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Alternative Policies to Agricultural Export Taxes That Are Less Market Distorting

William M. Liefert and Paul C. Westcott

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Abstract

In response to the surges in world agricultural and food prices that have occurred since 2006, many countries imposed controls on their agricultural exports, using taxes, quotas, and complete export bans. Further, during the past few decades, many countries have maintained longstanding export taxes not only on agricultural goods, but also on forestry and fishery products, minerals, metals, and precious stones. This study examines the market effects of a conventional export tax, as well as three alternative policies that are less market distorting, and thereby less welfare diminishing: a subsidy to consumption, a tax on production, and a modification of a conventional export tax that allows additional exports after producers meet a sales requirement for their output. All three alternatives result in more exports of affected goods than the unmodified tax does. The increased exports will thereby benefit foreign consumers, and if the country is a large exporter of an affected good on the world market, the benefit is larger, because the additional exports will lower the good's world purchase price. Increased global sales and lower prices will improve world food security and benefit the consuming poor of the world, especially if the affected product is a staple food such as wheat or rice. Policies that pursue such goals are consistent with U.S. efforts to improve world food security. However, the alternative policies are "second best" options because they are less effective at increasing both domestic and world economic welfare than the first best policy of abolishing the export tax and allowing free export.

Keywords: Export restrictions, export taxes, agricultural trade, free trade, trade policy.

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Alternative Policies to Agricultural Export Taxes That Are Less Market Distorting

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What Is the Issue?

During the surge in world agricultural and food prices of 2006-08, as well as the more recent price jumps during 2010-12, many countries restricted agricultural exports by implementing shortrun taxes, quotas, and complete export bans. For the past few decades, another commonly used class of export controls has been longstanding export taxes, levied on both agricultural and nonagricultural products. The World Trade Organization has reviewed the trade policies of 121 countries and trading blocs from 1995 to 2014 and found that 74 of those countries/blocs applied export taxes for such products as agricultural goods, fishery and forestry products, minerals, metals, and precious stones.

Export restrictions affect prices, production, consumption, trade, and producer and consumer welfare. Domestic consumers of the affected products benefit from prices lower than would exist without the export restrictions, while domestic producers are hurt by the lower prices. If a country exports enough of a good to affect its world price, then the reduced supply to the global market from the export restriction also raises the world price. The effects abroad are in the opposite direction of the domestic effects: foreign consumers are hurt by the higher world price while foreign producers benefit from it.

The study has two main objectives:

- To examine the market effects of a conventional export tax and
- To identify alternative policies to a longstanding conventional export tax that increase exports and make the tax less market distorting and less welfare diminishing.

What Did the Study Find?

The researchers examined three welfare-enhancing policy alternatives to a conventional export tax: (1) a consumption subsidy, (2) a production tax, and (3) a modification of a conventional export tax that allows additional exports after producers meet a domestic sales requirement. In the domestic economy, the net economic welfare is higher with each of the three policy alternatives than with the conventional export tax, and each alternative results in more of the affected good being exported than does the unmodified tax. Increased exports benefit foreign consumers, especially for goods from countries exporting large volumes of that good. The

additional exports lower the good's world price, further reducing the loss in global economic welfare from the initial tax.

A consumption subsidy can benefit domestic consumers as much as an export tax would, and it can benefit producers more than the export tax would because producers receive the same price and produce as much as they would without the tax. A production tax has the benefit that it can increase government revenue by more than the export tax would because all output is taxed, not just the amount exported.

However, the consumption subsidy and production tax have drawbacks. Two major government objectives in imposing export taxes are (1) benefiting consumers by lowering the price they pay for the exported good and thereby increasing their volume of consumption, and (2) gaining revenue from the tax. With the consumption subsidy, the government not only loses the revenue from the export tax but also must pay for the subsidy to consumers. With the production tax, consumers pay a higher price and purchase less of the good than they would with the conventional export tax.

