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Achieving food security and industrial development in Malawi: Are export restrictions the solution?

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Achieving food security and industrial development in Malawi: Are export restrictions the solution?

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Abstract

Restrictions on exports of staples or cash crops are frequently imposed in developing countries to promote food security or industrial development goals. By diverting production to the local market, these policies aim to reduce prices and increase the supply of food or intermediate inputs to the benefit of consumers or downstream industrial users. Export restrictions could, however, reduce aggregate welfare although they are attractive to policymakers: Governments gain support when they are seen to keep consumer prices low; likewise, politicians are swayed by industrial lobbyists who promise increased value-addition in exchange for access to cheaper inputs. This study weighs in on the debate around the desirability of export restrictions by simulating the economy-wide effects of Malawi's longstanding maize export ban as well as a proposed oilseed export levy intended to raise value-addition in processing sectors. Our results show that, while export restrictions may have the desired outcome in the short run, producers respond to weakening market prospects in the longer run by restricting supply, often to the extent that the policies become self-defeating. Specifically, maize export bans only benefit the urban non-poor, while poor farm households experience income losses and reduced maize consumption in the long run. The oilseed export levy is equally ineffective: Even when export tax revenues are used to subsidize processors, gains in industrial value-addition are outweighed by declining agricultural value-addition as production in the fledgling oilseed sector is effectively decimated. The policy is further associated with welfare losses among rural households, while urban non-poor households benefit marginally.

Key words: export restrictions; maize; oilseed; food security; value-addition; Malawi

JEL codes: C68, C17, Q18, Q28

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1 Introduction

Why export restrictions?

Whereas policies that promote exports or restrict imports are considered acceptable for developing economies, the frequent use of policies that restrict exports—most notably export quantity restrictions (bans or quotas) or export levies—have left economists puzzled (Bouët and Laborde, 2010; Porteous, 2012). Not only are their impacts—especially the longer-term ones—not always fully appreciated by policymakers, but they are by nature market distorting. By restricting exports, domestic production is diverted to the domestic market, which raises supply and suppresses prices. This benefits consumers or downstream industrial users of those goods, but adversely affects the incomes for primary producers of the crops. Both theoretical and applied real-world models have shown that the loss in producer welfare associated with export restrictions typically outweigh the gain in consumer welfare, leading to a net decline in overall welfare (Mitra and Josling, 2009; Minot, 2013; Diao and Kennedy, 2016; Dorosh *et al.*, 2009).

Despite potentially negative overall welfare effects, the distributional properties of export bans make them attractive to policymakers. Food security is most commonly offered as the reason for export restrictions on staple food products (Mitra and Josling, 2009) as they raise domestic food availability and reduce prices. Another objective is to shield domestic markets from price spikes in world markets, i.e., by preventing high global prices filtering through to the domestic economy, the domestic price is only determined by local supply and demand conditions. This is why many countries closed their borders during the 2007/08 global food price crisis. However, export bans are not always effective. At international level, there is considerable evidence that the world food price crisis was actually exacerbated when countries collectively banned exports of their staple crops and global supply dwindled (Minot, 2013; Bouët and Laborde, 2010; Anderson *et al.*, 2015). Domestically, export bans are likely to be ineffective if a large share of international trade takes place informally across porous borders and cannot be regulated (Babu, 2013; Chapoto and Jayne, 2009), or where bullish market agents hoard maize in anticipation of the domestic prices recovering, either due to their own attempts at restricting supply or because policymakers may eventually lift the ban (Porteous, 2012).

Export restrictions can also form part of an industrial strategy. Fledgling agro-processing sectors receive an implicit subsidy when export restrictions are imposed on raw, unprocessed commodities used by those sectors as intermediate inputs (Piermartini, 2004). These cheaper inputs allow processors to better compete with imported goods, which means the policy is essentially a variant of infant industry protectionist policies, which traditionally restrict competing imports through tariffs or quotas. A related objective of export restrictions applied in this manner is to raise domestic value-addition by restricting exports of raw products and diverting them instead to domestic manufacturing sectors. In doing so, processing margins are retained locally (Mitra and Josling, 2009). However, one potential drawback of infant industry protectionist policies implemented over a long period of time is that they could perpetuate the existence of inefficient firms or sectors (Piermartini, 2004).

There are several other justifications for export restrictions. Export levies may be an important source of government revenue, especially if the taxed commodity enjoys a monopoly position in world markets. Governments may also impose export restrictions in retaliation to trade restrictions imposed by trading partners. Export restrictions may also be implemented as a means to protect a scarce natural resource or to contain trade in illicit or dangerous goods (Anania, 2013). While these are all legitimate justifications, the focus in this study is specifically on the effectiveness of export restrictions

imposed on agricultural commodities with the aim of promoting food security and achieving industrial development objectives.

Political economy aspects

Since export restrictions transfer benefits from producers to consumers or downstream industrial users, the political economy aspects of these policies are extremely pertinent (Anania, 2013). Consumers (including net-consuming farm households) typically represent a larger share of the electorate than producers. Hence, policies that reduce consumer prices may garner more votes for politicians than those that protect net-producing farm households. Industrialists are also typically better organized and have stronger lobbying power than smallholder farmers, which may explain why governments are swayed towards adopting protectionist policies for industry at the expense of farmers. The notion that such policies will raise domestic value-addition is also a compelling one, especially for politicians whose career prospects often depend on the performance of the economy.

Unfortunately, a reality often overlooked by policymakers is that policies that persistently discriminate against farmers may become self-defeating in the longer run. For example, when export restrictions remain in place for too long, or when the policy decision-making process around imposing or lifting export restrictions is highly discretionary or *ad hoc*, they suppress prices or create market uncertainty for producers. Risk-averse farmers' rational response to uncertainty or the absence of markets is to shift productive resources towards other more reliably profitable crops (Mitra and Josling, 2009), discontinue producing a surplus for the market and instead revert to self-sufficiency (Fafchamps, 1992; de Janvry *et al.*, 1991), or constrain their productivity-enhancing investments, with long-term consequences for broad agricultural production and sectoral growth (World Bank, 2015; Chapoto and Jayne, 2009). All of these responses will undermine the food security and industrial development objectives of export restrictions.

Malawi case study

Malawi is a small agrarian economy facing persistent food security challenges. It also has an underdeveloped industrial sector which has proved to be a major stumbling block to its process of economic transformation. For these reasons Malawi represents an interesting case study of a country that has frequently used or called for export restrictions to promote its food security and industrial development goals. With respect to maize, Malawi's key staple crop, government has often in the past imposed export bans to "maintain a semblance of food availability" (Chirwa and Chinsinga, 2013:24). More recently government cited protection of its investment in the Farm Input Subsidy Program (FISP)—a large fertilizer subsidy program in place since 2005/06 designed to boost smallholder maize production—as a reason for its reluctance to allow maize exports (see Pauw and Edelman, 2015). Considering that the policy targets resource-poor subsistence farmers and provides inputs sufficient only to satisfy an average sized family's own demand, this latter justification seems unreasonable. Any maize available for export more likely originates from larger-scale farmers who produce a surplus and are not eligible for the FISP subsidy. Following intermittent bans on maize exports between 2005/06 and 2010/11, an export ban has now effectively been in place, uninterrupted, since the 2011/12 cropping season.

The Malawi government regulates international trade of so-called "strategic crops" through Malawi's *Control of Goods Act* (2015). Commodities listed in the act, such as maize, require an export license. Therefore, in practice, export bans are instituted by discontinuing the issuing of licenses. While this restricts formal maize trade, small-scale informal trade often continues unabated, provided market conditions are favorable. In this regard, export parity prices have been below domestic prices for

extended periods over the past decade, suggesting that Malawi's maize export bans have been mostly redundant with any informal international maize trade over this period primarily being into rather than out of Malawi (see Figure 3 further below and related discussion). Unfortunately, the licensing system is also a possible tool for furthering patrimonialism in Malawi, with some traders closely affiliated to government obtaining export licenses even when bans are in place (Chirwa and Chinsinga, 2013).

Whereas maize is a politically important crop in Malawi, making policymakers reluctant to engage in debate around maize policies such as export bans, in contrast, restrictions on oilseed exports are highly controversial and have been fiercely debated. To understand the context of these debates, it is useful to understand the provisions of Malawi's recently launched National Export Strategy (NES) 2013–2018. The NES prioritizes development of three product clusters—oilseed, sugar, and manufacturers—selected on the basis of the clusters' perceived global competitiveness, linkages to other domestic sectors, and potential for further value-addition (GoM, 2012b). Among the prioritized clusters, the oilseed cluster has perhaps attracted the most attention. The oilseed product strategy entails promotion of raw production and exports in the short term (e.g., sunflower, groundnut, soya, and cotton), and diversification and increased domestic value-addition within the cluster in the medium to longer term (e.g., cooking oil, soap, lubricants, paint, varnishes, flour, biofuel, and so on).

