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Can a cereal export ban affect a net food-importing economy? The case of Ethiopia*

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Abstract *Most governments implemented policies designed to offset the expected negative effects of high food prices of 2007/08 and 2010/11. Among other interventions, net food-importing countries, such as Ethiopia, have introduced a cereal export ban. Several studies have investigated the macroeconomic impacts of export bans on large net exporters of grains. However, only very few country case studies have examined the economy-wide and distributional effects combined. Further, there is a lack of rigorous studies that disentangle the net impact of a cereal export ban when an economy is jointly affected by an external price shock. This paper evaluates the impacts of a border price shock followed by a cereal export ban, and cereal export ban alone in a typical net food-importing country, Ethiopia. Results show that border price shocks can have negative production and supply effects on food, causing strong welfare losses on urban households. However, an export ban can stabilise domestic food prices in the short-run, but cannot erase the price hike. Moreover, the ban discourages cereal production, and reduces rural households' welfare. As expected, a cereal export ban alone can push domestic food prices down and lead to welfare loss for rural households and the society as a whole while urban households benefit.*

Key words: Food price shock, export ban, welfare, CGE, Ethiopia

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1. Introduction

1.1. Food price movements and export restrictions

In the past decade, prices of staple food crops have experienced very pronounced swings. In 2007/08 alone, the nominal prices of almost all food commodities increased by more than 50% (Tadesse *et al.*, 2014), followed by a second wave of price spikes in 2010/11. Multiple factors have been identified as triggers of these soaring world prices, albeit at different degrees (Tadesse *et al.*, 2014; OECD, 2008). Net food-importing developing countries are likely to be affected more adversely by these price movements as an even higher share of their limited income will be required for food.[1] According to Valdés and Foster (2012), there were 35 net food-importing low-income countries in the world and 31 net agriculture- and food-importing countries in sub-Saharan Africa in 2005-2009. As noted by OECD (2008) and HLPE (2011), the impacts of high international prices for food are heterogeneous in these countries and those households which produce mainly for own consumption could be insulated from price fluctuations in the national and international markets. However, their insulation depends on the degree of their self-sufficiency. For example, farm households in semi-subsistence communities tend to engage in food markets to satisfy part of their final consumption, facing the opportunities and risks in the market place.

At times of price spikes, countries with a considerable part of their population food insecure face exceptionally stronger pressure in stabilising domestic food price as high and volatile prices further limit access to food. Effectively operating markets would provide the solution to the food insecurity problem by guiding reallocation of resources in times of marked price changes. However, most countries, mainly the developing ones, lack well-functioning markets to reduce the impacts of high food prices on the population. These countries also lack the capacity to sustainably finance the required level of imports to satisfy food needs domestically. While increased agricultural production and productivity, improved income distribution, and reduced poverty are long-term solutions, countries design alternative short-term policies to respond to the problem of erratic food prices.

A number of policy instruments such as interventions in the grain market, direct support to the poor in the form of safety-nets, and tax reduction on food have been used to stabilise food prices and increase food availability. India, China, and Bangladesh are some of the effective countries which actively used publicly held stocks to stabilise prices (Demeke *et al.*, 2009; Dorosh, 2008), while others including Mexico, Bangladeshi, Malawi, and Ethiopia introduced targeted safety-nets for the poor (Clay *et al.*, 2011; Dorosh, 2008; Demeke *et al.*, 2009). Some sub-Sharan Africa (Wodon and Zaman, 2010) and other developing countries (Demeke *et al.*, 2009) reduced import and consumption taxes on food and observed stabilised domestic prices.

A number of countries also used an array of export restricting policy instruments such as export taxes, export quotas, export licensing, and export bans, among others, to stabilise food prices. Although these options can be used to obtain a reduced level of exports, they can

[1] OECD (2008) estimated that each 10% increase in the prices of all cereals (including rice) adds nearly USD 4.5 billion to the aggregate cereals import bill of developing countries that are net-importers of cereals.

have different level of efficiency. Export bans or quotas can yield the set volume of exports regardless of what happens in the international market (Anania, 2013). These are also more transparent and easy to implement. Hence, most countries resort to these options in the time of emergency. As a result, about one-third of the countries monitored by an FAO study were observed to react to the 2007/08 price increase by restricting exports (Demeke *et al.*, 2009). However, most of the countries which adopted export restrictions are major exporters of grains (Demeke *et al.*, 2009; Sharma, 2011; Anania, 2013).

So far, several studies examined the success and efficiency of export restrictions on domestic food price stabilisation. Some of these studies provide evidences that countries which restrict exports during times of high international prices were effective in maintaining domestic prices low than countries which did not react. Most of these successful countries are large net exporters of grains such as Bangladesh, China, and Indonesia for rice, and China, India, Turkey, and Japan for wheat (Anania, 2013; Anderson *et al.*, 2013). Thompson and Tallard (2010) and studies cited in Sharma (2011) also focus on the case of trade restrictions by large exporting countries.

Although countries are unilaterally imposing export restrictions to stabilise domestic prices, there is, however, a growing concerns that export restrictions can further exacerbate the negative food security effects of soaring food prices on importing countries, and at the global level. The globally traded volume and world price of commodities could be altered considerably if a big exporter or a large number of small exporters restrict their exports. As a result, export restrictions are recently gaining visibility in on-going multilateral negotiations (Anania, 2013).

This growing concern on export restrictions, mainly by main exporters of grains, leads to a new tide of studies on the impacts of these policy measures on prices in main importing countries, and at the global level. For example, Tanaka and Hosoe (2011) and Solleder (2013) use economy-wide and gravity models, respectively, to simulate the impacts of restrictions in food exports on importing countries and show that net-importers unambiguously lose since these measures increase import prices. At the global level, Anderson *et al.* (2013) and Martin and Anderson (2012) estimated the impacts of trade restrictions on international prices and saw that these policies further exacerbate the high commodity prices internationally. Similarly, using a large set of data constituting 125 countries and 29 food products, Giordani *et al.* (2012) observed a complementarity between international prices and export policy when trade policy aims at shielding the domestic economy from unfavourable developments in the world market; i.e., unilateral actions by exporting countries give rise to a 'multiplier effect' on global food prices. This is referred to as the beggar-thy-neighbour effect and its effect is more sever in less developed food-importing countries.

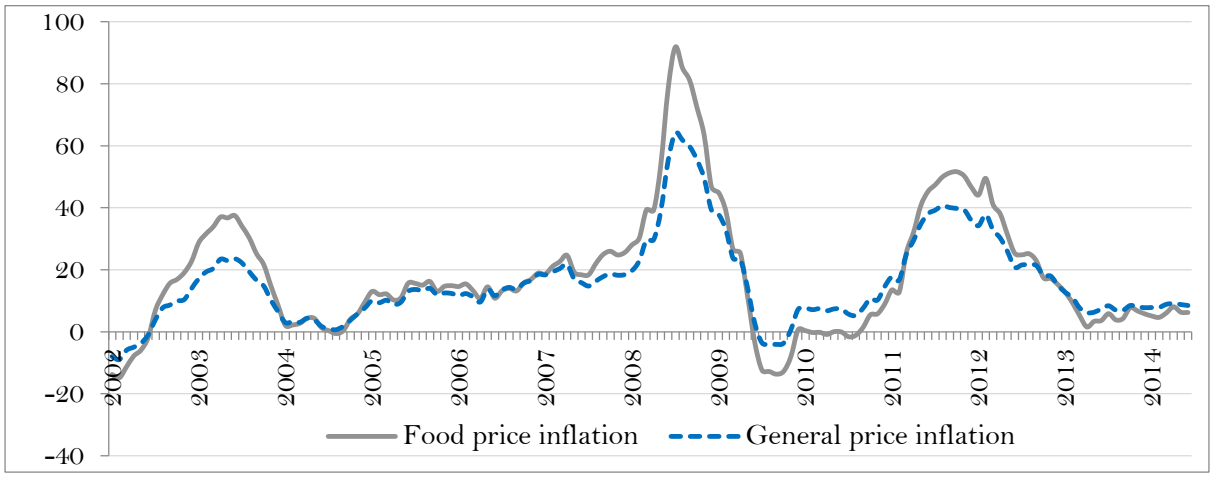
As shown, there is a skewed focus on export restriction by major food exporters, while food security is more of a concern for semi-subsistence low-income countries. Net food-importing low-income countries may also find it useful to prohibit exports to stabilise domestic prices, thereby preventing domestic production from leaving domestic markets even when the total volume of export is not huge. As noted by Anania (2013) and Wodon and

Zaman (2010), markets in the developing world, such as in Africa, are believed to be less integrated to the international market and active trade policies are not thought to be effective to stabilise domestic prices. This notion restricts the urge to investigate the role and effectiveness of export restrictions for food price stabilisation in net food-importing countries, and impact analysis on these countries is generally neglected or limited. Even when there are scant economy-wide studies (Daio and Kennedy, 2016 and Woldie and Siddig, 2009*a*), the studies did not single out the net effects of the export restrictions by jointly accounting for the border price shock which triggered the policy measure.