The third alternative policy, a modification of a conventional export tax, addresses these disadvantages. The key feature of this alternative is that domestic producers of the exported good must collectively sell a minimum total volume through either domestic sales or exports under a conventional export tax before being allowed additional exports at the world market price. The advantage of this policy over the other two is that domestic consumers pay the same price and purchase as much of the good as they would with the conventional tax, and the government can earn exactly the same tax revenue as with the conventional export tax. In this way, the additional export policy would not compromise any of the major objectives of export taxes—or put another way, domestic producers would gain, but no other domestic group would lose.

Although the welfare of both the domestic economy and the rest of the world is higher with all three alternative policies than with the conventional export tax, the alternative policies are less welfare enhancing in the aggregate for both the domestic and world economy than abolishing the export tax altogether to allow entirely free export. Thus, given the assumptions in this model, the alternative policies are "second best" policy options, with the first best policy being free trade.

How Was the Study Conducted?

The study uses market supply, demand, and trade analysis to examine the effects of an export tax and alternative policies to the conventional tax that are less market distorting. Key to the investigation is welfare analysis that includes measures of economic benefits to consumers and producers (consumer surplus and producer surplus) in different policy situations.

Alternative Policies to Agricultural Export Taxes That Are Less Market Distorting

Introduction

During the surge in world agricultural and food prices of 2006-08, as well as the more recent price jumps during 2010-12, many countries imposed restrictions on agricultural exports. The main types of controls were export taxes and quotas, as well as complete export bans. During 2006-08, at least 17 countries wholly banned the export of at least one agricultural commodity, 9 countries imposed export taxes, and 6 countries established export quotas or some other form of quantitative restriction (Trostle, 2008; FAO, 2008; Bouet and Debucquet, 2010; and Sharma, 2011). These restrictions were largely temporary, often lasting less than a year.

Another class of export controls is long-term taxes. From 1995 to 2014, the World Trade Organization (WTO) issued trade policy reviews (TPRs) for 121 member countries and trading blocs (not counting multiple reviews for the same country/bloc). During this time, 74 of the countries/blocs imposed an export tax on at least one product (table 1). Fifty-eight countries/blocs taxed at least one agricultural product. Other commonly taxed categories were hides, skins, and leather (22 countries/blocs); fishery products (14); forestry products (29); and minerals, metals, and precious stones (42).[1] From 2010 to 2014, WTO issued TPRs for 73 countries/blocs. During this time, 35 imposed an export tax on at least 1 product, including at least 1 agricultural good (24 countries/blocs); hides, skins, and leather (12); fishery products (3); forestry products (16); and minerals, metals, and precious stones (17).[2] Table 2 provides a sample of export taxes imposed on agricultural goods by various countries from 1995 to the present. The examples in the table were chosen to reflect both the diversity of the countries imposing export taxes (large countries such as Brazil, Indonesia, and Argentina and small countries such as Costa Rica and Burundi) and the diversity of agricultural products taxed.

Both the temporary restrictions on agricultural exports of recent years and longstanding export taxes have been used predominantly by developing or emerging market economies rather than developed countries. For example, of the 35 countries that enacted an export tax between 2010 and 2014, only one was a developed country (defined as a member of the Organization for Economic Cooperation and Development [OECD]).

Export restrictions affect a country's domestic markets by changing the following: prices; the volume of production, consumption, and trade; and producer and consumer welfare. Domestic end-use consumers and intermediate-stage users of the affected products gain from lower prices,

[1]One reason countries use export taxes rather than quotas is that agreements within the World Trade Organization restrict quantitative trade controls. Taxes are also easier to administer than quotas. Korinek and Kim (2010) examine longstanding quantitative export restrictions, mainly to metals, that countries have applied for strategic rather than economic reasons. One such strategic reason is that the metals are required for technologically sophisticated products.

[2]Table 1, in fact, understates the incidence of export taxes, because instances where an ad valorem export tax on a product was 1 percent or less were not included. Such low rates are typically used not to achieve the main economic objectives of export taxes examined later in the report, but rather to gain revenue simply to cover trade administrative expenses. OECD (2003), Kim (2010), Jones and Kwiecinski (2010), and OECD (2013) also present information on the incidence of export taxes covering various products and time periods.

