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Implications of High Commodity Prices on Poverty Reduction in Ethiopia and Policy Options under an Agriculture-Led Development Strategy

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Abstract

This research aims at measuring the potential impact of high commodity prices on Ethiopia's prospects of maintaining agricultural growth objectives and poverty reduction targets set in the CAADP agenda. In view of this, we build a Computable General Equilibrium model which uses the Dorosh and Thurlow (2009) approach as a benchmark. We then introduce international oil and fertilizer price shocks along with a devaluation policy. A poverty analysis is conducted using the latest household income and consumption expenditure survey.

We find that international oil and fertilizer price increments alone have a significant impact in Ethiopia as the country is a net importer of those commodities. The impact is higher when combined with devaluation measures. The major transmission channel of these international price shocks is through an increase in intermediate input prices followed by a drop in factor price. The impact of these shocks is negligible on overall real GDP growth compared to the reference scenario where a 6% agricultural growth is simulated. The shocks favor export-intensive agricultural and manufacturing activities while other sectors tend to contract. Agricultural food production declines showing that such price shocks may undermine food security by reducing supply and affordability of food crops on the local market. Devaluation and world oil and fertilizer price increments are likely to circumvent the poverty reduction achievable under a 6% agricultural growth scenario. The incidence of poverty increases by 2.9 percentage points in 2019-2020 while an additional 2.8 million individuals fall into poverty. Finally, we find that the devaluation policy is likely to result in higher local prices which may in turn cause real exchange rate appreciation thereby eliminating the competitiveness gains.

Résumé

Cette recherche a pour but de mesurer l'impact potentiel d'un niveau élevé des prix des biens sur les perspectives d'atteindre les objectifs de croissance agricole et les cibles de réduction de la pauvreté établis dans le cadre du PDDAA en Ethiopie. Pour cela, nous construisons un modèle d'équilibre général calculable basé sur l'approche de Dorosh et Thurlow (2009) pour notre scénario de référence. Nous comparons cette situation avec les résultats obtenus suite à l'introduction d'un choc au niveau des prix internationaux de pétrole et de fertilisants que nous combinons avec une politique de dévaluation. Une analyse de pauvreté est effectuée en utilisant l'enquête sur les ménages la plus récente.

Nos résultats montrent qu'un accroissement des prix internationaux de pétrole et des fertilisants sont à même d'avoir un impact important en Ethiopie étant donné que le pays est un importateur net de ces produits. L'impact est plus élevé lorsqu' une politique de dévaluation s'ajoute aux chocs de prix internationaux. Une augmentation du prix des intrants intermédiaires est le principal canal de transmission, suivi par une baisse du prix des facteurs de production. L'impact de ces chocs est négligeable sur le taux de croissance du PIB réel par rapport au scénario de référence où nous simulons une croissance agricole annuelle de 6%. L'accroissement des prix internationaux a tendance à favoriser les branches intensives en exportations notamment dans l'agriculture et l'industrie. Cependant, les autres activités de production se contractent particulièrement la production alimentaire agricole. De tels chocs créent un risque pour la sécurité alimentaire en réduisant l'offre de biens alimentaires sur le marché local à un prix abordable. La réduction de la pauvreté atteinte sous une croissance annuelle agricole de 6% est affaiblie en particulier en zone urbaine. L'incidence de pauvreté augmente de 2.9 points de pourcentage en 2019-20 et le nombre de pauvres s'accroit de 2.8 million de personnes supplémentaires à la même période comparé à la situation dans le scénario PDDAA. Enfin, nous trouvons que la politique de dévaluation résulte en un accroissent des prix locaux entrainant un risque d'appréciation du taux de change réel qui risque d'éliminer les gains de compétitivité à l'export.

1. Introduction

Since 1993, the Government of Ethiopia has implemented an agriculture-led development strategy through its Agricultural Development-led Industrialization (ADLI) policy. Currently, this strategy takes the form of the Growth and Transformation Plan (GTP), a five-year plan which began in the 2010-11 fiscal year. The GTP has the overall objectives of eradicating poverty, improving citizens' livelihoods, and transforming Ethiopia into a middle-income country. The plan is built around sustained, rapid, and equitable economic growth, with agriculture as the major source of that economic growth.

During the implementation of the previous medium-term development strategy, the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) between 2005-06 and 2009-10, Ethiopia's economic growth averaged 11%. In 2010-11, the country registered an 11.4 % real GDP growth rate, surpassing the GTP target of 11%. The government plans to maintain this pace over the next five years in order to achieve its MDG targets.

Recent years have witnessed important declines in Ethiopia's poverty levels. Poverty measured by real consumption expenditure[1] declined by 14.8% between 1995-96 and 2004-05, reaching 38.7 % in 2004-05; it further declined by 23.5% between 2004-05 and 2010-11, reaching 29.6 % in 2010-11. Food poverty also declined from 42% in 1999-00 to 38% in 2004-05, reaching 33.6 % in 2010-11. Poverty remains more concentrated in rural areas, where more than 80% of the population resides. In 2010-11, while the proportion of the population below the poverty line stood at 30.4% in rural areas, it was estimated to be 25.7% in urban settings. While income inequality[2] declined from 0.44 in 2004-05 to 0.371 in 2010-11 in urban areas, it increased marginally in rural areas from 0.26 to 0.27, leaving the overall inequality unchanged during this period.

Despite its overall progress in recent years, Ethiopia continues to face serious structural challenges that may undermine the progress made thus far in economic growth and poverty reduction. Inflation levels over the last two decades, measured by consumer price index (CPI), generally remained below or around 10% per annum; inflation even reached negative levels in the early 2000s (National Bank of Ethiopia, 2008). Since 2007, however, Ethiopia has recorded the highest inflation rates in Africa. Overall year-on-year inflation reached 28.4 % in July 2008, led mainly by food price increases, which

[1] Source: MoFED. 2013. Development and Poverty in Ethiopia 1995/96-2010/11. June 2013, Addis Ababa Ethiopia.
The cost of basic needs method was utilized for setting the poverty line. Poverty measurement is based on the cost of 2,200 kcal per day per adult food consumption with an allowance for essential nonfood items. The food and total poverty lines used since 1995/96 in the country are 648 and 1075 Birr per year at national average prices. The 1075 Birr poverty line is applied to real per adult household consumption expenditure in order to calculate head count, poverty gap and squared poverty gap indices. The 1999/00 and 2004/05 poverty indices were calculated by deflating all food and nonfood consumption items by spatial price indices and temporal price indices (relative to 1995/96 constant prices). As for the 2010/11 poverty indices, the 1995/96 poverty line was computed at 2010/11 prices. The food and total poverty lines for 2010/11 are 1985 and 3781 Birr respectively.

[2] Income (consumption) inequality measured by Gini Coefficient. Source: MoFED 2013, Development and Poverty in Ethiopia 1995/96-2010/11. June 2013, Addis Ababa Ethiopia.

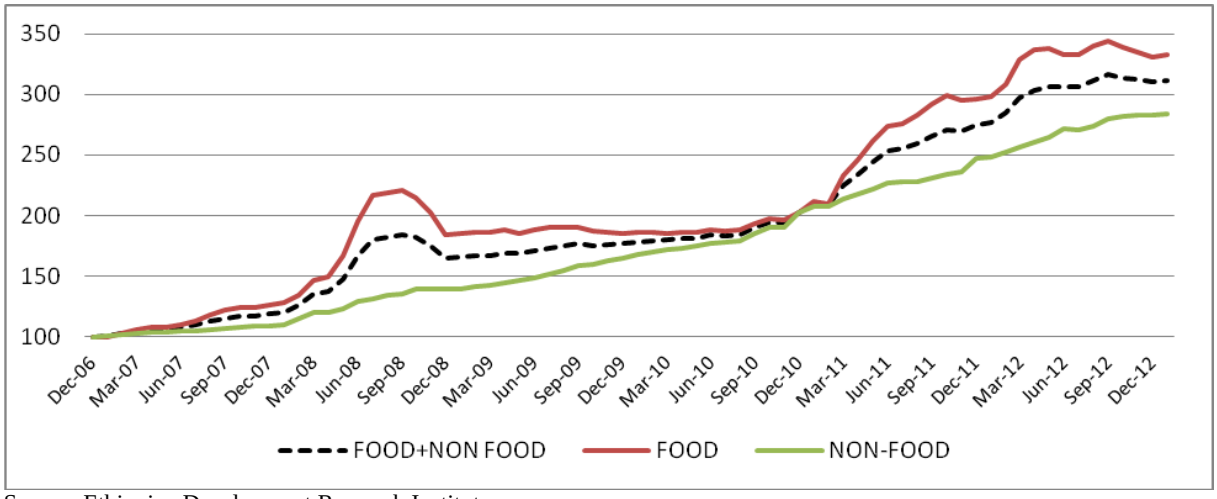
accounted for 60% of the weight attached to the CPI basket of goods. On an annual basis, the average headline inflation reached 36.4% in 2008-09. As of February 2012, the overall year-on-year inflation rate stood at 35.9%, driven mainly by rampant food inflation (44.3%). In fact, after several straight months of food price deflation (from February to October 2010), food prices began to rise at the end 2010, first with modest increases and then with a sharp acceleration beginning in May 2011; stable and increasing two-digit growth was seen in the following months (see Figure 1). Food inflation was most important for cereals like teff, wheat, maize, and barely, followed by pulses, meat, butter, coffee and tealeaves, peppers, potatoes, tubers, and stems.

This upsurge in high inflation rates has been a major threat to macroeconomic stability in Ethiopia, prompting the government to take several measures to contain inflation. The first measure consisted in imposing a ceiling on the retail price of selected commodities. Price caps on 18 essential commodities, including bread, rice, meat, cooking oil, and sugar, were imposed in January 2011. However, most price ceilings were lifted in late May 2011. Other measures consisted of importing commodities such as grains (particularly wheat), sugar, or cement in order to stabilize local market prices. Imported wheat, sugar, and palm oil were distributed at subsidized prices to poor urban households.

Another key measure adopted by the government has been the limitation of credit growth. In April 2011, in order to tighten the money supply and reduce liquidity, the National Bank of Ethiopia (NBE) required private banks to hold 27% of their lending portfolio in the form of five-years NBE bills. One of the sources of Ethiopia's rapid monetary expansion in recent years seems to have been the public sector's domestic borrowing. Evidence shows that the bulk of banking system credit was absorbed by the public sector in recent years (NBE Annual reports). Therefore, in addition to the aforementioned measures, the NBE also ceased lending to the government in the first quarter of the 2011-12 fiscal year; financing of public sector borrowing requirements is mainly addressed by sales of treasury bills to commercial banks and non-bank institutions.