In line with the short term ideals of the NES, oilseed producers have for the past two years enjoyed a policy environment conducive to free trade. However, more recently, and despite the fact that the NES is still in its infancy, government has mooted the idea of imposing export levies on primary oilseed products in order to fast-track domestic value-addition in the oilseed processing sector (i.e., mostly cooking oil). Many argued at the time that such a move could be perceived as premature and in contravention of the NES's gradual approach to promoting value-addition over the long term. For the moment the oilseed export levy appears to be off the agenda again, but oilseeds were unexpectedly added onto the list of products in the *Control of Goods Act* (2015) late in 2015, and subsequently removed early in 2016. As a result, producers in the subsector continue to face significant market-related uncertainty.

Study objectives

The aim of this study is to explore the economy-wide implications of maize export bans and the proposed oilseed export levy in Malawi against their respective objectives of improved food security and increased domestic value-addition in the short and long run. Economy-wide effects are measured using the Standard General Equilibrium (STAGE) model (McDonald and Thierfelder, 2012) calibrated to a 2010 Social Accounting Matrix (SAM) for Malawi (Pauw *et al.*, 2015). We simulate the impact of export restrictions under various scenarios with different assumptions about policy implementation modalities, policy timeframe, and the fundamental macroeconomic relationships that exist in the Malawian economy. In the case of the export levy, we also explore different options for utilizing revenue generated from the levy to potentially enhance the intended policy effect. The remainder of the paper is structured as follows: section 2 explores theoretical concepts further; section 3 elaborates on the model and simulation setup; section 4 presents the simulation results; and section 5 concludes.

2 Trade Restrictions in Theory and Practice

Theoretical considerations

A standard assumption for trade policy analysis in small developing countries is that their traded volumes are too negligible in world market terms for changes in domestic policies or demand

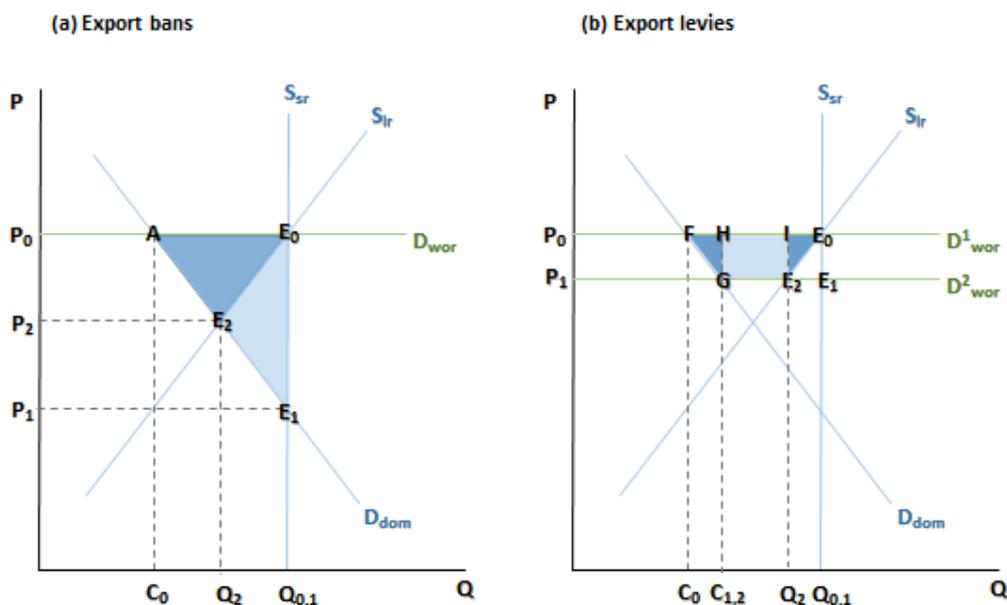
preferences to influence world prices. Instead, the chain of causality—in open economies—is that exogenous world prices have a determining influence on domestic prices (Dervis *et al.*, 1982). However, government can influence world prices faced by domestic agents through the use of tax instruments (i.e., import duties or export levies) or by altering the supply and demand conditions of traded commodities (i.e., trade quantity restrictions such as bans or quotas).

Figure 1 illustrates the partial equilibrium effects of export bans and levies using simple supply and demand diagrams, drawing on the discussion in Mitra and Josling (2009). Panel (a) considers the case of an export ban, imposed here, for argument's sake, on a primary agricultural product. In the short run, supply is highly inelastic or completely unresponsive to price changes, since farmers are unable to alter production decisions having already invested in inputs or planted. The vertical supply curve S_{sr} denotes a situation where supply is fixed irrespective of short run price fluctuations. As long as domestic producers have access to the world market, the domestic price is determined by the world price, P_0 . At this price, quantity Q_0 is produced of which C_0 is demanded domestically and the balance is exported.

When an export ban is imposed, the short run equilibrium shifts from E_0 to E_1 . Production is unchanged ($Q_0 = Q_1$), but the price drops from P_0 to P_1 as demand from the rest of the world falls away and supply is diverted entirely to the domestic market. This benefits consumers, with consumer surplus increasing by the area $P_1E_1AP_0$. Producer surplus, on the other hand, declines by the area $P_1E_1E_0P_0$, thus bringing about a net welfare loss to society equal to AE_1E_0 .

In the medium to longer term, supply is more responsive to price changes as denoted by the upwards-sloping supply curve, S_{lr} . In this instance, the imposition of an export ban leads to a new equilibrium at E_2 with only Q_2 being produced and consumed in the domestic market at price P_2 . Consumer surplus increases by $P_2E_2AP_0$ and producer surplus declines by $P_2E_2E_0P_0$, leading to a net welfare loss represented by AE_2E_0 , which is somewhat smaller than in the short-run scenario. In both the short and long-run scenarios, the extent of the net welfare loss associated with export bans depends on the responsiveness of domestic demand and supply to price changes—the less elastic demand or supply, the greater the net loss in welfare.

Figure 1—Partial equilibrium effects of export bans and export levies in the short and long run



Source: Adapted from Mitra and Josling (2009)

Panel (b) illustrates the case of an export levy. Once again we assume a perfectly inelastic or vertical supply curve in the short run. Since under the small-country assumption exporters are price-takers on world markets, the price received for an exported good in domestic currency terms is derived from the exogenous world price net of export taxes. A newly introduced export tax therefore lowers the domestic price received for exports from P_0 to P_1 . The relative increased attractiveness of the domestic market causes producers to switch some of their fixed short run supply to the domestic market. Local demand therefore increases from C_0 to C_1 and the balance of production is exported. Although under the small country assumption world demand is unaffected by domestic policy changes, reduced supply to the world market is tantamount to a downward shift in the world demand curve from D^1_{wor} to D^2_{wor} . Government collects export tax revenue equal to the area HGE_1E_0 . Consumer welfare increases by the area P_0P_1GF , while producer welfare declines by the area $P_0P_1E_1E_0$. The net loss to society, denoted by FGH , is higher the more elastic is demand.

In the medium to longer term, supply responds to the lower domestic price. Producers reduce supply to Q_2 , consumption remains at $C_2 = C_1$, and the balance is exported. Government tax revenue is now equal to the area HGE_2I , the gain in consumer welfare remains P_0P_1GF , and producer welfare declines by $P_0P_1E_2E_0$. The net welfare loss now corresponds to the sum of the areas FGH and IE_2E_0 . Once again it is evident that a higher elasticity of supply or demand will lead to a greater net welfare loss. When the export levy is prohibitive in the sense that it lowers the domestic export price to a level below the domestic market equilibrium price, producers will cease exporting altogether. Under such a scenario, government will no longer collect any export tax revenue, and the supply, demand, and net welfare effects will be similar to that of an export ban.

In summary, both export bans and export levies raise consumer welfare at the expense of producer welfare. In the case of an export levy, government also shares in the welfare gain through increased tax revenues. However, in all instances export restrictions lead to a net welfare loss to society. Net welfare losses associated with export bans are lower in the longer run when supply is more responsive to market prices, whereas those associated with export levies are higher in the long run due to the increased distortionary effects of taxes. For both policy instruments, the extent of the net welfare loss also relates to the elasticity of demand. In the case of export bans, the more inelastic demand, the greater the net welfare loss. By contrast, export taxes lead to greater welfare losses when applied to commodities with a high elasticity of demand.