Table 1

Incidence of export taxes

Time period	Countries/ blocs reviewed	Export tax	Agricultural goods	Hides, skins, & leather	Fishery products	Forestry products	Minerals, metals, & precious stones
1995-2014	121	74	58	22	14	29	42
1995-2005	93	52	38	13	11	16	24
2006-14	97	53	37	16	7	24	27
2010-14	73	35	24	12	3	16	17

Note: The "Countries/blocs reviewed" column gives the number of countries and trading blocs over the time period for which the World Trade Organization (WTO) did at least one trade policy review, and does not count multiple reviews of the same country/bloc over the period. The "Export tax" column gives the number of countries/blocs that taxed at least one product over each time period. The other columns give the number of countries/blocs that imposed at least one export tax on this type of product over the period. The row 2010-14 is a subset of the row 2006-14.

Source: WTO trade policy reviews.

Table 2

Selected agricultural export taxes

Country	Commodity	Year	Tax rate (percent)
Costa Rica	coffee	1995	12
Ivory Coast	cola nuts	1995	14
Mauritius	sugar	1995	18.75
Dominican Republic	sugar	1996	40
Mozambique	cashews	2000	18
Pakistan	animal hides & skins	2001	20
Burundi	grain	2003	15
Niger	tobacco	2003	5-15
Malaysia	palm oil	2006	10-30
Angola	animal hides & skins	2006	20
Indonesia	animal skins	2007	25
Pakistan	sugar	2008	15
Brazil	cashews	2009	30
Zambia	cotton seed	2009	20
Sri Lanka	cashews	2010	200
India	animal hides & skins	2011	10-25
Bangladesh	tobacco	2012	10
Indonesia	palm oil	2013	9
Argentina	wheat	2014	23
Argentina	corn	2014	20
Argentina	soybeans	2014	35
Malaysia	palm nuts	2014	20

Note: The "Year" column gives the publication year of the World Trade Organization (WTO) trade policy review that identifies each tax-imposing country as having the tax, which is not necessarily the same as the year the tax was created.

Source: WTO trade policy reviews.

but domestic producers lose with lower prices. Foreign consumers and producers are affected in the opposite direction of their counterparts in the countries imposing the export restrictions—foreign consumers lose while foreign producers gain. Export controls reduce the supplies put on the international market, and if the country is a large enough exporter to impact global prices, the drop in export volume also increases world prices. Because of this negative effect on foreign consumers, when countries restricted agricultural and food exports during the jumps in prices that began in 2006, they were strongly criticized for adding to world price increases and thereby hurting the world's poor outside of their own economy even more.

Various studies have empirically examined how countries' trade policy responses to the recent jumps in world agricultural and food commodity prices affected world markets. Yu et al. (2011) find that the trade policy responses (involving both exports and imports) to the rise in world agricultural and food prices during 2007-08 increased the world price for rice (24 percent), wheat (14 percent), and barley (9 percent). In a similar study, Martin and Anderson (2012) determine that countries' trade policy responses during 2005-08 accounted for 45 percent and 30 percent of the observed rise in the world price of rice and wheat, respectively. In a study with a broader focus, Laborde et al. (2013) find that the removal of export taxes for all products in 2007 would have increased world trade by 2.8 percent and real world income by 0.24 percent.[3] The empirical evidence, therefore, appears to show that export restrictions (especially for agricultural goods) have had nontrivial world economic impact.

This study has a different focus in that it examines alternative policies to a conventional export tax that are less market distorting, and thereby less welfare diminishing, to both the country that imposes the measure and the world market. The alternative policies examined are a subsidy to consumption, a tax on production, and a policy modification of a conventional export tax that allows additional exports after producers meet a sales requirement. The alternative policies are in a class of "second best" options to the first best policy of abolishing export taxes and allowing totally free export.

This 2015 ERS report builds on Liefert et al. (2012), which examines the market effects of complete export bans, as well as modifications of export bans to make them less market distorting. Also, Liefert et al. (2013) investigated various additional issues and scenarios related to this 2015 ERS report. While this 2015 ERS report focuses on longstanding export taxes, Liefert et al. (2013) covers shortrun as well as longstanding taxes and their possible policy modifications and export quotas.