1.2. The case of Ethiopia

Prior to the price spikes over the past decade, Ethiopia was a country of stable prices with generally low inflation levels, where price movements in the country were mostly linked to weather shocks. Despite strong agricultural performance since 2005, prices started to soar in late 2005 until early 2009 resulting in a 120% increase over the period (FAO, 2015). The month-to-month inflation then started to fall and stabilised in 2009-2010 before climbing again in 2011-2012 (see Figure 1).

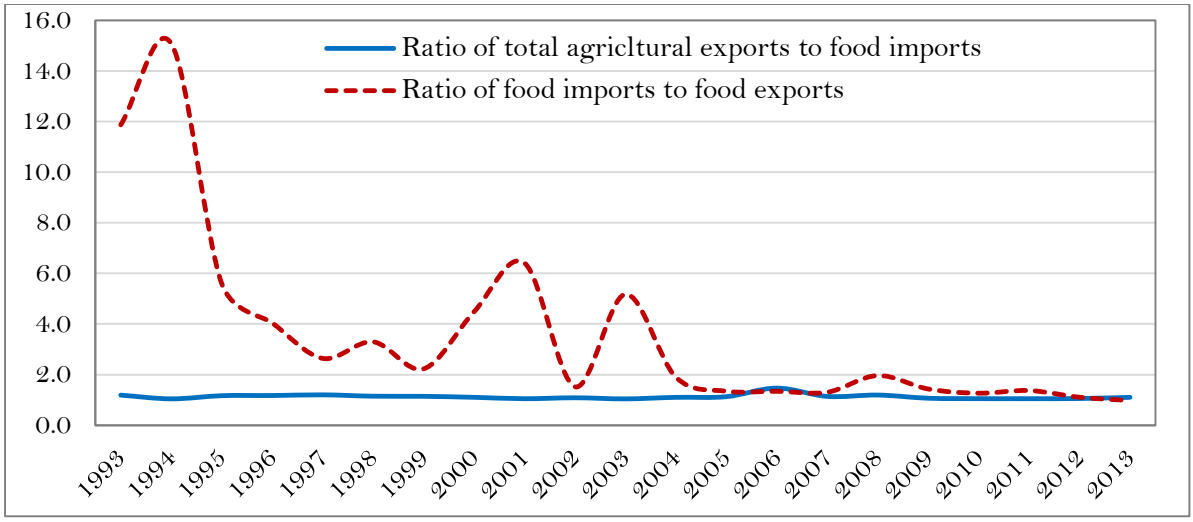
Figure 1: Month-to-month food and general inflation in Ethiopia (%)



Source: Computed based on FAO Food Price Index, FAO (2015)

This coupling of high food prices with good economic performance has attracted several researchers to study the real causes of the food price hikes. While Admassie (2013) identifies several causes including both supply and demand factors, Rashid (2010) suggests that rapid money supply growth combined with an overestimation of agricultural production explains the unusual food price trend in Ethiopia. Using error correction models, Haji and Gelaw (2012) and Loening *et al.* (2009) also claim that monetary expansion is the main driver of the recent price trend, although imported inflation further contributed to soaring domestic prices (Ulimwengu *et al.*, 2009). The latter is supported by the net food-importing trade status of the country. Food trade data in FAOSTAT shows that Ethiopia's food imports are 2-fold its food exports since 2001, and its total agricultural exports surpass its food import bill only slightly over this period (see Figure 2).

Figure 2: Net food-importing status of Ethiopia



Source: Computed based on FAOSTAT trade data, FAO (2016)

Although intervention by the Ethiopian government on the domestic food market has been limited since the market liberalisation in the early 1990's, soaring domestic food prices partly resulting from the global food crisis in 2007/08 and 2010/11 have recently altered the perception on the role of the government to stabilise domestic food markets and prevent further surge in food insecurity. As a consequence, the government responded by introducing at least four main food price stabilisation reforms (Rashid, 2010; Rashid and Lemma, 2011): i) imposition of export ban; ii) re-introduction of urban food rationing; iii) informal suspension of local procurement for price stabilisation and humanitarian purposes; and iv) direct government imports for open market sales and price stabilisation. The ban on cereal export was imposed in February 2008 with the assumption that it would help stabilise domestic markets, and is still operational. This policy measure was not backed up by ex-ante analysis of its potential effects on prices and production. The rationing program was rather large and designed to reduce urban food prices by providing highly subsidised wheat to consumers. However, it was challenged by the emergence of a parallel market. The government also tried open market sales to traders at less than 50% of market prices but the program was abandoned quickly for being too costly and for failing to achieve its purpose due to the bad behaviour of some of the traders. The other channel of price stabilisation was selling through flour millers at subsidised prices. Since all these interventions depleted the country's food reserves, the government (through Ethiopian Grain Tarde Enterprise (EGTE)) and aid organisations engaged highly on food imports.

In terms of monetary policy response, the central bank of the country (National Bank of Ethiopia) imposed a credit ceiling on private bank lending since the early 2009 with the intention of curbing food and general inflation (Admassie, 2013). Despite these commodity market and monetary policy interventions, food prices remained higher compared to the pre-inflation episode.

Since then, researchers have shown growing interest in analysing the effects of these policy interventions. For instance, Rashid and Lemma (2014) studied the rationale and cost-effectiveness of public wheat imports, and concluded that these imports were justified only in 2008 and 2009 when domestic prices for wheat were above import parity prices. However, they also recommend that the economy-wide linkages and feedbacks be analysed. Using a

computable general equilibrium (CGE) model, Woldie and Siddig (2009) examined the price stabilisation role of the introduction of the wheat subsidy in place of oil subsidy in Ethiopia. They concluded that the wheat subsidy was price reducing and welfare improving, while it could worsen the overall trade balance. Using a single representative household model on GTAP database, they subsequently simulate the impact of a cereal export ban in the country (Woldie and Siddig, 2009*a*). They show that the intervention could stabilise prices with no considerable trade balance consequences. However, they flag that the policy could have devastating impact on national welfare. Despite their first approximations on the likely impacts of the ban in the country, there are few gaps in their approach. First, the study does not incorporate the price shock which triggered the export ban while this is necessary to examine the net effect of the intervention. Second, building the analysis on a single representative household prevents an analysis of the distributional implications of the shock, such as between urban and rural households. Third, there is no discussion of how and to what extent the shocks affect producer and consumer prices.

1.3. Study objectives

Building on previous efforts and existing gaps to knowledge, this study adapts an economy-wide model and evaluates the effectiveness of a cereal export ban in a net food-importing economy, taking Ethiopia as a case example. Specifically, we evaluate the price stabilisation, commodity production and supply, income distribution, and welfare effects of a cereal export ban in the immediate and the short-run. We further examine whether these effects depend on the existence of an external price shock. The study shows that a food price in international markets can have strong consumption and welfare implications on urban households. The export ban could contribute to stabilise domestic food prices, but it is not adequate to eliminate the domestic price hike triggered by the external price shock. From a welfare perspective, introducing the ban could reduce rural households' incomes as it discourages cereal production. Finally, if the government imposes a cereal export ban in the absence of any external food price shock, domestic food prices could decrease from their base levels. This could lead to a welfare loss for rural households and at the national level, although urban households could benefit.

The next section of this paper introduces the method of analysis by discussing the features of the model and database used, together with the simulation design. Then the two following sections discuss (i) the impacts of joint shocks in border prices and cereal export ban in comparison to a border price shock alone, and (ii) the impacts of an export ban alone on a typical net food-importing economy. The last section summarises the results and concludes.

