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The Short and Longer Term Potential Welfare Impact of Global Commodity Inflation in Tanzania

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Abstract

This paper uses a computable general equilibrium model to assess the welfare impact of commodity price inflation in Tanzania and possible tax policy responses in the short, medium, and long term. The results suggest that global commodity inflation since 2006 may have had a significantly negative impact on all Tanzanian households. Most of the negative impact comes from the rise in the price of oil. In contrast, food price spikes are potentially welfare improving for all Tanzanian households in the medium to long run. In comparison with nonpoor households, poor households in Tanzania may be relatively shielded from global commodity inflation because they derive a larger share of their incomes from agricultural activity and consume less oil-intensive products. Finally, the results suggest that tax policies encouraging greater agricultural production and consumption may help to reduce poverty. In contrast, policies discouraging agricultural production (such as export bans) bear the risk of increasing poverty in the long run. However, such policies would only effect at the margin (in one direction or the other) the likely impact of global commodity inflation on poverty.

This paper—a product of the Development Economics Vice Presidency (DEC)—is part of a larger effort in the department to analyze policy-relevant topics rigorously with the best available information to support decision making. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at sdessus@worldbank.org.

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I. Introduction

In the face of its suddenness and severity, the surge in the international prices of food and energy commodities since 2006[1] has been receiving great attention from the development community.

A first branch of research is trying to understand the initial reasons behind such price spikes[2] – from greater demand for bio-fuels and climatic shocks to expansionary monetary policies, change in buffer stock policies, and commodity financial markets' development in response to diversification needs – against the backdrop of historically low pre-crisis world food prices.[3] From this literature emerges the outlook that commodity prices, while still volatile, will remain higher than before 2006[4], implying a shift in relative prices vis-à-vis other goods and services in the foreseeable future.

A second branch of research is trying to assess the macro-economic and welfare impacts of price spikes. Broadly speaking, balance of payments crisis risks are believed to be containable[5], while inflation risks (second-round effects) could be more important, even if not as severe as in 1973[6]. As far as welfare impacts are concerned, research[7] has so far mostly concentrated on the short term and micro-economic[8] impact of commodity

[1] See FAO (2008) for a discussion of the events and first-order impacts.
[2] See for instance Mitchell (2008), Krichene (2008) and Helbling et al. (2008).
[3] World Bank (2005) also contends that "halfway" market-oriented reforms have created the worst of all possible worlds, where the private sector is encouraged to operate in an environment in which governments continue to intervene in discretionary and unpredictable ways that make prices even less stable.
[4] See OECD-FAO (2008).
[5] Thanks in particular to the fact that the broadening of the commodity price boom from oil to metals and food has helped many developing economies offset the adverse effects of higher import prices through higher export prices. In contrast, floating exchange rates have not played major stabilizing roles so far, given the inelastic nature of food and oil demand. In countries most adversely affected by price spikes, a possible trade-off between external adjustment and inflation pressures could emerge.
[6] See Lipsky (2008) for a general discussion on inflation risks in the context of the current commodity prices crisis.
[7] See Ivanic and Martin (2008), Wodon et al. (2008), Dessus et al. (2008), and Aksoy and Isik-Dikmelik (2008).
[8] With a few exceptions, these studies do not systematically account for substitution effects (between commodities), macro-economic effects beyond changes in relative prices, or factor reallocation effects which could occur in the longer run. Yet, Ivanic and Martin (2008) account for changes in unskilled wages rates so as to capture higher factor remuneration in agriculture. Passa Orio and Wodon (2008) estimate the longer term impact of specific commodity price spikes on the price of other commodities through a social

inflation. From this bulk of work emerges the view that the urban poor and near poor are believed to be particularly vulnerable to price spikes, with concerns that it could severely aggravate current malnutrition problems.[9] The poverty impact on rural households is less obvious, depending on the transmission of food prices to farmers' incomes and their consumption patterns, often less diversified than in urban areas.

A third branch of the literature, more operational, focuses on appropriate policy responses at the macro-economic and social levels. Recommendations[10] emphasize the need to accommodate relative prices shifts – no export restrictions, no attempt to reduce the pass-through of world prices to domestic markets, with a view to foster private sector led agricultural investments in the medium term, while protecting the most vulnerable with targeted transfers and tackling some of the policy-induced factors behind prices spikes – such as bio-fuels subsidies in high-income countries.

Yet, to our knowledge, little effort has been paid so far to consistently integrate these macro-economic, social and time dimensions at the country-wide level, where policy decisions are most generally made. So far, most studies scrutinize one aspect of the problem at the cross-country level. While it is useful to identify vulnerable countries and get a sense of the global magnitude of the crisis, such literature is less useful to understand the various possible interactions between the different effects at play, and assess the efficiency of envisaged policy response at the national level.

Thus, this paper aims at developing a consistent economy-wide analytical framework to assess the impact of commodity price inflation and possible macro-economic responses on poverty, in the short, medium and long term.

For this purpose, we use a computable general equilibrium (CGE) model to assess the impact of global commodity inflation (agricultural products, fertilizers and oil) on households' welfare in Tanzania. This country was chosen for its data availability, as well as for the fact that it introduced in 2008 various policies to offset the negative impact of food price inflation, including export bans and the reduction of taxes on food grains.

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accounting matrix multiplier effect approach, and suggest than indirect effects are much more pronounced for oil than food.