[3]Djuric et al. (2012) and Gotz et al. (2013) examine the effect of export restrictions on specific commodity markets in particular countries, with Djuric et al. (2012) focusing on the wheat market in Serbia, and Gotz et al. (2013) focusing on wheat markets in Russia and Ukraine.

Objectives of Export Restrictions

Drawing largely from Mitra and Josling (2009), Bonarriva et al. (2009), Kim (2010), and Bouet and Debucquet (2010), we can identify four main reasons a government might impose an export tax or other export restriction: (1) to raise revenue; (2) to exploit the country's market power in the exported product by raising the price at which the country sells the good on the world market and thereby changing the terms of trade to its advantage; (3) to provide domestic processors that use the exported good as an intermediate input a cost advantage vis-à-vis foreign competitors by lowering the good's domestic price; and (4) if the exported good is an agricultural food product, to benefit domestic consumers and improve the country's food security by increasing the volume of the foodstuff available for domestic sale and lowering its price.

Because an export ban completely precludes exports, only the last two motives identified apply to that policy. The first three possible motives—raising revenue, exploiting world market power, and helping domestic processors—apply mainly to long-term export taxes, while the last motive (domestic food security) applies to short-term export restrictions in response to increases in world food commodity prices. Also, of the first three motives, the second is relevant *only* if the country's exports are large enough to provide market power in world trade. The other two motives are relevant without market power but are enhanced if the country has market power because restricting the good's outflow raises its export price. Other less common motives also exist for export restrictions, such as environmental protection and reducing the depletion of exhaustible resources, such as by restricting energy exports (Karapinar, 2011).

Market Effects of Export Taxes

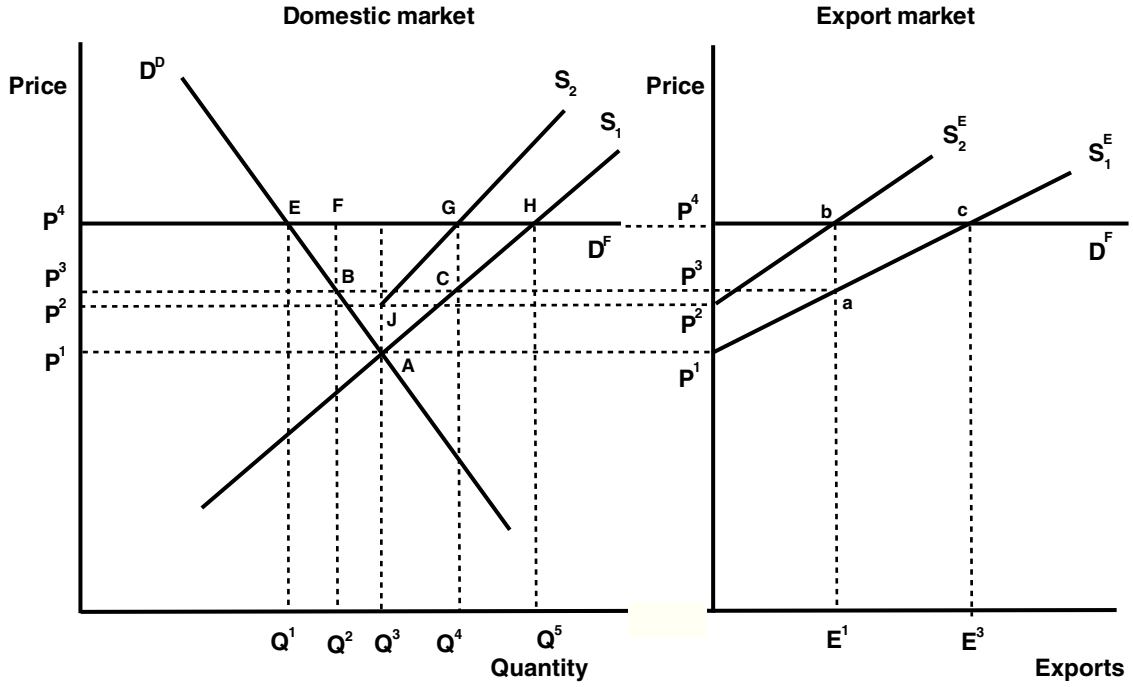
Mitra and Josling (2009), Bonarriva et al. (2009), and Anderson and Nelgen (2011) analyze the market effects of export bans, taxes, and quotas. Here, we draw on those analytical frameworks to focus on longstanding export taxes.