2. Method of analysis

2.1. Model structure

A modified version of a CGE model called STAGE[2] (McDonald, 2007) is applied for this study. This model (Aragie, 2014) has some innovative features on how commodity consumption and factor allocation decisions are modelled by incorporating home production

[2] STAGE is a short hand for Static General Equilibrium.

for home consumption under non-separability assumption in the database discussed below. These modifications allow better describe the production and consumption systems in peasant economies such as that of Ethiopia.

Production follows multi-level nested structure, where household and non-household activities are generally assumed to follow constant elasticity of substitution (CES) technology to combine primary factors, while fixed production shares are used between aggregate value-added and intermediate inputs to create output at activity level. The production nesting structure in the STAGE model discussed in McDonald (2007) is modified to account for the structure considered appropriate for low-income economies. Specifically, irrigation and fertilizer inputs are treated as part of value added to account for the close substitutability these inputs have with land. In addition, labour use by household enterprises for producing for own consumption is constrained by the household's own labour endowment, and this condition is imposed in the labour market equilibrium condition.

The trade block is central to the current analysis. The optimal compositions of imported and domestically produced commodities in the domestic market are determined using constant elasticity of substitution (CES) function following the Armington insight (Armington, 1969). The share of imports and domestic supply in composite supply of a commodity, say wheat, depends on relative import and domestic prices. Likewise, production is optimally allocated between the domestic and the export markets using a constant elasticity of transformation (CET) function based on relative prices in these two markets.[3]

Consumers behaviour is defined by a two-stage consumption nesting such that households demand for commodities can reflect the source of commodities as defined in the social accounting matrix (SAM) used for this study. At the bottom of the consumption nest is a CES demand system where pairs of notionally identical home produced and marketed commodities are combined to provide aggregate consumption of the commodity. Consumers decide on the optimal combination of these two types of commodities based on their relative prices subject to the imperfect substitution elasticity defined in the CES function. At the top of the nest, consumers maximise their utility from the consumption of a set of combined commodities (from the lower nest) subject to their budget constraints and the linear expenditure demand systems (LES) derived from Stone-Geary utility function. LES demand systems split subsistence consumption, which is still a dominant phenomenon in low-income countries, from discretionary consumption where the amount of household budget on discretionary demand is a residual component of total household consumption budget and committed expenditure on subsistence demand.[4] The subsistence and discretionary consumption expenditure is decided over the composite of own account and market commodities generated in the lower nest of the consumption tree.

[3] Based on the literature on price elasticity of imports and exports in developing countries (see Pandey, 2013; Imbs and Mejean, 2010) we assume elasticity of transformation of 0.8 (inelastic) in the export market and elasticity of substitution of 2.0 (elastic) in the import market.

[4] Income elasticity of demand of 0.8 (slightly inelastic) and 1.2 (slightly elastic) are assumed for food and non-food commodities, respectively, based on related literature.

2.2. Data

Since the latest SAM available for the country is for 2010 when a strict cereal export ban was imposed, the SAM needs to be re-estimated to incorporate features of cereal exports in a 'normal' year. The adjusted SAM builds on the 2010 SAM for Ethiopia (Aragie and McDonald, 2014) which has several salient features: it i) splits commodities in to 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 in semi-subsistence economies. The SAM conforms to the recommendations of the System of National Accounts (SNA) stipulating that 'in situations where there is a significant amount of consumption represented by own account production, it would be useful to record the distinction between consumption expenditure by households on home production for home consumption commodities from commodities purchased in the market place' (ISWGNA, 2009, paragraph 14:65). Hence, the SAM explicitly differentiates consumption of home produced commodities from marketed commodities by recognising households as producing units. There are a total of 39 commodities of which 15 are home production for home consumption, with corresponding number of marketed counterparts, and 9 are solely supplied by the market such as public services and industrial goods. The activity account is overrepresented owing to the fact that households are 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 households.[5] Further, rural households are classified under four agro-ecological zones: moisture sufficient highlands, drought prone highlands, moisture sufficient lowlands, and drought prone lowlands. In addition, the SAM provides a detailed account of factors of production. There are 88 factors in total where about two-third are labour related and classified by five skill types[6] for each administrative region. The SAM also presents several institutional accounts including accounts for enterprises, the government, investment-saving and the rest of the world (RoW).

2.3. Simulation scenarios

Since the export ban is a response to the high staple food prices that prevailed in the second half of the 2000's, the analysis first examines the possible impacts of high world prices of food commodities and then focuses on the consequences of a consequent imposition of a cereal export ban. A rise in world prices of commodities implies that prices of Ethiopia's exports also increase. Hence, a base case scenario of 10% rise in prices of Ethiopia's imports and exports of food commodities is assumed for simulation purposes. We chose a price shock level lower than the average level of inflation during the 2007-2009 and 2011-2012 periods (see Figure 1) because only a fraction of the domestic inflation can be explained by developments

[5] While big urban households include households in regional capitals and four other major cities which are markedly bigger than other urban centres in the country, other urban households include households in the rest of urban Ethiopia. Both of these major household groups are further disaggregated by region.

[6] The five labour types are white collar labour, blue collar labour, service labour, skilled agricultural labour, and unskilled labour extracted from the Household Consumption Expenditure (HCE) Survey for Ethiopia.

in world prices (Haji and Gelaw, 2012; Loening *et al.*, 2009). For result sensitivity analysis, this border price shock is increased/decreased by 5 percentage points from this base scenario, and results are compared.

The border price shock is imposed and analysed before the export ban shock is taken into account. Then, the export ban is simulated so as to examine its implications on domestic prices, consumption and supply responses in Ethiopia in a context of soaring world commodity prices. This helps to examine the net effects of the export ban on food security and price stabilisation. The government may also use an export ban to improve food availability in domestic markets even under normal international market conditions (i.e., in absence of world price shocks). Extra set of simulations is also designed to study the implications of an export ban alone on prices, supply, production, and welfare in the Ethiopian economy.

Implementing a world price shock using a CGE model framework is relatively straight forward, but simulating an export ban is not so straight forward. In most CGE analysis of export bans, the standard approach involves imposing i) a decline in world price of commodities, or ii) prohibitive tariffs on exports to ultimately reduce the quantity of exports. The advantage with these options is that these variables are exogenous and this makes it easier to impose the shocks. However, these approaches do not accurately depict the actual mechanism through which a direct control of the export quantity can affect the economy.[7]

In this study, we adapt the approach suggested by Philippidis (2010) and used, as such, by Boulanger *et al.* (2015) to study import bans, by directly restricting the quantity of exports. To do that, we need to introduce a preference scaling variable in the export transformation function and swap it with the quantity of exports.[8] The first order condition corresponding to the transformation function needs to be re-specified to take into account the preference variable. However, this approach presupposes a welfare loss resulting from the export ban; a result we rather want to obtain endogenously in the model. Hence, we decide to go one step closer to Philippidis (2010) methodological suggestion by incorporating a preference variable, but constrain the sum of domestic supply and export supply from domestic sources to equal to total domestic production for the commodity on which the export ban is implemented.[9] This means that the preference variable is not allowed to endogenously adjust in the CET function. We consider a 99% decline in exports of cereals because the government cannot inforce a complete ban as there will always be illegal cross-border trade with neighbouring countries.

The production response to the export ban depends on whether producers have adequate time to respond, since sometimes production decisions might have already been made when the ban is introduced. This is true in the case of agriculture where the decisions

[7] In situations where prices are considered as an option to achieve the intended drop in exports, a high level of elasticity of transformation between production for the domestic market and for exports will have to be assumed.
[8] Alternatively, it can be assumed that the country faces export demand function for the banned commodities and constrain the constant term in the world export demand function to the level required as if there was a change in a non-price demand variable from outside.
[9] This is done by replacing a CET function for the banned commodity with an identity equation, where in the simulations exogenously set export and endogenously determined total domestic production for a commodity determine production for domestic market.

on the amount and composition of inputs for production are made well before the harvest is realised. Hence, the above scenarios were considered under two additional conditions:

(i) Domestic production by all activities/sectors is allowed to adjust, i.e., short-run response; and
(ii) Domestic production by agricultural activities is assumed to be fixed at the base level, i.e., instantaneous/immediate case.

The condition where a composite output by an activity is restricted to remain at the base level allows for within activity adjustment depending on the elasticity of transformation for multiproduct activities; i.e., the share of a commodity *'c'* in total production by activity *'a'* is allowed to vary, permitting for partial adjustment in production of commodities.