[9] The impact of lower food consumption on malnutrition is not straightforward. Malnutrition is a cumulative process and depends on many other factors (diets) than just the quantity of food consumed. But risks of malnutrition certainly increase as the situation perpetuates. See Ravallion (1997).

[10] See World Bank (2008a).

CGE modeling has become a standard tool for integrated assessment of policy induced shocks, especially for small economies. This type of modeling allows combining detailed databases with a sound micro-based theoretical framework capturing the interdependence and inter-linkages of markets.

Using this model, we simulate various exogenous and policy-induced shocks, and assess ex-ante their impact on households' welfare, including various categories of poor households. Results first and foremost suggest that global commodity inflation since 2006 could have had a significantly negative impact on all Tanzanian households, reducing their welfare by approximately 4 percent. Most of the negative impact comes from the rise in the price of oil, which is fully imported and for which little substitution possibilities exist. In contrast, food price spikes could have had a much more nuanced impact, and could actually be potentially welfare improving for all Tanzanian households in the medium to long run. This would in particular be predicated on the possibility to produce crops for bio-fuels on a large scale.

Besides, the results suggest that the poor in Tanzania could have been relatively shielded from global commodity inflation in comparison with the non poor. Indeed, the poor in Tanzania derive a larger share of their incomes from agricultural activity and consume less oil-intensive products.

Finally, the results suggest that fiscal policies encouraging higher agricultural production and consumption could further contain overall poverty reduction losses, even if not particularly pro-poor. In contrast, policies discouraging agricultural production (such as export bans) bear the risks of strongly amplifying poverty increases in the long run. All in all, though, such policies would only alter at the margin (in one direction or the other) the likely impact of global commodity inflation on poverty.

The rest of this paper is organized as follows. Section II briefly describes the model and Section III assesses the impact of global commodity inflation since 2006 on Tanzanian households. Section IV explores the potential of various policy responses to contain poverty. Section V concludes.

II. The Computable General Equilibrium Model

The CGE model developed for this study is a typical neoclassical model with endogenous relative prices[11], market clearing, and imperfect substitution between domestic and foreign goods. As in any CGE prices are endogenous on each market (goods and factors) and equalize supplies (imports; Tanzania's production for the domestic market; factors supply) and demands (final demand from households, the government, investors and the rest of the world; intermediate demand from producers; factors demand), so as to obtain the equilibrium. The equilibrium is general in the sense that it concerns all the markets simultaneously.

Supply is modeled using nested constant elasticity of substitution (CES) functions, which describe the substitution and complement relations among the various inputs. Producers are cost-minimizers and constant return to scale is assumed. Output results from two composite goods: intermediate consumption and value added, combined in fixed proportions. The intermediate aggregate is obtained by combining all products in fixed proportions (Leontieff structure). The value-added is then decomposed in two parts: labor and the capital/land-energy-fertilizers bundle, which are both fully employed but imperfectly substitutable, the more so in the short run. Substitution possibilities between capital/land, energy and fertilizers are also limited.

Households derive their incomes from the various production factors they own, and whose remuneration vary with sectors' demand. Households' consumption behavior results from the maximization of a Cobb-Douglas utility function under the budget constraint of after direct tax (disposable) income. In other words, nominal shares of products' consumption (and savings) remain constant as relative prices vary.

The model assumes imperfect substitution among goods originating from different geographical areas (substitution possibilities increase with time). Import demand results from a CES aggregation function of domestic and imported goods. Export supply is symmetrically modeled as a constant elasticity of transformation (CET) function.[12] Producers decide to allocate their output to domestic or foreign markets responding to relative prices.

[11] The nominal exchange rate is the numeraire in this model.

[12] We retained the following substitution elasticities: 4.0 between imports and domestic goods (CES); 4.0 between exports and domestic goods (CET).

Several macro-economic constraints – closure rules - are introduced in this model. First, the small country assumption holds, the Tanzanian economy being unable to change world prices; thus, its imports and exports prices on world markets are exogenous. Capital transfers are exogenous as well, and therefore the trade balance is fixed in nominal terms, so as to achieve the balance of payments equilibrium. Second, the model imposes fixed real public expenditures, to reflect the government's choice of delivering a given amount and quality of public services. Public receipts, depending on the tax structure and economic activity are endogenously determined, and thus government savings as well. Third, investment is determined by the availability of savings, the latter originating from households, government and abroad.

The model comprises four periods: (1) a pre-shock benchmark period; (2) a post shock short term period during which sectors face exogenous changes in relative prices (global commodity inflation) without any possibility to reallocate factors across sectors, substitute factors within sectors, or re-allocate output between domestic and exports markets. Final consumers, in contrast, adjust more rapidly their demand mix to the new set of relative prices; (3) a post shock medium term period in which sectors adjust their input mix (capital-including land[13], labor, energy, fertilizers) and reallocate their output between domestic and foreign markets in response to price changes; and (4) a post shock long term period in which investment decisions based on new relative prices and opportunities materialize in additional or lower productive capacities (labor, capital) and the introduction of new technologies to fully meet new comparative advantages. While difficult to say with precision, the short term could take less than a year, depending notably on the duration of import and export contracts. The medium term could take 1 to 3 years (the time required to reallocate existing resources and access new markets, and the long term 3 years (the average time for investment projects to effectively materialize into additional productive capacities, or more prosaically, to grow a tree) or more.