Small-Exporter Case

We first examine the effects when the restriction-imposing country is a small exporter in the world market—its exports do not affect global prices, and the country is a price-taker for the exported good.[4]

In the domestic market panel of figure 1, D^D and S_1 are the initial domestic demand and total supply curves. Given that the country is a price-taker in the global market, at the product's world price of P^4, the foreign demand curve for export is the horizontal line D^F anchored at P^4. With free trade, the country produces a quantity of Q^5, domestically purchases Q^1, and exports $Q^5 - Q^1$. In the export market panel of figure 1, D^F is again the foreign demand curve for exports of the product (as faced by the country), and S_1^E is the supply curve for exports that the country provides to the world market. At any price above P^1, S_1^E in the export market panel equals the horizontal distance between S_1 and D^D in the domestic market panel. At world price P^4, equilibrium is determined by the intersection of D^F and S_1^E at point c, such that exports equal E^3 ($Q^5 - Q^1$ in the domestic market).

Figure 1
Market effects of an export tax, small-exporter case



Source: USDA, Economic Research Service analysis.

[4]In the body of this report, we focus on presenting the economic analysis in graphs. The appendix presents a mathematical representation of the associated economic models.

Assume now that the government imposes an ad valorem export tax. The tax rate equals $(P^2 - P^1)/P^2$, which also equals $(P^4 - P^3)/P^4$.[5] The tax creates a second policy-conditional supply curve S_2 in the domestic market, where beginning at the autarky output volume of Q^3, S_2 lies above S_1 by the magnitude of the export tax. This shifts the supply curve up from point A to point J at the volume Q^3. S_2 gives the quantity of the good produced (whether sold to domestic or foreign consumers) at any *world price* above P^2.[6] The tax creates a new market equilibrium where D^F and S_2 intersect at point G. The domestic price decreases to P^3 (the world price minus the per unit tax), domestic purchases increase from Q^1 to Q^2, production falls from Q^5 to Q^4, and exports drop to $Q^4 - Q^2$.

In the export market, the tax creates a new policy-conditional export supply curve S_2^E, derived as follows: an export tax of rate $(P^2 - P^1)/P^2$ would preclude exports at world prices below P^2. This is because at such a price, the after-tax per unit revenue, which domestic suppliers would receive from producing and exporting the good, would fall below the domestic autarky price P^1.

However, at any world price above P^2, the after-tax domestic price is higher than P^1. That domestic price generates a greater quantity of the good produced and a lesser quantity domestically purchased than with the world price of P^2. The difference between those two quantities equals the excess supply available for export, which yields a point on S_2^E in the export market associated with the given world price. The new equilibrium is given by the intersection of D^F and S_2^E at point b in the export market panel, such that E^1 is exported ($Q^4 - Q^2$ in the domestic market panel).

The concepts of consumer and producer surplus can be used to measure the associated changes in the economic welfare of consumers and producers from the export tax. Consumer surplus is the difference between (1) the sum of the maximum amount that each consumer is willing to pay to purchase a given quantity of a good and (2) the sum of the amount that each consumer actually does pay. Therefore, consumer surplus measures consumers' net welfare gain from purchasing and consuming the good. In any market, consumer surplus equals the area below the demand curve and above the horizontal line anchored at the domestic market price. In figure 1, the drop in the domestic price because of the export tax from P^4 to P^3 increases consumer surplus (welfare) by the area P^3P^4EB.

Producer surplus is the difference between (1) the sum of the revenue that each producer receives and (2) the sum of the minimum revenue that each producer is willing to accept to produce a given quantity of output. Therefore, producer surplus measures producers' net welfare gain from producing and selling the good. In any market, producer surplus equals the area above the supply curve and below the horizontal line anchored at the market price. In figure 1, the domestic price drop from the export tax decreases producer surplus (welfare) by the area P^3P^4HC. With this area being greater than the increase in domestic consumer surplus, the net consumer and producer welfare change is a loss equal to area BEHC.