2.4. Model closure and market clearing conditions

Alternative model closure rules are considered to capture the immediate and short- to medium-run effects of the shocks. While the immediate response corresponds to the change within a year after the shocks are introduced into the system, short- to medium-run corresponds to the effect in about five years' time.

In the immediate-term, output response is restricted to within sector/activity adjustment, where the composite level of production is forced to remain at the base level. In addition, full-employment is assumed reflecting the limited avenue for factors to transit between regimes of employment and unemployment. However, this assumption does not mean that factors are actually fully employed, but only that the transition from state of unemployment to employment, and vice-versa, is limited. Saving drives investment demand as it will be difficult to generate the required amount of saving within such a short period. The internal and external balances are kept at their base levels.

In the short- to medium-run, production is allowed to adjust to economic conditions; investment is assumed to dictate the saving level; and internal balance is assumed to temporarily deviate from baseline situation. Fixed external balance assumption is maintained to reflect the limited access a small developing country like Ethiopia has to world financial markets in the short-run.

These alternative assumptions on closure rules and market clearing conditions can also be viewed as instruments of model result sensitivity analysis in addition to the standard sensitivity analysis implemented by altering the magnitude of the border price shock.

3. Result and discussion: Impacts of border price shocks and associated cereal export ban

3.1. The *short-run* impacts

This section describes how the Ethiopian economy behaves if shocked by a rise in border prices for food and an export ban on cereals. Results are discussed in comparison with outcomes without the policy intervention (i.e., rise in border price alone). Unlike other studies so far, this approach will help disentangle the net impact of an export ban.

Impacts on commodity prices

The short-run impact of a 10% simulated exogenous increase in border prices for food commodities is to push import and export prices of cereals and other food commodities up by 6.3% (Table 1*a*).[10] However, non-food commodities (industrial and services) could experience declines in border prices in local currency terms. Appreciation of the exchange rate by 3.3% contributes to the less than proportionate increase in import and export prices of food commodities (in local currency). This change in the exchange rate also defines the declines in import and export prices of non-food commodities. The general equilibrium effect of the shock is reflected in the strong increase (3.5-3.9%) in producer prices of food commodities including cereals. The border price shock could also make cereals and other agricultural products expensive in local markets as supply prices for these commodities could surge by up to 4.1%. The rise in supply prices of cereal are slightly bigger than that of other agricultural commodities showing that cereal markets in Ethiopia are more integrated to international markets relative to other food commodities. Supply prices determine consumer prices, and the gap between the two is commodity specific and depends on the level of commodity taxes and marketing margins. The exogenous price shock makes food commodities more expensive for Ethiopian households as consumer prices for these commodities increase by about 3.0% on average. However, these changes are less than the changes in supply prices by 0.7 percentage points due to the decline in prices of marketing margins. Consumer prices for non-food commodities could decline, contributing to a slight reduction in overall consumer prices at the country level.

Table 1*b* provides estimates of price changes if the border price shock is accompanied by a cereal export ban. Price changes under cereal export ban are generally lower in comparison to those without the ban, showing the price stabilisation effects of the intervention. Cereals for which the ban is introduced are the commodities with much reduced increase in producer prices (price rise shrinks by 2.7 percentage points). As a consequence, we observe a stronger decline in domestic production of these commodities vis-à-vis the case without the ban (compare Table 2*a* and Table 2*b*). Producer prices of other food commodities increase by 2.6%, which is lower by 1.1 percentage points than the change in the no policy case. This indicates that agricultural producers would receive lower price incentives as a result of the intervention. Similarly, producer prices for non-food commodities decline, but the price drops are only 60% of changes without the ban.

These reduced changes in producer prices of commodities are partly explained by declines in responses in export and import prices by about 1.0 percentage points when exports of cereals are restricted. Like the situation under the border price shock alone, prices of imports change by the same rate as export prices, although import prices fall overall as non-food commodities dominate Ethiopia's imports. This net effect on import price of all commodities is lower by 1.1 percentage points than the case under border price shock alone. These new developments in export and import prices result from the increase in prices of

[10] Other food commodities include all food commodities other than cereals (which constitute wheat, maize, barley and sorghum) for which the export ban is implemented.

margin services by about 1.0%, although the exchange rate revived compared to the case without intervention.[11]

The combined effect of the changes in producer and import prices is reflected in total supply price. Price changes in Table 1*b* are consistent with the case under the border price shock alone, but the changes are much lower under the joint shock scenario. These differences in the magnitudes of price changes are also reflected in consumer prices for all types of commodities. Changes in consumer prices are reduced by 0.6, 0.8, and 0.8 percentage points for services, industrial, and other food commodities as a result of the economy-wide effects of the cereal export ban. Convincingly, the price stabilisation role of the ban is stronger for cereals as consumer price changes are now lower by 2.1 percentage points for these commodities although the country exports only 3% of its total cereal production.

Table 1*a*: Changes in commodity prices (%) without export ban

	Producer price	Export price	Import price	Supply price	Consumer price
Cereals	3.89	6.25	6.25	4.06	3.30
Other food	3.48	6.25	6.25	3.03	2.68
Industry	-1.50	-3.41	-3.41	-2.45	-2.42
Services	-1.37	-3.41	-3.41	-1.88	-1.83
All	0.92	2.17	-2.93	-0.18	-0.33

Source: Own compilation based on model results

Table 1*b*: Changes in commodity prices (%) with export ban

	Producer price	Export price	Import price	Supply price	Consumer price
Cereals	1.21	5.34	5.34	1.59	1.23
Other food	2.55	5.34	5.34	2.10	1.87
Industry	-0.98	-2.22	-2.22	-1.59	-1.58
Services	-0.84	-2.22	-2.22	-1.18	-1.15
All	0.63	2.08	-1.84	-0.13	-0.22

Source: Own compilation based on model results

Impacts on commodity production and supplies

The quantity of exports and imports change noticeably as a result of the border price shock simulated (Table 2*a*). While the production of other food commodities increases, the part supplied to the domestic market declines marginally (by 0.3%), and the rest is reflected by a strong increase in export (3.8%). Changes in domestic supply and import supply determine the overall change in composite supply for each commodity. Total supply of other food commodities declines by 0.5% owing to a 7.7% decline in imports and a slight drop in supply from domestic sources although domestic production marginally increases. Also, a border price shock is likely to make cereals scarcer, causing a decline in supply by 0.6%. In contrast, the food price shock has a positive effect on total supply of non-food commodities. This positive effect on non-food commodities resulted in a slight expansion in overall commodity supply.

However, owing to the cereal ban introduced in response to the rise in world food price, commodity production and supply changes are less compared to the scenario without policy intervention. What stand out odd are the changes in the production of cereals. These

[11] The revival of the exchange rate is because exports marginally decline and imports increase by about 1.2% causing scarcity of foreign currency.

commodities show stronger declines (more by 1.3 percentage points), while the production of other food commodities slightly increases (Table 2*b*). This strong decline in the production of cereals is explained by the disincentive to the producers generated by the quantity restriction. This is consistent with the 99.0% decline in exports of these selected cereals compared to an export rise of about 1.4% under the world price shock alone. In addition, exports of other food commodities could increase strongly, while non-food exports decline by marginally lower rates compared to the responses under the border price shock alone.

There emerges a clear divide between food (including cereals) and non-food commodities on how imports respond to the cereal export ban accompanying the border price shock. While imports of agricultural commodities decline by greater rates, imports of non-food commodities (industry and services) increase by reduced levels. Specifically, imports of cereals declines by 2.4 percentage points higher rate when the ban is accounted for. This is caused by bigger rises in prices of imports compared with the rise in prices of domestic supply (see how producer prices change in Table 1*b*). The other component of total supply of commodities is domestic supply. Changes in domestic supply for the major commodity groups follow changes in domestic production. Compared to the scenario without a ban, these changes are smaller. What is noticeable is the rise in domestic supply of cereals (by 0.8%) against the drop by 0.3% under border price rise alone; a change that is directly attributed to the ban. Although domestic production of cereals decline, the part supplied to the domestic market increase as exports are diverted. This is so even though the country exports only less than 3% of total cereal production under a normal situation.