Thus, while in the short and medium run total factors endowments (capital, labor) are fixed, labor and capital become endogenous in the long run. The former respond (with elasticities ranging from 0.1 to 0.3 depending on labor types) to changes in real wages. The latter evolves in proportion with real investment. In other words, we capture here the

[13] The SAM does not allow to genuinely distinguishing agricultural land from other forms of capital.

long term impact of policy-induced changes in households' saving rates and in the price of investment on the steady-state capital stock. In the long run, we also allow some substitutability between intermediate consumption and value added (an elasticity of substitution of 1, against 0 in the short and medium term), so as to reflect greater opportunities for changes in technologies.

The chosen yardstick for welfare is the assessment of equivalent variation, which is the sum of two terms. The first one measures the gain (or the loss) of disposable income caused by the reform (producers surplus), and the second one measures the income needed after the reform to obtain the same level of utility as before the reform (consumers surplus).

The model is calibrated using data (a Social Accounting Matrix, SAM) for the year 2005[14], the year before food prices started to surge on international markets. The SAM for 2005 updates the SAM built for the year 2001 by Thurlow and Wobst (2003). In particular, it accounts for (i) the large increase in public consumption over GDP, (ii) the large increase in the value of imported petroleum products, and (iii) changes in output and exports of most important agricultural commodities between 2001 and 2005. The SAM contains 12 different households (including 2 rural poor and 2 urban poor, 4 rural non poor, 4 urban non poor) of different population sizes, 9 types of labor (distinguished by gender and school levels, plus child labor), physical capital & land, and 43 sectors of activities (including 21 agricultural sectors and 4 food processing sectors). See the annex for the full list of the various dimensions of the model.

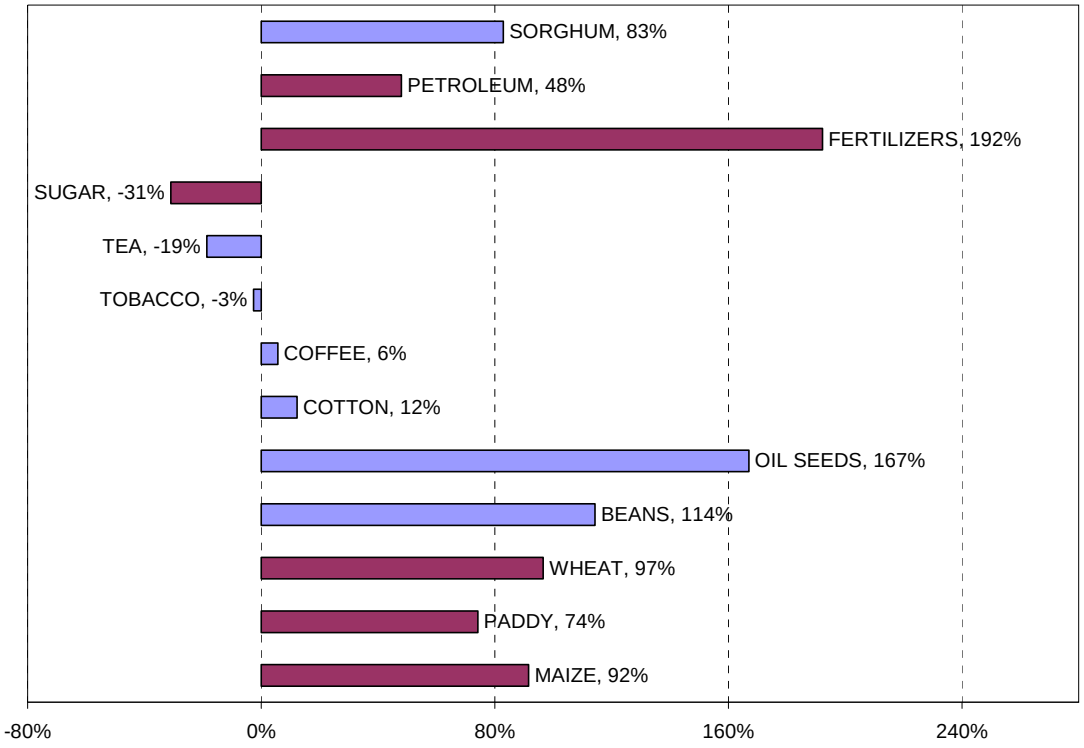
III. The Welfare Impact of Commodity Inflation in Tanzania

We use the CGE model to measure ex-ante the impact of commodity inflation on households' welfare. The exogenous shock consists in raising commodities' world prices, as denominated in Tanzanian shillings, by the relative change observed between January 2006 and June 2008. Such a change is computed econometrically on monthly data, and discounted by the overall CPI in Tanzania to capture relative prices changes on the domestic market. The Figure 1 reports the computed changes, for the most important

[14] The estimated SAM for 2005 is available upon request from the author.

products.[15] In blue (red) are the products for which Tanzania was estimated to be a net exporter (importer) in 2005.

