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Does productivity level influence the economic impacts of price support policies in Ethiopia?

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Abstract

This study follows from the recent move by most developing economies to introduce price support programs for selected cereals. For Ethiopia, we examine the price, quantity, welfare and government intervention effects of alternative producer and consumer price policies backed-up by public cereal storage services when agriculture is faced with positive and negative productivity shocks. We find that producer price support policies are production enhancing. However, these policies work against the urban poor and rural net-buyers as food prices could not fall anymore beyond the level dictated by the support program. Meanwhile, consumer price support policies tend to harm rural households due to further losses in incomes as the control on consumer prices suppresses producer prices. The analysis further shows that consumer price stabilisation policies aggravate food insecurity since domestic cereal production declines strongly.

Key words: Price support policies, public storage, agriculture, CGE, distributional effect

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1 Introduction

The level and trends of agricultural prices are crucial in most developing countries as these prices determine farm incomes and cost-of-living. Agricultural prices are more volatile than the prices of non-agricultural commodities (Peng, 1991; Demeke *et al.*, 2012), and this affects the risk perception of and incentives for producers. Meanwhile, consumers in developing countries are highly exposed to movements of prices in agricultural and food commodities since a considerable segment of the population is poor, allocating a significant share of incomes on food. To protect producers and consumers, governments implement several policy options which could sometimes be conflicting. Some of the producer support policies include price incentives to farmers, trade restrictions on imports, development of irrigation infrastructure, technical support to producers, and the provision of extension services (Balisacan and Ravago, 2003). Governments also support consumers by restricting exports of principal food commodities, importing and distributing subsidised cereals, and reducing taxes on food commodities, apart from direct cash transfers in some cases. Some of these interventions demand well operating institutional bodies. For example, the effective operation of a price stabilisation policy requires government purchases and sales of commodities at predetermined price floors and ceilings.

While consumer support programs are common in most developing countries (Mariano and Giesecke, 2014; Gouel and Jean, 2012) with varying degrees of success, producer support policies are more restricted to input subsidies, infrastructural development and trade restrictions (Angelucci *et al.*, 2013).² Direct producer price support has also been implemented in few emerging economies such as India (Parikh *et al.*, 2003; Parikh and Singh, 2007), Indonesia (Robinson and El-Said, 1997; Timmer, 1996) and Chile (Holland *et al.*, 2003; Bagwell and

² This is typically so in Africa where governments most frequently attempted to support consumers without considering the negative impacts on producers (Demeke *et al.*, 2012).

Sykes, 2004), where governments guarantee producers that farm-gate prices for their outputs do not fall below some minimum levels; i.e., practicing a minimum support price (MSP) policy. The high price volatility in the international and domestic markets in recent years, coupled with continued food insecurity, appears to motivate a renewed interest on price support programs from countries in Africa (Demeke *et al.*, 2014; Bryan, 2013; Dawe *et al.*, 2015). Although sometimes not at regular basis, state-controlled marketing parastatals in Kenya (Kamau *et al.*, 2012), Malawi (Ricker-Gilbert *et al.*, 2013), Nigeria (Olomola, 2013) and Zambia (Bryan, 2013) have been implementing MSP schemes for maize. Some West African countries, including Côte d'Ivoire and Benin, already have operating MSP schemes for cash crops such as cocoa and cotton (Ecobank, 2013). Likewise, the Ethiopian government is also considering introducing MSP for selected cereals (Minot and Rashid, 2013) principally to support staple grain producers, and is questioning the potential sectoral, economy-wide and distributional implications of such an intervention.

However, there is a lack of consensus on whether governments in poorer countries should intervene to stabilise agricultural and food prices (Gouel, 2013), leading to a continued research on the likely effects of such interventions on agricultural production and agents' welfare. Further, the economic costs of grain stock as well as associated operation expenses (such as freight, handling and storage charges) could also be substantial for governments in developing countries. The optimal grain stock change band, i.e., the extent to which the government can vary its grain stocks for effective impact on grain markets, is hard to determine and could also have considerable implications on government finance. Overall, such price and stockholding interventions can have a far reaching economy-wide implications as the effects can spread over the whole economy (Femenia, 2010); and in such situations impact assessment using computable general equilibrium (CGE) model has long been recommended (Newbery and Stiglitz, 1981).

By adapting a CGE model that accounts for the inter-sectoral interactions, price determination and income distribution mechanisms explaining a semi-subsistence developing economy, this study examines the potential implications of alternative agricultural and food pricing policies tied to storage programs taking the case of Ethiopia. This study is closely related to the literature on commodity price stabilisation such as Robinson and El-Said (1997), who analyse rice price policies in Indonesia, and Parikh *et al.* (2003), who examine the growth and welfare consequences of a rise in MSP in India. However, unlike these studies which consider commodity specific shocks, the model adapted for this study: (i) considers productivity shocks on the agricultural sector as a whole because agriculture in most semi-subsistence economies is a multiproduct activity; (ii) accounts for and endogenises the cost of running storage services which could influence the success of agricultural price policies; and (iii) examines a wide range and combination of producer and consumer price support policies. Also, unlike Robinson and El-Said (1997), the model and the database used for this study explicitly accounts for production for home consumption, which is seen to affect policy outcomes (Aragie and McDonald, 2014). Once the model and the data are set, a mix of possible price and storage policies are analysed to answer the following set of questions:

- What would be the potential price, production and supply implications of the introduction of price support and storage policies in semi-subsistence economies?
- What are the likely income, welfare and distributional implications of such policies?
- How would trends in productivity in the agricultural sector affect the procurement and storage behaviours of a national parastatal?
- What would be the fiscal implications of increasing national stockholding capacity?

Simulation results show that the effectiveness of price support and storage policies depends on the nature and magnitude of the productivity change in the agricultural sector. While producer price support policies stimulate production, these policies harm net-consumers, specifically the

urban poor as food prices could not fall anymore beyond the level dictated by the price support program. On the other hand, price ceilings on commodities work against producers, and in favour of consumers, by damping further increases in producer and consumer prices. This policy appears to discourage producers as domestic cereal production declines strongly. The study further reveals that the magnitude of market intervention by the government grows proportionately with the magnitude of the productivity shock. Government operation in the commodity market may also become more costly at times of bumper harvest if the average level of stocks and the stock change band increases.

2 A Conceptual Framework of Productivity Change, Price Policy and Storage Intervention

Governments in agrarian economies with poorly operating agricultural sector and widespread food insecurity have been implementing policies that would improve sectoral performance. However, the sector is yet to realise its potential in most of these economies, while there is still a possibility of marked progress if key ingredients are met. Meanwhile, agriculture is inherently susceptible to exogenous shocks such as volatile international prices and bad weather conditions. For instance, positive (technological progress) and negative (such as bad weather) shocks to agricultural productivity can alter agricultural performance, and hence domestic prices, agricultural trade, and government procurement and storage behaviours. In such cases, the role for price support and storage policies can be high.

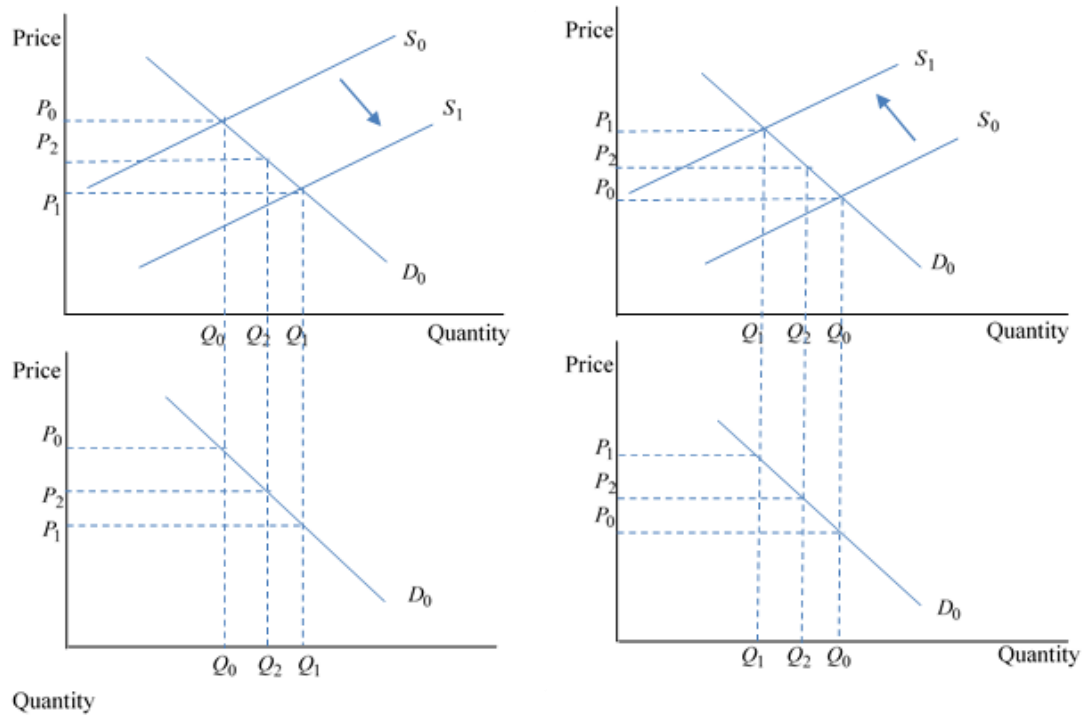
Governments may devise agricultural price policies that may target either producers, consumers, or both. Under a policy objective of supporting both producers and consumers and in a context of productivity gain, targeted grains are unboundedly procured from farmers with a guaranteed minimum price, where the procured grains are stored as state-run buffer stocks. Excessive stocks are then released to the domestic market to stabilise local prices as set by a price ceiling, or to the international market in the form of exports. Release of stocks and imports

of grains would be strategic instruments to stabilise domestic markets in situations of upward pressures on prices.