Table 2*a*: Changes in commodity production and supply (%) without export ban

	Production	Export market	Domestic market	Import supply	Total supply
Cereals	-0.28	1.42	-0.32	-3.42	-0.62
Other food	0.31	3.82	-0.34	-7.72	-0.53
Industry	-2.79	-4.40	-2.25	2.31	0.55
Services	-0.41	-2.70	-0.27	2.61	0.55
All	-0.35	0.54	-0.46	2.05	0.16

Source: Own compilation based on model results

Table 2*b*: Changes in commodity production and supply (%) with export ban

	Production	Export market	Domestic market	Import supply	Total supply
Cereals	-1.61	-99.00	0.75	-5.81	0.10
Other food	0.42	4.09	-0.26	-6.84	-0.42
Industry	-1.80	-2.99	-1.40	1.49	0.38
Services	-0.24	-1.83	-0.14	1.77	0.40
All	-0.23	-0.41	-0.21	1.22	0.14

Source: Own compilation based on model results

What is more close to welfare analysis and food security is how household consumption of commodities fare with border price shocks for food and agricultural commodities. As a result of the simulated rise in world prices of Ethiopia's imports and exports of food and agricultural commodities, the national level of food consumption declines while the consumption of non-food commodities increases (Table 3*a*). This is consistent with the increase in prices of food commodities and the decrease in prices of non-food commodities. The world price shock could trigger rural households to reallocate their consumption expenditure away from food and towards non-food commodities, experiencing an overall slight gain in consumption as a result of the income effect (discussed below). However, urban

households would consistently consume less of all types of commodities. The decline in consumption is stronger for food commodities including cereals. This confirms the general view that border price shocks can have important food security implications for urban households in general and the urban poor in particular.

The national level changes in consumption of commodities under the joint shock (border price rise and export ban) are consistent with the case under the border price shock alone. However, the magnitudes of the changes are smaller and the 1.3% loss in consumption of cereals observed under the price shock scenario is largely resolved with the ban (see Table 3*b*). Specifically, the consumption of cereals improved by about 1.2 percentage points compared to the case under the border price shock alone.

Meanwhile, there emerge two contrasting results at household level. While gains in consumption of non-food commodities reduced for rural households when cereal export ban is imposed, the declines in consumption of these commodities contracted (by up to 0.4 percentage points) for urban households. Another noticeable result is the 0.9% increase in consumption of cereals triggered by the export ban for rural households even compared to the base period, while the change in consumption is still negative for urban households. Urban households can also enjoy a 1.1 percentage points decline in the consumption loss of other food commodities observed under the border price shock alone. Overall, the consumption effect of the export ban is stronger for urban households as these households could see improvement in consumption from the 1.9% reduction observed under the benchmark scenario.

Table 3*a*: Changes in consumpion of commodities (%) without export ban

	Rural	Urban	All
Cereals	-0.01	-3.17	-1.30
Other food	-0.27	-2.70	-0.72
Industry	1.55	-1.07	0.64
Services	1.08	-1.15	0.63
All	0.49	-1.89	-0.06

Source: Own compilation based on model results

Table 3*b*: Changes in consumpion of commodities (%) with export ban

	Rural	Urban	All
Cereals	0.87	-1.56	-0.12
Other food	-0.27	-1.85	-0.56
Industry	1.01	-0.68	0.42
Services	0.68	-0.76	0.39
All	0.31	-1.20	-0.03

Source: Own compilation based on model results

Impacts on incomes, expenditures and costs-of-living

While the changes in production as a result of the shock on border price for food commodities is reflected on the income and expenditure effects,[12] the changes in commodity prices are summarised in the cost-of-living effect. The scenario without the export ban shows that incomes of most rural household groups could improve (Table 4*a*). On average, the 10%

[12] The expenditure effect also incorporates the changes in savings rates, if any, which are determined in the model closures. Models which assume fixed saving rates will not see deviations between changes in incomes and expenditures as the full degree of the income change will pass on to expenditure changes.

increase in world price for food could cause rural incomes to surge by 1.4%. However, urban households could lose incomes by up to 2.9%. The country-level impact is a slight gain (0.6%) in nominal income as the country is predominantly rural.

The change in income dictates the change in expenditure for final demand. Results are consistent with the income changes. An important observation is how expenditures change in relation to incomes. Since savings are assumed to respond to investment demand, the magnitudes of changes in expenditure are smaller than the changes in income when the changes are positive, and stronger when they are negative. This is reflected in the 6.7% increase in savings to balance the increase in investment expenditure due to the price shock. As a result, the country-level change in nominal expenditure is about 0.2% compared with the 0.6% increase in incomes.

These income and expenditures changes display lower magnitudes in both directions when the price shock is accompanied by the export ban on cereals (see Table 4*b*). While all rural household groups become almost free from the negative effects of the shocks on their incomes, urban households continue losing out. The latter is due to the joint effects of decline in returns to skilled labour types and slight increase in unemployment for urban unskilled factors. Returns to non-agricultural capital, which are largely owned by urban households, also decline by about 2.0%. Meanwhile, expenditures increase (decrease) by lower (higher) degree than income since savings rates increase by 4.7% to maintain the saving-investment balance set in the closure.

Changes in commodity prices affect different households differently depending on the relative share of each commodity in their consumption basket. This summary information is captured by the consumer price index computed for each household group. While the border price shock increases the cost-of-living for rural households (+0.4%), commodities become cheaper for urban households (by up to 0.8%). The increase in cost-of-living for rural households, as the border price of food commodities increase by 10%, is due to the subsequent rise in prices of food commodities which accounts for the greater share (52%) of their consumption. Likewise, the decrease in cost-of-living for urban households is due to the fall in prices of non-food commodities as these commodities account for 60% of their consumption expenditures.

The joint introduction of the export ban and the border price shock also significantly affects the cost-of-living responses. Although they move in the same direction, the magnitudes of the changes in the cost-of-living under a joint shock (border price shock and export ban) are lower and only 40% of that of the changes under border price shock alone. Prices of commodities remain bigger than the base situation (i.e., prior to any shock) for rural households, while prices become cheaper on average for urban households. Urban are better off because non-food commodities represent a huge share in consumption for a typical urban household. Table 1*b* shows that consumer prices of non-food commodities decline.

Table 4*a*: Changes in income, expenditure, and cost-of-living (%) without export ban

		Income	Expenditure	Const-of-living
Dry rural	Highland	0.88	0.48	0.43
	Lowland	-0.30	-0.77	0.17
Moist rural	Highland	1.65	1.32	0.20
	Lowland	1.05	0.54	0.62
Rural total		1.38	1.03	0.35
Urban	Other	-0.26	-0.75	-0.46
	Major	-2.87	-3.52	-0.78

Source: Own compilation based on model results

Table 4*b*: Changes in income, expenditure, and cost-of-living (%) with export ban

		Income	Expenditure	Const-of-living
Dry rural	Highland	0.79	0.54	0.19
	Lowland	-0.06	-0.35	0.04
Moist rural	Highland	1.01	0.80	0.09
	Lowland	0.79	0.47	0.27
Rural total		0.92	0.70	0.15
Urban	Other	-0.29	-0.60	-0.19
	Major	-1.79	-2.20	-0.30

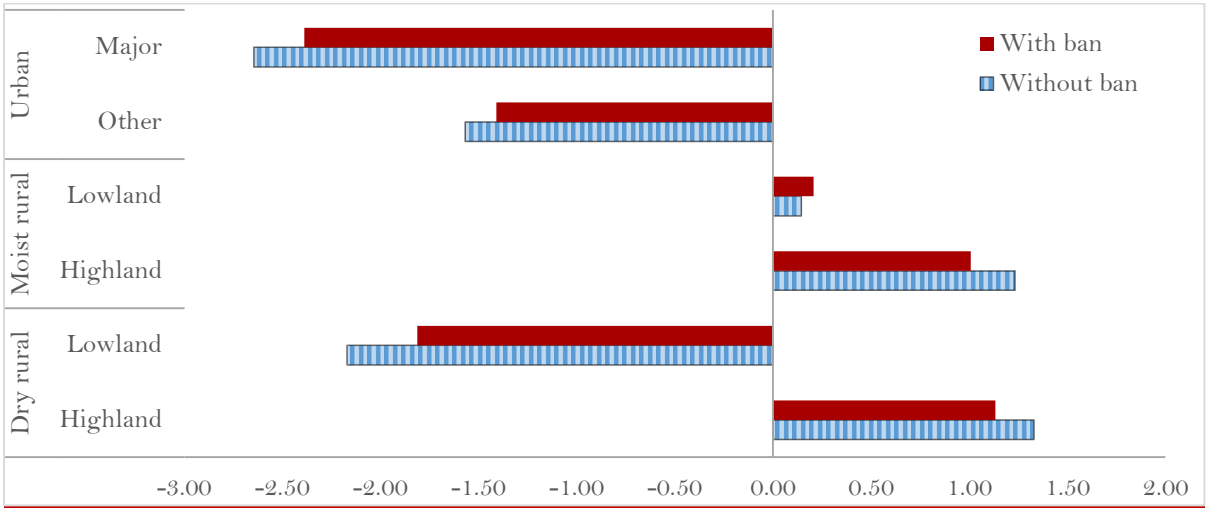
Source: Own compilation based on model results