Offsetting some of this loss, however, the export tax earns the government revenue equal to BFGC (the per unit export tax of $P^4 - P^3$, which is the difference between the world and domestic price, times the quantity exported). Thus, the country has a net welfare loss from the export tax of BEF + CGH.

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[5]In identifying the export tax rate as $(P^2 - P^1)/P^2$, we use P^2 in the denominator because we want to express the tax relative to the price that domestic producers would receive without the tax.

[6]Given that the export tax is ad valorem, S_2 has a steeper slope than S_1 because the per unit tax increases as the price rises.

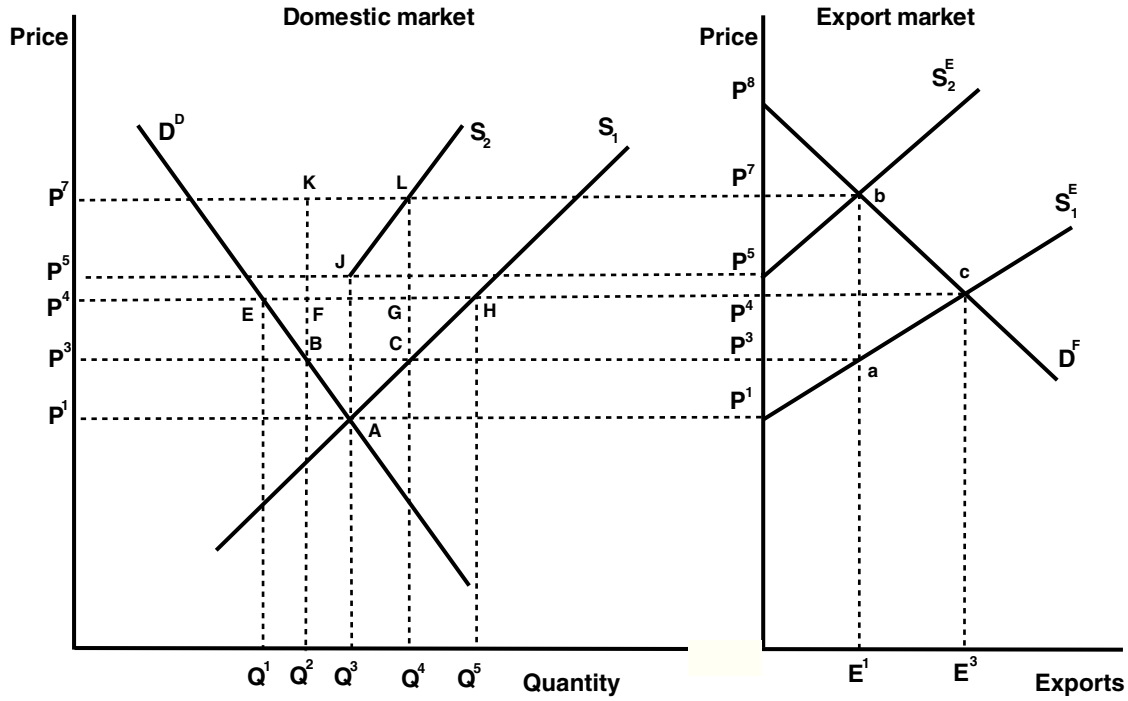
The export tax in figure 1 can achieve three of the four objectives of export restrictions identified earlier. It raises government revenue (by BFGC), lowers the domestic purchase price (by $P^4 - P^3$), and raises domestic purchases and use (by $Q^2 - Q^1$). If the good is used as an intermediate input by a domestic processing industry, the lower domestic price gives the processors a cost advantage vis-à-vis foreign competitors. If the good is a foodstuff, the higher volume sold domestically increases food availability. The only goal of the export tax not achieved in the small-exporter case is raising the export price and thereby improving the country's terms of trade.

Large-Exporter Case

We next examine the market effects of an export restriction with a large exporter that has world market power in the exported good because the country's exports are big enough to affect the world price. Figure 2 reproduces the market presented in figure 1, though modified for market power. With market power, the country faces a downward sloping foreign demand curve for its export. To avoid cluttering the panel for the domestic market, we do not give this demand curve in that panel, though it appears in the export market panel as D^F. In fact, in the large-exporter case, the analysis for determining the market equilibrium can be shown more easily in the export market panel than in the domestic market panel.