Despite these measures, inflation, particularly food price inflation, continues to rise, putting significant stress on the livelihoods of Ethiopia's poor population. Figure 1 shows that food prices have increased significantly more than non-food prices; higher food prices are more severe if a significant share of a household's expenditure is spent on food items. The latest Household Income and Consumption Expenditure Survey (HICES, 2010) has shown that expenditures on food, as a share of total household expenditure, remains high at 52%.

Figure 1 - Trend in Consumer Price Index (Dec 2006 = 100)



Source: Ethiopian Development Research Institute

Higher commodities prices, particularly food commodities, are also likely to affect real income and consumption if wages/income are not adjusted accordingly. Using monthly data on consumer prices and informal/unskilled wages to explore the impact of higher food prices, Headey et al. (2012) show that food prices outpaced nominal wage growth during the 2007–2008 and 2011 food crises. Testing whether daily laborer wages responded to price changes over the short run, they find that wages did not fully respond to the sharp food price spikes of 2008 and 2011, translating into a deterioration in both food and overall purchasing power (20% and 10% in 2007-08). Their findings suggest that the 2010-11 food crisis had larger welfare effects, owing to higher non-food inflation.

In line with the GTP and as part of the Comprehensive Africa Agriculture Development Program (CAADP), Ethiopia allocates more than 10% of its expenditures to agriculture (data show a 22.1% share of total capital expenditure and 9.2 % of total current expenditure in EFY 2009-10) and has met its targeted 6% growth rate in agriculture (6.4 % in 2008-09, 7.6 % in 2009-10, and 8.6 % in 2010-11). A recent IFPRI Discussion Paper (Dorosh and Thurlow, 2009) uses a Computable General Equilibrium (CGE) Model for Ethiopia and finds that if Ethiopia can meet its targets for crop yields and livestock productivity, it should be possible to continue to reach and sustain the 6% annual growth targeted by the CAADP. According to their simulations, this sustained 6% growth would result in overall economic growth leading to an 18.4% reduction in poverty by 2015. At the time of their research, inflation had stabilized; however, since the end of 2010, prices have been on the rise in Ethiopia. This implies that the simulated 6% agricultural growth's impact on poverty ought to be revised in order to account for the negative effects of rising commodity prices. Income effects resulting from the simulated 6 % agricultural growth translate into an increase in consumption, reducing the number of households below the poverty line. However, the level of poverty reduction is expected to be lessened if recent changes in prices are to be accounted for.

This paper aims at measuring the potential impact of high commodity prices on Ethiopia's prospects for maintaining the agricultural growth objectives set in the CAADP agenda. Furthermore, we aim at measuring the likely impact on the country's efforts and advancement toward attaining its poverty reduction targets. In view of this, we build a CGE model which uses the Dorosh et al. (2009) approach as a benchmark and introduce international oil and fertilizer price shocks, along with nominal exchange rate devaluation. The rationale for choosing these shocks is outlined in the following sub-sections.

1.1 Sources of Inflation

Compared with previous periods, Ethiopia's recent inflation has some unique characteristics. Historically, inflation peaks, particularly food inflation, have been highly driven by supply-side shocks resulting from droughts or bad weather. However, recent pattern of high inflation has coincided with high economic growth and relatively good harvests. This pattern is new to Ethiopia, and it has become a concern for the government because it has the potential to undermine the accomplishments made thus far in terms of poverty reduction, as well as future prospects. The country's targeted economic growth may also be unattainable if this pattern of high inflation continues. Therefore, understanding the determinants of inflation, as well as its effects on economic growth and poverty, is essential in order to design adequate policy interventions.

Inflation has several drivers in Ethiopia, which can be classified into two categories: external and internal factors. Internal factors are essentially related to expansionary monetary policy. Massive financing of public budget deficits, disbursement of large volumes of credit to the private sector with negative real interest rates (including through micro-credit schemes), salary increases for government employees[3], inflows of remittances, and monetization of food aid are major factors behind the increase in money supply. Other internal factors include the oligopolistic wholesale market structure, an overall increase in aggregate demand, and inflation expectations.

External shocks have also contributed to the inflationary pressure seen in Ethiopia. International food and commodity prices rises, particularly fuel, food, and raw materials, combined with a drastic devaluation of the local currency (20% devaluation against the USD was reported in September 2010 by the National Bank of Ethiopia) and continuous depreciation of the Birr against major currencies (40.8 percent against USD in 2009-10 and 25% during 2010-11), which increases the price of imported goods, have been identified as main external sources of inflation in Ethiopia.

Looking at the literature, most of the above-mentioned factors have been analyzed using different techniques. However, there appears to be no consensus regarding the primary sources of inflation in Ethiopia.

[3] At the beginning of 2011, wages of civil servants (about one million people) increased on average by about 33%, representing a re-alignment of salaries to the higher cost of living after three years of no increase.

Klugman (2007) examines food inflation in Ethiopia based on micro-analysis. She suggests that recent food inflation can be largely explained by overall inflation, which is related to an increase of money stocks. Other explanations of high food inflation include a shift from food aid to cash aid; activities of agricultural cooperatives would also affect price levels by improving the bargaining power of farmers.

Ahmed (2007) concludes that "structural changes," such as monetary expansion and increasing farmers' bargaining power, are the main reasons for Ethiopia's recent inflation. He argues that monetary expansion is largely dictated by credit expansion in both the public and the private sector.

Ayalew (2007) constructs a macroeconomic model and simulates impact of various shocks on inflation, using annual data from 1970-2006. He suggests that Ethiopia's inflation is affected by real GDP, money stocks, foreign prices, and the exchange rate.

In its 2008 country report, the IMF argues that excess aggregate demand generated by expansionary monetary policy was a key driving force of inflation in Ethiopia. Inflation expectations are also identified as a source of the continuous upward trend in inflation. The analysis shows that, until 2008, the role of external factors was relatively limited, although it also notes that future upward adjustments of retail fuel prices would add some pressures on prices. In addition, structural factors, including the convergence of the prices of some exported agricultural products to international prices, are believed to have played a significant role in driving up the domestic prices of some food items, as they have been converging to higher world prices.

The Ethiopian Development Research Institute (EDRI) (2007) points out that both domestic and external factors account for the recent inflation, among them (i) the increase in international commodity prices, including oil; (ii) Ethiopia's structural changes and continued good economic performance; (iii) the increasing supply of money and the injection of cash into the rural economy; (v) changes in farmers' behavior to supply products more uniformly throughout the year (including improvements in access to micro-credit, storage facilities, marketing information, etc.); and (vi) increased local purchases by governmental food security institutions, agricultural cooperatives, and relief agencies.

In its 2012 country report, the FAO attributes the recent surge in the overall inflation rate to a series of factors, such as rising international commodity prices (mainly fuel, food, and raw materials), the expansion of national broad money supply with negative real interest rates, the large currency devaluation, the oligopolistic wholesale market structure, and an overall increase in aggregate demand.

Loening et al. (2009) use monthly data from 2000-2009 and find that, in the long run, domestic food and non-food prices are determined by the exchange rate and by international food and goods prices. In the short to medium run, agricultural supply shocks and inflation inertia strongly affect domestic inflation, causing large deviations from long-term price trends. Money supply growth affects food price inflation in the short run, although excess money supply does not seem to drive inflation in the long run.

Durevall et al. (2010) use the same data set to estimate models of inflation to identify the factors contributing to CPI inflation and three of its major components: cereal prices, food prices, and non-food prices. They find that movements in international food and goods prices, measured in domestic currency, determine the long-run evolution of domestic prices. In the short run, agricultural supply shocks affect food inflation, causing large deviations from long-term price trends. The evolution of the money supply does not affect food prices directly, although growth in the money supply significantly affects non-food price inflation in the short run.

1.2 High Commodity Prices and Poverty

Inflation can severely impact vulnerable households' access to food, particularly for urban households and net buyers in rural areas (FAO, 2012). Poor populations, as well as those just above the poverty line, suffer from eroded purchasing power. The food security assessments conducted by the World Food Program in Addis Ababa found that the proportion of households consuming an adequate diet decreased from 64 to 40% between January and July 2008 (World Food Program, 2008). However, few studies provide evidence regarding the adverse impact of food price shocks on poverty in Ethiopia, and findings are somewhat contradictory in regards to urban versus rural poverty effects.

Ulimwengu et al. (2009) estimate welfare changes as a result of price increases, measured by the compensating variation and nutrient elasticity with respect to price. They find that there are significant short-term price effects between the world maize market and some regional Ethiopian markets, but no long-term connections. Due to the dominance of cereals in households' food budgets, compensation or loss as a result of price increases is much higher for cereals than for other food items. Across regions, the amount of consumption loss is not evenly distributed; on average, consumption loss is higher in rural areas than in urban areas for cereals, pulses, and legumes. In terms of loss in calorie intake, rural households are more affected by price increases than their urban counterparts.

Alem and Söderbom (2010) use panel survey data to investigate how urban households in Ethiopia coped with the food price shock of 2008. Qualitative data indicate that high food price inflation was by far the most adverse economic shock seen between 2004-2008, and that a significant proportion of households had to adjust their food consumption patterns in response. Regression results indicate that households with low asset levels, as well as casual workers, were particularly adversely affected by high food prices.

Ticci (2011) assesses the poverty and distributive impact of Ethiopia's 2006–2008 price acceleration using price indexes and the 2004-2005 WMS-HICES. The estimated increase in the incidence of poverty is of 23 percentage points. She finds that the effect of overall inflation on poverty was differentiated both across rural and urban areas and across regions; however, overall, the rate of urban poverty, as well as its severity, increased. The worsening of poverty in urban areas is explained by these areas' reliance on the market for most consumption needs. In rural areas, while the incidence of poverty might have actually decreased, the severity of poverty increased even under the most

optimistic hypotheses, suggesting that the main risk in rural areas is a further impoverishment of the poorest households.

Headey et al. (2012) look at the welfare impacts of rapid food price inflation in cities and large rural towns using a monthly series of casual wages from 119 locations. They find that the disposable income of daily laborers declined sharply as food prices soared in 2007–2008; there is neither descriptive nor econometric evidence to suggest that wages substantially adjust to higher food prices, except in the long run. Their analysis suggests that the 2010–2011 food crisis had larger welfare impacts than the 2008 crisis because of more rapid non-food inflation.