Figure 1. Changes in Commodities World Prices
(TNZ shillings, January 2006-June 2008)



Applying these changes in commodities prices to net trade positions by end- 2005 results into a negative terms-of-trade shock of 3.1 percent of GDP, in line with the estimated average for Sub Saharan Africa over the same period, 4.2 percent.[16] Excluding petroleum oil though, the overall impact of the shock declines to 0.5 percent of GDP, reflecting Tanzania's balanced trade position vis-à-vis agricultural products.[17]

Simulations suggest that the impact of global commodity inflation on domestic prices (including indirectly through their impact on costs of production) could remain moderate for most items in the short run, but for wheat, fertilizers and petroleum oil. In

[15] One exception is cashew nuts (which represented 1-2 percent of total export receipts in 2005), for which world price data until mid-2008 were not found at the time of writing this paper. FOB prices of cashew nuts into the US did not significantly evolve over the period 2005-7 (Red River Foods, 2008) and we thus assume unchanged terms of trade for cashew nuts for the period January 2006-June 2008.
[16] See World Bank (2008b)
[17] In 2005/6, Tanzania recorded a food self-sufficiency rate of 103 percent. This ratio went up to 106 percent in 2007/8.

the medium to long run though, domestic prices of wheat and fertilizers would fall as their domestic production would increase and progressively replace imports. Overall, the price of imports would increase by 12 percent in the medium term, against 9 percent for domestic products sold on the domestic market.[18]

This result is consistent with what was observed so far in several countries, including Tanzania, where the transmission of high world prices to domestic markets was in most cases only partial. Effects depended on the depth of international markets for different commodities, countries' exchange rates variations against the US dollar during the period, the degree of openness of the different economies, the share of non traded goods in absorption and domestic policies in response to the shock. Evidence is scant for many countries and commodities.[19] But incomplete pass-through combined with differentiated price inflation across commodities is consistent with the observation of relatively moderate food inflation in many developing countries relative to the overall consumer price index. In all observable cases, domestic food inflation is significantly lower than international levels. In ten developing countries, the relative price of food over non food items grew up by 15 percent on average between late 2005 and March 2008.The FAO obtains the same broad conclusion on a different sample of countries over the period 2007-8.[20]

The three columns in the Table 1 reports simulated post-shock relative change in welfare (as a percentage of their pre-reform utility levels, or disposable income) for the various households regrouped into 4 categories, in the short, medium and long term. Overall, the shock entails welfare losses in the short and medium terms, equivalent to respectively 4.0 and 1.8 percent of pre-shock total disposable income.

In the long run, though, the shock turns positive for all households, 2.5 percent on average, as resources get reallocated in sectors with new comparative advantages, such as

[18] These computations are made using Laspeyres indexes.
[19] FAO research suggests that the pass-through of the world price of rice in US$ to domestic markets in six Asian countries currencies over the period Q4-2003 to Q4-2007 ranged between 6 and 64 percent, or one-third on average (FAO, 2008).
[20] See Dessus et al. (2008), and FAO (2008).

oil seeds. This reflects Tanzania's potential capacity to satisfy higher demand in crops for bio-fuel production.[21]

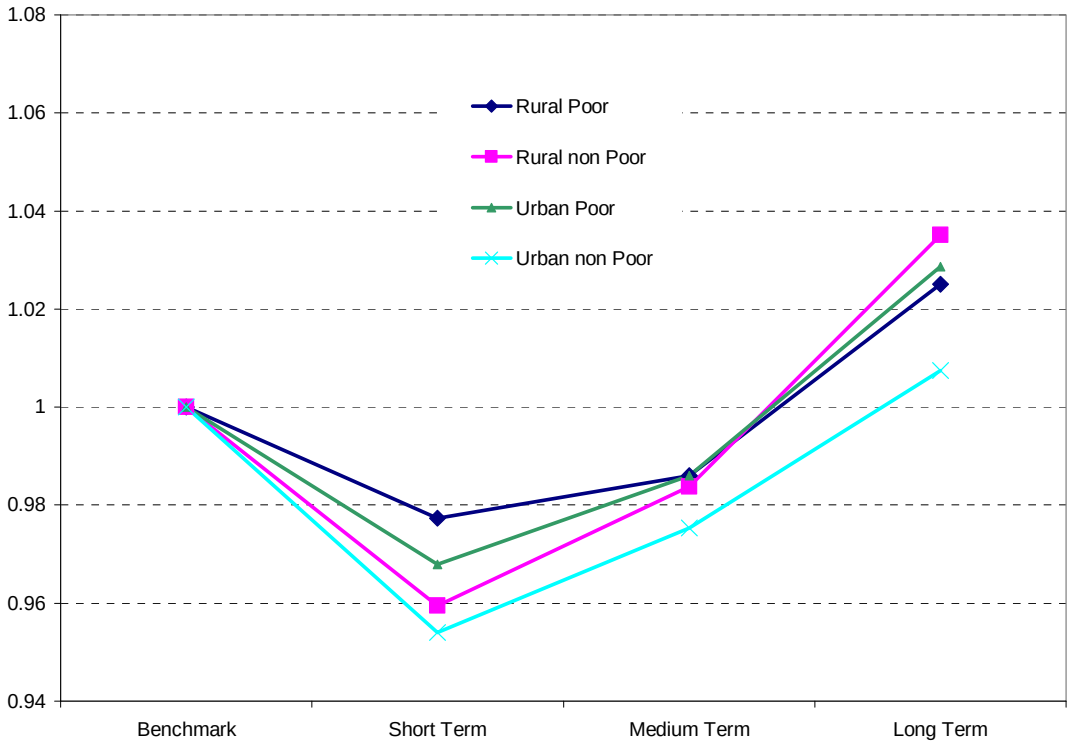
Table 1. Welfare impact of global commodity inflation since January 2006