Figure 2.1 particularly illustrates public storage responses in reaction to productivity changes in a partial equilibrium setting. We could not demonstrate the storage capacity of a national parastatal in this illustration; this will rather be elaborated in the succeeding general equilibrium framework. For simplicity, we further assume here that there are no trade and transport margins; hence producer and consumer prices are identical. The first panel of the figure illustrates the joint impact of productivity and storage gains on prices and consumption. In the second panel, we show the case of a joint productivity and grain storage loss. While the top parts of the panels show the production effects of positive and negative productivity shocks, the lower sections link these changes to consumption and price changes due to the storage operations as elaborated below.

When there are productivity gains, supply shifts outwards, suppressing domestic prices. This would discourage farmers, triggering the government to support producer prices. The government responds by buying and storing the commodity such that what is available to consumers' contract back to Q_2 , pushing prices up to P_2 . In contrast, declines in productivity would imply contraction in supply. At this time, the government will have to pump in grains to the domestic market, which will ultimately push prices down (to P_2 in panel-b) from what they would have been under a free market operation (P_1 in panel-b). However, the net gains and losses from such interventions to the society and their distributional implications to consumers, producers and the government depend largely on the difference in the prices of grains with and without stock operations in addition to further feedback effects on income and economic activity.

Figure 2.1: A simplified framework of productivity change and storage intervention



Source: Authors compilation

While there could be a political economy justification for maintaining prices within a certain band, whether and to what extent producer price support policies would stimulate production has not always been obvious and remains an area of research in agricultural economics. In addition, the level of productivity gain or loss that can trigger price support policies is contextual, demanding a quantitative analysis. Further, although the welfare impacts of producer and consumer price support policies seem obvious at first, the outcome may not be so conclusive in the context of semi-subsistence economies like those in Africa where farm households greatly depend on own production to satisfy their consumption needs. On top of that, the partial equilibrium framework adopted above presupposes a fixed demand structure and does not capture responses in household incomes and relative prices of commodities. Exposing these needs an integrated framework where production, factor allocation and

consumption decisions of farm and non-farm households are jointly modelled with government pricing, storage and market operation policies. This is taken up in the succeeding sections.

3 Modelling Agricultural Price and Public Storage Policies

3.1 Basic model structure

As pointed out by Newbery and Stiglitz (1981) and followed by Robinson and El-Said (1997), Parikh *et al.* (2003) and Femenia (2010), price support policies and stockpiling operations are best dealt with a CGE framework due to linkage effects of such policies on other sectors of the economy. These operations could also have budgetary and tax implications that could affect the whole economy. Thus, a modified version (Aragie, 2014) of the CGE model called Static General Equilibrium (STAGE) (McDonald, 2007) is used for this study to incorporate price support policies and public stockholding behaviours in the model.³ This model explicitly incorporates the joint production and consumption decisions by splitting commodities into home produced and marketed counterparts⁴. This is particularly relevant to the economy studied. Recognising the dual role of farm households both as producers and consumers is important in the context of price support policies since the producer or consumer price support policies can affect a typical farm household differently depending on its position as a producer or a consumer.

Production follows a multi-level nesting structure where household and non-household enterprises aim at maximising profit. All activities are generally assumed to follow nested constant elasticity of substitution (CES) technology. The production nesting structure in the

³ Model codes including the base model and the extensions made relating to agricultural price and storage policies are provided [online](#) as supplementary material.

⁴ See McDonald (2010) and Aragie (2014) for more on modelling households as joint producers and consumers in economy-wide models, details on related changes made to the underlying STAGE model, and the implications these features have on policy responses.

base model discussed in McDonald (2007) is modified to account for a structure considered more appropriate for agrarian economies. Specifically, at the lowest strata of the nest, physical land is combined with irrigation to form *land-irrigation* aggregate. This aggregate input is then combined with fertilizer to form *land-irrigation-fertilizer* input. This way of aggregating land, irrigation and fertilizer along the different stages of the production nest helps to capture the different rates of substitution among the inputs and accounts for the close substitutability between land and irrigation.

Consumers' behaviour is represented by a two-stage consumption nesting structure such that household demand reflects the sources of commodities in semi-subsistence economies. At the bottom of the consumption nest is a CES demand system, where a pair of notionally identical home produced and marketed commodities are combined to provide aggregate consumption. Consumers decide on the optimal combination of these two types of commodities based on their relative prices subject to the imperfect substitution elasticity defined as part of the CES function. At the top of the nest, consumers maximise their utility from the consumption of a set of composite commodities subject to their budget constraints and linear expenditure demand systems (LES) derived from Stone-Geary utility function. We assume income elasticities of demand of 0.8 (slightly inelastic) and 1.2 (slightly elastic) for food and non-food commodities, respectively.

With respect to the country's trade relations with the rest of the world, we follow Armington (1969) and adapt a CES function to determine the substitutability between an optimal mix of imported and domestically supplied commodities, subject to their relative prices. Likewise, a constant elasticity of transformation (CET) function determines the optimal allocation of

domestically produced commodities across domestic and export markets. Relatively elastic CES and CET elasticities are assumed for traded goods.⁵

3.2 Extensions to model agricultural price and public storage policies

The base model did not incorporate the price and storage policies we intend to study. Hence, we extend the model and include price support and public storage policies following Robinson and El-Said (1997) and using mixed complementarity problem. A mixed complementarity equation problem refers to inequality relationship linked to a bounded variable in a complementarity slackness condition (Rutherford 1995). Such equation problems are familiar to economists since the Kuhn-Tucker optimality condition and are common in agricultural programming models to capture relationships that cannot readily be handled in strict-equality equation system.⁶ The first set of mixed complementarity equations in our model extension relates to producer and consumer price support programs. Producer prices (PXC) are not allowed to fall below a certain level set by $dpxctar_{ctarg}$ [2.1], where $pxctar_{ctarg}$, measured as a proportion of base producer price, defines the level over which prices can fluctuate.⁷ $ctarg$ is a set of commodities for which the price target is set.⁸ Hence, equation [2.1] introduces a policy tool to maintain producer price floors for commodity $ctarg$, such as a set of selected cereals. Different levels of $dpxctar$ can be assured depending on the extent to which the government wants producer prices to fluctuate.

$$PXC_{ctarg} - pxctar_{ctarg} + dpxctar_{ctarg} \geq 0 \quad [2.1]$$

⁵ The Global Trade Analysis Project (GTAP) assumes average CES and CET elasticity values of about 2.4 for both agricultural and non-agricultural tradeable commodities (Narayanan *et al*, 2012). Following this, we assume CES and CET elasticity values of 2.0 for Ethiopia.

⁶ See Rutherford (1995) and Lofgren and Sherman (1997) for more on the application of mixed complementarity equation problem to economic analysis.

⁷ For model calibration purposes, $pxctar_{ctarg}$ is set at the base level of producer prices (PXC).

⁸ $ctarg$ includes major cereals, particularly barley, maize, sorghum, and wheat.