The World Bank (2012) report on the Ethiopian economy and inflation estimates that the impact of rising consumer prices on expenditures in both rural and urban areas is non-negligible and leads to an estimated increase (around 1.8 million) in the number of poor people. According to the report, it is to be expected that the consumer price inflation seen between July 2010 and October 2011 led to a greater increase in both the depth and the severity of poverty in urban than in rural areas.

Our survey of the literature on Ethiopia's inflation shows important negative poverty and welfare impacts; however, none of the research we came across used economy-wide models to analyze the impact of rising prices. We therefore use a CGE model to analyze both the impact of world petroleum and fertilizer price shocks and the devaluation of the national currency, which have been identified as some of the drivers of Ethiopia's inflation. CGE models are an excellent tool to estimate the general equilibrium effects of price shocks, while at the same time allowing us to capture poverty impacts through micro-simulation methods. It is essential to measure the potential impacts of rising prices on economic performance, government accounts, investment, employment, trade, income, and consumption. This type of modeling enables us to account for the different dimensions of such shocks.

2. Analytical Framework

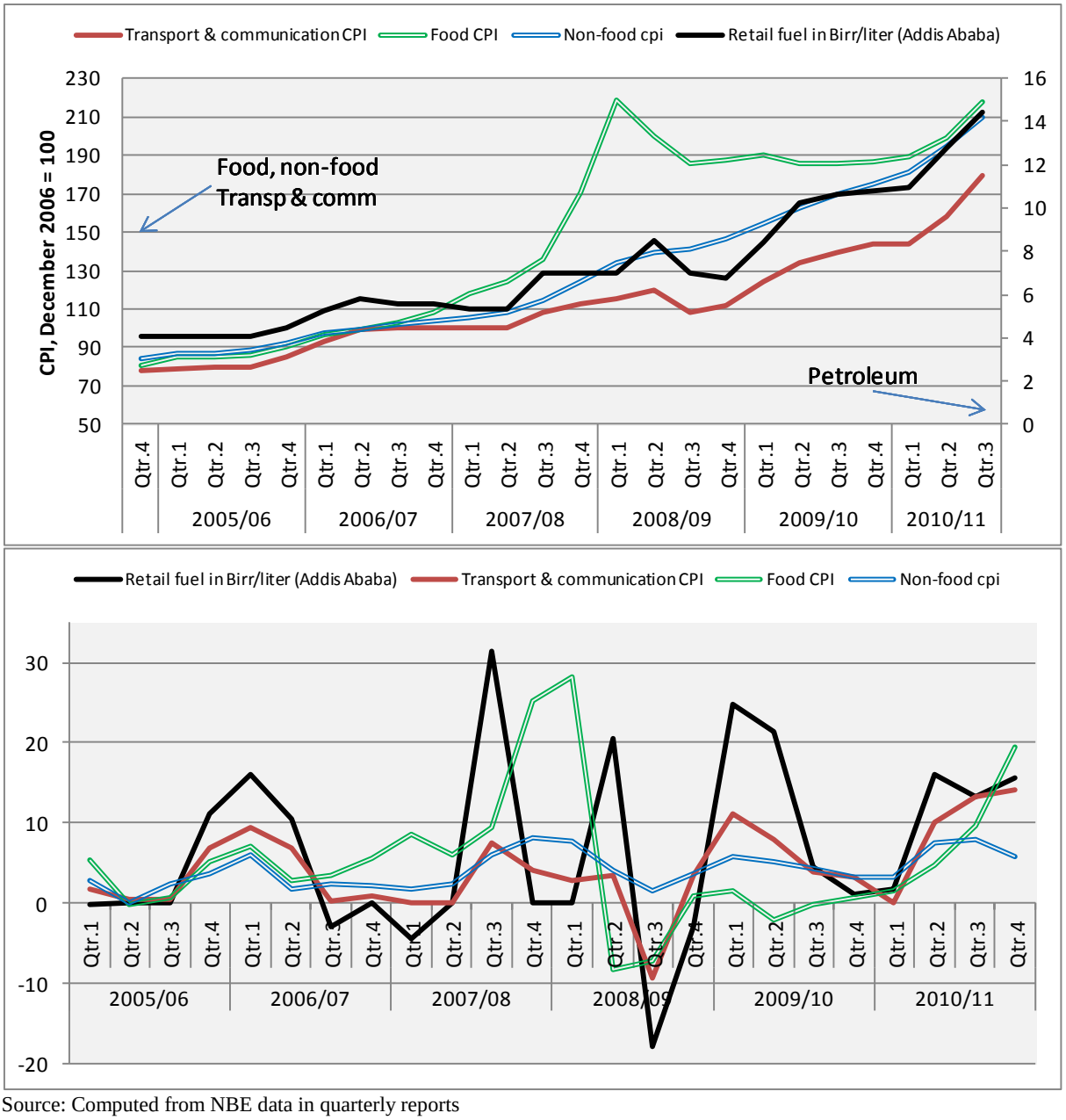
In a CGE framework, it is not possible to talk about inflation per se. To introduce changes in prices, two options were available to us: i) build a financial CGE or ii) explore ways in which to introduce price hikes into the standard CGE model. We opted for the second option.

To introduce price changes within a CGE framework, we looked into the root causes of inflation in Ethiopia. As presented in the above section, we found that there are both internal and external sources. Internal factors are essentially related to expansionary monetary policy, while external drivers are fueled by international food and commodity prices, particularly oil and fertilizers, combined with a drastic depreciation of the local currency. Using this information, we opted for the introduction of price hikes stemming from an external source. We therefore introduce a shock on world fuel and fertilizer prices, followed by a depreciation of the nominal exchange rate.

Retail prices of petroleum products have long been regulated in Ethiopia. Although they were adjusted in mid-2006, early 2007, and early 2008, they were isolated from world prices through government

subsidies (IMF, 2008). These price controls may have helped to mitigate the impact of the hike in world petroleum prices on domestic prices, but oil subsidies have been lifted since 2008. Since then, the domestic retail prices of petroleum products have been adjusted monthly in line with the movements in oil prices on the world market. Recent increases in international commodity prices, particularly petroleum prices, are thus contributing to food and non-food inflation. While changes in retail fuel prices appear to affect both food and non-food CPI, Figure 2 shows that food CPI is particularly strongly correlated with fuel prices. Our assumption is that fluctuations in world oil prices will transmit to local prices, thereby affecting intermediate input and transport costs.

Figure 2 - Food and Non-Food CPI, Transport & Communication CPI and Retail Fuel Prices (level and percent changes from previous quarter)



Source: Computed from NBE data in quarterly reports

3. The SAM

The CGE model used in this analysis is calibrated on a social accounting matrix (SAM) of Ethiopia, which was built by the Ethiopian Development Research Institute (EDRI) based on 2005-2006 data. The EDRI 2005-2006 SAM distinguishes 47 activities (14 agricultural, 20 manufacturing, and 13 services) producing 69 commodities (25 agricultural, 30 manufacturing, and 14 services). There are five primary factors of production (agricultural labor, non-agricultural labor, land, livestock, and non-agricultural capital). Non-agricultural labor is also disaggregated by occupational category (administrative and professional, unskilled, and skilled). There are four aggregate household groups: rural and urban and poor and non-poor. The SAM has 17 tax accounts as well as aggregate accounts for trade margins, transport margins, government, investment, and the rest of the world.

The SAM required aggregation and disaggregation work to fit the needs and modeling requirements of the present study. In addition, the SAM has been updated to 2009-2010 to reflect, to the extent possible, the macroeconomic situation during that period. The value of the GDP for 2009-2010 at constant market price was taken as a reference. Information was taken from the National Bank of Ethiopia (NBE) and the Ministry of Finance and Economic Development (MOFED) data. After proceeding to the update of real GDP, the following rates were taken as benchmarks to update the SAM, using their shares in the 2009-2010 GDP.

- Agricultural GDP: 42%
- Manufacturing GDP: 13%
- Imports: 33%
- Exports: 13.6%
- Gross fixed capital formation: 22.3%
- Private final consumption: 86.1%
- Tax revenue: 11.3%
- Current net income and transfers: 8.3%
- Current account balance: 30%

4. The CGE Model

The proposed CGE model uses an adapted version of the PEP standard computable general equilibrium model presented in Decaluwé et al. (2009). Our model runs on a dynamic basis, enabling the evaluation of long-term impacts. We use 2015 as the medium-term time frame as it corresponds to the MDGs' timeline, as well as that of the CAADP. This year also marks the end of the current government's medium-term development agenda. The eleventh year timeline corresponds to the end of Ethiopia's Agricultural Sector Policy and Investment Framework (PIF), 2010-2020. The model includes a poverty module using a "top-down" approach in which changes in the CGE model are

imported in the household data, using micro data from the most recent Household Income and Expenditure Survey. The CGE model used in this analysis is calibrated on the social accounting matrix of Ethiopia presented in the previous section.

The model's production function is a two-level constant elasticity of substitution (CES) function. At the lowest level, agricultural labor, administrative and professional labor, unskilled non-agricultural labor, and skilled non-agricultural labor are aggregated into composite labor. In parallel, non-agricultural capital, land, and livestock are combined into composite capital. At the intermediate level, composite labor and composite capital are aggregated to form value-added. Finally, value-added is combined in fixed proportions with intermediate inputs to make gross output.

The model's treatment of trade is standard. We assume that the relationship between the rest of the world and the domestic economy is determined by an imperfect substitutability between imported and domestically produced goods and services on the consumption side (Armington hypothesis). Similarly, local producers divide their output between the home and export markets; the shares vary with the ratio of domestic prices to exports process. Thus, allocation between domestic and foreign markets for demand and supply responds to the relative prices of foreign goods defined by exogenous international (import and export) prices, the real exchange rate, and the local tax levels.

In terms of the model's closure, non-agricultural capital is sector-specific and exogenously set at the base year level for the first period of time. Land is mobile across agricultural sub-sectors except for the production of oil seeds, enset, and cash crops, where land is sector-specific. The three other categories of labor are used in agricultural and non-agricultural production. Administrative and professional, unskilled, and skilled labor categories are fully mobile across all sectors. Agricultural labor is mobile in agricultural sub-sectors. Both agricultural and non-agricultural wages adjust to ensure full employment; this is one of the limitations of the model. By adopting the full employment assumption, we consider unemployment as fixed. Unemployment stood at 4% in 2007 (Census 2007). Unemployment is also an urban phenomena, reaching as high as 34% in the urban setting while remaining at 2.1% in rural areas.