The observations about relative supply and demand elasticities are pertinent when considering the type of commodities subjected to export restrictions. As an important staple, maize demand tends to be inelastic in both the short and long run. Marketed grain supply (i.e., not including production for own consumption), on the other hand, tends to be fairly elastic in the long run, particularly since production is not highly capital intensive, thus making it easy for commercial producers to switch to other cash crops, such as tobacco or oilseed crops. The welfare implications of a maize export ban, therefore, will be very different in the short and long run owing mostly to the responses of producers. In the case of oilseed, for which the Malawian government is considering an export levy, domestic demand is not only limited, but also fairly sensitive to price changes. Likewise, supply is also likely to be highly elastic in the long run, especially if markets are uncertain and since own consumption of these commodities, especially soya, is less common. The implication is that welfare losses associated with oilseed export restrictions are likely to be fairly high for producers.

Whereas the diagrams in Figure 1 are useful to form a broad understanding of the effects of export restrictions, they are not suitable for measuring the actual impact of policies on prices and quantities. Partial equilibrium approaches also do not account for potentially important indirect or second-round

effects of policies, including in markets or sectors other than those targeted directly by the policy. Some potentially important indirect effects include: lower staple food prices may have significant effects on households' disposable incomes, and hence on patterns and levels of demand; policies that raise domestic value-addition and/or substitute imports may have important implications for balance of payments, employment, or economic growth; or increases in tax revenue may allow government to restructure taxes or raise public spending or transfers. In order to capture both the direct effects and these indirect effects as well, we utilize a computable general equilibrium model to explore the impact of export restrictions in Malawi.

3 Model and Simulations

Model overview

For our analysis of the economy-wide effects of export restrictions, we use a comparative static general equilibrium model called STAGE¹ (McDonald and Thierfelder, 2012). Compared to their recursive-dynamic variants, static general equilibrium models are appropriate when the analytical focus is on the impact of a once-off shock or event, or where the inter-temporal path of adjustment (i.e., in terms of capital accumulation, labor force growth, or productivity growth paths of sectors) is not critical to the overall analysis. The static model also permits sufficient flexibility in terms of reallocation of factors of production for analyzing both short and long run effects, while the fundamental behavioral relationships governing household consumption, production, and government revenue and expenditure are identical in static and recursive-dynamic models.

Production in the STAGE model is defined by a multi-level nested structure, specified for each sector, with fixed input-output relationships and variable factor use governed by a constant elasticity of substitution (CES) function. Consumption behavior of representative households is defined by a linear expenditure system (LES) that distinguishes consumption of home-produced goods from discretionary consumption (market purchases). We assume income elasticities of demand of 0.8 (slightly inelastic) and 1.2 (slightly elastic) for food and non-food commodities, respectively.

The model further adopts an Armington approach to modelling trade flows. Specifically, a CES function determines the substitutability between—and optimal mix of—imported and domestically produced goods consumed locally, subject to relative prices of imports and locally produced goods. Likewise, a constant elasticity of transformation function (CET) determines the optimal allocation of domestically produced goods across domestic and export markets, again subject to relative prices in those markets. Relatively elastic CES and CET elasticities are assumed for traded goods, while the robustness of our results are also tested for higher and lower elasticity values.

Government collects tax revenue (sales taxes, trade taxes, and income taxes), provides government services, and makes transfers to households. In the case of a budget surplus, the balance of the recurrent budget is made available for investment, while a deficit is financed from government borrowings. Households and incorporated business institutions serve as other sources of national savings, which is pooled together with government savings to fund current investments.

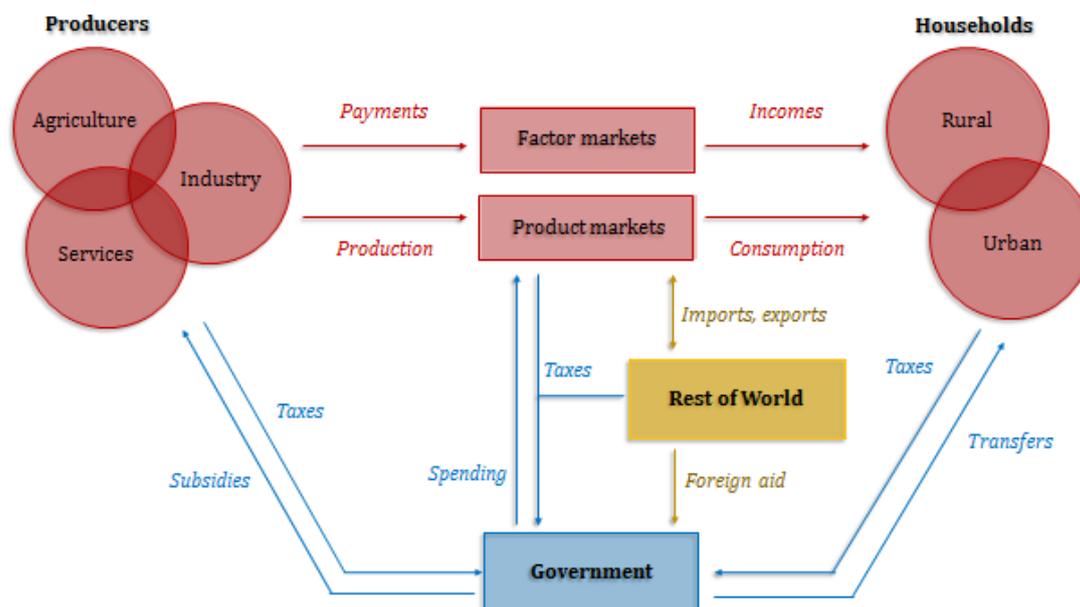
We calibrate the model with a 2010 Social Accounting Matrix (SAM) for Malawi (Pauw *et al.*, 2015). The SAM includes 70 commodity accounts, 52 activities representing producers operating in the main sectors of the economy, 15 types of factors of production by subgroups labor, land, and capital, and 30 representative household groups distinguished by main economic activity, location, and

¹ STAGE refers to Static General Equilibrium model.

expenditure quintile. Whereas the SAM captures financial resource flows associated with transactions between different economic sectors and agents in the economy for a particular accounting period, the STAGE model defines, in mathematical terms, the behavioral responses of economic agents to economic or policy shocks. The calibrated model therefore represents an initial state (“baseline”) of the economy, while at the same time serving as a tool for quantitatively examining through simulation policy impact channels, economic interactions, and spillovers associated with exogenous policy shocks.

Figure 2 provides a representation of the economic linkages between economic agents (producers, households, government, and the rest of the world) and markets (factor and product markets) captured in a typical general equilibrium model. While simplistic, the diagram is a useful framework for tracing the impact of a policy intervention through the economy. A maize export ban, for example, eliminates the flow of maize from the product market to the rest of the world, raises the availability of maize for domestic consumption, and alters relative prices. This induces behavioral changes by households and producers, as discussed, which affects non-maize sectors via demand-side channels or inter-industry linkages. Further rounds of indirect effects are transmitted to households, producers, and government via factor and product markets as well as shocks to the external balance. As we have seen, export levies have similar implications for consumers and producers to that of an export ban, but they also have tax revenue implications, which may induce further indirect effects depending on how government utilizes any additional revenue.

Figure 2—Simplified representation of general equilibrium linkages in a typical general equilibrium model