S_1^E in the export market panel is again the supply curve for exports that the country provides to the world market. As in the small-exporter case, at any price above P^1, S_1^E in the export market panel equals the horizontal distance between S_1 and D^D in the domestic market panel. The free-trade equilibrium occurs at the intersection of D^F and S_1^E at point c, with exports of E^3 at a world price of P^4.

Figure 2
Market effects of an export tax, large-exporter case



Source: USDA, Economic Research Service analysis.

With free trade, the world price determines the domestic price. Thus, equilibrium in the domestic market panel is at point H, the point on the supply curve S_1 corresponding to P^4. The quantity produced is Q^5, with Q^1 domestically purchased and $Q^5 - Q^1$ exported.

Assume now that the government imposes an ad valorem export tax of rate $(P^5 - P^1)/P^5$ (which also equals $(P^7 - P^3)/P^7$). Beginning at autarky output Q^3, the tax again creates a policy-conditional supply curve S_2 starting at point J. S_2 gives the quantity of the good produced (whether sold to domestic or foreign consumers) at any world price above P^5.

In the export market panel, the tax creates the export supply curve S_2^E. It is derived as before in the small-exporter case. A world price above P^5 generates a domestic price above P^1, which motivates a given quantity of the good produced and a quantity domestically purchased. The difference between the two quantities yields a volume of excess supply for export, which generates a point on S_2^E associated with the world price. The intersection of D^F and S_2^E at point b in the export panel determines the new equilibrium world price of P^7, such that E^1 is exported. The tax thus reduces the volume exported and raises the world price.

The new world price P^7 yields an equilibrium in the domestic market panel at point L (where S_2 intersects the horizontal price line at P^7). A corresponding equilibrium is at point C, which determines the producer after-tax per unit revenue. The equilibrium domestic price is P^3, Q^4 is produced, Q^2 is sold domestically, and $Q^4 - Q^2$ (which equals E^1) is exported at world price P^7. In the domestic market, therefore, the tax lowers the market price and raises the amount sold domestically.

Changes in consumer and producer surplus with the export tax in the large-exporter case are the same as in the small-exporter case. Consequently, in figure 2, the tax again results in a producer surplus loss of P^3P^4HC and a consumer surplus gain of P^3P^4EB, resulting in a net welfare loss of BEHC. However, the export tax earns the government revenue of area BKLC (the per unit export tax of $P^7 - P^3$ times the quantity exported). On balance, the net change in the country's economic welfare (including government tax revenue) depends on how the tax revenue area of BKLC compares to the net consumer and producer welfare loss area of BEHC. Since these areas overlap (area BFGC), the net welfare change depends on the size of area FKLG relative to the sum of areas BEF and CGH.

The analysis shows—in the large-exporter case where a country has world market power in the exported good—that an export tax not only fulfills the main objectives of an export restriction but can also bring greater net economic gains to the country. First, as in the small-exporter case, the tax benefits all domestic consumers by decreasing the domestic price from P^4 to P^3 and increasing domestic purchases from Q^1 to Q^2. Second, the tax helps domestic processors who use the exported good as an input to compete with foreign processors, not just by lowering its domestic price from P^4 to P^3, but also by raising its world price from P^4 to P^7. This widens the gap between the domestic and world price for the good to $P^7 - P^3$. Third, the increase in the export price from P^4 to P^7 improves the country's terms of trade. Fourth, the government's revenue gained from the export tax increases.

Finally, the tax may generate more government revenue than it causes loss of domestic producer surplus that is not offset by the gain in domestic consumer surplus. This outcome will depend on the price elasticities of supply and domestic demand (which determine the shape of the supply-and-demand curves) and the size of the tax. Thus, in the large-exporter case, the export tax may result in a net welfare gain to the exporting country, which is consistent with the earlier discussion that a

country with world market power can benefit by restricting trade. However, the export tax will create welfare losses in the global market. In the export panel of figure 2, consumer surplus in importing countries under free trade is measured by area P^4P^8c. With the export tax, importing countries' consumer surplus declines to area P^7P^8b, for a loss of area P^4P^7bc. (See box, "Disciplines on Agricultural Export Restrictions," for a discussion of export-restriction considerations by WTO and regional trade agreements.)