All commodity markets follow the neoclassical market-clearing system in which each market is cleared when the total endogenous demand equals the total supply through price adjustment. Our numeraire is the nominal exchange rate. World import and export prices are set fixed following the small price-taking economy hypothesis. Current account balance (in nominal terms) is set fixed at the first period and increases yearly with the population growth rate.

Other variables that grow with the population growth rate are the minimum consumption of commodities in the LES demand equations, the government's current real expenditure, public investment by category and by public sector industry, and changes in inventories. Total investment expenditure is equal to the sum of agents' savings. For the savings investment account, real investment adjusts to changes in savings (i.e., savings-driven investment). Also, the sum of the different forms of

investment expenditure is equal to total investment. Real public investment is fixed and increases yearly with the population growth rate.

Based on the SAM, the production technologies across all sectors are calibrated to their current situation, including each sector's use of primary inputs, such as land, labor, and capital, and intermediate inputs. Exogenous production and trade elasticities, including substitution and transformation elasticities, have been obtained through the EDRI.

The study uses the IFPRI extended standard recursive dynamic CGE modeling system, Version 2.00 (Lofgren et al. 2003), for its poverty analysis. This system endogenously estimates the impact of the simulation's scenarios on poverty. The study investigates this by using a "top-down" approach in which changes in the CGE model are imported in the household data, using micro data from the very recent 2009-2010 HICES of CSA for information on households' detailed expenditure. There are six representative groups in the model, disaggregated by rural zones, small and big urban centers, and poor/non-poor status.

In this "top-down" approach, each household questioned in HICES 2009-2010 is linked directly to the corresponding representative household in the model. The representative households in the CGE model and the SAM are distinguished by location and income level. The mapping exercise is based on these two levels of categorization. In this formulation of the model, changes in representative households' consumption in the CGE model component are passed down to their corresponding households in the survey. Only commodities used in the calculation of the poverty line are considered. In the next step, real total consumption expenditures are recalculated in the survey. This new level of per capita expenditure for each survey household is compared to the exogenously given poverty line, and standard poverty measures are recalculated. Poverty changes are then evaluated using the standard measures. The Foster Greer and Thorbecke (FGT) measures are applied.

$$\mathbf{P_\alpha} = \frac{\mathbf{1}}{\mathbf{N z^\alpha}} \sum_{\mathbf{j=1}}^{\mathbf{J}} \left(\mathbf{z} - \mathbf{y_j}\right)^{\alpha}$$

where j is a subgroup of individuals with consumption below the poverty line (z), N is the total sample size, y is expenditure of a particular individual j, and α is a parameter for distinguishing between the alternative FGT indices[4]. This poverty extension enables us to calculate poverty incidence, poverty depth, and poverty severity.

The 3781 Birr per year and per adult poverty line used in this study is directly adopted from MoFED (2013). The method used for setting a poverty line is the cost-of-basic-needs method. First, the food poverty line is defined by choosing a bundle of food typically consumed by the poor, which gives the

[4] When $\alpha=0$ the expression simplifies to J/N, or the headcount ratio. This is a measure of the incidence of poverty. When $\alpha=1$ the expression gives us poverty depth measured by the poverty gap. When $\alpha=2$ the expression gives us the severity of poverty measured by the squared poverty gap.

minimum caloric requirement (2,200 kcal). An allowance for essential non-food items is also included. Then this bundle is valued at the local price (or it is valued at the national price if the goal is to get a uniform poverty line across regions and groups). In the poverty analysis, consumption is used as the metric to measure poverty; consumption is a better measure of longer-term household welfare because it is subject to less temporal variation than income. Also, in Ethiopia, consumption is likely to be measured more accurately than income.

5. Simulations

The base scenario consists of simulating a 6% sustained agricultural growth, as targeted in the CAADP. The first two simulations consist of introducing international oil and fertilizer price changes observed since 2009-2010. The third simulation introduces a devaluation of the national currency. The last scenario combines the first three simulations. Further details of the simulations are presented below.

Base Scenario: CAADP Scenario

For the reference scenario, we introduce shocks on agricultural TFP, taking as a reference the approach by Dorosh and Thurlow (2009). Applying the same level of annual growth rate of TFP, we are able to obtain a 5.53 % and 5.61 % annual agricultural growth rate for 2014-2015 and 2019-2020. This is close to the values in Dorosh and Thurlow (2009), in which agriculture grew at 5.98 % annually until 2014-2015 under the CAADP scenario[5]. After developing a reference scenario in which productivity follows its trend and agriculture grows at less than 6%, Dorosh and Thurlow make the assumption that Ethiopia can meet its crop yield and livestock productivity targets. In their "all agriculture" scenario, they exogenously shock agricultural productivity based on the above assumption. On the basis of their simulation results, they conclude that if Ethiopia can meet its productivity targets, then a 6% agricultural growth rate is plausible. Following Dorosh and Thurlow, we do not take into account the means by which productivity increases can be achieved. Although Ethiopia has already attained its 6% growth target, it is to be noted that the sources of growth are not necessarily a direct result of increased factor productivity.

The choice of an agriculture-centered reference scenario is justified in the Ethiopian case because agriculture plays a significant role in the country. The agricultural sector contributed up to 50% of GDP on average until 2002-2003. Its share gradually decreased to 42 % in 2009-2010 and lowered further to 41% in 2010-2011. However, agriculture still remains the main driver of growth, although the services sector has gained influence since 2006-2007. Agriculture and its allied activities grew by 13.5% in 2004-2005, with a less sustained pace over the following five years, reaching 7.6% in 2009-2010. Agricultural growth picked up in 2010-2011, reaching 8.4% annual growth. Cereals dominate

[5] Agricultural real GDP growth is lower in our reference scenario, as we apply a lower population growth rate based on more recent data from the Central Statistical Authority (2.6% annually rather than the 3% applied in the Dorosh and Thurlow model).

Ethiopian agriculture, accounting for about 66% of agricultural GDP. Livestock production accounts for about 27% of agricultural GDP, and draught animal power is critical for all farming systems. Forestry accounts for about 7% of agricultural GDP.

Agriculture is the economy's largest employer. A significant proportion of the labor force works in agriculture and related activities and earns a living from these activities. The 2005 Labor Force Survey shows that agricultural activities absorb 80.2 % of the total population; this share is close to 90% in rural areas, where more than 80% of the total population resides.

Agriculture also provides the largest source of exports (over 80%), and thus foreign currency inflows, which enables the country to import vital raw materials and inputs, including those essential for agricultural production. Coffee has long been the major source of export income in Ethiopia, but its share has decreased in recent years owing to greater diversification. Exports of coffee, oilseeds, chat, and flour together accounted for 63.2% and 57.6% in total export earnings in 2009-2010 and 2010-2011. The agricultural sector also plays a central role in the production and provision of food. Thus, this sector can strongly contribute to poverty alleviation if food prices fall, as a considerable share of income is spent on food (52%).

At the policy level, agriculture is seen to be a potential source of broader economic growth through its backward and forward production linkages, as well as its consumption linkages with non-agricultural sectors of the economy. Along with education, health, roads, and water, agriculture has been identified by the government as a strategic poverty-oriented sector and has benefited from important public resources and investment.

In view of the importance of agriculture and of the Ethiopian government's policy priorities, we believe that it is reasonable to expect that Ethiopia will take the necessary steps to attain its agricultural productivity targets. The issue addressed in this paper is not whether or not the productivity targets can or will be attained, but rather, assuming they are attained[6], if they could result in the expected growth and poverty reduction if, at the same time, there is high inflation due to higher import prices.

Inflation Scenarios: Introduction of International Oil (SIM1) and Fertilizer (SIM2) Price Shocks and Currency Devaluation Shock (SIM3)

The first set of simulations consists of introducing international price changes for oil and fertilizer. Data are taken from the World Bank, and corresponding changes in global import prices of oil and fertilizer are applied for the second period and onwards. We focus on import prices as both commodities are only imported in the Ethiopian case, not produced. Regarding fertilizer, Ethiopia imports two types of fertilizer: Diammonium phosphate (DAP) and Urea. DAP represents 65% of

[6] Here, we follow the approach by Dorosh and Thurlow (2009). Hence, we do not take into account the means by which the productivity increase can be achieved.

fertilizer sales, while urea represents 35%. For the simulation, we calculate the weighted average price changes between the two types of fertilizer. The following table summarizes the shocks.

Table 1 – International Price Scenario for Oil, Fertilizer and other Commodities

	Annual prices (nominal)		**% change from previous year**		**% change from constant price reference scenario**					
	Crude oil, average ($/bbl)	DAP + Urea ($/mt)	Crude oil	DAP + Urea	SIM1: World import price of Crude oil	SIM2 : World import price of DAP + Urea	SIM3 : All world import and export prices including Crude oil and DAP + Urea	SIM4: World import price of Crude oil	SIM4 : World import price of DAP + Urea	SIM4 : All other world import and export prices
2009	61.8	297.3								
2010	79.0	426.4	27.8%	43.4%	27.8%	43.4%	20.0%	53.4%	72.1%	20.0%
2011	104.0	549.6	31.6%	28.9%	68.3%	84.9%	20.0%	101.9%	121.8%	20.0%
2012	105.0	492.7	1.0%	-10.4%	69.9%	65.7%	20.0%	103.9%	98.9%	20.0%
2013	105.0	408.0	0.0%	-17.2%	69.9%	37.2%	20.0%	103.9%	64.7%	20.0%
2014	105.7	412.8	0.7%	1.2%	71.0%	38.8%	20.0%	105.2%	66.6%	20.0%
2015	102.0	417.5	-3.5%	1.1%	65.0%	40.4%	20.0%	98.1%	68.5%	20.0%
2016	100.7	416.1	-1.3%	-0.3%	62.9%	40.0%	20.0%	95.5%	68.0%	20.0%
2017	100.1	414.8	-0.6%	-0.3%	62.0%	39.5%	20.0%	94.4%	67.4%	20.0%
2018	99.6	413.4	-0.5%	-0.3%	61.2%	39.1%	20.0%	93.4%	66.9%	20.0%
2019	99.1	412.0	-0.5%	-0.3%	60.4%	38.6%	20.0%	92.4%	66.3%	20.0%
2020	98.7	410.7	-0.4%	-0.3%	59.7%	38.1%	20.0%	91.7%	65.8%	20.0%

Source: World Bank Commodity Price Data (Pink Sheet) - Annual prices. 2009 to 2012 and projections from 2013 onwards (http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0..contentMDK:21574907~menuPK:7859231~pagePK:64165401~piPK:64165026~theSitePK:476883.00.html)

We now assess the effects of this recent devaluation aimed at boosting the country's exports. Exports may indeed increase (and the government has set ambitious targets for 2014-2015), but such a policy may have severe adverse effects on the local economy if the devaluation translates into imported inflation. The NBE intervened to devaluate the nominal exchange rate by 20% in September 2010; this is simulated in SIM3. As the nominal exchange rate is the numeraire, we introduce the devaluation scenario by shocking the international prices of imports and exports by 20% for all tradable commodities. To account for changes in transfers from and to the rest of the world, we introduce a shock which allows us to increase the transfers by 20%.

