incidence of poverty in that household group. However, very high rates of the subsidy (95%) increase their poverty incidence by only 0.36%.

When it comes to the poverty gap index, there are notable similarities and differences in the poverty incidence variations, as indicated in Table 4 below.

Table 4: Poverty depth variations (% changes)

	Base	Fertiliser subsidy rates		
	value	25%	50%	95%
Rural: Agricultural small scale	0.1	-1.37	-2.71	-5.1
Rural: Agricultural medium scale	0.01	-1.52	-2.97	-5.5
Rural: Agricultural large scale	0.01	-0.29	-0.68	-1.26
Rural: Non-agricultural	0.1	0.01	0.01	0.05
Metro: Lilongwe and Blantyre (non-agricultural)	0.01	0.00	0.00	0.00
Urban: Non-agricultural	0.04	-0.13	-0.25	-0.48
Urban: Agricultural	0.04	-1.34	-2.71	-5.16

As with poverty incidence, the following households experience reductions in the extent to which households fall below the poverty line, namely rural smallholders, rural medium-scale households, urban agricultural and non-agricultural households. On a different note, there are poverty depth reductions within the rural large-scale household group, which is not the case when it comes to poverty incidence. Rural non-agricultural households experience increases in poverty depth, albeit nominally. However, for the metro households there are no changes as far as poverty depth is concerned. Some further analysis was carried out with respect to the severity of poverty, as indicated in Table 5 below.

Table 5: Poverty severity variations (% changes)

	Base	Fertiliser subsidy rates		
	value	25%	50%	95%
Rural: Agricultural small scale	0.05	-1.46	-2.9	-5.46
Rural: Agricultural medium scale	0.01	-1.39	-2.77	-5.13
Rural: Agricultural large scale	0.01	-0.38	-0.75	-1.5
Rural: Non-agricultural	0.05	0.02	0.02	0.06
Metro: Lilongwe and Blantyre (non-agricultural)	0.01	0.00	0.00	0.00
Urban: Non-agricultural	0.02	-0.15	-0.25	-0.45
Urban: Agricultural	0.02	-1.36	-2.66	-4.99

The results from the severity of poverty indicate similar trends as in the case of poverty depth. At 50% and 95% subsidy rates, rural medium scale and urban agricultural households experience lower reductions in the severity of poverty than in the case of poverty gap. However, the opposite is true for the rural smallholders. Rural non-agricultural households' severity of poverty worsens compared to the other two poverty indices.

As stated earlier, policymakers envisioned maize fertiliser subsidies as a tool for the reduction of poverty, particularly in rural areas. The main targets were the rural smallholders and rural non-agricultural households. Comparative analysis from Tables 3 to 5 suggests that, while subsidies may have some notable gains with regard to rural smallholders, the rural non-agricultural households end up being losers. It is also revealed that income benefits accrue to some households, namely the rural medium scale, more than to the intended beneficiaries. This may suggest a weakness in the way the subsidies are administered. For instance, some of the beneficiaries, although poor, are not poor enough to receive the subsidies.

4. Conclusions

The main objective of this paper was to assess the impact of maize fertiliser subsidies on income distribution and poverty in Malawi. Based on CGE modelling, three simulations focusing on increases in the subsidies on the price of fertiliser were considered. Modelling results suggest that the subsidies lead to small increases in income for all agricultural households. Rural non-agricultural households experience reductions in their incomes, while changes in the rates of subsidies have no income effects on metro households. Although urban non-agricultural households experience increases in income, such changes occur at a decreasing rate.

Results of the FGT decomposition of poverty suggest that the subsidies help to reduce income poverty for the rural and urban agricultural as well as urban non-agricultural households. For these households (except for rural large-scale households), all poverty indices, namely the headcount, gap and severity, register reductions. This means improvements occur not only in the proportion of but also in the extent to which households fall below the poverty line. However, the poverty situation of the rural non-agricultural households worsens, while no changes occur in the case of metro households.

Since the subsidies have been implemented mainly with the aim of improving income distribution and reducing poverty for the rural poor, it can be argued that their effects are mixed. On the one hand, rural smallholders can be said to have benefited from the subsidy programmes. On the other hand, rural non-agricultural households turn out to be the losers. Their income losses are associated mainly with non-lucrative trade in agricultural produce and reductions in farm and off-farm labour.

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Appendix 1: CGE simulations and sectoral performance (% change)

	Fertiliser subsidy		
Sectoral performance	**25%**	**50%**	**95%**
1 Maize	1.01	2.03	3.9
2 Rice	1.3	2.61	5.02
3 Cereals	1.42	2.86	5.49
4 Roots	1.41	2.84	5.47
5 Pulses	1.24	2.5	4.8
6 Groundnuts	1.4	2.81	5.41
7 Vegetables	1.22	2.45	4.71
8 Fruits	1.24	2.49	4.78
9 Tobacco	0.63	1.27	2.43
10 Cotton	-0.88	-1.77	-3.4
11 Sugar	-0.8	-1.61	-3.08
12 Tea	-0.76	-1.52	-2.9
13 Other crops	1.3	2.62	5.03
14 Poultry	1.24	2.49	4.78
15 Livestock	1.37	2.76	5.32
16 Fishing	1.32	2.66	5.11
17 Forestry	1.2	2.42	4.65
18 Mining	-0.63	-1.26	-2.39
19 Food processing	1.08	2.17	4.16
20 Beverages	0.85	1.7	3.25
21 Textile	1.13	2.27	4.36
22 Wood	1.27	2.55	4.88
23 Chemicals	1.32	2.65	5.1
24 Machinery	-1.76	-3.54	-6.81
25 Construction	-1.55	-3.15	-6.14
26 Electricity	1.82	3.67	7.03
27 Agricultural trade	1.59	3.2	6.18
28 Non-agricultural trade	0.97	1.95	3.73
29 Traded services	-0.34	-0.71	-1.4
30 Communication	1.13	2.27	4.35
31 Banking	1.22	2.45	4.7
32 Real estate	0.89	1.78	3.41
33 Community services	1.34	2.69	5.18
34 Government administration	0.52	1.05	2
35 Health	1.01	2.02	3.89
36 Education	0.99	1.99	3.81