Governments in developing countries could also target to stabilise consumer prices for cereals as these commodities account for a considerable proportion of consumption expenditures in most of these countries. Equation [2.2] describes the policy tool to maintain a ceiling on consumer price (PQD_{ctarg}) of a commodity. This is done by exogenously imposing a ceiling $dpqdtar_{ctarg}$ defined as a proportion of the base level consumer price for that commodity. Similarly, $pqdtar_{ctarg}$ is a parameter that defines consumer price at the base, and $dpqdtar_{ctarg}$ can take any possible value.

$$pqdtar_{ctarg} + dpqdtar_{ctarg} - PQD_{ctarg} \geq 0 \quad [2.2]$$

The government maintains the producer price floor and consumer price ceiling through effective interventions in the domestic (procurement and/or release of stocks) and international commodity markets (authorisation of imports or exports). The second set of equations relates to this. The government is assumed to achieve such market stabilisation roles using a public enterprise that trades and stores strategic grains, such as the Ethiopian Grain Trade Enterprise (EGTE) in Ethiopia, the Food Reserve Agency (FRA) in Tanzania, or the Bureau of Logistics (BULOG) in Indonesia. Taking the actions of the EGTE of Ethiopia, equation [2.3] defines the EGTE's stocks ($EGTESTK_{ctarg}$) as a sum of its initial stocks ($stk0_{ctarg}$) and net of its domestic and international trade activities. EGTE can participate in the domestic market by purchasing ($EGTEP_{ctarg}$) and selling ($EGTES_{ctarg}$) grains, depending on the government's pricing policy and the state of the domestic demand and supply. It can be involved in imports ($EGTEM_{ctarg}$) when there are shortages, and in exports ($EGTEE_{ctarg}$) when there are surpluses.

$$EGTESTK_{ctarg} = stk0_{ctarg} + EGTEP_{ctarg} - EGTES_{ctarg} + EGTEM_{ctarg} - EGTEE_{ctarg} \quad [2.3]$$

Equations [2.4] and [2.5] are inequalities setting the EGTE's upper and lower bounds, respectively, of stocks by commodity type as defined in [2.3]. $dstk_{ctarg}$ is the target band on stocks by commodity $ctarg$ and specified as a proportion of $stk0_{ctarg}$. The choice of the target

band on stocks is not straight forward, and is a good candidate for analysis of sensitivity of the:

(i) level of the government's participation in domestic and foreign markets, and (ii) changes in producer and consumer prices.

$$stk0_{ctarg} + dstk_{ctarg} \geq \underline{EGTESTK}_{ctarg} \quad [2.4]$$

$$\underline{EGTESTK}_{ctarg} \geq stk0_{ctarg} - dstk_{ctarg} \quad [2.5]$$

If producer prices for cereals fall below the price floor, the EGTE purchases as much as necessary from domestic producers at the price floor thereby maintaining producer prices at the level that satisfies the inequality in [2.1]. For example, if the government sets the target producer price band to zero, i.e., $dpxctar_{ctarg} = 0$, it is assuring that, after a certain shock, farmers are getting a price at least equal to the base level. Similarly, if domestic and international conditions derive consumer prices above the price ceiling level, the government through the EGTE, imports and sells in the domestic market thereby maintaining prices at their price ceiling as explained by the constraint in [2.2]. However, the EGTE is not going to do that without capacity constraints, and there is usually a limit to the extent to which it can intervene in the market by stocking and de-stocking. This is determined by the relationships in [2.3]-[2.5]. Typically, when EGTE runs into a period of consumer price stabilisation, stock levels could be low and hit the lower limit. In this case, the EGTE will experience stock accumulation by buying from domestic or international sources. When stocks accumulate and hit the upper limit, such as due to active grain purchases from farmers to keep producer prices at least at a target floor level, EGTE will engage in selling in the domestic or export market.

The sale and purchase of grains by the EGTE have connotations to the government demand for commodities, government expenditure and the balance of payments through international purchases and sales of cereals. Equation [2.6] depicts government demand for commodities other than storage services ($QGD_{cothers}$) as the initial volume of government demand for direct consumption of those commodities ($qgdconst_{cothers}$) plus the net of EGTE's trade interventions

(purchases and sales) for price stabilisation purposes.⁹ $QGDADJ$ is government consumption adjustment factor. Cereal storage services are provided by the government and are also included in total government consumption as storage service demand $qgdconstSTOR_{ctarg}$ (see equation [2.7]).

$$QGD_{cothers} = QGDADJ * qgdconst_{cothers} + (EGETP_{cothers} - EGTES_{cothers}) \quad [2.6]$$

Public stockholding involves a considerable amount of operating (distribution) costs, consisting of freight, handling and storage charges, transit and storage losses and administrative overheads, on top of the value of the grains purchased, stored and distributed. An extract from Sharma (2012) for the case of India, a country with a long history of MSP policy, shows that operating costs of food grains administered under the MSP program amount to about 15% of the total economic costs of grains in the public warehouses. However, studies including Storm (1994), Robinson and El-Said (1997) and Parikh *et al.* (2003) examined public or private storage operations without incorporating an estimate of the cost of running such interventions. In this study, we account for operating costs associated with storage by modelling an activity that produces a commodity called storage services. A similar approach is followed by Femenia (2010). We introduced Equation [2.7] in the system of equations to link the stock levels to the storage service demand, which is entirely consumed domestically by the government. However, in the process of storage service production, the producing sector is assumed to use value added and intermediate inputs, where storage related losses are included as part of the intermediate input cost using a Leontief coefficient.

$$QGD_{cmstorage} = QGDADJ0 * qgdconstSTOR_{cmstorage} + \sum_{ctarg} (EGTESTK_{ctarg} - EGTESTK0_{ctarg}) * 0.15 \quad [2.7]$$

⁹ *cothers* is a set of all other commodities, agricultural and non-agricultural, demanded by the government, but exclusive of storage service commodity “*cmstorage*”. Equation [2.7] depicts government demand for “*cmstorage*” separately.

In equation [2.7], $QGDADJ0$ is the initial level of government consumption adjustment factor for commodity "cmstorage" and $qgdconstSTOR_{cmstorage}$ is the initial volume of storage service "cmstorage" demand, which equals to 15% of the economic value of cereal stocks at the base. After a shock, the new level of storage services consumption would be the initial plus that incurred on the net stock change (the right-hand-side in [2.7]), which either can be positive or negative.

Meanwhile, EGTE's external activities (in the form of imports and exports) are incorporated in equation [2.8], which defines the government's total expenditures (EG). Whereas ER is the exchange rate, PWM and PWE are import and export prices of commodity c , respectively, expressed in foreign currency. The net of EGTE's external activities (exports less imports) is also included in the external balance computation for the country.

$$EG = \sum_c (QGD_c * PQD_c) + net_transfers + \sum_{ctarg} (EGTEM_{ctarg} * ER * PWM_{ctarg}) - \sum_{ctrags} (EGTEE_{ctrags} * ER * PWE_{ctrags}) \quad [2.8]$$

3.3 Database for analysis

A 2010 social accounting matrix (SAM) for Ethiopia, described in detail in Aragie (2014), is used to calibrate the model discussed earlier. In addition to providing well disaggregated commodity, activity, factor and household accounts, the SAM has several salient features: it (i) splits commodities into own account and marketed counterparts, and (ii) incorporates households as producing units in the activities account separating them from activities by incorporated non-household enterprises, thereby properly reflecting the consumption and production structures of semi-subsistence economies.

The SAM includes 39 commodity types, of which 15 are home production for home consumption, with corresponding number of marketed counterparts, while 9 are solely supplied by the market such as public services and industrial goods. There is extensive representation of production activities since households are now explicitly recognised in the SAM as producing

units. As a result, the SAM includes 57 activities of which 35 are multiproduct household activities, while 12 are purely non-agricultural. There are also 35 representative household groups, where each regional state in the country is represented by rural, other urban and big urban household groups. In addition, there are a total of 88 factors, two-third of which are labour types classified into five skill levels for each administrative region. Apart from these relevant extensions, the SAM also has other institutional accounts, including accounts for enterprises, the government, investment-saving and the rest of the world (RoW).

As discussed in the model extension section, we account for operating costs associated with storage by incorporating in the SAM an activity that produces a commodity called storage services. An estimate from Sharma (2012) is used to determine the per-unit quantity of storage cost when introducing a storage service activity in the SAM and later in the simulations. Costs of storage services are then entirely covered by the government; i.e., storage services are public goods, the unit prices of which are determined endogenously in the model. This new activity is assumed to use labour and non-agricultural capital as value added inputs and transport services as intermediates. We also gave allowance to losses of cereals in transit and stores by incorporating this as an intermediate input cost. An estimate from Sharma (2012) suggests that transit and storage losses are about 20% of total operating costs. Labour income is assumed to be distributed equally across skilled and unskilled non-agricultural labour in all administrative regions represented in the SAM. The same is true for return to non-agricultural capital.

An initial level of public storage needs to be assumed for a couple of reasons: (i) this makes it possible to define a band within which the level of public storage can oscillate, and (ii) the introduction of a storage service activity in the SAM as discussed above implies some positive level of storage service production. Hence, we assume a bassline level of stock equivalent to

5% of total domestic production of marketed cereals.¹⁰ While this will be considered as the ‘normal’ level of cereal stock within a period, economic conditions could force the government to undergo through times of stocking and de-stocking, deviating the stock level from its ‘normal’ amount. A constraint within which stock levels can deviate is imposed as discussed earlier.

3.4 Policy Experiments

Analysis on the impacts of alternative price and storage policies requires specification of a benchmark and changing policy regimes. Hence, to facilitate comparison of outcomes under alternative policy regimes, benchmark scenarios are first generated. The benchmark scenarios, identified as **SIM0**, are baseline scenarios where productivity shocks are introduced without corresponding price support policies. Two types of productivity shocks are considered: (i) increase and (ii) decrease in productivity of the agricultural sector against which the implications of price support policies are evaluated. This is different from the way Robinson and El-Said (1997) examined price support policies in Indonesia; these authors restrict the productivity shocks to rice only. Activities in most rural economies are multiproduct and it is expected that shocks affect products jointly. The productivity shocks are simulated by altering the shift parameter in the CES production function at a stage where intermediate inputs are combined with value added inputs. The shocks can be interpreted as changes due to weather change or technology.