Impacts on welfare

The welfare effect of a shock on a typical household depends on how the income and cost-of-living changes interact. The result without any policy response shows that rural households could benefit with an overall welfare gain of 0.6%. Nevertheless, this welfare change is distributed unevenly across household groups (Figure 3). While moisture sufficient highland households gain welfare, drought prone lowland and moisture sufficient lowland households lose welfare slightly. Drought prone highland households are almost unaffected, showing that lowland households are the most likely to be negatively affected among rural households if the economy is affected by a food price rise at the border. Ethiopia is also home to about 15 million urban population, although this represents only 16% of the total population. On average, urban households could lose welfare by 1.3% due to their considerable reliance on marketed food, reinforcing the income effect of the shock discussed earlier. However, the country could gain welfare by 0.3% owing to the positive overall welfare change for rural households which constitute 84% of the population.

In terms of comparison of effects with and without cereal export ban, the general observation made so far holds; i.e., changes in welfare are smaller under the joint shock than in the case of border price rise alone (Figure 3). This implies that the export ban works against rural households as it prevents them from enjoying some extra unit of welfare, while it works in favour of urban households as it reduces their welfare loss initially resulting from higher domestic food prices. Although there is no an overall welfare loss at the national level, the implementation of an export ban seems to reduce any welfare gain as the positive welfare changes for rural households decline as a result of such an intervention.

Figure 3: Changes in welfare (%)



Source: Own compilation based on model results

3.2. The *immediate* impacts

The price and quantity changes are stronger in the immediate period vis-à-vis the short-run under joint shocks of border price rise and cereal export ban. Changes in producer prices increase for other food and all non-food commodities; the increase is as much as 0.7 and 0.3 percentage points for other food and industrial commodities, respectively. However, producer price responses for cereals are reduced in the instantaneous period. This is also true for supply and consumer prices. Like producer prices, changes in supply and consumer prices become stronger for other food and all non-food commodities in the immediate period due to stronger exchange rate effects. Export and import prices of other food commodities also change by stronger magnitudes, where these prices increase by 1.7 percentage points to 7.0%.

The instantaneous increase in export and import prices of cereals on which the ban is imposed also reaches 7.0% compared to 5.3% in the short-run. The strong instantaneous increase in export price for this commodities leads to a 3.3 percentage point further reduction in imports compared to the response over the short-run. Nevertheless, changes in aggregate import supply, domestic supply from domestic sources, and total supply are more positive in the immediate-run. This holds for the cereals under discussion as well. Household consumption of non-food commodities also revives, leading to a marginal gain in consumption (by 0.5%) versus the decline in consumption in the short-run. Cereals intake could also increase slightly (by 0.5%) compared to the slight decline observed under the short-run assumption. Among households, those in rural Ethiopia tend to experience further gains in consumption of both food and non-food commodities in the immediate-run, while urban households seem to face strongly negative consumption changes in the immediate-run.

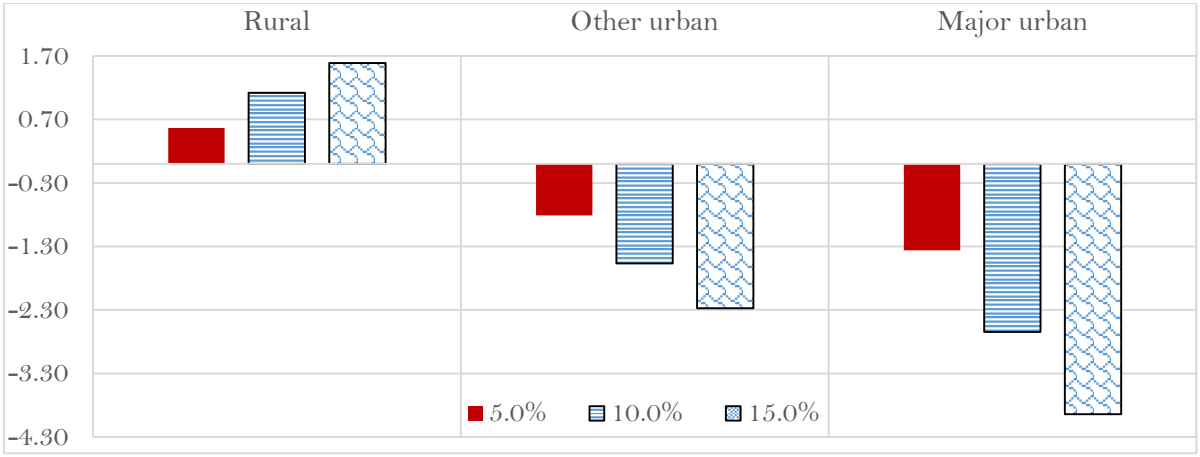
The instantaneous income, expenditure, and welfare effects are much stronger than the changes over the short-run where some economic conditions can adjust. Rural households experience increases in income, expenditures, and welfare by 2, 2, and 3 folds, respectively. However, major urban households face 1.0-1.6 percentage points more reductions in income, expenditures, and welfare in the immediate-run.

3.3. Sensitivity of results to magnitude of border price shocks

The 10% rise in border prices for food assumed so far is almost arbitrary and one can question how sensitive responses are to the magnitudes of border price shocks. This section answers this question by considering price socks 5 percentage points below and above the base case scenario considered so far, i.e., we further assume price shocks of 5 and 15%. The sensitivity analysis is restricted to short-run welfare changes since welfare provides the summary effect of the shocks on households.

The sensitivity analysis shows that the welfare changes increase in both direction as the magnitude of border price shocks for food commodities increase (Figure 4). However, results remain consistent in terms of direction and rank: rural households continue to gain welfare whether a lower or higher level of price shock is assumed, while urban households lose. There is, however, an indication that the welfare change more than proportionately increases as the magnitude of price shock increases, typically for urban households. Specifically, the elasticity of welfare change increases from 0.2 when world prices for food increase by 5% to 0.3 when border prices increase by 15%. This is due to stronger declines in income and expenditures as the magnitude of the shock increases. Major urban households can lose welfare by up to 4.0%, whereas rural households can, on average, gain welfare by 1.7%. The income and expenditure changes follow the same patterns as the welfare changes as the magnitude of price shocks increases from 5 to 15%; i.e., incomes and expenditures of rural households increase with the magnitude of the shock while these decrease for urban households.

Figure 4: Sensitivity of welfare changes to the magnitude of the border price shock (%)



Source: Own compilation based on model results

4. Result and discussion: Impacts of cereal export ban

4.1. The *short-run* impacts

In this section, we investigate the impact of an export ban on the economy, under a context where there is no noticeable world price shock. This helps explore whether cereal export bans should be sustained or lifted after an external price shock has been settled so as to achieve desirable outcomes for both consumers and producers. It is noticeable from the result that price and quantity changes are markedly different from the case discussed earlier.

Impacts on commodity prices

Through the interactions in the economy, the export ban on cereals causes producer prices of other food commodities to fall slightly, while producer prices of non-food commodities (industry and services) marginally rise (see Table 5). Cereals face noticeable declines in producer prices, which could reach 1.6%. The fact that producer prices for cereals fall implies that the export ban would work against cereal producers compared to others. Prices of exports and imports increase slightly owing to an exchange rate depreciation of 0.4%. Derived by the strong decline in producer prices, supply prices of cereals could fall by 1.4% despite a slight rise in their import prices. Thanks to the ban, cereals become cheaper for domestic agents compared to the base case as consumer prices of these commodities drop by 1.2%. Nevertheless, the cereal export ban do not cause considerable changes in supply and consumer prices of other groups of commodities although other food commodities tend to be slightly cheaper while non-food commodities appear to be slightly expensive to consumers.