	Welfare changes relative to initial disposable incomes		
Term	Short	Medium	Long
Rural Poor	-2.3%	-1.4%	2.5%
Rural non Poor	-4.0%	-1.6%	3.5%
Urban Poor	-3.2%	-1.4%	2.9%
Urban non Poor	-4.6%	-2.5%	0.7%
Poor	-2.5%	-1.4%	2.6%
Non Poor	-4.2%	-1.9%	2.5%
Rural	-3.7%	-1.6%	3.3%
Urban	-4.4%	-2.3%	1.0%
Total	-4.0%	-1.8%	2.5%

In the short run, rural poor suffer the less from the shock in relative terms. Rural non poor and urban households – urban non poor notably - suffer more, as consuming more imported goods, oil in particular. But rural poor (comprising almost 90 percent of all poor) are also the ones benefiting the less from the reallocation of factors in the medium and long term in the face of a new set of relative prices. While rural non poor see their welfare gains increasing by 7.6 percentage points between the short and long term, the rural poor only increase it by 4.8 percentage points, reflecting their relative inability to reap emerging opportunities on export and import-competing sectors, thus their isolation from external markets.

[21] See for instance Janssen (2006) for a discussion of Tanzania's potential for palm oil production for bio-fuels. The author notably indicates that the land available and suitable for oil palm production approaches 1.2 million ha. In comparison, less than 5,000 ha of oil palm were harvested in 2004, or 1/250 of the potential. The potential for developing jathropha oil production is also promising

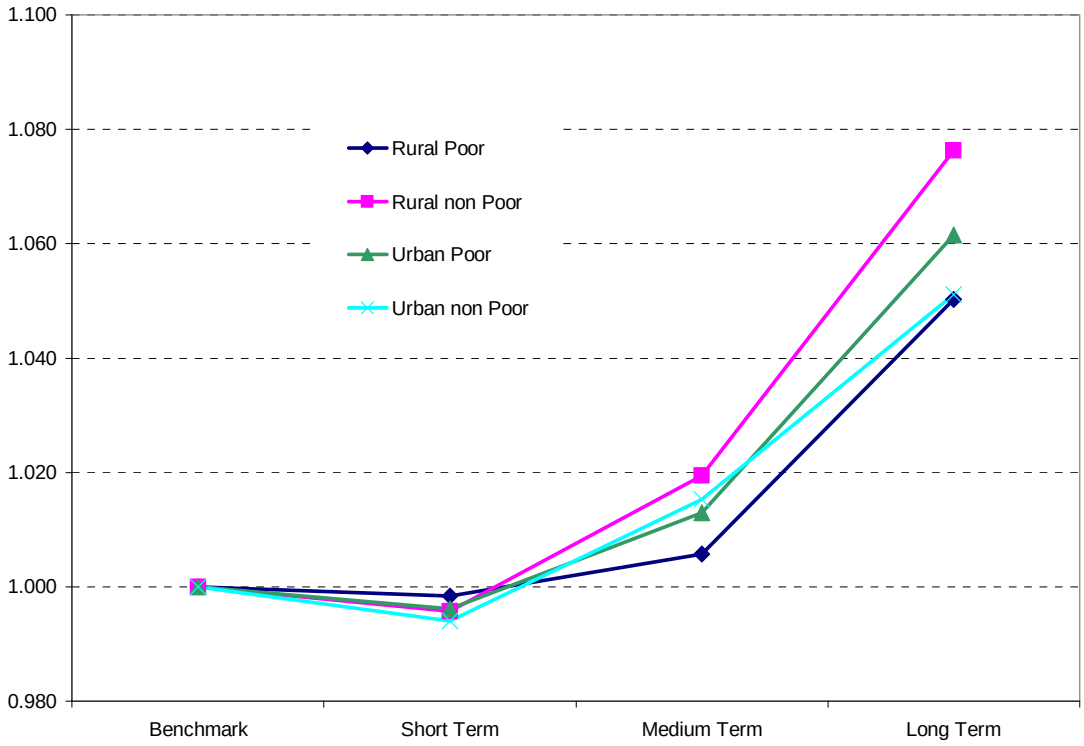
Figure 2. Simulated impact of imported inflation on households welfare
(Equivalent variation in percentage of benchmark disposable income)



This conclusion appears more clearly when distinguishing the impact of oil price spikes from that of agricultural goods. Even if high oil prices are unavoidably real, it is interesting to note that the change in agricultural relative prices benefit first and foremost the non poor rural households. This result is obtained by simulating the increase in agricultural prices (including fertilizers) between January 2006 and April 2008, leaving unchanged oil prices at their end-2006 level. As one can observe, changes in agricultural prices benefit all groups in the long run (with an overall welfare gain between 6 and 7 percent of total disposable income), in spite of the increase in fertilizers prices. But as rural poor suffer the less in the short term they also benefit the less in the long term.

In contrast, the distributional impact of the oil price shock alone remains largely unchanged over time. This is understandable given Tanzania's limited inability to significantly reduce the content of imported oil in domestic production and consumption through substitution effects in the years to come. Poor households in rural and urban areas suffer less than non poor households at every period from the oil shock.

Figure 3. Simulated impact of imported inflation (excl. oil) on households welfare
(Equivalent variation in percentage of benchmark disposable income)



IV. Policy Responses

We first test the impact of fiscal policies aimed at lowering the pass-through of world prices on domestic markets, through the introduction of (i) consumer subsidies and (ii) export taxes. Percentage point changes in taxes / subsidies are set in proportion of observed imported inflation at the product level. In other words, the higher the observed change in the world price of a given commodity, the higher the tax change applied to that commodity.