Each of these baseline scenarios, which are assumed to be consistent with new market equilibria after the economy adjusts to the shocks, are first run as benchmark and independent of the price policies. Later, these productivity shocks are run jointly with producer and consumer price support policies, and outcomes are compared with the appropriate baseline scenario and against

¹⁰ This is equivalent to the average amount of yearly imports of wheat and maize in the country through EGTE and World Food Program for price stabilisation and humanitarian purposes (see Minot and Rashid, 2013).

each other. Under **SIM1**, the government through the EGTE, is assumed to stabilise producer prices by preventing these prices from falling by more than 5%, but does not provide price support to consumers. In **SIM2**, the EGTE considers stabilising both producer and consumer prices, where these prices are only allowed to oscillate within a $-/+5\%$ band.¹¹ We refer **SIM1** as producer price support policy, while **SIM2** is a joint producer and consumer price support policy. Each of these price policies are executed jointly with cases of productivity gains and losses. Following Robinson and El-Said (1997), productivity gains and losses of 5, 10, 15, 20, and 25% are considered.

Further, a 25% cereal stock change band is assumed, which is altered later by adapting a more flexible band to undertake sensitivity analysis of changes in producer and consumer prices and government's stockholding behaviour to alternative degrees of variations in stock levels.¹² The 25% band in stock change is relaxed to 50%, thereby allowing the EGTE to intervene much strongly by stocking and de-stocking in response to economic conditions. This allows to examine how selected economic indicators respond in relation to the case where a 25% band on stock change is imposed. We could also increase the baseline level of stocks. However, knowing that maintaining a bigger level of stocks as a requirement would cost the government a lot of money, the EGTE will rather choose to allow for a bigger variation in stock levels. In addition, the 5% stock level is more appealing as it corresponds to the current public stock holding behaviour in the country.

3.5 Model closure and market clearing conditions

As we take Ethiopia as a case study, a small country assumption is imposed with regard to the relationship the country has with the rest of the world; i.e., the country is assumed to be price

¹¹ We also run four extra experiments with strict controls on producer and consumer prices where the price policies aim at maintaining prices at the base levels. However, these options are less likely to be implemented. Hence, we focus our discussion on those reported here.

¹² Stock change band of 10% was also assumed, but this implies a very restrictive regime on EGTE's interventions.

taker in the import and export markets. In relation to the behaviours of saving and investment, an investment driven saving closure is considered, where the saving rate is allowed to respond to changes in investment demand. As it is difficult for a small open economy to raise foreign savings as it wishes, a fixed external balance is imposed, where the exchange rate endogenously adjusts to clear the external balance. Further, the government is assumed to maintain its internal balance and volume of expenditures at their base levels, while the income tax rate adjusts to maintain the balance.^{13,14} By way of fixing the internal and external balances at their base levels, we somehow select “future neutral” closures. Meanwhile, we carry out a simplified baseline assumption on the factor market. Factors of production are assumed to be fully employed. However, this assumption only implies that the transition from state of unemployment to employment, and vice-versa, is limited.

4 Discussion of Results

4.1 Responses to productivity shocks

Before examining impacts under a joint introduction of the productivity shocks and price support policies, it is essential to briefly discuss the effects of the productivity shocks first (i.e., **SIMO**). Results show that increases in agricultural productivity causes declines in producer prices of food commodities including cereals. However, producer prices of non-food commodities increase since economic adjustments result in outflow of resources to more efficient sectors. Owing to the stronger decline in producer prices of food items, producer prices decline overall although non-food commodities share marginally more in total production than food commodities. As a result of the productivity gains, consumer prices of food commodities

¹³ The choice of income tax rate as the tax replacement instrument is down to the fact that it is currently the least exploited tax instrument in the hands of the government, contributing only less than 7% of its tax revenue.

¹⁴ We also flex the import and excise tax rates as tax replacement instruments, but find out that results are consistent with the income tax replacement option.

decline, while these prices increase for non-food commodities, mirroring the changes in producer prices.

Meanwhile, declines in agricultural productivity could lead to higher producer prices for cereals and “other food” items. However, producer prices for non-food commodities could decrease as factors of production are reallocated out of agriculture towards these sectors, although the overall impact on producer prices is marginally positive. Changes in consumer prices under productivity losses are largely consistent with observed changes in producer prices. As expected, the negative productivity shock on agriculture makes food commodities more expensive.

Gains in productivity stimulates production. As a result, supply of commodities from domestic sources increase, triggering an increase in consumption of all types of commodities. However, the increase in consumption is stronger for food commodities as the exogenous gain in productivity is restricted to the agricultural sector. This is so for all groups of households, although the increase in consumption is consistently stronger for rural households due to a stronger income effect. The opposite is true when the agricultural sector is faced with negative productivity shocks. Domestic production and supply of all commodity types decline, the decline being more pronounced for food commodities. Further, the price (see above) and income (see below) changes imply that consumption will be affected negatively as the agricultural sector faces productivity loss. Consequently, consumption of food and non-food commodities decline for both urban and rural households, but the decline appears stronger for rural households.

We also note that exogenous gains in agricultural productivity improves the incomes and expenditures of both rural and urban households. The changes in incomes and expenditures are closely proportional since savings have not changed markedly. As a result of the positive change in consumption expenditure, welfare improves for all household groups. However, the

welfare gain is stronger for rural households as a result of a stronger income effect, whereas the gain by urban households is almost half of that of their rural counterparts. Meanwhile, consistent to expectations, decline in productivity of the agricultural sector leads to stronger losses in incomes, expenditures and welfare of rural households. Urban households are also negatively affected, but by noticeably lower rates compared to the average loss in rural areas due to their limited reliance on agriculture.

4.2 Positive productivity shocks with price support policies

4.2.1 SIM1: Producer price support policy for cereals

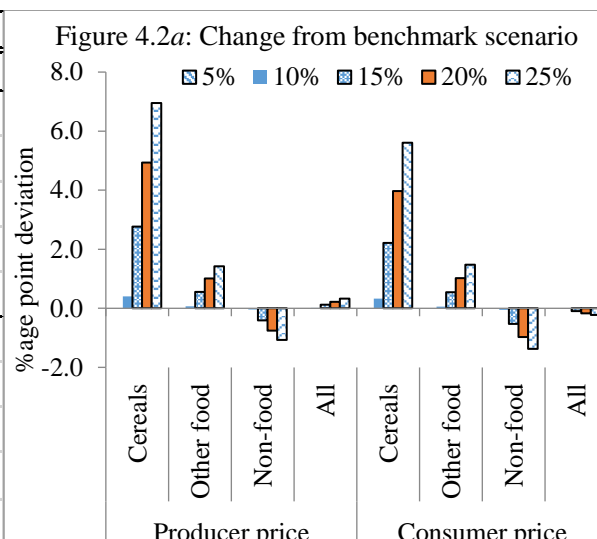
Impact on commodity prices:

In this scenario, we evaluate the joint effects of positive productivity shocks and producer price support policies. Discussions are in comparison to economic outcomes under the benchmark (**SIM0**) scenario of positive productivity shocks without price support policies. We find that responses in producer prices under **SIM1** are markedly lower in relation to those under the benchmark scenario. Interestingly, the fall in producer prices of cereals remain fixed at 5% (Table 4.2a) once the price decline hits the floor at productivity gain of 10%. Likewise, decline in consumer prices of cereals and “other food” items¹⁵ is reduced noticeably when the gains in agricultural productivity are accompanied by the producer price support policy as the policy restricts producer prices of agricultural products from falling beyond the 5% limit. The price policy particularity reduces the declines in consumer prices of cereals once producer prices hit the price floor. The distributional and food security implications of this outcome is considerable as we will see later. Meanwhile, consumer prices of non-food commodities remain increasing as in **SIM0**, but by reduced rates.

¹⁵ “Other food” items incorporate all food (processed and non-processed) commodities other than cereals. The non-food commodities group constitutes all non-food service and industrial products.

	5%	10%	15%	20%	25%
Producer price:					
Cereals	-2.82	-5.00	-5.00	-5.00	-5.00
Other food	-1.77	-3.28	-4.20	-5.03	-5.78
Non-food	1.46	2.72	3.51	4.21	4.83
All	-0.26	-0.54	-0.77	-1.01	-1.27
Consumer price:					
Cereals	-2.00	-3.54	-3.38	-3.25	-3.14
Other food	-1.83	-3.46	-4.51	-5.45	-6.32
Non-food	1.80	3.35	4.32	5.18	5.95
All	0.40	0.70	0.85	0.95	1.02

Source: Authors compilation based on model results



Source: Authors compilation based on model results

Note: Cereals include maize, sorghum, wheat, and barley, whereas “other food” items include all other crop and non-crop food items. Non-food items include all other non-food agricultural, service and industrial products.