In the last scenario, SIM4, we combine SIM3 with SIM1 and SIM2. The devaluation now includes international oil and fertilizer price increments. Global import prices of oil and fertilizer are subject to an additional 20% increase above the changes in the international market in the second period.

6. Results

Our first sub-section here discusses results from the first two scenarios, SIM1 and SIM2, in which changes in the global prices of oil and fertilizer are simulated. The second sub-section presents the third simulation, SIM3, in which a devaluation of the national currency is simulated. The last sub-section discusses results from a combination of SIM1, SIM2, and SIM3. Results for SIM1 to SIM4 refer to percentage changes form the reference scenario: the BAU. Results for the BAU are reported based on percentage changes from the previous year.

6.1 Impact of Changes in World Oil and Fertilizer Prices

6.1.1 Effects on prices

The first two simulations consist of introducing shocks on global oil and fertilizer import prices. The simulated changes in international import prices transmit to the price of imports in the local market.

Table 2 — Local Prices of Oil and Fertilizer Imports

(BAU: % change from preceding year; other scenarios: % change from BAU reference scenario)

Local price of imports										
	Oil					Fertilizer				
	BAU	SIM1	SIM2	SIM3	SIM4	BAU	SIM1	SIM2	SIM3	SIM4
2010/11	-2.1	18.3	-0.2	14.4	36.4	-2.0	-0.8	30.2	14.7	50.2
2011/12	-1.7	45.7	-0.4	14.8	69.8	-1.6	-1.8	59.9	15.1	85.5
2012/13	-1.3	47.5	-0.3	15.2	72.4	-1.3	-1.8	47.0	15.4	70.3
2013/14	-1.1	48.1	-0.2	15.5	73.6	-1.0	-1.7	26.9	15.7	46.5
2014/15	-0.9	49.4	-0.2	15.8	75.4	-0.9	-1.7	28.3	16.0	48.5
2015/16	-0.8	45.7	-0.2	16.0	71.1	-0.8	-1.5	29.7	16.2	50.6
2016/17	-0.7	44.6	-0.2	16.3	70.0	-0.7	-1.4	29.6	16.5	50.7
2017/18	-0.7	44.3	-0.2	16.5	69.8	-0.6	-1.4	29.5	16.7	50.8
2018/19	-0.6	44.0	-0.2	16.7	69.7	-0.6	-1.3	29.3	16.9	50.9
2019/20	-0.6	43.7	-0.2	16.9	69.6	-0.5	-1.2	29.1	17.1	50.9

Accounting for import tariff, local taxes, and trade and transport margins, the simulated changes in world prices resulted in an increase in the local prices of imported oil by 49.4% in 2015 and by 43.7% in 2020, compared to their value in the reference scenario. As for fertilizer, local import prices rise sharply until 2013 and thereafter increase at a decreasing rate, rising by 28.3% in 2015 and 29.1% in 2020, compared to the reference situation. Rates of margin applied to oil and fertilizer are particularly high (50% and 45%, respectively). Margins are added to the world price of imports, translated into the local currency, including duties on imports. Changes in local import prices are of lesser magnitude than international price changes because trade and transport margins have fallen in SIM1, SIM2, and SIM4 (-6.4%, -0.7%, and -1.5%, respectively, in 2015) while they increased less than proportionately in SIM3 (+4.9% in 2015).

6.1.2 Effects of the local price of imported oil

Changes in import prices affect the volume of imports, which decline for both oil and fertilizer, although slightly less for the latter, as presented in Table 3. These two commodities are not locally produced; therefore, changes in volumes are of less magnitude than changes in prices.

Table 3 – Changes in Volume of Imported Product: Results from Model Scenarios
(BAU: % change from preceding year; other scenarios: % change from BAU reference scenario)

Volume of imports										
	Oil					Fertilizer				
	BAU	SIM1	SIM2	SIM3	SIM4	BAU	SIM1	SIM2	SIM3	SIM4
2010/11	6.5	-5.0	0.1	-6.3	-11.4	5.7	-0.3	-1.3	-0.2	-2.4
2011/12	6.0	-4.9	0.1	-6.5	-11.5	5.3	-0.6	-1.6	-0.5	-3.1

On the demand side, oil is used as a final consumption good by households and as an intermediate input in the manufacturing and services sectors. This is the stage at which the international price shock transmits to the rest of the economy via changes in prices of and demand for intermediate inputs. It is particularly important in the transport and communication sector, the manufacturing of grain mill services, and the manufacturing of mineral products; in these sectors, oil represents 45%, 40%, and 32% of total intermediate demand, respectively. Overall, petroleum products account for 8.1% (and 10% of the value) of total intermediate demand. The transport sector is affected by changes in the prices and supply of oil; in turn, it affects several other sectors, as it supplies 18.4% of total intermediate demand (in volume). More specifically, 67% of the volume of intermediate inputs used by wholesale and retail trade services consists of transport services. Although agricultural production is not directly affected by changes in the prices and supply of oil, it is indirectly impacted through effects on other sectors of the economy. Table 4 presents changes in real GDP in the above-mentioned sectors. All production activities that intensively use petroleum products in their production processes contract, compared to their performance in the reference scenario. Given the hypothesis of strict complementarity between different categories of inputs and between intermediate consumption and total factor demand (value-added), higher prices of intermediate inputs implies higher production costs, hence higher prices of outputs. Those activities producing goods and services for which demand has shifted toward other commodities (following changes in relative prices) tend to contract. Accordingly, these activities reduce their factor demand, pushing wages and return to capital downward.

Table 4 – Real Sector Growth Results

(BAU: % change from preceding year; other scenarios: % change from BAU reference scenario)

	2014/15					2019/20				
	BAU	SIM1	SIM2	SIM3	SIM4	BAU	SIM1	SIM2	SIM3	SIM4
Teff**	4.90	-3.28	-1.55	-4.20	-9.42	4.74	-3.19	-1.77	-3.79	-9.06
Barley**	4.65	-2.01	-1.12	-2.25	-5.65	4.51	-2.01	-1.34	-2.05	-5.63
Wheat**	8.83	1.41	-2.39	1.99	-0.82	6.97	-0.18	-2.95	0.30	-4.03
Maize**	4.34	-1.90	-1.13	-2.14	-5.43	4.25	-1.86	-1.30	-1.92	-5.32
Sorghum**	4.39	-1.79	0.00	-1.85	-3.81	4.28	-1.77	-0.01	-1.67	-3.58
Pulses**	3.60	0.15	0.63	0.23	0.85	3.44	0.11	0.67	0.19	0.78
Vegetables and Fruits**	3.48	-0.97	0.15	-1.05	-1.93	3.43	-0.98	0.16	-0.98	-1.86
Oil seeds**	6.40	11.30	2.09	14.90	30.07	5.58	10.34	2.19	12.68	26.29
Cash crops[ψ] **	5.97	2.29	0.75	3.51	7.18	6.07	2.33	0.86	3.33	6.98
Enset**	4.08	-1.59	-1.38	-1.84	-5.20	4.27	-1.59	-1.59	-1.68	-5.21
Other crops**	3.73	0.81	-1.16	1.41	0.75	3.43	0.65	-1.15	1.04	0.17
Coffee**	9.04	5.74	1.83	7.00	15.08	9.48	5.70	2.02	6.52	14.47
Livestock. dairy & animal products	4.75	-0.79	0.47	-1.01	-1.26	4.81	-0.70	0.51	-0.77	-0.88
Forestry and fishing	4.69	-3.04	0.13	-4.91	-8.25	4.50	-3.05	0.14	-4.89	-8.16
Mining and quarrying	8.67	-1.93	0.45	-9.28	-11.78	7.21	-2.37	0.41	-9.34	-12.18
Agro-precessing	5.81	-0.60	-0.17	0.26	-0.74	5.66	-0.82	-0.22	0.02	-1.22
Dairy	11.31	0.30	-0.27	0.86	0.95	16.02	0.29	-0.27	0.74	0.81
Grain milling products	9.19	1.79	0.00	2.77	4.57	8.61	1.89	-0.03	2.68	4.49
Grain milling services*	8.00	-1.63	-0.33	0.30	-2.06	7.84	-1.79	-0.36	0.22	-2.32
Sugar	6.25	1.03	-0.02	2.23	3.34	5.84	0.91	-0.02	1.98	2.97
Beverages	5.13	-0.82	-0.49	0.64	-0.82	4.99	-1.00	-0.56	0.39	-1.30
Tobacco processing	7.19	-0.90	-0.29	0.00	-1.44	6.85	-1.11	-0.34	-0.21	-1.92
Textile	11.11	6.33	0.07	11.74	18.28	9.82	5.14	0.01	9.23	14.39
Apparel	11.49	8.70	0.01	16.04	24.45	9.40	6.57	-0.08	11.84	17.45