Lower/higher induced tax receipts are financed through higher/lower government savings.[22] Ceteris paribus, lower taxes induce lower public revenue and higher deficit,

[22] Other fiscal closure rules could be envisaged, such as higher / lower current expenditures or taxes for instance, in response to lower / higher government revenues. The closure rule used here can be considered as the "default" closure rule, i.e. what would happen if no specific decision was made regarding the financing of policies tested here through offsetting tax or expenditure reforms. This closure rule, like any other actionable measure is not strictly neutral from a distributional impact perspective. On the contrary, income transfers/taxes strictly proportional to initial levels of welfare could be considered neutral, but almost impossible to implement in real life. Sensitivity analysis nevertheless suggests that using such closure rule does not significantly affect the conclusions obtained when letting the public deficit adjust endogenously.

thus lower investment, the latter being determined by the sum of foreign, households and public savings.

Consumer Subsidies. The first policy simulation consists in introducing consumer subsidies (in the form of vouchers for instance) on agricultural goods recording positive imported inflation. As such, this policy tends to lessen the transmission of global inflation to Tanzanian food consumers. The subsidy is equal to the imported inflation rate (cf. Figure 1) multiplied by the ratio of imports over total absorption for the given commodity.[23] Results are reported in the Table 2 in difference with those obtained without policy change, to single out the impact of the considered policy. For instance, the 0.3 percentage point gain reported for rural poor means that such households would see their welfare decline by 1.1 percent in the medium run if global commodity inflation were to be accompanied with consumer subsidies (against -1.4 percent without).

Table 2. Welfare impact of accompanying fiscal policies

Policy	Consumer subsidies		Export taxes		Producer taxes	
Term	Medium	Long	Medium	Long	Medium	Long
Rural poor	0.25%	0.25%	-0.08%	-0.46%	0.07%	0.08%
Rural non poor	0.25%	0.22%	-0.17%	-0.59%	0.08%	0.09%
Urban poor	0.09%	0.07%	-0.11%	-0.55%	0.07%	0.09%
Urban non poor	0.22%	0.18%	-0.13%	-0.49%	0.06%	0.06%
Poor	0.21%	0.21%	-0.09%	-0.48%	0.07%	0.08%
Non poor	0.24%	0.21%	-0.15%	-0.55%	0.07%	0.08%
Rural	0.25%	0.23%	-0.15%	-0.57%	0.08%	0.09%
Urban	0.20%	0.17%	-0.13%	-0.50%	0.06%	0.07%
Total	0.23%	0.21%	-0.14%	-0.54%	0.07%	0.08%

Note: Welfare changes (relative to initial disposable incomes) are presented in difference with those estimated without accompanying policies, cf. Table 1.

Overall, introducing consumer subsidies on food commodities which record high imported inflation entail a slight reduction in the consumer price of grains (a one percentage point reduction in the inflation rate in the medium run), which favors both consumers and producers of these products. The latter re-allocate part of their outlets to domestic markets to satisfy additional demand, which reduces exports (and thus imports,

[23] In the absence of any substitution possibility between domestic goods and imports, this policy would neutralize the impact of imported inflation on domestic consumer prices.

given our fixed trade balance closure rule). Investment also declines as the price of consumption decreases with respect to the price of investment and as the fiscal deficit rises (to finance subsidies). This slightly reduces the available capital stock and development prospects in the long run.

Yet, as intended to offset a negative shock without being greatly distortionary (as preserving relative prices between imports and domestic goods, and not affecting directly the price of intermediate consumption and related costs structure), this policy generates mildly positive welfare results. Considering the post-shock situation as benchmark would have nevertheless possibly led to an opposite conclusion (as artificially encouraging the demand for subsidized products, reinforcing the term-of-trade shock and reducing export opportunities). In any case, the magnitude of welfare gains stemming from such a policy is small, in comparison with the total welfare changes recorded when oil price spikes are factored in.

Export taxes. The second set of policy simulations consists in introducing export taxes on products facing global inflation, with a view to redirecting part of the export supply to the domestic market to exert a downward pressure on its domestic price.[24] Export tax levels at the product level are set in proportion of imported inflation, with a view to obtain the same containment of consumers' grain prices than in the previous simulation, for the sake of comparability. In the medium run, the introduction of export taxes generates additional revenue for the government equivalent to 0.1 percent of GDP.

As intended, introducing export taxes redirect domestic agricultural output towards domestic markets, thus also reducing the demand for imports of similar goods (yet to a lower relative extent, given the imperfect substitutability between goods of different origins). But by doing so, the economy also renounces to fully benefit from the emerging income opportunities stemming from a positive agricultural terms of trade shock. Thus, rural households stand to lose from the reform, as their income decline more rapidly than the price of their consumption basket. Through derived effects, other households – including poor – also lose from the reform, the more so in the long run, in comparison with a situation where the economy is not prevented from fully meeting its new comparative advantages.

[24] In May 2008, the Government of Tanzania introduced a ban on all food exports.

Producer taxes, tariffs. Other fiscal policy responses could consider amplifying the supply response to the terms of trade shock. In particular, producer taxes on goods facing large imported inflation could be reduced to (further) foster domestic production. Thus, the next simulation envisages a reduction of producer taxes proportional to the observed imported inflation (excluding oil), and a diminution in tariff rates by a similar amount, to maintain levels of protection unchanged.