Table 5: Changes in commodity prices (%)

	Producer price	Export price	Import price	Supply price	Consumer price
Cereals	-1.58	0.40	0.40	-1.39	-1.18
Other food	-0.11	0.40	0.40	-0.19	-0.15
Industry	0.18	0.40	0.40	0.29	0.29
Services	0.15	0.40	0.40	0.21	0.21
All	-0.08	0.40	0.40	0.00	0.03

Source: Own compilation based on model results

Impacts on production and supply of commodities

Although not strong in magnitude, the production, export and import levels of food commodities are likely to decline, whereas non-food commodities are almost unaffected (Table 6). What are more noticeable are the 0.7% increase in exports of other food commodities and the 1.1% decline in imports of these commodities. Turning our attention to how production and supplies of commodities for which export restrictions are imposed fare, we show in Table 6 that domestic production of cereals could decline by 1.5%. This response is comparable with the change under the joint shocks of high world price and export ban (see Table 2*b*). Despite the decline in the domestic production of cereals, the fall in exports by 99.0% causes a 0.8% increase in the part of output supplied to the domestic market. Furthermore, the cereal export ban causes imports of cereals to fall by 3.0%, although overall cereal supply in the market increases by about 0.5% as a result of surge in locally produced cereals diverted from the export market. This forces supply and consumer prices for cereals to drop (as discussed above), leading to an increase in cereal consumption by about 0.8% (Table 7). Nevertheless, the overall consumption impact of the ban is almost nil (i.e., -0.1%) as the consumption of all other commodity classes decline in response to a negative overall income effect although cost-of-living is almost unaffected at national level (see Table 8).

Table 6: Changes in commodity production and supply (%)

	Production	Export market	Domestic market	Import supply	Total supply
Cereals	-1.52	-99.00	0.84	-3.01	0.46
Other food	0.00	0.71	-0.13	-0.91	-0.15
Industry	0.28	0.54	0.19	-0.28	-0.10
Services	0.00	0.38	-0.02	-0.33	-0.11
All	-0.09	-1.00	0.03	-0.40	-0.08

Source: Own compilation based on model results

The cereal export ban affects consumption by rural and urban households differently. Rural households show declines in consumption of all commodity types except cereals (Table 7). Urban households, on the contrary, seem to experience small but positive changes in consumption of other food and all non-food commodities. On the other hand, the export ban increased the consumption of cereals for both rural and urban households, although the increases are slightly bigger for urban households. The changes in consumption by commodity type at the national level mirror the changes for rural-households.

Table 7: Changes in consumption of commodities (%)

	Rural	Urban	All households
Cereals	0.64	0.92	0.76
Other food	-0.23	0.26	-0.14
Industry	-0.34	0.14	-0.17
Services	-0.27	0.16	-0.18
All	-0.21	0.28	-0.10

Source: Own compilation based on model results

Impacts on income, expenditure, and cost-of-living

The income, expenditure, and cost-of-living changes reflected in Table 8 further demonstrate that the export ban does not have significant impacts on small net food-importing economies such as Ethiopia if it is put into action after any upheavals in the world prices of commodities, or in a situation where there are no shocks that work against the domestic market. The income effect is considerably lower than those reported above for the world price shock, or for the joint shocks. Overall, cereal producing highland households are the main losers in terms of income and expenditure as the ban is instituted. However, urban households tend to gain income and see increased consumption expenditure. The expenditure change is slightly lower than the income change due to a 1.0% increase in the saving rate as the economy is shocked by the export ban. This increase in savings is to make up for the extra investment expenditure as a result of the rise in prices of non-food commodities (see Table 5 on prices). The export ban has no overall noticeable impact on cost-of-living of both urban and rural households (see cost-of-living in Table 8).

Table 8: Changes in income, expenditure, and cost-of-living of households (%)

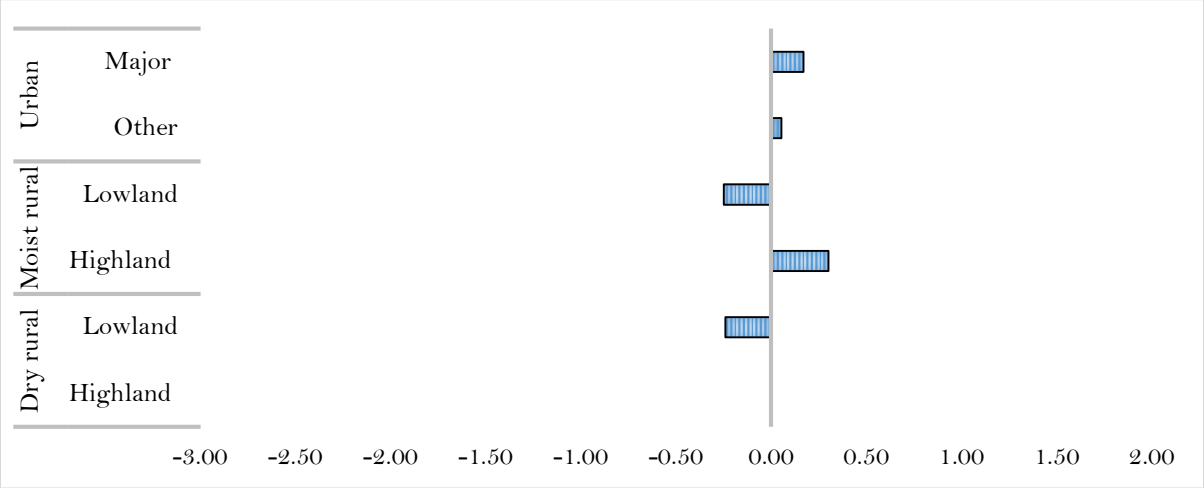
		Income	Expenditure	Cost-of-living
Dry rural	Highland	-0.35	-0.30	-0.04
	Lowland	0.14	0.21	-0.07
Moist rural	Highland	-0.31	-0.27	-0.01
	Lowland	-0.13	-0.07	-0.08
Rural total		-0.30	-0.26	-0.05
Urban	Other	0.08	0.14	0.02
	Major	0.31	0.40	0.07

Source: Own compilation based on model results

Impacts on welfare

Changes in welfare as measured by equivalent variation shown in Figure 5 provide an interesting observation, although the impacts remain weak. While traditional cereal producing highland farm households lose welfare, cereal deficit lowland households gain from the slight drop in prices. The loss in welfare for highland households is mainly due to drop in production, although they too enjoy the price advantages as consumers. Overall, consistent with the income and expenditure changes, rural households face declines in welfare. However, the income effect seems to benefit urban households to overcome the cost-of-living effect (mainly as a result of increasing non-food prices), leading to a slight welfare gain.

Figure 5: Changes in welfare (%)



Source: Own compilation based on model results

4.2. The *immediate* impacts

The instantaneous price effects of the export ban are stronger for all commodity groups in both directions, although the changes remain marginal. For example, producer, export, import, and consumer prices under the short-run case are 80, 70, 70, and 50%, respectively, of the corresponding price changes under the immediate-run. Likewise, purchaser, supply, and consumer prices respond by about 25% higher rate in the immediate-run compared to the short-run, indicating that the price effects of this shock are likely to be felt in the immediate-run.

Likewise, commodity production, supply and consumption respond by more positive rates, where some of the negative changes in Table 6 becomes slightly positive. The instantaneous impact of the export ban is to increase the overall production and supply of commodities. The supply and consumption of cereals also increase as a result of a lower reduction in production of these crops compared to short-run scenario, despite a 0.8 percentage point further decline in imports of cereals. At the household level, rural households continue losing the consumption other food and all non-food commodities, albeit by reduced rates, while their consumption of cereals marginally increase. However, unlike the case under the joint shock, the instantaneous impact of the ban on cereal exports benefit urban households in the form of positive change in consumption.

The income, expenditure, and welfare impacts tend to be more favourable (less negative or more positive) when the immediate period is considered. Nevertheless, rural households continue losing incomes, expenditures, and overall welfare due to the ban, while urban households gain. The overall economy-wide effect of the exports ban on income, expenditure, and welfare are negative but very small since the overall allocative and income effects of a change in cereal exports are minimal.

5. Conclusion

Soaring food prices have been policy challenges for most developing countries for the last decade. Most governments feared that sustained higher food prices would exacerbate the food security problem, mainly for the urban poor and could ultimately affect political stability. As a result, several policy interventions were adopted by most governments, of which cereal export ban is one. Nevertheless, the effectiveness of such bans to mitigate or even offset food price surges without significantly eroding incentives to producers has always been a concern for policy makers as well as trade and market analysts.