Leather	11.46	4.12	0.56	6.44	11.53	11.31	4.46	0.78	6.35	11.80
Wood	12.63	3.50	0.35	3.41	7.23	14.04	3.17	0.39	2.45	5.83
Paper. publishing. printing	10.11	3.84	0.26	6.62	10.88	9.55	3.35	0.28	5.51	9.14
Chemicals. rubber. plastic	11.19	1.82	0.12	5.08	7.02	11.42	1.53	0.13	4.52	6.09
Mineral products*	8.22	-3.15	0.40	-5.98	-10.57	6.90	-3.82	0.37	-7.47	-12.49
Basic iron & steel	12.41	2.59	0.28	3.09	5.86	12.55	2.38	0.32	2.52	5.05
Machinery	6.92	2.02	0.38	-10.70	-8.27	5.72	1.57	0.35	-11.47	-9.70
Vehicules	5.92	0.86	0.20	-4.80	-3.96	5.22	0.45	0.18	-5.56	-5.22
Other manufacturing	10.45	2.31	-0.06	3.10	4.82	10.35	1.61	-0.12	1.93	2.83
Electricity. gas. steam and hot-water	7.03	-0.34	0.01	0.51	0.12	6.67	-0.41	0.02	0.41	-0.10
Activity of collecting(fetching) free water	6.93	5.23	-0.94	8.83	17.28	6.94	6.49	-0.80	9.04	19.05
Collection purification and distribution of Water	6.72	-1.24	-0.06	-1.58	-4.17	6.03	-1.57	-0.09	-1.79	-5.04
Construction*	7.21	-2.18	0.65	-13.06	-15.57	6.17	-2.80	0.61	-13.23	-16.31
Wholesale and retail trade*	6.33	-0.73	-0.02	-2.00	-2.72	6.36	-0.61	0.01	-1.66	-2.29
Hotel	5.22	-1.73	-0.68	-0.89	-3.44	5.09	-1.87	-0.77	-0.97	-3.72
Transport. storage & communication*	6.28	-2.03	0.08	1.16	-1.20	5.84	-2.29	0.09	0.79	-1.84
Financial intermediation	6.42	-1.49	-0.01	-1.83	-3.81	6.09	-1.70	-0.03	-2.01	-4.21
Real Estate. Renting and Business	8.21	-0.02	-0.01	0.03	-0.01	7.85	-0.02	-0.01	0.03	-0.01
Public administration	2.75	-1.45	-0.11	-0.50	-2.31	2.76	-1.46	-0.13	-0.50	-2.32
Education	3.25	1.37	-0.10	0.84	2.43	3.29	1.36	-0.10	0.89	2.41
Health & social work	3.71	0.33	-0.37	1.05	1.06	3.75	0.40	-0.40	1.14	1.19
Other services	4.78	0.03	-0.46	2.28	1.77	5.00	0.14	-0.46	2.09	1.68
Agriculture	5.53	0.45	0.15	0.61	1.17	5.61	0.56	0.18	0.74	1.44
Industry	8.89	1.13	0.06	1.81	2.77	8.88	1.00	0.07	1.49	2.31
Services	5.56	-0.71	-0.03	-1.10	-2.02	5.52	-0.78	-0.03	-1.16	-2.17
Total GDP	5.98	-0.15	0.03	-0.25	-0.51	6.04	-0.15	0.04	-0.25	-0.52

Note: * represents sectors where intermediate demand is intensive in petroleum products
**represents agricultural activities using fertilizer as an intermediate input
ᵠ cash crops include sugar cane & beet, tea, chat, plant-based fibers, cotton

6.1.3 Effects of the local price of imported fertilizer

Similarly to oil imports, higher import prices for fertilizer affect the volume of imports, which declines. DAP and Urea are not locally produced in Ethiopia; therefore, changes in volume are of less magnitude than changes in price.

Fertilizer is only used as an intermediate input in agriculture, excluding livestock, forestry, and fishing activities. The impact of changes in fertilizer prices directly transmits to agricultural crop production, where it represents, on average, nearly half of intermediate demand. The transmission mechanism is analogue to that of the international oil price shock. Higher intermediate input prices increase production costs, and demand tends to fall as agricultural products are substituted by other commodities for which prices have increased less, remained unchanged, or fallen. Activities producing goods for which demand has shifted toward other commodities tend to contract and reduce their factor demand, putting a downward pressure on return to factors.

Table 4 above presents the simulation results for the agricultural sectors. Without any exception, all agricultural food crop activities contract. Food crop activities employ about 35% of total agricultural labor and use around 40% of total land. In contrast, activities producing cash crops, which are export-intensive, increase because cash crops become more competitive products on the export market as prices have fallen (because of reduced factor costs). The fall in factor costs overrides the rise in intermediate input prices because agricultural production is highly intensive in labor and land rather than intermediate inputs.

In the first two simulations, although projections of the international price of oil and fertilizer indicate a decrease in trend, the decline is not strong enough to override previous price increments, which were of a large scope. Overall, oil and fertilizer price shocks have little effect on total real GDP, which remains nearly unchanged compared to the reference scenario. At the sector level, agriculture expands slightly due to the expansion in export-intensive activities (see Table 9). The industrial sector is also driven by export-intensive activities, essentially dairy and meat, textile, clothing, apparel, and leather products; exports in this sector increase by more than 10%. The services sector, on the other hand, contracts slightly. Despite higher prices for intermediate inputs, factor costs decrease, allowing some activities to expand due to increased export demand. However, those activities that do not engage in exports tend to contract, particularly agricultural food crop sectors.

In sum, the international oil and fertilizer price shocks do not negatively affect the economy's growth potential. The simulated imported inflation has a limited impact on private investment. In SIM1, private investment in real terms is 1.9% lower in 2014-2015 and 2.8% lower in 2019-2020 relative to its level in the reference scenario, in which investment increases by an average of 8%. In SIM2, private investment in real terms is 0.9% and 0.8% higher in 2014-2015 and 2019-2020, respectively, compared to levels in the reference scenario. This is likely to affects the country's economic growth potential, particularly that of the manufacturing and services sectors, which are highly capital-intensive. At this stage, the slowdown

in private investment growth in SIM1 affects real GDP growth, although the scope of this slowdown is very small.

6.1.4 Effects on poverty

Households receive income from the employment of factors in the production process. Other sources of income include transfers from other agents or institutions. Table 5 shows that the two price shocks are likely to diminish the return to factors in real terms. The international oil price shock results in a decline in the return to all factors except land; this means that such shocks are likely to transmit directly or indirectly to most of the production activities. Return to land increases, driven by the expansion in export-oriented activities (oil seeds, coffee, and cash crops) in which land is sector-specific. The international fertilizer price shock essentially affects agricultural (and its allied) activities; only factors utilized in agricultural production have returns that fall compared to levels in the reference scenario. Other factors have returns that remain unchanged or increase only slightly.

Table 5 – Results on Return to Factors of Production (Factor Price) in Real Terms
(% change from BAU reference scenario)

	2014/15				**2019/20**			
	SIM1	SIM2	SIM3	SIM4	SIM1	SIM2	SIM3	SIM4
Agricultural labor	-1.8%	-2.0%	0.4%	-3.6%	-1.7%	-2.1%	0.2%	-3.7%
Administrative & professional labor	-8.0%	0.0%	-11.1%	-19.3%	-8.1%	-0.2%	-10.2%	-18.6%
Skilled labor	-5.9%	0.5%	-8.4%	-14.3%	-5.8%	0.4%	-7.5%	-13.3%
Unskilled labor	-6.7%	0.3%	-12.0%	-18.2%	-6.8%	0.2%	-10.8%	-16.8%
Capital	-8.6%	0.2%	-9.8%	-18.6%	-8.8%	0.1%	-9.2%	-18.2%
Land	2.4%	-1.4%	6.1%	7.6%	2.5%	-1.3%	5.7%	7.4%
Livestock	-3.3%	-1.2%	-1.6%	-6.0%	-3.0%	-1.1%	-1.3%	-5.3%

Changes in agricultural and non-agricultural factor income affect households depending on their endowments. Owing to the drop in factor income, all categories of households are affected by a loss of real income following the international oil price shock (Table 6). Disposable income declines the most for higher-income households in small urban settlements. These households earn 44% of their income from capital, where return has declined the most, and 31% from skilled labor, where wages have also dropped sharply. For lower-income households in small urban settlements, 78% of income is earned from non-agricultural labor, for which wages have also dropped. In line with its impact on return to factors, the international fertilizer price shock only affects rural households, particularly lower-income households, as they are highly endowed with agricultural labor (relative to land and livestock).

Table 6 – Results on Real Household Disposable Income (% change from BAU reference scenario)

	2014/15				2019/20			
	SIM1	SIM2	SIM3	SIM4	SIM1	SIM2	SIM3	SIM4
Lower-income rural households	-2.7%	-1.5%	-1.0%	-5.4%	-2.6%	-1.6%	-0.9%	-5.2%
Higher-income rural households	-4.0%	-1.0%	-3.0%	-8.2%	-3.9%	-1.1%	-2.7%	-7.7%
Lower-income households in small urban settlements	-5.7%	0.3%	-8.1%	-13.7%	-5.7%	0.2%	-7.4%	-13.0%
Lower-income households in large urban settlements	-5.6%	0.3%	-6.5%	-12.1%	-5.6%	0.2%	-6.0%	-11.6%
Higher-income households in small urban settlements	-6.9%	0.3%	-8.6%	-15.6%	-7.0%	0.2%	-8.0%	-15.0%
Higher-income households in large urban settlements	-5.8%	0.2%	-6.0%	-11.9%	-5.9%	0.2%	-5.6%	-11.6%

There are also price effects that affect the consumption levels and patterns of representative households. The CPI drops in SIM1 and SIM2, and agricultural commodity prices fall even more compared to levels in the reference scenario (Table 7). These commodities hold an important share in the consumer food basket in Ethiopia, making the drop in agricultural CPI (and in particular the prices of food crops) more essential for maintaining or increasing household consumption.

Table 7 – Results on Consumer Price Index (CPI)

(BAU: % change from preceding year; other scenarios: % change from BAU reference scenario)

	2014/15				2019/20			
	Agriculture	Industry	Services	Total	Agriculture	Industry	Services	Total
BAU	-1.9	-2.2	-3.7	-2.4	-1.1	-1.9	-2.6	-1.7
SIM1	-8.2	-4.5	-9.7	-7.2	-7.6	-4.3	-8.8	-6.7
SIM2	-1.7	-1.2	-1.6	-1.5	-1.7	-1.3	-1.7	-1.5
SIM3	8.4	10.2	3.7	8.0	9.9	11.3	6.0	9.6
SIM4	-1.6	4.3	-7.7	-0.8	0.5	5.6	-4.5	1.3

The poverty effects measured by FGT indices are presented in Tables 8 and 8a. The micro-simulation results show that poverty is likely to rise as a result of the international oil and fertilizer price shocks. Potential gains in terms of poverty reduction under the CAADP scenario are offset by imported inflation shock. Despite the above-mentioned drop in the CPI, this is not sufficient to enable an increase in households' real income and consumption. The impact of the international oil price shock is more severe for urban households, for which poverty incidence increases from 21.4% under the CAADP reference scenario to 25.1% in 2014-2015 and from 15.9% to 19.1% in 2019-2020. These households are net food buyers and therefore are more exposed to price shocks. As expected, the international fertilizer price shock has a more severe effect on rural households, for which poverty incidence increases (from 19.8% in the reference scenario to 20.9% in 2014-2015 and from 12.7% to 13.4% in 2019-2020). Indeed, 78% of rural lower income households and 55% of higher income households earn their income from agriculture. The poverty impact of the international oil price shock is much higher compared to the

fertilizer price shock. Looking at the number of people below the poverty line, the micro-simulation exercise applied to the 2009-2010 HICES puts the figure at 22.7 million[7]. Without any price shock, the number of poor would be reduced to 13 million in 2020 in the CAADP scenario (Table 9). However, when introducing the two international price shocks, we find that the number of poor people is likely to rise by as much as 1.6 and 1.3 million in 2015 and 2020 in SIM1 and by 0.8 and 0.5 million in 2015 and 2020 in SIM2.