The combination of reduced producers taxes and tariffs on goods facing imported inflation entail greater demand for these products, both domestic and imported. With positive terms of trade for the set of products concerned, Tanzania stands to gain in macro-economic terms from a closer alignment of domestic prices to world prices in these sectors. Interestingly, in spite of its cost in terms of foregone public revenue (and hence in terms of lower available savings), long term benefits slightly exceed medium terms ones, reflecting significant gains of reallocation.

The reform is particularly beneficial to non poor rural households, non poor farmers in particular, who can reap the benefits of increased export opportunities. Yet, other households also benefit from the reform, urban poor in particular, who enjoy greater purchasing power for food products.

Petroleum oil taxes. Yet, introducing consumer subsidies while liberalizing the sectors facing inflation does not suffice to offset the overall negative welfare impact generated by global commodity inflation in the short and medium run. This discrepancy stems from the large negative impact of oil prices spikes on all the sectors of activity, including agriculture. Although the authorities might be reluctant to reduce the pass-through of imported oil prices, a reduction in taxes on petroleum oil could be considered given its large impact on the economy.

In 2005, the government collected the equivalent of 1 percent of GDP from the ad-valorem VAT on petroleum.[25] As such, it is likely that higher oil prices since allowed the generation of substantial additional tax receipts for the government.

In the next simulation, we thus reduce by a third the VAT rate on oil imports. As directly offsetting initial welfare losses induced by oil price spikes, such a policy

[25] The government collects another 1 percent of GDP through excise taxes on oil. Oil imports are also subject to tariffs.

generates large welfare gains, above 0.3 percent of total disposable income. Such gains nevertheless disproportionately favor the non poor, who consume more oil, and strongly impact the fiscal balance.

Combined policies. In a last simulation, we combine the three sets of policies that produce positive welfare gains: consumer subsidies, producer taxes and tariffs reduction on goods facing imported inflation (but oil), VAT reduction on oil products. Results obtained do not differ significantly from the sum of those obtained when simulating separately the three sets of policies, reflecting their additive natures. While beneficial to the poor, these policies are not particularly pro-poor, in the sense that non poor households would stand to gain more from it in absolute and relative terms. Besides, such policies would only reduce initial welfare losses by a third, certainly not eliminate them. But symmetrically, they would not either hurt longer term prospects, and would actually increase by a ¼ long term welfare gains.

Table 3. Welfare impact of accompanying fiscal policies

Policy	VAT petroleum		Combined policies	
Term	Medium	Long	Medium	Long
Rural poor	0.20%	0.19%	0.52%	0.52%
Rural non poor	0.39%	0.38%	0.71%	0.69%
Urban poor	0.27%	0.27%	0.44%	0.42%
Urban non poor	0.42%	0.39%	0.70%	0.63%
Poor	0.22%	0.21%	0.50%	0.50%
Non poor	0.40%	0.38%	0.71%	0.67%
Rural	0.35%	0.34%	0.68%	0.66%
Urban	0.40%	0.38%	0.67%	0.61%
Total	0.37%	0.36%	0.68%	0.64%

Note: Welfare changes (relative to initial disposable incomes) are presented in difference with those estimated without accompanying policies, cf. Table 1. Combined policies comprise the introduction of consumer subsidies, the reduction in producer taxes and tariffs and the reduction in VAT on oil discussed in the main text.

Other policies to curb the negative impact of imported inflation could obviously be envisaged, including in particular targeted transfers to the poor or the provision of public goods to raise agricultural supply and yields (research, extension services, infrastructure, irrigation, etc). These policies are not tested here in the absence of data on their cost effectiveness. Indeed, given their nature, targeted transfers should directly favor

the poor. But the targeting efficiency and its mode of financing need to be known to appraise the overall impact of such a policy in a general equilibrium framework. Similarly, one would need to know the induced public cost of raising agricultural supply and its mode of financing to assess its net efficiency.

V. Concluding Remarks

Results from this exercise suggest that the poor could have been relatively shielded from current global commodity inflation in comparison with the non poor. Indeed, the poor in Tanzania derive a larger share of their incomes from agricultural activity and consume less oil-intensive products. They nevertheless most likely suffered in absolute terms – the result of oil price increases, even if their situation could improve once factor allocation and investment decisions respond to the new set of relative prices.

The results also suggest that fiscal policies encouraging higher agricultural production and consumption could further contain overall poverty reduction losses, even if not necessarily pro-poor. In contrast, policies discouraging agricultural production (such as export bans) strongly amplify poverty increases and reduce poverty alleviation prospects. All in all, though, existing tax instruments can only alter at the margin (in one direction or the other) the likely impact of global commodity inflation on poverty. One might want to contemplate the use of other instruments (targeted transfers, infrastructure, etc) to further contain poverty losses in the short run and turn them into poverty gains in the longer run.