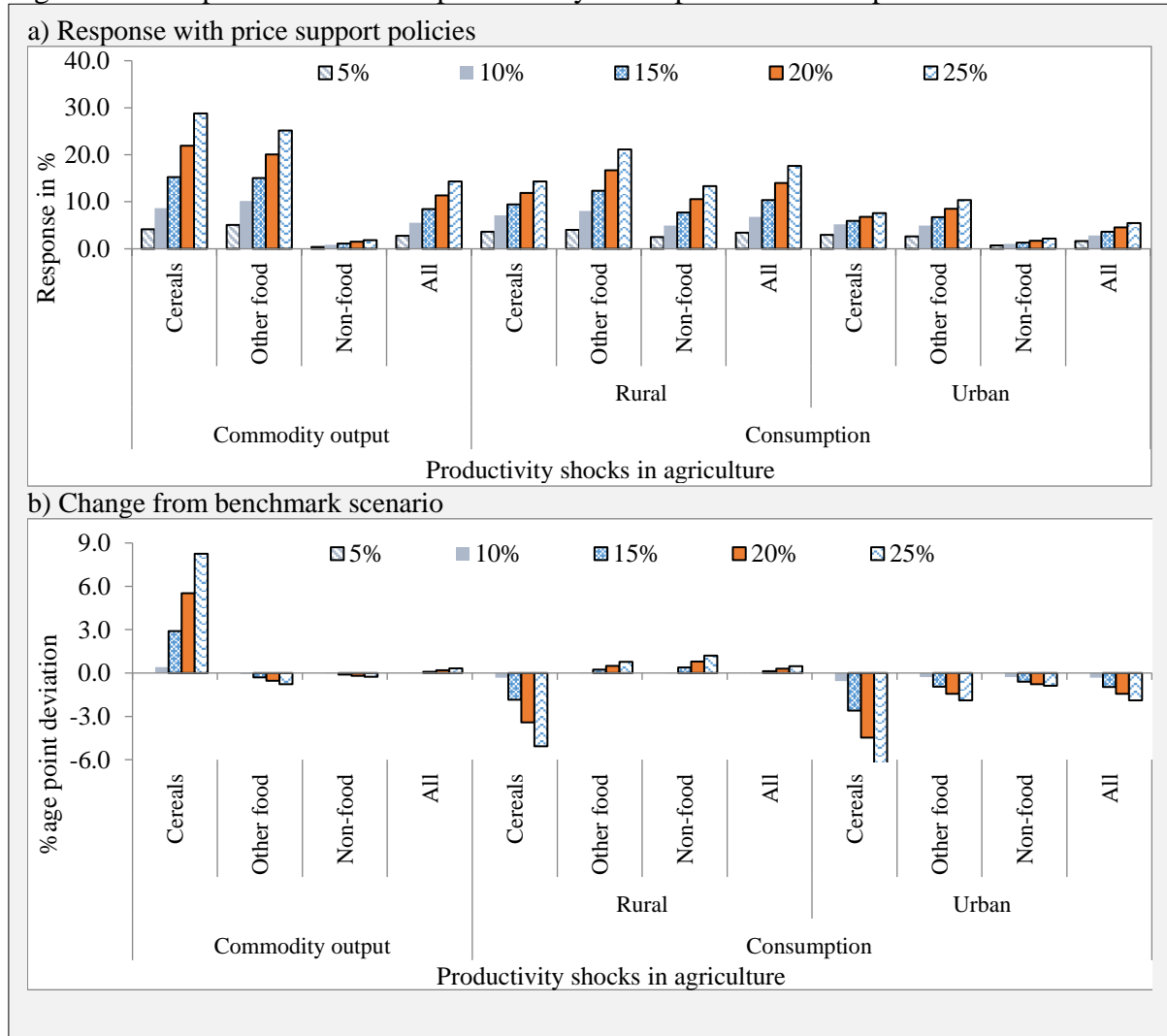
Impact on output and consumption:

The producer price support policy alters responses in output and consumption once productivity increases by 10% or above. We observe that production responds more strongly when the government introduces the price policy, revealing the production increasing roles of minimum price support policies under an initial state of positive trend in agricultural productivity. The deviation widens proportionately with the gain in productivity, reaching to 8.3 percentage points for productivity increase of 25%. However, the production of “other food” and non-food commodities increases by marginally lower rates than the benchmark scenario.

Due to the production enhancing effect of the price floor on cereals, supply of these commodities increases considerably compared to the response under the positive productivity shock alone. However, the price support policy prevents consumer prices of cereals from falling as much (see Figure 4.2a), limiting the surge in consumption of these crops with potential food security implications. This is so for both rural and urban households. Consumption of “other food”, non-food and all commodity types increases by higher rates under **SIM1** compared to **SIM0** for rural households as these households resort to cheaper options (see part *b* in Figure 4.2b). For urban households, consumption of “other food”, non-food and all commodities

increases by a lesser degree under **SIM1** due to the income effect of the price policy (see Figure 4.2.c).

Figure 4.2b: Impact of increase in productivity on output and consumption



Source: Authors compilation based on model results

Impact on household income and welfare:

The 5% price band causes economic adjustment that results in stronger increase in the incomes of rural households compared to the benchmark scenario (Table 4.2b). Incomes of moisture sufficient households grow faster than their drought prone counterparts since the former set of households are the main producers of cereals (Figure 4.2c). However, incomes of urban households increase by a lower rate compared to **SIM0** when the price policy materialises. This slower increase in the incomes of urban households is due to a modest performance in the urban

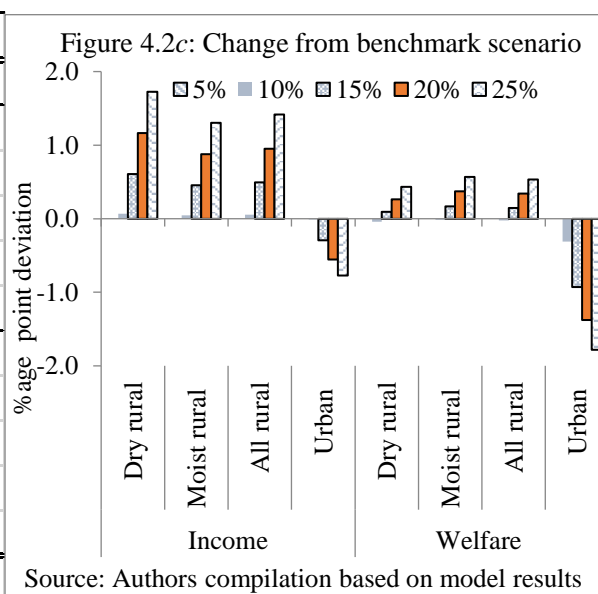
sector (services and industry). The same pattern is apparent for changes in consumption expenditures, but expenditures change by marginally lower rates than incomes since household savings increased slightly strongly to finance the increased investment demand associated with the reduced prices of non-agricultural commodities (see Figure 4.2a).

Change in welfare summarises the price, income and expenditure changes.¹⁶ While rural households tend to become better-off when the price policy is implemented, welfare of urban households improves less under the price policy scenario since the producer price support on cereals prevents urban households from enjoying further increases in incomes and further declines in consumer prices of cereals (Figure 4.2a). The extra gain in welfare in rural areas implies that the positive income effect of the price policy outweighs the negative price effect explained by the slower decline in consumer prices of cereals, “other food” items and overall (see Figure 4.2a).

Table 4.2b: Impact of increase in productivity on income and welfare (%)

	5%	10%	15%	20%	25%
Income:					
Dry rural	2.61	5.31	8.50	11.73	14.98
Moist rural	3.04	6.14	9.59	13.07	16.55
All rural	2.92	5.91	9.30	12.71	16.13
Urban	1.91	3.68	5.08	6.41	7.70
Welfare:					
Dry rural	3.22	6.41	9.80	13.25	16.72
Moist rural	3.33	6.65	10.19	13.77	17.36
All rural	3.30	6.59	10.09	13.63	17.19
Urban	1.56	2.72	3.50	4.40	5.29

Source: Authors compilation based on model results



Impact on EGTE operations:

The EGTE starts to operate in the grain market when agricultural productivity increases by 10% from its current levels as this gain in productivity could otherwise force producer prices of

¹⁶ Equivalent variation (EV), measured as percentage share of households initial consumption expenditures, is used to assess the welfare implications. Technically speaking, EV is the income change the representative household is prepared to accept, in the new situation, to avoid the policy or exogenous change.

cereals to fall beyond the price floor. Once the producer price floor is reached, the government, through the EGTE, buys from farmers, accumulates stocks, and sells in the export market. Table 4.2c shows that grain stocks can only increase by a maximum of 25% as this is the physical capacity constraint introduced in the simulations as a policy rule.¹⁷ The study shows that the volume of interventions in the form of purchases and sales become lower as the expansion in production declines. We note that total purchases from farmers' sums up to exports and change in stocks. The EGTE is not participating in domestic sales and imports at the moment as it has no consumer price stabilisation objectives.