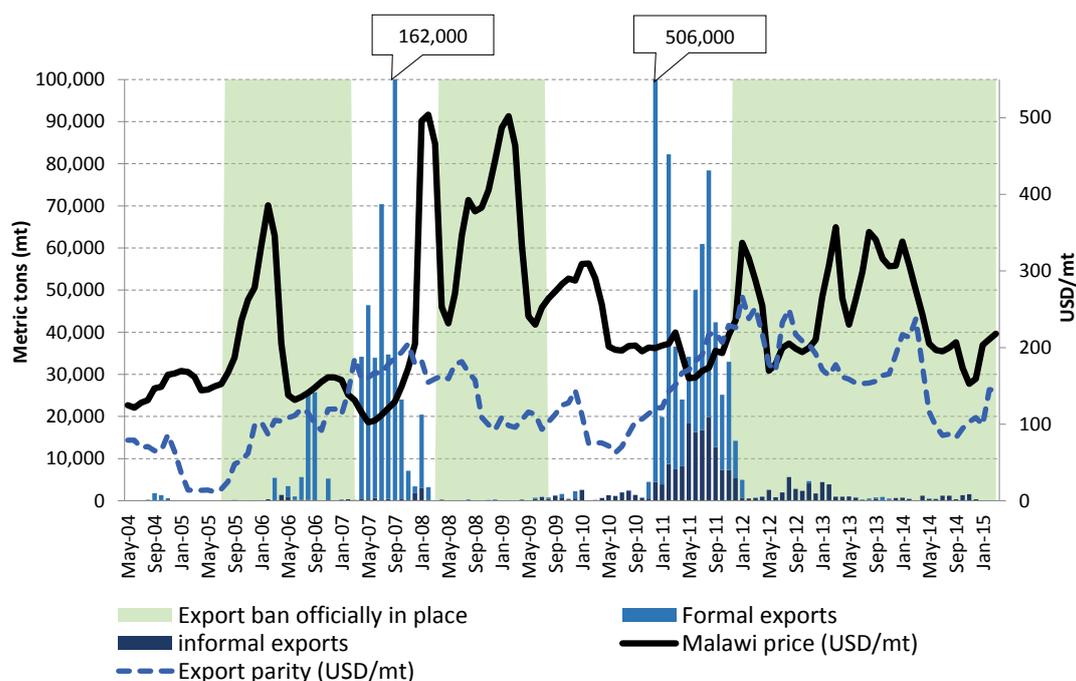
Source: Authors

Simulation design: maize export bans

Maize is a dominant crop in Malawi, accounting for 28.8 percent of agricultural GDP (Table 1). However, over 60 percent of maize is consumed by producers themselves, which means the traded maize market is relatively thin. By some estimates, only around 10 percent of maize produced is

formally traded (Pauw and Edelman, 2015), of which only a fraction is traded internationally when the opportunity exists, i.e., when parity prices in export markets are higher than domestic prices. In 2010, for example, the SAM base year, less than 0.4 percent of maize production was exported (Figure 3). This is explained by low export parity prices, as no export restrictions were in place during 2009–2011. By 2011, however, export parity prices were more favorable and significant quantities of maize were exported before an export ban was reintroduced late in 2011. During the “2009–2011 free trade period”, approximately five percent of all maize produced was exported.

Figure 3—Formal and informal maize exports from Malawi, 2004/05 to 2014/15



Source: Adapted from Pauw and Edelman (2015); based on the Agricultural Market Information System (AMIS) data of the Ministry of Agriculture, Irrigation and Water Development.

In the absence of maize exports in our SAM, an export ban simulation would yield insignificant results. For this reason we first create—through a simple simulation exercise involving raised maize productivity and trade openness—an “alternative” baseline model scenario where surplus maize is produced and around five percent of production is exported, thus adjusting our baseline to be more representative of the period 2009–2011 up to the point when an export ban was reintroduced late in 2011. Although our GDP estimate under this alternative baseline is somewhat higher, the value-added structure of the economy is virtually unchanged (see Table 1). The maize export ban introduced late in 2011 remains in place to this day, and therefore our model results are useful for informing us on the impacts of an existing policy, both in the short run, i.e., immediately after the policy shock is introduced, and in the long run.

When in force, Malawi’s maize export ban applies to both maize grain and processed maize (flour). Maize flour is produced by the grain milling sector, where it accounts for around two-thirds of that sector’s output. Maize flour constitutes the bulk of grain milling exports, although exports account for less than one percent of domestic production. The low export intensity of maize flour may lead one to erroneously conclude that an export ban on milled grain products will not have a significant impact and can therefore be ignored in the simulations. However, by not extending the ban to maize flour the export ban on maize grain will provide millers with cheap grain inputs, thus putting them in a position to rapidly increase maize flour exports. Incidentally, from a consumption perspective the grain milling

sector is also relatively small. Even though maize is mostly consumed in its milled form in Malawi, reported household expenditure on maize grain is almost five times as much as on grain milling products, which means most grain processing is done at home or informally. Nevertheless, since these two products are close substitutes, the export ban could still have interesting consumption effects if the policy causes a shift in the relative prices of maize grain and maize flour.

On a more technical note, since the optimal allocation of maize between domestic and export markets is arrived at endogenously through the CET function in the STAGE model, some modification is required to allow us to exogenously impose the maize export ban. This is done following an approach proposed by Philippidis (2010) and applied by Boulanger *et al.* (2015) in a comparable application to import bans. This approach is preferable to one by which the effects of an export ban is approximated by either introducing prohibitively high export levies or by setting world prices of exports very low. Our approach also differs from the general equilibrium assessment of export bans in Tanzania by Diao and Kennedy (2016). As was appropriate in that particular setting, informal maize exports introduced in the model originating directly from the farm gate to the border were suspended, but formal exports were still permitted to flow through the CET function. Our approach accounts for the fact that the export ban in Malawi extends also to formal trade.

We model two scenarios. In the short-run scenario (labelled *sim1a* in the results tables), there is no supply response from producers, i.e., domestic production is restricted to exactly equal the sum of the base-level exports and domestic supply. In the longer run scenario (*sim1b*), maize producers have the option to reallocate resources away from maize production to more profitable crops, subject to overall arable land constraints.

Simulation design: oilseed export levy

The National Export Strategy (NES) oilseed cluster identifies cotton, groundnut, soya, and sunflower as priority subsectors for development in Malawi (GoM, 2012b). Among these, cotton is the most important export earner and fourth most important export sector in Malawi behind tobacco, sugar, and tea. Unprocessed cotton and cottonseed trade is strictly regulated under Malawi's *Cotton Act* (2013), and hence did not feature in discussions around an oilseed export levy. The remaining priority oilseed crops are all listed in the *Control of Goods Act* (2015) as commodities requiring export licenses, and are the focus of the analysis in this study.

Groundnut is a relatively significant smallholder food and cash crop. In the baseline model, around 50 percent of groundnut production is consumed by producers themselves. Of the marketed surplus, approximately two-thirds is accounted for by household demand. Domestic demand from agro-processors is minimal and most of the balance of domestic supply—around 15 percent of total production—is exported. The sector remains small in value-added terms, contributing 1.6 percent to agricultural GDP (Table 1). Malawi's sunflower sector is also relatively small and considered underexploited. Soya has also long been considered a high-potential crop in Malawi (GoM, 2012b), but soya production has been hampered by a lack of transparency and predictability in soya trade policy. Soya and sunflower are jointly included in the model as the "oilseed" sector (i.e., separate from groundnut). Soya and sunflower are mostly grown as cash crops, and household own consumption as well as marketed consumption by households is negligible. Oilseed crops are highly traded crops: Imports make up around one-third of total domestic supply, while exports volumes virtually match domestic production levels. The balance of demand consists almost entirely of intermediate input demand from the "other food processing" sector, which is where cooking oil production is captured. Soya and sunflower account for around 13 percent of that sector's total intermediate input expenditure. Our oilseed subsector accounts for 1.9 percent of agricultural GDP (Table 1).

The rationale for the introduction of an oilseed export levy in Malawi is that it would encourage domestic value-addition in the domestic oilseed processing sector. Cooking oils are produced primarily from soya and sunflower, and, to a more limited extent, groundnut. Hence, these three commodities are the target of our export levy simulations. Apart from direct implications for producers, we expect economic shocks to filter through to oilseed processors via intermediate input-use channels, while consumers will be impacted mostly via the groundnut consumption channel.

In our simulations we impose a 15 percent ad valorem tax on oilseed and groundnut exports. This causes producers to reallocate output to the domestic market. Increased supply of oilseed and groundnut at lower prices will lower production costs in the food processing sector, which in turn, depending on changes in other prices and household disposable levels, may lead to a demand-induced increase in production. Importantly, since intermediate inputs are fixed relative to output levels under the Leontief specification, the only way in which industrial demand for oilseed can increase is when household consumption demand for its processed variant (e.g., cooking oil) increases. The effect is, therefore, an indirect one, and likely not a particularly strong one since oilseed make up a relatively small percentage of the total production cost in the food processing sector. By contrast, in the case of groundnut, which is an important household consumption crop, changes in price or household disposable income levels will lead to a direct change in consumption demand via the LES demand function.

Two sets of simulations are conducted. In the first, all export tax revenue collected is added to government savings, where it is available to finance current investments. As in the case of the maize export ban simulations, we consider both a short-run scenario (*sim2a*), in which factor allocations in the agricultural sector are fixed, as well as a long-run scenario (*sim2b*), in which agricultural producers can respond to the changes in market conditions by reallocating cropland to more productive agricultural sub-sectors. Under a second set of scenarios, we rerun the same simulation and use the additional export tax revenue to finance a subsidy to oilseed processors, which is expected to enhance the effect of the policy on domestic value-addition. These simulations are revenue-neutral, i.e., the subsidy rate is determined endogenously so that all export tax revenue is allocated towards the subsidy. Although this is a hypothetical simulation involving ring-fencing of government revenue, the practical interpretation, as we shall see, is subsidizing oilseed producers' output by around eight percent in the short run, which together with the 15 percent export levy should have no impact on the overall budget after considering all the economy-wide effects. Since the policy-induced decline in exports is smaller in the short run-scenario (*sim2c*) than in the long-run scenario (*sim2d*), the amount of funding available for the subsidy is expected to be less in the long run.