The consideration given to structural policies (social protection, agricultural development) vs. shorter term tax policy responses is particularly important given the high uncertainty regarding the permanent vs. transitory nature of the food price shock.[26] At least as important as the challenge of containing welfare losses in the short run is the

[26] As already mentioned, Current outlooks from most international institutions now foresee a slow decline in food prices in 2009, stabilizing thereafter to a higher plateau than in 2006. But such outlook still remains quite uncertain. Indeed, the transitory vs. permanent component of food inflation is yet to be quantified with more certainty. This is not an easy task as many important factors exerting influence on agricultural supply and demand can move in the near future in different directions, implying the existence of multiple equilibriums in the medium term. The policy response to the current crisis is itself one of these factors, as well as its interpretation by markets. Others comprise global macro-economic imbalances, the impact of climate change on agricultural yields and volatility, potential technological gains, energy prices, and possible remaining bubbles on financial and assets markets.

challenge of being able to rapidly adjust the tax policy response to a changing environment. Indeed, tax policy reforms which could be considered today pro-poor and welfare improving could turn the opposite if the current evolution of commodity prices was reversed.

The results described above rely to some extent on the assumption of competitive transmission of prices from producers to consumers. However, the possible existence of market power in the trade and transport sectors could alter such transmission. In Tanzania, there is no obvious regulation candidate to generate monopolistic situations in these sectors. Rather, the absence of competition in intermediary sectors is often linked to the lack of adequate public infrastructure combined with fixed costs in the transport sector.[27]

Another uncertainty lies in Tanzania's ability to benefit from its new potential comparative advantages, in oil crops notably. According to land surveys, Tanzania still disposes of a huge reservoir of uncultivated arable land (for oil crops in particular, but for sugar cane too[28]), and World Bank analysis suggests that land extension significantly contributed to agricultural output growth in the past. But land extension might not be immediate, as it would depend on the ability of people to migrate to low density zones, secure farmland and use labor saving technologies in these areas. The adequate provision of infrastructure and public services in these new areas might also be an important factor in this regard. Besides, the impact on rural poverty would depend to a large extent on who is able to claim new lands. In the model, though, land extension – as any other capital accumulation – only results from past investment expenditure, and it would take specific efforts to model correctly this dimension.

[27] See Nyange, D. (2005).

[28] In spite of higher demand for bio-fuels, international prices for sugar cane have not gone up so far. But it is likely that they will if the high demand for bio fuels is accompanied with a decrease in subsidies granted to producers of corn-based ethanol. This reduction in subsidies is justified on several grounds: for the global environment, as bio-fuels produced with sugar cane in developing countries is far less Co2-intensive than that produced with grains in developed countries; for food consumers as increased demand for grains to produce bio-fuels exert upward pressure on food prices. Furthermore, relying on sugar cane ethanol imported from developing countries rather than only ethanol from corn would be likely to increase energy security. This is because the year-to-year variation of corn yields is very high (higher according to some calculations than the variation in oil prices), and because exporters of sugar ethanol would have a vital interest in exporting continuously.

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Annex

The various dimensions of the model are listed below:

Sectors of activity

1. MAIZE
2. PADDY
3. SORGHUM
4. WHEAT
5. BEANS
6. CASSAVA
7. OTHER CEREALS
8. OIL SEEDS
9. ROOTS
10. COTTON
11. COFFE
12. TOBACCO
13. TEA
14. CASHEW NUTS
15. SISAL
16. SUGAR
17. FRUITS & VEGETABLES
18. OTHER CROPS
19. LIVESTOCK
20. FISHING
21. HUNTING & FORESTRY
22. MINING
23. MEAT & DAIRY
24. GRAIN MILLING
25. PROCESSED FOOD
26. BEVERAGES
27. CLOTHES
28. WOOD PRODUCTS
29. CHEMICALS
30. FERTILIZERS
31. PETROLEUM PRODUCTS
32. RUBBER & PLASTICS
33. GLASS
34. METAL
35. EQUIPMENT
36. UTILITIES
37. CONSTRUCTION
38. TRADE
39. HOTEL
40. TRANSPORT & COMM.
41. ESTATE
42. ADMINISTRATION
43. PRIVATE SERVICES

Factors of production:

1. CHILD LABOR
2. FEMALE LABOR NO EDUCATION
3. FEMALE LABOR (NOT FINISHED PRIMARY SCHOOL)
4. FEMALE LABOR (NOT FINISHED SECONDARY SCHOOL)
5. FEMALE LABOR (FINISHED SECONDARY SCHOOL)
6. MALE LABOR NO EDUCATION
7. MALE LABOR (NOT FINISHED PRIMARY SCHOOL)
8. MALE LABOR (NOT FINISHED SECONDARY SCHOOL)
9. MALE LABOR (FINISHED SECONDARY SCHOOL)
10. CAPITAL (INCLUDING LAND)

Households:

1. RURAL (BELOW FOOD POVERTY LINE)
2. RURAL (BELOW BASIC NEEDS POVERTY LINE)
3. RURAL NON POOR, HEAD WITHOUT EDUCATION
4. RURAL NON POOR, HEAD NOT FINISHED PRIMARY EDUCATION
5. RURAL NON POOR, HEAD NOT FINISHED SECONDARY EDUCATION
6. RURAL NON POOR, HEAD FINISHED SECONDARY EDUCATION
7. URBAN (BELOW FOOD POVERTY LINE)
8. URBAN (BELOW BASIC NEEDS POVERTY LINE)
9. URBAN NON POOR, HEAD WITHOUT EDUCATION
10. URBAN NON POOR, HEAD NOT FINISHED PRIMARY EDUCATION
11. URBAN NON POOR, HEAD NOT FINISHED SECONDARY EDUCATION
12. URBAN NON POOR, HEAD FINISHED SECONDARY EDUCATION

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