Table 4.2c: Impact of increase in productivity on the EGTE operations (in '00 million units)

	Base	Productivity shocks				
		5%	10%	15%	20%	25%
<u>EGTEP</u>						
Cereals	0.00	0.00	0.37	2.42	4.49	6.59
<i>Growth (%)</i>	-	-	<i>+inf</i>	<i>+inf</i>	<i>+inf</i>	<i>+inf</i>
<u>EGTES</u>						
Cereals	0.00	0.00	0.00	0.00	0.00	0.00
<i>Growth (%)</i>	-	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>
<u>EGTEE</u>						
Cereals	0.00	0.00	0.00	1.85	3.92	6.02
<i>Growth (%)</i>	-	-	-	<i>+inf</i>	<i>+inf</i>	<i>+inf</i>
<u>EGTEM</u>						
Cereals	0.00	0.00	0.00	0.00	0.00	0.00
<i>Growth (%)</i>	-	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>
<u>EGTESTK</u>						
Cereals	2.28	2.28	2.65	2.85	2.85	2.85
<i>Growth (%)</i>	-	<i>0.00</i>	<i>16.37</i>	<i>25.00</i>	<i>25.00</i>	<i>25.00</i>

Source: Authors compilation based on model results

4.2.2 SIM2: A joint producer and consumer price support policy for cereals

SIM1 above considers a producer price support policy alone. However, the government could also target to stabilise consumer prices. This scenario examines a joint introduction of both producer and consumer price support policies in the face of positive productivity shocks to the agricultural sector. We observe that price, quantity, income, welfare and the EGTE responses

¹⁷ Section 4.4 shows how economic responses deviate from those reported above when increased storage capacity is assumed.

under a joint producer and consumer price support policy are identical with responses in these economic indicators under **SIM1**. This is because producer prices are restricted not to decrease by more than 5% from the base levels in both cases, and *consumer prices could not reach to the price ceiling* set as a policy rule. Hence, the comparison between **SIM1** and **SIM0** holds for **SIM2** and **SIM0**.

4.3 Negative productivity shocks with price support policies

4.3.1 SIM1: Producer price support policy for cereals

The benchmark scenario (**SIM0**) indicates that declines in productivity would push producer prices of cereals up. Producer support price policies will not be required in such situations, and economic responses under **SIM1** would be identical with those under the benchmark scenario. Thus, there is no active involvement of the EGTE in the commodity market.

4.3.2 SIM2: A joint producer and consumer price support policy for cereals

Impact on commodity prices:

Earlier, we saw that the producer price support policy is inefficient in times of declines in productivity. If the implementation of a joint price policy of 5% band on both producer and consumer prices of cereals affects the economy, it will be through the consumer price ceiling. Evidently, consumer prices of cereals increase by a maximum of 5% (see Table 4.3a) under this price rule when the agricultural sector faces productivity loss of 15% or more. The 5% increase in consumer prices of cereals at most is due to the impact of the price ceiling imposed by the government and assured by the EGTE's interventions. Similarly, the price policy dampens the increases in consumer prices of "other food" commodities, whereas those of non-food commodities decline by reduced rates. Despite the consumer price ceiling on cereals, average consumer prices decline by reduced rates since consumer prices of non-food

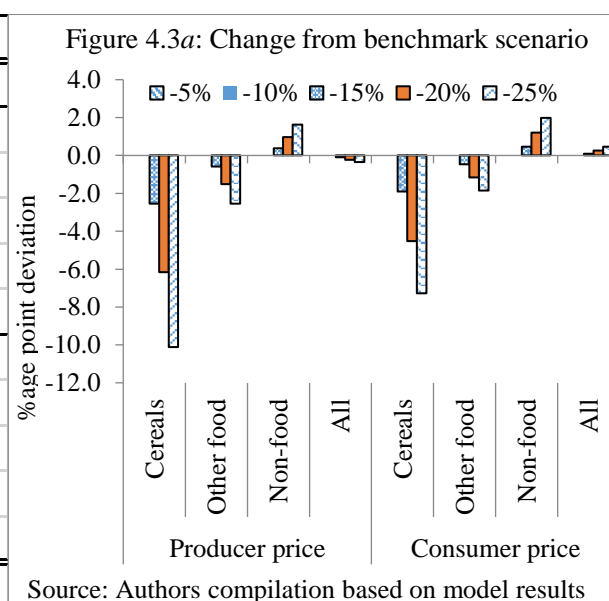
commodities do not decline as much as what was observed without the price policy (i.e., under **SIM0**).

The effect on consumer prices of the 5% band on both producer and consumer prices of cereals transmits to producer prices. Specifically, producer prices respond by reduced rates in both directions, where the decline is stronger for cereals (Figure 4.3a). For example, producer prices for cereals increase by 2.5 percentage points lower rate compared with the case of no consumer price support policy, and the price response gap increases proportionately with the magnitude of the productivity loss (see the first part of Figure 4.3a). This shows that cereal producers lose out if the government implements controls on consumer prices when the agricultural sector is faced with declines in productivity.

Table 4.3a: Impact of increase in productivity on commodity prices

	-5%	-10%	-15%	-20%	-25%
Producer price:					
Cereals	3.10	6.52	7.76	8.34	9.06
Other food	2.00	4.28	6.32	8.43	10.96
Non-food	-1.65	-3.52	-5.29	-7.14	-9.32
All	0.22	0.37	0.35	0.20	-0.06
Consumer price:					
Cereals	2.15	4.45	5.00	5.00	5.00
Other food	2.00	4.21	6.17	8.16	10.44
Non-food	-2.02	-4.29	-6.41	-8.61	-11.18
All	-0.51	-1.15	-1.85	-2.67	-3.68

Source: Authors compilation based on model results

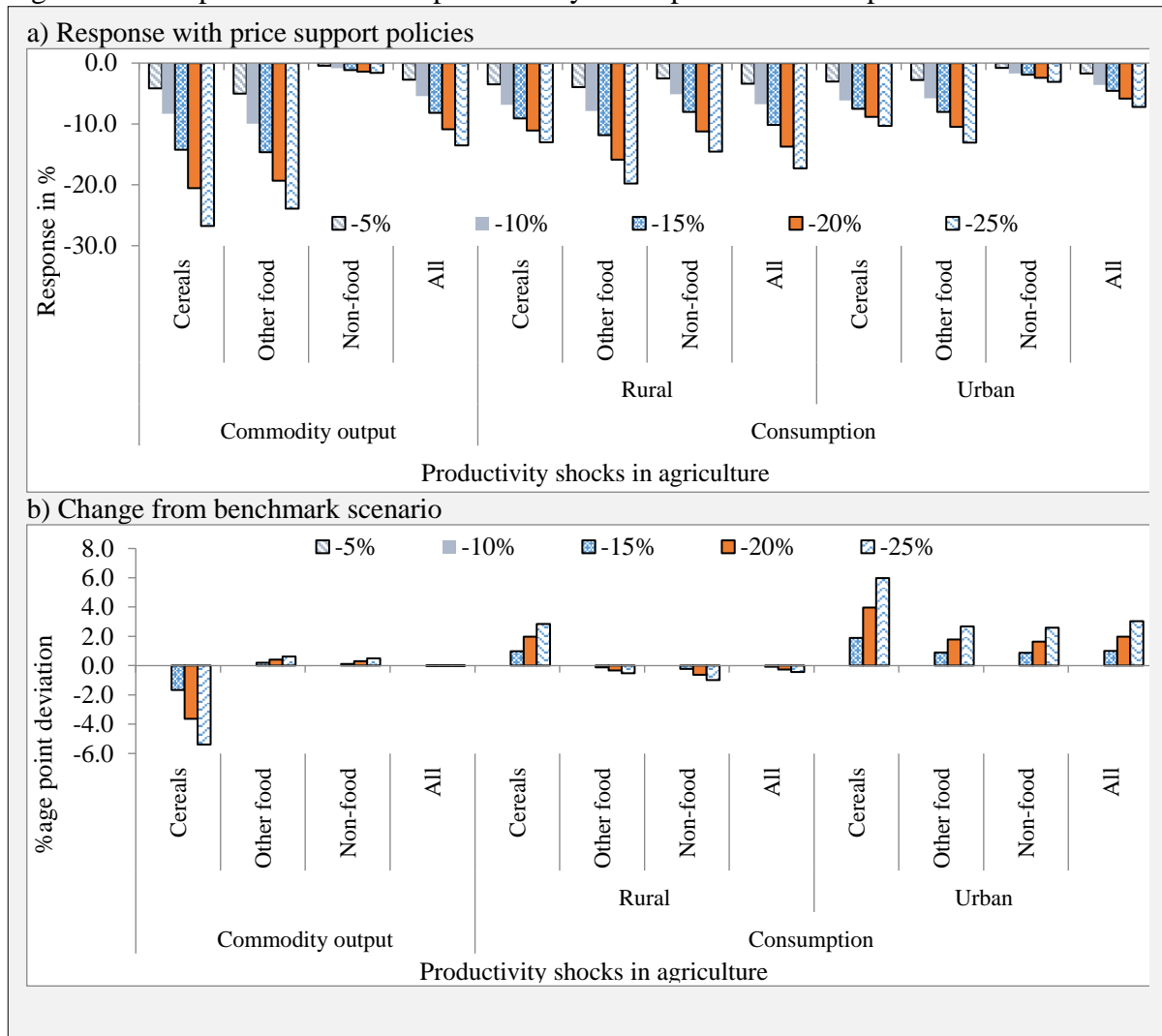


Impact on output and consumption:

The decline in producer prices of cereals in response to the ceiling on consumer prices for these commodities can further discourage cereal production. This is supported by the 1.7 percentage points further reduction in cereal production when productivity contracts by 15% compared to the 12.6% reduction under the negative productivity shock alone. However, the production of “other food” and non-food commodities decline by marginally lower rates under **SIM2** due to

the reallocation of resources away from the sector with price controls. The slower decline in production of non-food commodities is due to the relatively smaller decline in producer prices under **SIM2**, while the slower decline in the production of “other food” commodities is as a result of the improvement in their producer prices relative to cereals.

Figure 4.3b: Impact of increase in productivity on output and consumption



Source: Authors compilation based on model results

Although imports increase from the base level, the strong decline in domestic supply of cereals causes their overall supply to fall further under **SIM2**. This could further aggravate the food insecurity problem in the country. Despite a stronger decline in overall supply of cereals, the introduction of consumer price ceiling on these commodities works in favour of consumers as

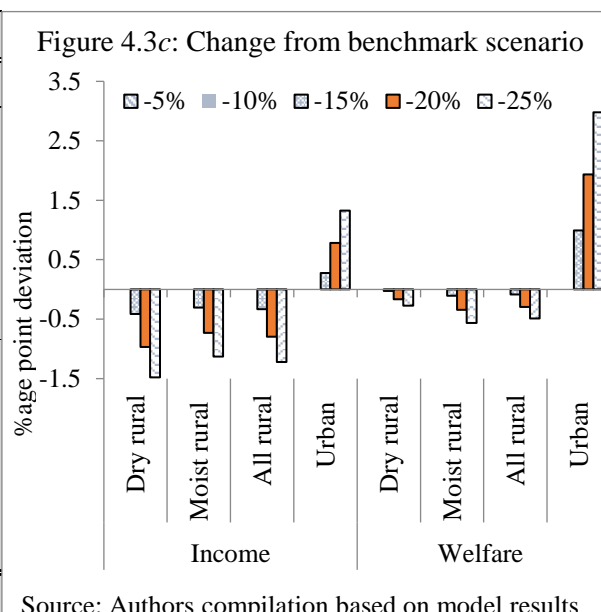
it reduces the decline in consumption of cereals for both rural and urban households compared with the outcome without the price policies. However, whereas consumption of commodities other than cereals further decline for rural households, consumption of these commodities contract by reduced levels for urban households.

Impact on household income and welfare:

The imposition of consumer price ceiling on cereals in the face of a productivity loss makes rural households worse-off by higher levels in terms of income, expenditures and welfare (Table 4.3b). We note stronger losses in the income, expenditures and welfare of rural households (Figure 4.3c) compared with the case of no price intervention as productivity declines by 15-25%. Among rural households, moisture sufficient ones lose the most, where the loss in welfare ranges between 9.4 and 16.3% when agricultural productivity declines between 15 and 25%. In contrast, the consumer price support policy benefits urban households as declines in their income, expenditures and welfare slightly drop. The gain in welfare for urban households can be as high as 3.0 percentage points compared to the outcome under the case of no policy response. Generally, the welfare loss tends to move inversely with the level of urbanisation since income sources and the composition of consumption differ as one moves from rural to highly urbanised areas.

	-5%	-10%	-15%	-20%	-25%
Income:					
Dry rural	-2.59	-5.17	-8.14	-11.25	-14.33
Moist rural	-3.04	-6.07	-9.42	-12.88	-16.33
All rural	-2.92	-5.83	-9.07	-12.44	-15.79
Urban	-2.06	-4.31	-6.49	-8.70	-11.17
Welfare:					
Dry rural	-3.20	-6.39	-9.61	-12.95	-16.28
Moist rural	-3.31	-6.61	-10.01	-13.53	-17.06
All rural	-3.28	-6.55	-9.90	-13.38	-16.85
Urban	-1.66	-3.45	-4.40	-5.60	-6.93

Source: Authors compilation based on model results



Impact on EGTE operations:

We note that producer prices remain above the price floor as productivity declines; hence, there is no role for producer support intervention. However, consumer prices for cereals increase by more than 5% when agricultural productivity falls by 15% and more. The EGTE has to intervene to keep consumer prices for cereals at the level specified by the price policy. To achieve this, the EGTE needs to do de-stocking, importing and selling of cereals in the domestic market (Table 4.3c). Initially, the EGTE starts to release cereals from its stocks, and it imports once the stock level hits the threshold.¹⁸ This is shown by the 25% decline in cereal stocks when agricultural productivity falls by 15% and more. Imports and sales increase almost proportionately as productivity continues declining. This increase in interventions by the EGTE has considerable negative effects on overall volume of government demand for commodities, although its demand for commodities other than stock operations is maintained at the baseline levels. Specifically, we note a 14.9% (or 538 million units – see Table 4.3c) contraction in

¹⁸ The condition for the government to first exhaust stocks (to the limit allowed) and then resort to imports is guided by two further conditions (technically as *PXCTOP.EGTE \bar{S}* and *STKLO.EGTE \bar{M}*) locked to the two mixed complementarity problems (in equations [2.2] and [2.5]). See the [online](#) supplement for further.

volume of government demand under a 25% decline in productivity as the EGTE rather releases cereals. Cereal imports and domestic sales by the EGTE reach 12% and 14% of total domestic supply, respectively, compared to the base case of 5%.

Table 4.3c: Impact of decline in productivity on the EGTE operations (in '00 million units)

	Base	Productivity shocks				
		-5%	-10%	-15%	-20%	-25%
<u>EGTEP</u>						
Cereals	0.00	0.00	0.00	0.00	0.00	0.00
<i>Growth (%)</i>	-	-	-	-	-	-
<u>EGTES</u>						
Cereals	0.00	0.00	0.00	1.59	3.52	5.38
<i>Growth (%)</i>	-	-	-	<i>+inf</i>	<i>+inf</i>	<i>+inf</i>
<u>EGTEE</u>						
Cereals	0.00	0.00	0.00	0.00	0.00	0.00
<i>Growth (%)</i>	-	-	-	-	-	-
<u>EGTEM</u>						
Cereals	0.00	0.00	0.00	1.02	2.95	4.81
<i>Growth (%)</i>	-	-	-	<i>+inf</i>	<i>+inf</i>	<i>+inf</i>
<u>EGTESTK</u>						
Cereals	2.28	2.28	2.28	1.71	1.71	1.71
<i>Growth (%)</i>	-	<i>0.00</i>	<i>0.00</i>	<i>-25.00</i>	<i>-25.00</i>	<i>-25.00</i>

Source: Authors compilation based on model results

4.4 Sensitivity of results to stock band levels

In this section, we examine how responses in selected economic indicators fare when a more flexible band is established in relation to the result with a 25% band on stock change. As explained earlier, we relax the cereal stock variation to 50% of current stocks. This implies that the EGTE can intervene by buying and selling larger quantities of cereals than what was assumed so far. Sensitivity of results to this alternative stock band level is undertaken under a joint producer and consumer price support policy,¹⁹ when the agricultural sector is faced with positive or negative productivity shocks. Results show that the relaxation of the stock band has no strong impact on most economic variables, except on the roles of the EGTE and some government accounts, mainly government income and value and composition of its

¹⁹ This scenario is chosen because we suppose that the government may find it politically right to support both consumers and producers.