Market clearing conditions and sensitivity analysis

We adopt a set of model closure rules that can be considered fairly standard when applied in a developing country context such as that of Malawi. As already discussed, in the short run, agricultural production is fixed and factors of production in the agricultural sector are fully employed but immobile across sectors. A less stringent assumption applies for non-agricultural sectors, where we assume labor is not only fully employed but also mobile across sectors, although capital is sector-specific (immobile). A long-run scenario relaxes the restrictive assumptions for the agricultural sector, allowing farmers to reallocate land and labor in response to the simulated shock; similarly, greater flexibility is also permitted in the non-agricultural sectors with flexible capital stock allocation.

As far as the macroeconomic closures are concerned, we assume a flexible exchange rate, which adjusts to bring the balance of payments into equilibrium. This is consistent with the Malawian government's current free-floating exchange rate regime. Since the export restriction simulations all

involve a direct or indirect decline in exports, and, hence, a deterioration of the trade balance, we anticipate the exchange rate to depreciate in all scenarios. For national savings and investments, we follow a so-called balanced closure whereby the share of current investments in domestic absorption is fixed (domestic absorption is the sum of household and government consumption and investment demand). Private savings rates are flexible and adjust to achieve the target level of investment.

Since the export ban simulations have no direct revenue implications for government, we assume that government savings is a flexible residual amount after accounting for expenditure, which is fixed as a share of domestic absorption. The same closure applies in the first set of export levy scenarios, while, as explained, in the second set of simulations government savings is fixed under a revenue-neutral closure whereby export tax revenue is recycled to finance a production subsidy for oilseed processors. The subsidy rate is determined endogenously in the model.

Although not reported on at length, we do run a series of sensitivity tests to determine the robustness of our model results to changes in assumptions. Of potential significance to our results are the income elasticities of demand used in the LES function, particularly for maize, as well as the supply elasticities in the CET function, particularly for groundnut and oilseed crops. The sensitivity tests entail adjusting these commodity-specific elasticities upwards and downwards by 25 percent and rerunning all the simulations described above.

4 Results and discussion

Maize export bans

In this section we focus our attention on the short-run and long-run results of the model simulations for the maize export ban. Table 1 shows the baseline GDP estimates by sector, calculated at factor cost (value-added) and reported in millions of Malawi Kwacha (2010 prices). The combined relative size of the maize grain and grain milling sectors suggest that a maize export ban will have potentially significant economy-wide production and consumption effects. As discussed earlier, for the maize export ban simulation, the results are compared against an “alternative” baseline in which the maize export share is increased to around five percent of production to bring it in line with the share over the period 2009 to 2011, as opposed to the 2010 model baseline when the export share was only 0.4 percent. The baseline adjustment is done in such a way that the overall value-added structure of the baseline remains similar to that reported in Table 1, i.e., GDP shares move up or down by only around ± 0.1 percentage points on average.

Table 1—Maize export ban simulations, changes in real GDP value-added (selected sectors), short-run and long-run changes

	GDP (value-added) 2010 (baseline)		GDP (value-added) 2010 ("alternative" baseline)		% change relative to base*	
	GDP (MWK millions)	National GDP share (%)	GDP (MWK millions)	National GDP share (%)	Short run closure (sim1a)	Long run closure (sim1b)
National GDP	953,383	100.0	984,363	100.0	0.0	0.0
Agriculture	310,331	32.6	320,463	32.6	-0.2	-0.6
Field crops, staples, & pulses	144,152	15.1	149,309	15.2	-5.0	-1.8
Maize	89,305	9.4	92,451	9.4	-13.5	-4.3
Other cereals	11,689	1.2	12,024	1.2	6.4	3.2
Roots	17,150	1.8	18,089	1.8	10.4	3.2
Pulses	15,155	1.6	16,065	1.6	7.6	0.9
Groundnut	5,060	0.5	5,336	0.5	10.5	3.0
Oilseeds	5,793	0.6	5,345	0.5	12.0	0.9
Fruits & vegetables	21,976	2.3	23,198	2.4	8.0	3.1
Export & other crops	23,192	2.4	21,957	2.2	13.2	4.4
Livestock, forestry & fishing	121,010	12.7	125,998	12.8	1.6	-0.7
Industry	158,532	16.6	160,183	16.3	1.0	1.2
Food & agro-processing	57,756	6.1	57,588	5.9	-2.7	2.0
Meat processing	1,278	0.1	1,316	0.1	7.5	-0.6
Grain milling	7,210	0.8	6,519	0.7	-21.9	-11.5
Export agro- processing	25,604	2.7	25,096	2.5	0.5	2.1
Other food-processing	6,367	0.7	6,449	0.7	-3.9	-1.7
Mining & other manufacturing	100,775	10.6	102,595	10.4	3.1	2.3
Services	484,520	50.8	503,717	51.2	-0.2	0.0

Source: Malawi Social Accounting Matrix (SAM) 2010 (Pauw et al. 2015), and STAGE model results

Note: * Simulation results reflect changes relative to the "alternative" baseline generated for this scenario, as discussed in section 3.

In the short run (*sim1a*), the introduction of the maize export ban has a significant impact on sectoral GDP, with declines of 13.5 and 21.9 percent in the maize and grain milling sectors, respectively (Table 1). Agricultural production is assumed unchanged in the short run (see *QXC* in Table 2), but since exports (*QE*) are diverted to the local market, domestic maize grain supply (*QQ*) rises by 6.8 percent, which, in turn, causes a 15.5 percent decline in maize grain prices (*PQD*). The supply shock in the domestic market is somewhat cushioned by the fact that maize imports (*QM*) decline quite sharply (by 48.6 percent), albeit from a low base. Although its exports are banned, the grain milling sector does not face the same production constraints as agricultural producers in the short term, and therefore increases output (*QXC*) by 4.0 percent, replacing imports (*QM*) in the process. Overall supply (*QQ*) still increases by 5.2 percent and causes prices (*PQD*) to decline by 13.0 percent. Rapidly falling maize grain and flour prices cause wages and profits to decline, which explains the large decline in GDP (Table 1) in both the maize and grain milling sectors.

Table 2—Maize export ban, price and quantity effects for selected activities and commodities, short run and long-run changes

	% change relative to base									
	Short run closure (sim1a)					Long run closure (sim1b)				
	Domestic prices (PQD)	Domestic production (QXC)	Exports (QE)	Imports (QM)	Total domestic supply (QQ)	Domestic prices (PQD)	Domestic production (QXC)	Exports (QE)	Imports (QM)	Total domestic supply (QQ)
Field crops, staples & pulses	-11.0	-	-52.5	0.9	4.2	-3.1	-3.9	-51.7	-0.2	0.1
Maize	-15.5	-	-	-48.6	6.8	-3.3	-6.6	-	-25.1	0.0
Other cereals	-13.7	-	3.2	4.6	1.0	-2.3	0.1	4.5	1.3	0.4
Roots	-2.4	-	9.3	-8.5	0.0	-3.0	0.1	8.5	-7.6	0.1
Pulses	-2.8	-	0.0	-7.6	0.0	-4.0	0.1	0.0	-9.6	0.1
Groundnut	-1.6	-	2.9	-4.3	-0.5	-4.2	1.8	8.8	-8.1	0.5
Oilseeds	-0.1	-	-0.1	2.7	2.6	1.0	1.0	1.0	1.7	1.7
Fruits & vegetables	-1.4	-	1.2	-3.2	-0.2	-1.3	0.3	3.0	-3.0	-0.1
Export & other crops	1.0	-	0.1	-1.3	-0.1	0.4	3.8	6.6	-3.3	2.7
Food & agro-processing	-0.9	1.0	-0.5	-4.0	1.0	-0.5	1.3	2.0	-2.3	0.4
Meat processing	0.3	0.0	-1.1	1.4	0.5	-0.6	1.9	4.4	-1.3	0.8
Grain milling	-13.0	4.0	-	-20.7	5.2	-5.4	0.1	-	-10.1	2.0
Export agro-processing	0.9	0.2	0.3	-0.4	-0.3	0.7	2.3	2.9	-1.1	-0.1
Other food processing	-5.1	2.4	8.4	-4.0	0.4	-0.9	1.1	3.9	-2.0	0.1
Mining & other manufacturing	1.6	2.4	11.7	-1.5	-0.3	0.7	1.6	9.5	-0.8	-0.2
Exchange rate			1.8					1.0		

Source: STAGE model results

The long run (*sim1b*) price changes are similar to those in the short run in terms of their direction, although generally smaller due to behavioral responses from maize producers. Maize grain and flour prices (*PQD*) decline by 3.3 and 5.4 percent, respectively. This is associated with a 6.6 percent decline in maize grain production (*QXC*), which, together with the decline in imports (*QM*), almost exactly offsets the quantity of maize previously exported, such that there is no change in the domestic availability of maize (*QQ*). There is also virtually no increase in grain milling output. Under the more flexible long run closure, productive resources, such as labor, land, and capital, are extracted from the maize and grain milling sectors and reallocated to more profitable activities. The small depreciation of the exchange rate (the cost of foreign currency increases by 1.0 percent) caused by the loss of maize export earnings makes the export crops and export agro-processing sectors important targets for diverted investments, leading to production (*QXC*) increases of 3.8 and 2.3 percent in these two sectors (Table 2), respectively.