This study examines the implications of the imposition a cereal export ban in a net food-importing economy on several key variables affecting the overall economic performance of the country such as domestic prices, output, commodity supplies, and welfare. Results emerge from the following main simulations: i) the impact of border price shock to examine the role of high food prices on selected variables; ii) the impact of joint shocks on border prices and cereal export ban on price stabilisation, food consumption, and welfare; and iii) the impact of a cereal export ban on domestic outcomes when there is no imported inflation.

Simulation results show that a food price rise at the border can have strong consumption and welfare implications on urban households. It is further evidenced from the analysis that the export ban could contribute its part in stabilising domestic prices for food, but is not adequate to remove the price hike triggered by the external price shock simulated. Moreover, the export ban could affect the welfare of rural households through income losses as production is discouraged. If the government imposes a cereal export ban in the absence of a food price rise in international market, domestic food prices could decrease from the base level. This intervention could, however, lead to loss in welfare for rural households and at the national level, although urban households could benefit.

From the various simulations, it appears that adopting an export ban could only present temporary advantages in a context of soaring international food prices, but the government

should abolish such an intervention in the commodity market as soon as such a shock dissipates.

6. References

Admassie, A. (2013) The political economy of food price: The case of Ethiopia. WIDER Working Paper No. 2013/001

Anania, G (2013) Agricultural export restrictions and the WTO: What options do policy-makers have for promoting food security? ICTSD, Geneva. http://ictsd.org/i/publications/179103/

Anderson, K., Ivanic, M., and Martin, W. (2013) Food Price Spikes, Price Insulation and Poverty, NBER Working Paper No. 19530

Aragie, E. (2014) Climate Change and Semi-subsistence Agricultural Households. Thesis submitted in partial fulfilment of the requirements of the degree of Doctor of Philosophy. Oxford Brookes University, UK.

Aragie, E., and McDonald, S. (2014) Semi-subsistence Farm Households and Their Implications for Policy Response. Paper prepared for the 17th Annual Conference on Global Economic Analysis, June 18-20, 2014, Dakar, Senegal

Armington, P. (1969) A theory of demand for products distinguished by place of production. Staff Papers. International Monetary Fund. 16(1): 159-178

Boulanger, P., Dudu, H., Ferrari, E., and Philippidis, G. (2015) The cost of import prohibition for political reason: CGE analysis of the Russian ban on agri-food products. Paper prepared for the 18th Annual Conference on Global Economic Analysis "Information for the Policy Maker: Practical Economic Modeling for Tomorrow". June 17-19, 2015, Melbourne, Australia.

Clay E. J., S. Keats and P. Lanser. (2011). Incorporating Global Food Price Spikes into the Risk Management Agenda. Overseas Development Institute.

Demeke, M., Pangrazio, G., and Maetz, M. (2009) Country responses to the food security crisis: Nature and preliminary implications of the policies pursued, Food and Agriculture Organization (FAO), Rome, Italy.

Diao, X., Kennedy, A. (2016) Economywide impact of maize exports on agricultural growth and household welfare in Tanzania: A dynamic computable general equilibrium model analysis, Development Policy Review, 34(1): 101-134.

Dorosh, P. (2008) Food price stabilization and food security: International experience, *Bulletin of Indonesian Economic Studies*, Vol. 44, No. 1, 2008: 93–114

FAO (2016) FAOSTAT trade data. Food and Agricultural Organization (FAO). http://faostat3.fao.org/download/T/TP/E. (Retrieved March 17, 2016).

FAO (2015) Monthly food price index for Ethiopia. Food and Agricultural Organization (FAO). http://faostat3.fao.org/download/P/CP/E. (Retrieved June 26, 2015).

Giordani P, Rocha, N., and Ruta, M. (2012), Food Prices and the Multiplier Effect of Export Policy, WTO Working Paper ERSD-2012-08.

Haji, J., and Gelaw, F. (2012) Determinants of the recent soaring food inflation in Ethiopia. *Universal Journal of Education and General Studies* 1(8): 225-233

HLPE (2011) Price volatility and food security. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome

Imbs, J., and Mejean, I. (2010) Trade Elasticities: A Final Report for the European Commission, European Economy - Economic Papers 432, Directorate General Economic and Financial Affairs (DG ECFIN), European Commission.

ISWGNA (2009) System of National Accounts (2008 SNA). Inter-Secretariat Working Group on National Accounts (ISWGNA). United Nations Statistics Division and the United Nations regional commissions, New York; International Monetary Fund – IMF, Washington, DC; World Bank, Washington, DC; Organization for Economic Cooperation and Development –OECD, Paris; Statistical Office of the European Communities - Eurostat, Brussels/Luxembourg.

Loenning, J., Durevall, D., and Birru, YA. (2009) Inflation Dynamics and Food Prices in an Agricultural Economy: The Case of Ethiopia. http://www.africametrics.org/documents/conference09/papers/Loening_Durevall_Birru.pdf. (Retrieved June 25, 2015).

Martin, W., and Anderson, K. (2012) Export restrictions and price insulation during commodity price booms, *American Journal of Agricultural Economics*, 94 (2): 422-427.

McDonald, S. (2007) A Static Applied General Equilibrium Model: Technical Documentation STAGE Version 1: July 2007 DRAFT. Tech. rep. Department of Economics/& Strategy. Oxford Brookes University. UK.

OECD (2008) Rising food prices: Causes and consequences, http://www.oecd.org/trade/agricultural-trade/40847088.pdf

Pandey, R. (2013) Trade Elasticities and the Marshal Lerner Condition for India Trade Elasticities and the Marshal Lerner Condition for India *Global Journal of Management and Business Studies.* 3(4): 423-428

Philippidis, G. (2010) EU import restrictions on genetically modified feeds: impacts on Spanish, EU and global livestock sectors. *Spanish Journal of Agricultural Research* 8(1): 3-17.

Rashid, S. (2010) Staple Food Prices in Ethiopia. Prepared for the COMESA policy seminar on "Variation in staple food prices: Causes, consequence, and policy options", Maputo, Mozambique, 25-26 January 2010 under the African Agricultural Marketing Project (AAMP)

Rashid, S., and Lemma, S. (2014) Public Wheat Imports to Ethiopia since 2008: The Rationales and Cost-Effectiveness. International Food Policy Research Institute, Washington, DC.

Rashid, S., and Lemma, S. (2011) Strategic Grain Reserves in Ethiopia Institutional Design and Operational Performance. IFPRI Discussion Paper 01054

Sharma, R. (2011) Food Export Restrictions: Review of the 2007-2010 Experience and Considerations for Disciplining Restrictive Measures, FAO Commodity and Trade Policy Research Working Paper No. 32

Solleder, O. (2013)Trade Effects of Export Taxes Graduate Institute of International and Development Studies, Working Paper No: 08/2013

Tadesse, G., Algierib, B., Kalkuhlc, M., von Braun, J. (2014) Drivers and triggers of international food price spikes and volatility, *Food Policy*, 47:117–128

Tanaka, T., and Hosoe, N. (2011) What Drove the Crop Price Hikes in the Food Crisis? GRIPS Policy Research Center Discussion Paper 11-16

Thompson, W. and G. Tallard (2010) Potential market effects of selected policy options in emerging economies to address future commodity price surges, OECD Food, Agriculture and Fisheries Working Papers, No. 35, OECD Publishing, OECD, Paris

Ulimwengu, JM., Workneh, S., and Paulos, Z. (2009) Impact of Soaring Food Price in Ethiopia: Does Location Matter? IFPRI Discussion Paper 00846

Valdés, A., and Foster, W. (2012) Net food-importing developing countries: Who they are, and policy options for global price volatility, CTSD Programme on Agricultural Trade and Sustainable Development

Wodon, Q and Zaman, H. (2010) Higher Food Prices in Sub-Saharan Africa: Poverty Impact and Policy Responses, *World Bank Research Observer*, 25 (1): 157-176.

Woldie, GA., and Siddig, K. (2009) Do subsidies matter in food price stabilization? Evidences from Ethiopia in a computable general equilibrium framework. http://mpra.ub.uni-muenchen.de/29117/1/MPRA_paper_29117.pdf

Woldie, GA., and Siddig, K. (2009*a*) The impact of banning export of cereals in response to soaring food prices: Evidence from Ethiopia using the new GTAP African database. http://mpra.ub.uni-muenchen.de/18241/1/MPRA_paper_18241.pdf