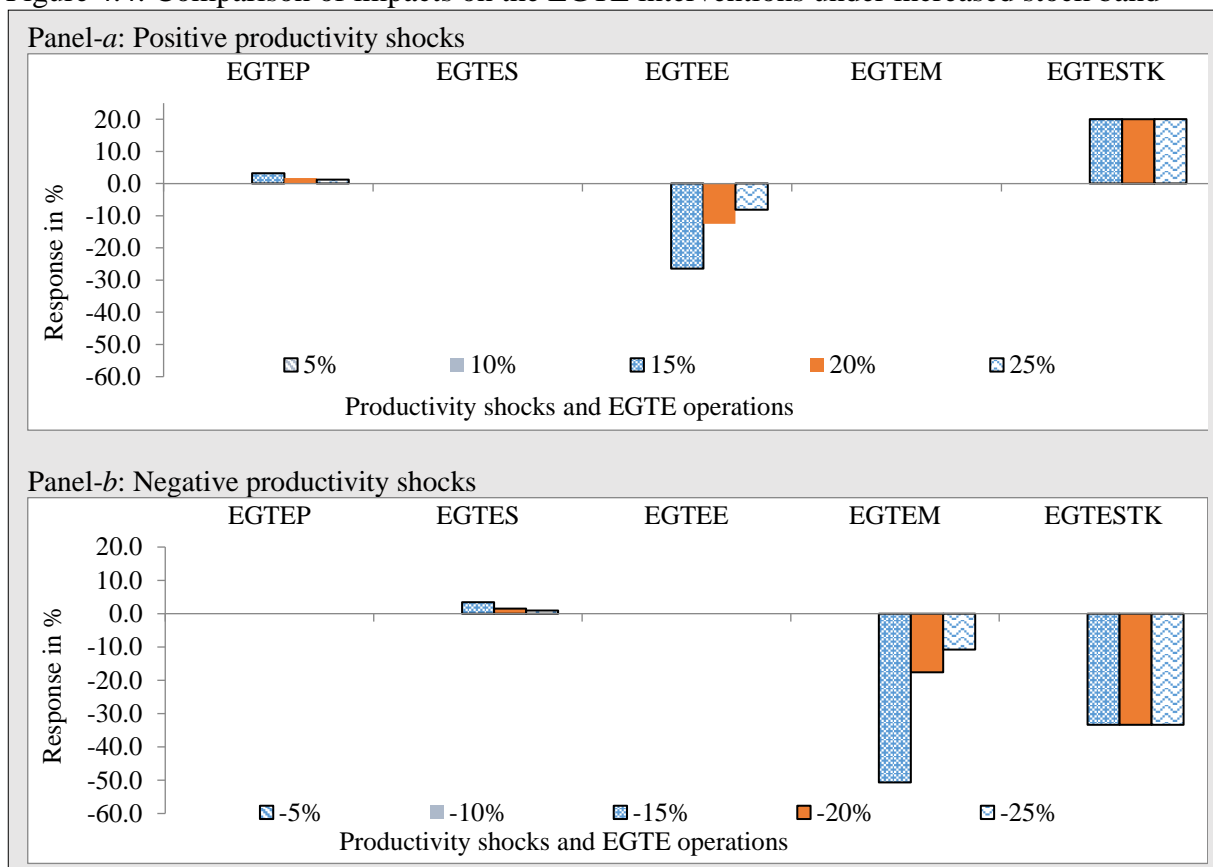
expenditures. It can also be concluded from further experiments not reported here that price and quantity variables are more sensitive to price targets than the level at which the government allows cereal stocks to vary.²⁰

With regard to the EGTE's participation in the cereal trade, with increased flexibility in the size of cereal stocks, the enterprise tends to further increase its purchases from farmers in periods of bumper harvest as it can now expand its stocks by 50% over the base level. As Panel-*a* of Figure 4.4 shows, cereal purchases increase by 3.3% when agricultural productivity increases by 15%. This change in local purchases gradually declines as the productivity shock increases since the requirement for further purchases shrinks. However, the increase in domestic purchase is not translated to increase in export interventions, as the EGTE can now accumulate a greater amount of stocks. Exports of cereals by the EGTE rather decline by up to 26.5% compared with the case of restricted variation in stocks when agricultural productivity increases by 15%. However, this decline in the EGTE's exports quickly shrinks to 12.5% at 20% productivity gain. The extra cereal purchase from the domestic market is fully shipped to the EGTE, where its cereal stocks increase by 20% compared to the case under a 25% stock band.

The new level of stock band increases total government expenditure (in value) by a further 5.7 percentage points on average as productivity increases by 10-25%, mainly due to increased level of cereal net-purchases, cereal transaction costs and declines in net-exports (see equation [2.6] and [2.8] on how these affect government expenditure). A surge in the prices of non-agricultural commodities (see Table 4.2*a*) consumed by the government, the volume of which is maintained at the baseline, contributes partly to the increase in the total value of expenditures. This increase in expenditures are financed by extra income tax revenue (government income) which increases by about 11% over the base case as the stock band is relaxed.

²⁰ In addition to the 5% producer and consumer price band, we tested for responses of price and quantity variables under a strict (but unlikely) price policy of 0% band, and found strong responsiveness of various price and quantity variables as the price policies are implemented.

Figure 4.4: Comparison of impacts on the EGTE interventions under increased stock band



Source: Authors compilation based on model results

Meanwhile, it was shown that declines in productivity would push consumer prices up, triggering the government to stabilise consumer prices by importing and selling in domestic markets. The relaxation of the cereal stock floor is expected to allow the EGTE de-stock more and reduce the pressure on import requirement. Panel-*b* of Figure 4.4 reflects this outcome. As expected, cereal stocks decline by 33.4% compared to the decline under the baseline stock band level if productivity declines by 15%. As a result, the EGTE releases 3.4% more cereals into the domestic market. A more flexible stock level also helps to reduce the cereal import requirement. We see that cereal imports by the EGTE decline by 50.7% under the alternative stock band scenario for a productivity decline of 15%.

In contrast to the case under productivity gains, the alternative level of cereal stock band would rather help to cut the value of government expenditure by a further 15.8 percentage points. This

is mainly associated with the declines in net-imports as the government would be able to pump cereals from the stock compared to the baseline stock band, hence reducing the need for imports. Net-purchases in the government account also decline due to increase in cereal sales. However, the volume of government consumption of commodities other than those related to storage operations remains fixed.

5 Summary and Conclusion

The high price volatility in the international and domestic markets in recent years, coupled with continued food insecurity, appears to motivate a renewed interest on price support programs in some developing countries. This study examines the impact of a potential implementation (or strengthening) of price support policies, taking the case of the cereal sector of Ethiopia. To that end, two productivity shocks and two pricing policies are examined jointly with a public storage intervention. Increases and decreases in agricultural sector productivity by 5-25% are considered under the following pricing policy options: (i) a producer price support policy of a 5% price floor; and (ii) a joint producer and consumer price support policy of 5% floor and ceiling band. These price policies are enforced using active government intervention in the commodity market by stocking and de-stocking of cereals.

We find that the effectiveness of the price policies in stabilising domestic prices and improving food security depends on the prevailing trend in productivity in the agricultural sector. Whereas producer price support policies can only affect the economy when the sector experiences productivity gains, consumer price support policies are visible only under negative productivity shocks. We observe a role for producer price policy to further stimulate agricultural production, thereby benefiting rural households. However, this policy suppresses the welfares of urban households as consumer prices of cereals cannot fall beyond the level dictated by the support program. A price ceiling policy has no particular effect on consumer prices in times of positive

changes in productivity unless demand factors dominate the price effects of supply. Meanwhile, the producer support program could require the government purchase over 10% of the cereals produced, amounting about 15% of its total commodity demand although the average stock level is only about half of this.

Price ceiling on commodities appears to be effective only when there are productivity losses as consumer prices tend to increase. Consumer price support policies can help urban households since they slightly dampen increases in consumer prices. However, rural households lose welfare mainly due to further losses in incomes as the price ceiling limits the increase in producer prices for cereals and discourages production. The consumer price support policy aggravates food insecurity as overall supply of cereals falls further when the price policy is implemented under declining agricultural productivity. In such situations, the state controlled grain trade enterprise de-stocks, imports and releases cereals into the domestic market to dampen the rise in consumer prices. The government satisfies about 14% of overall supply of cereals compared to the base case of 5%.

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1969/70 wurde durch Zusammenschluss mehrerer bis dahin selbständiger Institute das **Institut für Agrarökonomie** gegründet. Im Jahr 2006 wurden das Institut für Agrarökonomie und das Institut für RURALE ENTWICKLUNG zum heutigen **Department für Agrarökonomie und RURALE ENTWICKLUNG** zusammengeführt.

Das Department für Agrarökonomie und RURALE ENTWICKLUNG besteht aus insgesamt neun Lehrstühlen zu den folgenden Themenschwerpunkten:

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- Internationale Agrarökonomie
- Landwirtschaftliche Betriebslehre
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- Soziologie Ländlicher Räume
- Umwelt- und Ressourcenökonomik
- Welternährung und rurale Entwicklung

In der Lehre ist das Department für Agrarökonomie und RURALE ENTWICKLUNG führend für die Studienrichtung Wirtschafts- und Sozialwissenschaften des Landbaus sowie maßgeblich eingebunden in die Studienrichtungen Agribusiness und Ressourcenmanagement. Das Forschungsspektrum des Departments ist breit gefächert. Schwerpunkte liegen sowohl in der Grundlagenforschung als auch in angewandten Forschungsbereichen. Das Department bildet heute eine schlagkräftige Einheit mit international beachteten Forschungsleistungen.

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