Consistent with our partial equilibrium analysis in Figure 1, the greater responsiveness of maize producers in the longer run helps the sector reduce welfare losses, as evidenced by the smaller decline in the share of maize in GDP, which now falls by 4.3 percent (see Table 1). However, the agricultural sector as a whole suffers a greater reduction in GDP, i.e., by 0.6 percent compared to a 0.2 percent decline in the short run, partly as a result of more mobile productive resources, such as labor, being attracted to non-agricultural sectors. These structural shifts in the economy and their associated implications for household incomes, combined with fairly significant shifts in relative prices, are bound to have significant welfare implications for households, which we consider next. Among urban households, the non-poor gain more than the poor from the maize export ban, which reflects this group’s ability to benefit from increased economic activity in the non-agricultural sector. Of course, the nuances of the welfare impact of the export ban is lost through aggregation into representative household groups. More detailed micro-modelling can help us better understand impacts on producers—including net-consumers and net-producers—and non-producers of maize.

Table 3 summarizes changes in disposable income (i.e., the portion of household income that is available for consumption after deductions for taxes, savings, and other transfers) and maize consumption quantities for different household sub-groups.

Table 3—Maize export ban, disposable income and consumption effects for different household groups, short run and long-run changes

	% change relative to base					
	Short run closure (sim1a)			Long run closure (sim1b)		
	Disposable income (HEXP)	Maize grain cons. (QCD _g)	Grain flour cons. (QCD _f)	Disposable income (HEXP)	Maize grain cons. (QCD _g)	Grain flour cons. (QCD _f)
Rural households	-1.4	4.6	4.6	-0.8	-1.7	0.9
Rural households (by farm type)						
Smallholder farmers	-0.1	6.0	5.6	-0.5	-1.3	1.2
Medium-scale farmers	-2.4	4.0	2.9	-1.2	-2.1	-0.1
Large farmers	-1.7	3.3	2.4	-0.9	-1.8	0.4
Non-farm households	2.1	11.7	7.1	0.9	5.0	3.7
Rural households (by poverty status)						
Rural poor	-2.2	5.0	4.5	-1.3	-2.2	0.1
Rural non-poor	-1.1	4.5	4.6	-0.7	-1.6	1.5
Urban households	1.8	11.2	8.7	0.9	2.6	4.1
Urban households (by poverty status)						
Urban poor	0.3	8.7	7.7	-0.1	-0.6	3.1
Urban non-poor	1.8	11.3	8.7	0.9	2.7	4.2
All households	0.0	5.5	6.1	-0.1	-1.2	2.1

Source: STAGE model results

Note: “Poor” households here are defined as the bottom two per capita expenditure quintiles, which translates to a poverty rate of 40 percent. The remaining quintiles are considered non-poor. By contrast the

official poverty rate in Malawi is 50.7 percent (NSO 2012). Hence, our definition of non-poor includes around one-fifth of people officially classified as poor.

The most striking result in the short-run scenario (*sim1a*) is a 1.4 percent decline in rural disposable income (*HEXP*), which stands in contrast to the 1.8 percent increase in urban areas. Among farm households, the biggest losses occur among medium and large scale farmers (2.4 and 1.7 percent, respectively), who are more likely to produce a marketable surplus and are therefore vulnerable to price shocks. Smallholder farmers, on the other hand, are more often subsistence-oriented and often net-consumers of maize, and hence are less affected. Among rural households, only non-farm households benefit from export bans (2.1 percent gain), as their incomes are not directly linked to the profitability of maize. Among urban households the non-poor gain more than the poor, which reflects this group's ability to benefit increased economic activity in the non-agricultural sector. Of course, the nuances of the welfare impact is lost through aggregation into representative household groups. More detailed micro-modelling can help us better understand impacts on producers—including net-consumers and net-producers—and non-producers of maize.

While we see in the short-run scenario mixed results as far as disposable income levels are concerned, maize grain (QCD_g) and flour (QCD_f) consumption quantities increase across the board, thanks to the sharp decline in prices and increased availability. Consumption levels increase more for households that are net-consumers of maize, e.g., urban non-poor or rural non-farm households in particular. In summary, therefore, the short-run scenario is associated with an improvement in household access to and affordability of maize, but this comes at the expense of farm households' ability to access other goods and services due to declines in disposable income levels.

In the long run (*sim1b*), we still note an increase in disposable incomes (*HEXP*) for urban households (0.9 percent) and a decline for rural households (0.8 percent), although changes are somewhat smaller than in the short run owing to behavioral responses. Medium and large-scale farmers are able to mitigate some of the short run losses by refocusing on more profitable crops, in particular export crops. Smallholder farmers, on the other hand, are less likely to benefit from new opportunities and see their disposable income levels decline even more in the longer run (0.5 percent). In addition to farming households, all poor households—rural ones in particular—experience a decline in disposable income levels, with the policy now only benefiting urban non-poor and non-farm rural households. These households benefit from cheaper food and increased income-earning opportunities in the non-agricultural sector related to structural shifts in the economy.

Despite lower prices, consumption of maize grain (QCD_g) in the long-run declines across the board, with the exception of non-farm and urban non-poor households, suggesting that income effects dominate substitution (or price) effects. At the countrywide level, consumption declines by 1.2 percent. Note that this result is not inconsistent with unchanged total supply (*QQ*) in the long run (see Table 2), since QCD_g represents maize availability to households after industrial demands have been met. Consumption of maize flour (QCD_f), on the other hand, increases for virtually all household types, and by 2.1 percent for the country as a whole, in part because of a shift in household demand towards maize flour, which is now relatively cheaper than maize grain (see *PQD* in Table 2). However, since in value terms households spend almost five times as much on maize grain than on maize flour, and with the latter priced almost three times more (NSO 2015), the decline in maize grain quantity far outweighs the increase in flour consumption, such that the combined grain and flour consumption quantity declines by around one percent.

From a food security perspective, the above is perhaps not an alarming result, especially when considering increases in supply and access to other staple foods, pulses, and oilseeds (see Table 2).

However, it is evident that a long term maize export ban does not contribute to the availability of and access to maize, and, as such, is not an effective food security strategy. Instead, it more likely limits maize production. The long term maize export ban in Malawi, combined with the FISP inputs subsidy program for subsistence farmers, has likely suppressed commercial cultivation of maize to such an extent that surpluses are at an absolute minimum, thus providing a very limited buffer of maize stocks for use during periods of crisis or even minor production swings. A more favorable trade policy regime will encourage commercial producers to re-enter the maize market, thus improving food security outcomes. Equally disconcerting is that export bans are regressive in that they generally favor urban non-poor at the expense of farm households, many of whom are poor.

Oilseed export levy

In this section we focus our attention on the short-run and long-run results of the model simulations for the oilseed export levy. Table 4 shows the baseline GDP estimates by sector, calculated at factor cost (value-added) and reported in millions of Malawi Kwacha (2010 prices).