[7] The population growth rate applied is 2.6% per year starting from the second period. This is applied to a total survey sample size of 27835 households. Multiplying this by each household size, we obtain a total population of 76.1 million for the first period.

Table 8 – Results on Poverty Reduction (FGT indices)

	2009/10					2014/15					2019/20				
	BAU	SIM1	SIM2	SIM3	SIM4	BAU	SIM1	SIM2	SIM3	SIM4	BAU	SIM1	SIM2	SIM3	SIM4
	P0														
National	29.8	29.8	29.8	29.8	29.8	20.1	22.0	21.0	21.4	24.0	13.2	14.5	13.8	14.1	16.1
Rural	30.6	30.6	30.6	30.6	30.6	19.8	21.3	20.9	20.5	22.8	12.7	13.6	13.4	13.0	14.5
Urban	25.9	25.9	25.9	25.9	25.9	21.4	25.1	21.5	26.1	30.1	15.9	19.1	15.8	19.8	23.9
	P1														
National	7.8	7.8	7.8	7.8	7.8	5.1	5.6	5.3	5.5	6.3	3.3	3.6	3.4	3.5	4.0
Rural	8.1	8.1	8.1	8.1	8.1	5.1	5.5	5.4	5.3	6.0	3.2	3.5	3.4	3.3	3.7
Urban	6.6	6.6	6.6	6.6	6.6	5.1	6.1	5.1	6.5	7.8	3.5	4.2	3.5	4.4	5.4
	P2														
National	3.1	3.1	3.1	3.1	3.1	2.0	2.2	2.1	2.1	2.5	1.2	1.3	1.3	1.3	1.5
Rural	3.2	3.2	3.2	3.2	3.2	2.0	2.2	2.1	2.1	2.4	1.2	1.3	1.3	1.2	1.4
Urban	2.5	2.5	2.5	2.5	2.5	1.8	2.2	1.8	2.4	2.9	1.2	1.5	1.2	1.5	1.9

Table 8a – Results on Poverty Reduction (FGT indices) (BAU: level of P1, P2, P3; other scenarios: ratio of the BAU value)	2009/10					2014/15					2019/20				
	BAU	SIM1	SIM2	SIM3	SIM4	BAU	SIM1	SIM2	SIM3	SIM4	BAU	SIM1	SIM2	SIM3	SIM4
	P0														
National	29.8	1.0	1.0	1.0	1.0	20.1	1.09	1.05	1.07	1.20	13.2	1.10	1.04	1.07	1.22
Rural	30.6	1.0	1.0	1.0	1.0	19.8	1.08	1.06	1.03	1.15	12.7	1.07	1.05	1.03	1.15
Urban	25.9	1.0	1.0	1.0	1.0	21.4	1.17	1.00	1.22	1.40	15.9	1.20	1.00	1.25	1.50
	P1														
National	7.8	1.0	1.0	1.0	1.0	5.1	1.1	1.0	1.0	1.2	3.3	1.1	1.0	1.0	1.2

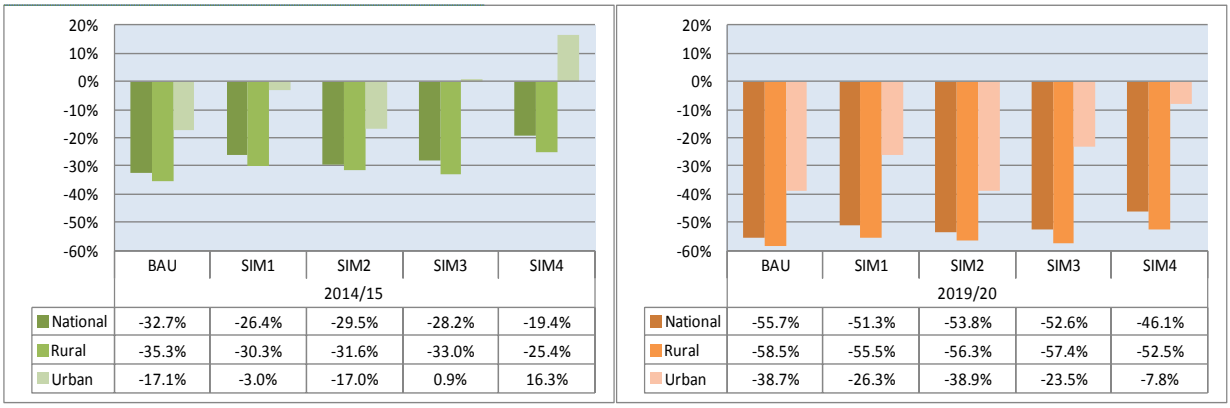
							0	5	7	3		0	5	7	3
Rural	8.1	1.0	1.0	1.0	1.0	5.1	1.08	1.06	1.03	1.17	3.2	1.07	1.06	1.03	1.16
Urban	6.6	1.0	1.0	1.0	1.0	5.1	1.20	0.99	1.27	1.52	3.5	1.21	1.00	1.27	1.56
	P2														
National	3.1	1.0	1.0	1.0	1.0	2.0	1.11	1.05	1.08	1.26	1.2	1.11	1.06	1.08	1.26
Rural	3.2	1.0	1.0	1.0	1.0	2.0	1.09	1.06	1.04	1.20	1.2	1.09	1.07	1.04	1.20
Urban	2.5	1.0	1.0	1.0	1.0	1.8	1.21	0.99	1.30	1.59	1.2	1.23	0.99	1.29	1.60

Table 9 – Results on Poverty Reduction: Number of Poor and Changes in Number of Poor (in million)

	Total population	**Number of poor**					**Changes in number of poor compared to BAU**			
	All scenarios	BAU	SIM1	SIM2	SIM3	SIM4	SIM1	SIM2	SIM3	SIM4
2009/10	76.1	22.7	22.7	22.7	22.7	22.7	0.0	0.0	0.0	0.0
2014/15	86.5	17.4	19.0	18.2	18.5	20.8	1.6	0.8	1.2	3.4
2019/20	98.4	13.0	14.3	13.5	13.9	15.8	1.3	0.5	0.9	2.8

Poverty depth (the average difference between the income of the poor and the poverty line) and severity (the extent to which some of the poor are very far from the poverty line) both decline in the CAADP scenario. This reference scenario is quite promising, as the indices P1 and P2 decline faster than the poverty incidence, with poverty severity declining faster than poverty depth. Oil and fertilizer price shocks may lead to an increase in both the depth and the severity of poverty in urban compared to rural areas. The increase in severity is likely to be more pronounced in urban areas, suggesting that the urban poorest are among the most vulnerable to an oil price shock. As for the international fertilizer price shock, this worsens poverty depth and severity in rural settings, while P1 and P2 remain unchanged in urban settings.

Figure 3 – Impact on Poverty Reduction: % changes in P0 compared to its level in 2009/10



As reflected in Figure 3, rural poverty declines more than urban poverty in the CAADP scenario. At the national level, we find cumulative poverty reduction of 32.7% between 2009-2010 and 2014-2015 and a drop by more than half between 2009-2010 and 2019-2020. The international oil and fertilizer price shocks do not affect this downward trend but are likely to undermine the poverty reduction efforts in the country by affecting the pace at which poverty declines in the reference scenario. Looking at SIM1, urban poverty is reduced by only 3% between 2009-2010 and 2014-2015, while in the reference scenario, the figure reached 17.1% and remained at 17.0% in SIM2. Urban poverty is reduced by 30.3% in SIM1 compared to 35.3% in the reference scenario and 31.6% in SIM2 between 2009-2010 and 2014-2015. The international oil price shock has relatively less severe effects on poverty reduction efforts in the long run (-51.3% in SIM1 compared to -55.7% in the BAU and -53.8% in SIM2).

6.2 Impact of Devaluation

The devaluation of the Birr, which reversed to some extent the real exchange rate appreciation of the past few years, was aimed at boosting export competitiveness and encouraging import substitution (thereby reducing the pressure on limited foreign currency reserves). SIM3 analyzes the potential

impact of this policy, taking into consideration the fixed current account balance constraint. This implies that, if we consider capital income and transfers fixed (or of little scope), the value of exports must equal the value of imports. For the country to increase imports, it has to be able to export more. Exports will rise if the export price paid by the rest of the world is lower than the average world price and if the price elasticity of exports is greater than 1. All price elasticity of exports is greater than 1 for agricultural export commodities, with the exception of flour. For industrial exports, price elasticity is lower than 1 for four commodities; for services, only one elasticity is greater than 1.

The immediate result of devaluation is the rise in import prices, followed by a drop in the volume imported. At the aggregate level, demand for imported goods and services drops by 12.1% in 2014-2015 and by 11.2% in 2019-2020 relative to the situation in the reference scenario (Table 10). Imports of agricultural commodities fall the most. Import penetration is very low (4%) for agricultural commodities, so despite a sharp decline in imports, the effect may be limited on local market prices and supply. The supply of manufacturing goods is more likely to be affected, considering the sector's import penetration of 56%. As for services, with a 10% import penetration rate, the relatively lower level of reduction in imports may not significantly affect local supply and prices.

Table 10 – Results on Volume of Exports and Imports (%)

(BAU: % change from preceding year; other scenarios: % change from BAU reference scenario)

		Exports				**Imports**			
		Agriculture	Industry	Services	Total	Agriculture	Industry	Services	Total
2014/15	BAU	8.7	12.0	5.4	7.9	-3.3	3.9	5.4	4.1
	SIM1	11.5	11.7	-0.5	6.5	-24.4	-5.6	-2.2	-5.2
	SIM2	2.9	1.8	0.2	1.5	-2.1	-0.6	-0.3	-0.5
	SIM3	14.5	18.0	3.2	10.5	-27.2	-14.1	-5.4	-12.1
	SIM4	30.0	33.3	2.6	19.2	-45.3	-19.7	-7.5	-17.1
2019/20	BAU	8.6	11.2	4.9	7.8	0.1	3.7	5.7	4.2
	SIM1	10.2	10.5	-0.7	6.3	-22.8	-5.6	-1.8	-4.9
	SIM2	3.0	1.8	0.2	1.7	-1.9	-0.6	-0.3	-0.5
	SIM3	11.9	15.3	2.8	9.4	-24.1	-13.5	-4.7	-11.2
	SIM4	25.6	28.8	1.9	17.7	-41.1	-19.1	-6.6	-15.9

In parallel to reducing imports, devaluation also boosts exports. Export demand expands the most for industrial commodities, followed closely by agricultural goods. It is those activities that are export-intensive that expand the most.

The combination of declining imports and increasing exports means reduced supply on the local market, which pushes market prices upward. As reflected in Table 7, overall CPI increases by 9.6% in 2019-2020 compared to its level in the reference scenario, essentially driven by the prices of industrial goods, which increase by 11.3%. Agricultural goods also become more expensive, with prices

increasing by 9.9%. Intermediate inputs are also more expensive, putting upward pressure on the cost of production.

Overall, agricultural growth remains positive at a level 0.61% higher than the CAADP scenario in 2014-2015. The manufacturing sector expands due to its export-intensive activities, but also driven by demand from the export-intensive agricultural sectors. In contrast, the services sector contracts by 1.10%, reducing total GDP growth by 0.25% in 2014-2015. The trend is similar for 2019-2020. The services sector is highly affected by levels of private investment, which drop by 23.8% in 2014-2015 and by 22.5% in 2019-2020.

The expansion of export-intensive agricultural activities increases production and, therefore, demand for factors which impact agricultural factors' remuneration. Returns to agricultural labor and land increase in real terms (Table 5). Returns to other factors of production, particularly capital and administrative, professional, and unskilled labor, diminish because of the contraction in the services sectors. Output in services declines, resulting in reduced labor demand. Although services employ 62% of total non-agricultural labor, the sector has low labor-intensity (22%) as opposed to capital-intensity. This negatively affects non-agricultural wages, as shown in Table 5. Manufacturing activities are relatively more intensive in non-agricultural labor; they therefore absorb the excess labor supply and increase output.

Resulting from changes in factor remuneration, disposable income is impacted. All households see their income decline in real terms (Table 6). The effect is more severe for urban households than rural ones, which is explained by the difference in factor endowments.

The resulting poverty effects are negative (Table 8). Poverty incidence increases from 20.1% in the reference scenario to 21.4% in 2014-2015 and from 13.2% to 14.1% in 2019-2020. Looking at the number of poor people, the devaluation is likely to increase that figure by 1.1 million individuals compared to the CAADP scenario in 2014-2015 and by 0.9 million individuals in 2019-2020 (Table 9). The severity and depth of poverty are also negatively affected (Table 8). As in the case of the international oil price shock, devaluation is likely to have a larger effect on those living in urban settings. Poverty incidence increases from 21.4% in 2014-2015 and 15.9% in 2019-2020 to 26.1% and 19.8%, respectively. Looking at the cumulative figures, devaluation is likely to undermine poverty reduction efforts in urban areas (Figure 3). In 2014-2015, we find that the incidence of poverty is higher than its 2009-2010 levels, although the trend is reversed by 2019-2020.

6.3 Impact of Devaluation Combined with International Oil and Fertilizer Price Increment

The last scenario, SIM4, combines the devaluation shock with international oil and fertilizer price increments. These are three important external sources of inflation that have been identified by the literature. It is well known that other international import and export prices have risen as well, but we do not consider those in our analysis. The transmission mechanisms are accounted for when simulating the devaluation shock, and the latter applies to all imported and exported goods and

services, although the shock is of the same scope for all. Furthermore, by accounting for oil and fertilizer shocks, we exclude the impact of the latter on other prices on the world market.

As the transmission mechanisms of the three separate shocks have already been discussed, our analysis here will focus on our major findings. When combining the three shocks, in addition to their SIM1 and SIM2 increases, oil and fertilizer prices are hiked another 20% (Table 1). Imports of oil and fertilizer drop further compared to scenarios SIM1, SIM2, and SIM3 (Table 3). At the aggregate level, devaluation accelerated the drop in imports for all commodities except coal. Imports of agricultural commodities fall the most, as import penetration is low (Table 10). On the other hand, import penetration is 56% for industrials goods, resulting in a smaller decline in demand for imports. Supply of manufacturing goods is greatly affected, resulting in a sharp increase in industrial final and intermediate consumption price indexes. Demand for imported services declines the least because of low substitution elasticity (all lower than 1 except for one service) between locally produced services and those imported.

As the FOB price of exported commodities has increased relatively less than global export prices, the volume of exports increases further in SIM4 due to gains in the anticipated export competitiveness (Table 10). However, this comes at the expense of the local supply, which is reduced by 4.4% for agricultural goods and by 0.5% for industrial goods in 2019-2020. The supply of services also declines by 5.6% in 2019-2020, mainly driven by the contraction in outputs resulting from lower local demand and limited opportunities to increase exports.

Lower imports and higher exports tend to reduce the local production of agricultural goods and services even further in SIM4. Although exports of agricultural products increase, it is not sufficient to override the decline in demand from the local market. In contrast, output expands in industrial activities. Indeed, exports increase the most for industrial goods; local demand also increases as demand shifts away from imported goods that are relatively more expensive. Overall, export-intensive activities expand further in SIM4, while other sectors tend to contract even further. The former also increase their factor demand; however, this is not sufficient to counter the downward pressure on factor remuneration coming from activities that are contracting. Factor income falls in real terms (as prices have risen), with the exception of returns on land. The magnitude of change is higher when the three scenarios are combined (Table 5). This transmits to household income; all households see their income decline in real terms (Table 6). The effect is more severe for urban households.

As expected, the resulting poverty effects are even greater (Table 8). The incidence of poverty increases from 20.1% in the reference scenario to 24.0% in 2014-2015 and from 13.2% to 16.1% in 2019-2020. Looking at the number of poor people, devaluation combined with international oil and fertilizer price increments is likely to increase the number of poor by 2.8 million individuals compared to the CAADP scenario in 2019-2020 (Table 9). The severity and depth of poverty are also negatively affected (Table 8). The devaluation and international oil and fertilizer price shocks are likely to have a

greater effect on those living in urban settings. Urban poverty incidence increases from 21.4% in 2014-2015 and 15.9% in 2019-2020 to 30.1% and 23.9%, respectively. Looking at the cumulative figures, this increase is likely to seriously undermine poverty reduction efforts in both rural and urban areas (Figure 3). In 2014-2015, we find that urban poverty incidence is 16.3% higher than its 2009-2010 level, although the trend is slightly reversed by 2019-2020, leading to a total poverty reduction of 7.8% over a period of 10 years. Overall, total poverty increases by as much as 4 percentage points in 2014-2015 and by 2.9 percentage points in 2019-2020 compared to levels attainable in the reference scenario. Poverty is higher in rural areas, where most of the Ethiopian population lives. Although the simulation's impact on poverty is higher in urban settings, poverty incidence is likely to increase by 1.8 percentage points in rural areas. The depth and severity of poverty are also higher in rural settings. These indices are also likely to be greatly impacted, increasing by 23.3% and 26.4% in 2019-2020 compared to their levels in the reference scenario.

7. Conclusion

We use a CGE model and a micro-simulation to assess the potential impact of high world petroleum and fertilizer prices, in combination with a devaluation policy, on growth and poverty reduction in Ethiopia. These simulations' major transmission channel is through the increase in intermediate input prices, followed by a drop in factor costs/remuneration. We find that the impact of these shocks is negligible on overall real GDP growth compared to the reference scenario, where a 6% agricultural growth is simulated. However, at the sector level, we find that these price shocks, combined with devaluation, only favor export-intensive agricultural and manufacturing activities; other sectors tend to contract in these scenarios. This is particularly true for agricultural food crop production activities, where output decreases considerably. The services sector is also negatively affected, putting a downward pressure on non-agricultural wages.

As for the effect on household income and consumption, we find that, considered alone, world oil price shocks are likely to circumvent the poverty reduction achievable under a 6% agricultural growth scenario. Poverty incidence increases by as much as 2 percentage points in 2014-2015 and 1.3 percentage points in 2019-2020. Urban households are more affected by higher global imported oil prices. Furthermore, this type of shock is more likely to transmit to the rest of the economy through direct and indirect effects compared to international fertilizer price shocks, where the effect is rather concentrated on agricultural activities. Looking at the devaluation policy alone, poverty incidence increases by 0.9 percentage points. When combining international oil and fertilizer price shocks with devaluation, we find even higher levels of poverty incidence (4 percentage points higher in 2014-2015 and 2.9 percentage points higher in 2019-2020). Poverty increases significantly more in urban settings, reaching a level higher compared to the 6% agricultural growth scenario, while rural households are relatively less affected. The depth and severity of poverty are also higher in all scenarios.

However, it is to be noted that this paper considers only some of the possible external sources of inflation in Ethiopia. Furthermore, while a devaluation may allow to curb the negative effects of global petroleum price shocks by boosting Ethiopia's export competitiveness, it is only effective to a certain extent, as poverty is rising. It also does not reduce inflation, but rather increases local market prices, adding considerable additional upward pressure on high inflation rates. Finally, if high inflation persists, it will increase the real effective exchange rate, which amounts a reevaluation, thereby eliminating the competitiveness gains from the devaluation. Thus, such a policy may not be sustainable in the medium and long run.

In sum, international oil and fertilizer price changes are likely to have a significant impact on Ethiopia, as the country is a net importer of those commodities. Despite the export gains that can be generated by a devaluation of the national currency, there could also be a further increase in inflationary pressure. This could potentially lead to further impoverishment of already poor populations in urban areas, as well as put those near the poverty line in rural areas at greater risk of sinking into poverty. As output and supply of major food staples to the local market drop, food security is also likely to be negatively impacted. Furthermore, food production is highly affected by changes in fertilizer prices. The first two periods of the second scenario simulate an increase in world fertilizer prices, while the remaining periods simulate a progressive decline in line with projections from the World Bank. We find that when fertilizer prices are on the rise, food crop production diminishes even more.

Imported inflation is likely to diminish poverty reduction progress achieved so far and poverty reduction that could be attained under the CAADP agenda. Such price shock may further undermine food security by reducing supply and affordability of food crops on the local market. Sustainable and long-term price stabilization policies are necessary in particular those addressing supply side constraints.

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