Table 4—Oilseed export levy simulations, changes in real GDP value-added (selected sectors), short-run and long-run changes

	% change relative to base*			
	15% oilseed export levy		15% oilseed export levy, with processing subsidy	
	Short run closure (sim2a)	Long run closure (sim2b)	Short run closure (sim2c)	Long run closure (sim2d)
National GDP	0.0	0.0	0.0	0.0
Agriculture	0.0	-0.1	0.0	-0.1
Field crops, staples, and pulses	-0.3	-2.9	-0.2	-2.8
Maize	0.6	1.2	0.9	1.2
Other cereals	0.3	0.7	0.4	0.7
Roots	0.8	1.3	0.9	1.3
Pulses	0.5	0.5	0.3	0.5
Groundnut	-9.1	-4.3	-9.3	-4.3
Oilseeds	-14.1	-93.0	-14.3	-92.9
Fruits & vegetables	0.4	0.9	0.1	0.9
Export & other crops	0.7	16.5	0.3	16.2
Livestock, forestry & fishing	0.1	-0.2	0.0	-0.1
Industry	0.0	0.1	0.1	0.1
Food & agro-processing	0.0	2.6	1.1	2.9
Meat processing	0.2	-0.4	1.4	0.0
Grain milling	0.0	-1.1	2.5	-0.5
Export agro-processing	0.0	6.4	0.0	6.2
Other food-processing**	-0.1	0.0	7.2	2.1
Mining & other manufacturing	0.0	-1.3	-0.6	-1.4
Services	0.0	0.0	0.0	0.0

Source: Malawi Social Accounting Matrix (SAM) 2010 (Pauw et al. 2015), and STAGE model results

Note: * Simulation results reflect changes relative to the GDP (value-added) 2010 baseline, as presented in Table 1.

** Other food processing includes cooking oil.

The relatively small size and limited export penetration of the groundnut and oilseed sectors in Malawi means that even a fairly significant export levy of 15 percent is unlikely to have major macroeconomic

effects or government revenue implications. However, it is expected to have important sector-level effects. In interpreting the results of our model simulations, it is important to remind ourselves that intermediate input use is fixed relative to the output of a sector (Leontief function). Thus, if demand for cooking oil, for example, is constrained, intermediate input demand for raw oilseed will also be constrained. In principle, the use of a fixed input will not rise rapidly when its price declines unless it also leads to a significant decline in the price of the product produced using that input, or if household incomes rise sharply.

Table 5a shows the results from the short (*sim2a*) and long run (*sim2b*) scenarios where export tax revenue contributes to government savings. Since the domestic consumer market for groundnut is relatively large, producers are able to divert a relatively large share of exports (*QE*) to the domestic market (11.6 percent), but with the consequence that prices (*PQD*) decline quite sharply (7.4 percent). By contrast, oilseed (soya and sunflower) is mostly used domestically as an intermediate input for which demand is less robust for the reasons explained earlier. Hence, a smaller share of exports is diverted (0.8 percent) and domestic prices decline less sharply (0.8 percent). Since a relatively large share of soya and sunflower production is still exported but is now taxed, profitability of the oilseed sector is severely affected, leading to a larger reduction in value-added (14.1 percent) than is seen in the groundnut sector (9.1 percent) (Table 4).

Table 5a—Oilseed export levies (without processing subsidy), price and quantity effects for selected activities and commodities, short run and long-run changes

	% change relative to base									
	Short run closure (sim2a)					Long run closure (sim2b)				
	Domestic prices (PQD)	Domestic production (QXC)	Exports (QE)	Imports (QM)	Total domestic supply (QQ)	Domestic prices (PQD)	Domestic production (QXC)	Exports (QE)	Imports (QM)	Total domestic supply (QQ)
Field crops, staples & pulses	-0.3	-	-1.9	-1.4	0.0	-0.7	-3.2	-79.0	-3.9	-0.3
Maize	-0.1	-	0.3	-0.2	0.0	-0.8	0.1	2.1	-1.8	0.1
Other cereals	-0.2	-	0.0	-0.1	0.0	-0.4	-0.3	1.7	-0.4	-0.4
Roots	0.0	-	0.2	-0.1	0.0	-1.0	0.1	2.9	-2.6	0.1
Pulses	-0.1	-	0.0	-0.3	0.0	-1.3	0.1	0.0	-3.0	0.1
Groundnut	-7.4	-	-11.6	-15.0	1.9	0.5	-4.8	-27.6	-2.2	-1.0
Oilseeds	-0.8	-	-0.8	-4.5	-2.8	5.0	-93.2	-94.8	-12.3	-19.8
Fruits & vegetables	0.0	-	0.0	-0.1	0.0	-0.3	0.1	1.0	-0.7	0.0
Export & other crops	0.1	-	0.0	0.0	0.0	-0.2	12.3	12.2	-3.7	12.2
Food & agro-processing	0.0	0.1	0.0	0.0	0.1	0.1	4.5	11.1	-0.2	-0.1
Meat processing	0.2	0.0	-0.3	0.3	0.1	0.1	-0.1	-0.2	0.0	-0.1
Grain milling	0.0	0.1	0.2	0.0	0.1	-0.2	0.0	0.8	-0.7	0.0
Export agro-processing	0.0	0.0	0.0	0.0	0.0	-0.1	9.2	11.5	-2.9	-0.1
Other food-processing*	0.0	0.1	0.3	-0.1	0.1	0.4	-0.3	-1.1	0.5	-0.1
Mining & other manufacturing	0.1	0.0	-0.1	0.0	0.0	0.2	-0.8	-5.4	0.3	0.2
Exchange rate			0.1					0.1		

Source: STAGE model results

Note: * Other food processing includes cooking oil.

The small decline in soya and sunflower prices implies limited benefits to the oilseed processing sector in terms of reduced costs of production, especially bearing in mind that oilseed only accounts for around 13 percent of total intermediate input demand. Output (*QXC*) in the food processing sector, which includes the manufacturing of cooking oils, increases by only 0.1 percent (Table 5a), suggesting some increased economic activity as the sector is able to replace imports (*QM*) and raise exports (*QE*). However, with no significant change in processed food prices (*PQD*), consumers switch towards cheaper agricultural produce. Value-added declines, albeit very marginally (0.1 percent; Table 4), and so ultimately the policy fails to achieve its objective in the short run.

In the long run, we observe a very significant supply (*QXC*) shock from oilseed producers (decline of 93.2 percent). With production almost decimated, a relatively larger share of the domestic supply mix is made up of imports. Overall, we see a 19.8 percent decline in total domestic supply (*QQ*) of oilseed. These effects, together with the small depreciation of the exchange rate, which raises the cost of imported oilseed, explain the price (*PQD*) increase of 5.0 percent. The impact is much less severe for groundnut, of which a significant share of production is consumed by producers themselves. Crucially, however, behavioral responses in the long run mean that an export levy is no longer a tool for lowering prices of inputs. Agricultural production is diverted mostly to the export crop sector, which leads to relatively large increases in value-added in this sector (16.5 percent) as well as the export agro-processing sector (6.4 percent; Table 4). By sharp contrast, output (*QXC*) declines by 0.3 percent and prices (*PQD*) rise by 0.4 percent in the food processing sector, the intended beneficiary. Consequently, the sector experiences no value-addition relative to the base, while the small gain in value-addition in the industrial sector as a whole (0.1 percent) is more than offset by the 0.1 percent decline in agricultural value-added.

Table 5b—Oilseed export levies with processing subsidy, price and quantity effects for selected activities and commodities, short run and long-run changes

	% change relative to base									
	Short run closure (sim2c)					Long run closure (sim2d)				
	Domestic prices (PQD)	Domestic production (QXC)	Exports (QE)	Imports (QM)	Total domestic supply (QQ)	Domestic prices (PQD)	Domestic production (QXC)	Exports (QE)	Imports (QM)	Total domestic supply (QQ)
Field crops, staples & pulses	0.5	-	-2.1	2.8	0.2	-0.6	-3.2	-79.0	-2.7	-0.2
Maize	0.8	-	-1.2	1.4	0.0	-0.7	0.2	2.1	-1.7	0.2
Other cereals	0.3	-	-1.3	3.9	1.1	-0.3	-0.2	1.7	0.7	0.0
Roots	0.7	-	-0.3	0.3	0.0	-0.9	0.1	2.9	-2.6	0.1
Pulses	0.3	-	0.0	0.2	0.0	-1.2	0.2	0.0	-2.9	0.2
Groundnut	-7.1	-	-11.9	-14.6	2.0	0.6	-4.8	-27.6	-2.2	-1.0
Oilseeds	-0.5	-	-0.9	0.7	2.3	5.1	-93.2	-94.7	-10.6	-18.3
Fruits & vegetables	0.3	-	-0.1	0.2	0.0	-0.2	0.1	1.0	-0.7	0.0
Export & other crops	0.2	-	0.0	-0.3	0.0	-0.1	12.1	11.9	-3.7	12.0
Food & agro-processing	-1.3	1.5	0.4	-5.7	1.1	-0.3	4.8	11.0	-2.1	0.3
Meat processing	1.4	0.0	-2.9	3.9	1.3	0.2	0.3	0.2	0.5	0.3
Grain milling	0.5	1.9	1.2	2.6	1.9	-0.1	0.6	1.3	-0.1	0.6
Export agro-processing	0.3	0.1	-0.1	0.3	0.5	0.0	9.0	11.2	-2.8	0.0
Other food-processing*	-5.0	7.2	24.8	-9.2	1.8	-1.2	1.8	5.8	-2.4	0.4
Mining & other manufacturing	0.2	-0.4	-1.8	0.0	-0.1	0.2	-0.8	-5.6	0.3	0.1
Exchange rate			0.2					0.2		

Source: STAGE model results

Note: * Other food processing includes cooking oil.

Constrained demand for oilseed used as intermediate inputs explains the poor outcome of this scenario. Since the policy does raise some revenue for government, one possibility is to subsidize oilseed processing in an attempt to increase demand for its output and, hence, intermediate input demand for oilseed. (Another possibly more effective strategy would be to provide government grants directly to consumers, but this falls beyond the scope of the analysis.) Table 5b reports the price and quantity results of these scenarios, once again under a short run (*sim2c*) and long run (*sim2d*) closure. A detailed discussion of these results is not provided here, but suffice to say that this oilseed export levy with producer subsidy policy indeed raises value-addition in the food processing sector in the short run (i.e., by 7.2 percent; Table 1), but still fails to mitigate the negative effects for primary producers. In the long run the results look much less positive. Since primary producers get no reprieve, they respond sharply by reducing supply by a similar extent as in the first set of simulations. This lowers government revenue from the export levy—by a staggering 86.4 percent—which lowers the subsidy rate to oilseed and other food processors from 8.2 percent to 2.4 percent of the value of output. Even with the subsidy in place, the reorientation of the agricultural sector towards the export crop sector still makes the export agro-processing sector a more viable option for investors than the food processing sector.

Finally, we turn to an assessment of household welfare outcomes associated with the oilseed export levy as measured by changes in disposable income levels reported in Table 6. In the absence of the oilseed processing subsidy (*sim2a* and *sim2b*) the oilseed export levy harms farmers, particularly medium- and larger-scale farmers who are more actively engaged in cash crop cultivation. Urban households benefit slightly, and these effects are amplified in the long run. The oilseed processing subsidy (*sim2c* and *sim2d*) helps alleviate the negative effects for rural households, particularly the poor, in the short run, mostly as a result of lower processed food prices (see *PQD* in Table 5b). However, in the long run the significant reduction in funding available for the subsidy leads to a distributional outcome that is very similar to the scenario without subsidies. In summary, therefore, the oilseed export levy fails not only in achieving its goal of raising value-addition in the economy—unless the oilseed processing sector is heavily subsidized—but causes a deterioration in the already skewed distribution of income between rural and urban areas.

Table 6—Disposable income effects of oilseed export levies for different household groups

	% change relative to base			
	15% oilseed export levy		15% oilseed export levy with processing subsidy	
	Short run closure (<i>sim2a</i>)	Long run closure (<i>sim2b</i>)	Short run closure (<i>sim2c</i>)	Long run closure (<i>sim2d</i>)
Rural households	-0.1	-0.2	0.1	-0.2
Rural households (by farm type)				
Smallholder farmers	0.1	0.0	0.3	0.1
Medium-scale farmers	-0.1	-0.4	0.1	-0.3
Large farmers	-0.2	-0.6	-0.1	-0.5
Non-farm households	0.2	0.3	0.1	0.3
Rural households (by poverty status)				
Rural poor	-0.1	-0.3	0.2	-0.3
Rural non-poor	0.0	-0.2	0.1	-0.2
Urban households	0.2	0.3	0.1	0.3
Urban households (by poverty status)				
Urban poor	0.1	0.1	0.2	0.1
Urban non-poor	0.2	0.3	0.1	0.3
All households	0.1	0.0	0.1	0.0

Source: STAGE model results.

Sensitivity analysis

For our sensitivity analysis, all modeled simulations were rerun with higher (lower) income elasticities of demand for maize as well as higher (lower) elasticities of transformation for oilseed and groundnut crops. Two patterns of interest were observed. First, maize grain and flour consumption is relatively more sensitive to changes in the income elasticity of demand in the short-run than in the long-run scenarios. For example, a 25 percent deviation from the benchmark elasticity causes consumption responses to deviate about 10 percent from the simulated benchmark consumption level, with the direction of the deviations symmetrical to that of the change in the elasticity. In the long-run the consumption deviation is only about 5 percent for the same elasticity adjustment. Second, with respect to the oilseed levy, higher (lower) elasticities of transformation understandably cause the policy response (in terms of diverting supply of oilseed to the domestic market) to be somewhat larger (smaller), and these responses tend to be larger in the long-run scenarios. However, overall these

elasticity changes do not significantly alter our key economic variables and, therefore, the main conclusions from the analysis.

5 Conclusions

Restrictions on exports of staple foods or cash crops are frequently imposed in developing countries as a means to promote food security or industrial development goals. By diverting domestic production to the local market, these policies reduce domestic prices and increase supply of food or intermediate inputs to the benefit of consumers or downstream industrial users. However, a reality often overlooked by policymakers is that short term outcomes—which may be consistent with the intended objectives—are very different from those in the long run owing to the behavioral responses of producers. The aim of this study is to explore the economy-wide implications of maize export bans and a proposed oilseed export levy in Malawi against their respective objectives of improved food security and increased domestic value-addition, highlighting the differences between the short and long run. Using the Standard General Equilibrium (STAGE) model calibrated to a 2010 Social Accounting Matrix (SAM) for Malawi, we simulate the impact of export restrictions under various scenarios and policy timeframes.

In line with findings from related *ex ante* analyses (Diao and Kennedy, 2016; Dorosh *et al.*, 2009), our results show that in the short run Malawi's maize export ban achieves its stated objective of increased food security as measured in terms of access and availability of maize. Maize grain and flour consumption increases by around six percent. However, these gains come at a cost to the rural farm sector in particular, as evidenced by a 0.2 percent decline in agricultural value-added, which translates into lower disposable income levels for farm households. In general, the policy benefits urban households and harms rural households, especially the poorest. In the long run, the policy causes maize producers to shift to other crops, to the extent that maize grain and flour consumption actually declines by around one percent, while agricultural value-addition declines by 0.6 percent. In the long run, the maize export ban only benefits urban non-poor and rural non-farm households, with all other households, including the urban poor, experiencing declines in their disposable income levels.

In contrast to the maize export ban results, a 15 percent oilseed export levy is less likely to achieve its goal of increased value-addition in processing sectors unless the revenue generated by the new tax is used to finance a production subsidy for oilseed processors. In the long run, whether processors are subsidized or not, we note a very significant response from oilseed (soya and sunflower) producers, who lower their oilseed production by over 90 percent. Given robust demand for groundnut from domestic consumers, the supply response is smaller for groundnut producers. As in the case of the maize export ban, an oilseed export levy tends to benefit urban consumers at the expense of rural producers in the short run and even more so in the long run. In the short run, the subsidy to processors mitigates some of the negative welfare effects for rural households by lowering food prices. However, the sharp decline in export tax revenue in the long run (i.e., by 86.4 percent) prevents government from continuing to offer a generous food processing subsidy. Thus, irrespective of how export tax revenues are utilized in the scenarios explored here, the distributional effects of the oilseed export levy in the long run remain biased against the poorest rural households and favor better off urban households.

Our results show that policy-induced distortions in the form of export bans or export levies on agricultural commodities in Malawi create disincentives for farmers to produce, rendering these policies self-defeating and unsustainable. Together with restrictive policies such as the fixed exchange rate regime maintained until 2012 (see Pauw *et al.*, 2013) and the Farm Input Subsidy Program (FISP) still in place, which has kept maize prices low (see Arndt *et al.* 2016), export restrictions are believed to perpetuate a subsistence farming culture by creating uncertainty, distorting markets, and discouraging commercial crop cultivation. Beyond the modeling analysis itself, many have argued that, even when policies are not actually implemented or actively enforced, the mere

threat of their imposition or the possibility of penalties for non-compliance raises transaction costs, contributes to market uncertainty, and suppresses production in the longer run. As our results confirm, export restrictions can be welfare-reducing and they tend to be biased against poorer rural households, but most importantly they are ultimately inconsistent with the Malawi government's ambition—articulated in the second Malawi Growth and Development Strategy (MGDS II)—of transforming the economy from being a “predominantly importing and consuming economy to a predominantly producing and exporting economy” (GoM, 2012a).

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