Disciplines on Agricultural Export Restrictions

Export restrictions hurt foreign end-use consumers and intermediate product users by reducing the amount of the good put on the world market, and if a country imposing an export control is a large enough exporter of the good to affect its world price, foreign end-users will be hurt further by the rise in the good's world price. What disciplines are put on export restrictions by the World Trade Organization (WTO) and regional trade agreements, such as the North American Free Trade Agreement (NAFTA) and European Union (EU)?

Article XI of the General Agreement on Tariffs and Trade (GATT) of 1994 bans export quotas, export and import licenses, and other types of quantitative trade controls. However, certain exceptions are permitted. Paragraph 2(a) allows an export restriction when it is a temporary measure "to prevent or relieve critical shortages of foodstuffs," while paragraph 2(c) permits an import restriction "to remove a temporary surplus" of domestic production. In addition, Article XX allows export controls that conserve exhaustible resources. No discipline of export taxes exists in the WTO, and taxes can be high enough to prevent trade.

Article 12 of the Uruguay Round Agreement on Agriculture (implemented beginning in 1995) states that before a country creates an agricultural export control, it must give written notice and consult with other member countries, as well as give "due consideration to the effects of such prohibition or restriction on importing members' food security." Yet, when WTO members have imposed such restrictions, they have typically not followed these procedures (Mitra and Josling, 2009). In addition, Article 12's disciplines on export restrictions do not apply to developing country members, unless the country is a net food exporter of the affected product.

At the beginning of the negotiations for the Doha Round of trade liberalization (beginning in 2001), a number of countries wished to discipline export restrictions further (as identified in papers submitted in Phase 1 of the Agricultural Negotiations).[1] The United States wanted to strengthen WTO disciplines on export restrictions to increase the reliability of the global food supply, and in particular, prohibit the use of export taxes for competitive advantage or supply-management purposes. The European Union (EU) wished to eliminate, or at least reduce and bind, all export taxes, while Switzerland (not an EU member) wanted to eliminate all export restrictions on agricultural goods (though with flexibility for the least developed countries). Japan, on the other hand, wished to replace export restrictions with taxes and then bind the tax levels, though with a minimum quota volume of exports to be exempt from the tax. South Korea took the stronger position of wanting to ban all export restrictions, including taxes.

Some regional trade agreements (RTAs) also impose disciplines on export restrictions (especially for agricultural goods) for their member countries. NAFTA (which comprises the United States, Canada, and Mexico) bans export taxes, unless the same taxes also apply to locally sold goods. However, Mexico has been allowed temporary exceptions for certain agricultural products. The EU forbids all manner of export restrictions (including taxes) on intra-EU trade. The South American RTA MERCOSUR allows export taxes, though Uruguay would like to abolish them.[2]

[1]The main sources of information in this and the next paragraph are Crosby (2008), Mitra and Josling (2009), and Anania (2013), with the last author also presenting options for dealing with export restrictions within the World Trade Organization.

[2]MERCOSUR members include Argentina, Brazil, Paraguay, Uruguay, and Venezuela. Bolivia has also negotiated its accession agreement and could join pending approval from the member States' legislatures.

Less Market Distorting Policy Alternatives to a Conventional Export Tax

In this section, we examine three alternative policies to a conventional export tax that are less market distorting, and thereby less welfare reducing, to both the exporter's own country and the rest of the world. The three policies are (1) a consumption subsidy; (2) a production tax; and (3) a modified conventional tax policy that allows additional exports after producers meet a sales requirement. We use diagrammatic analysis to examine only the small-exporter case where the volume of the country's exports of the good is too small to affect the world price. With all three alternative policies, the volume of the good exported is greater than with the conventional tax. Therefore, in the large-exporter case where the volume of the country's exports of the good are large enough to change the world price, the increased exports would benefit the rest of the world not only by increasing the supplies of the good put on the international market, but also by lowering its world price.

Consumption Subsidy

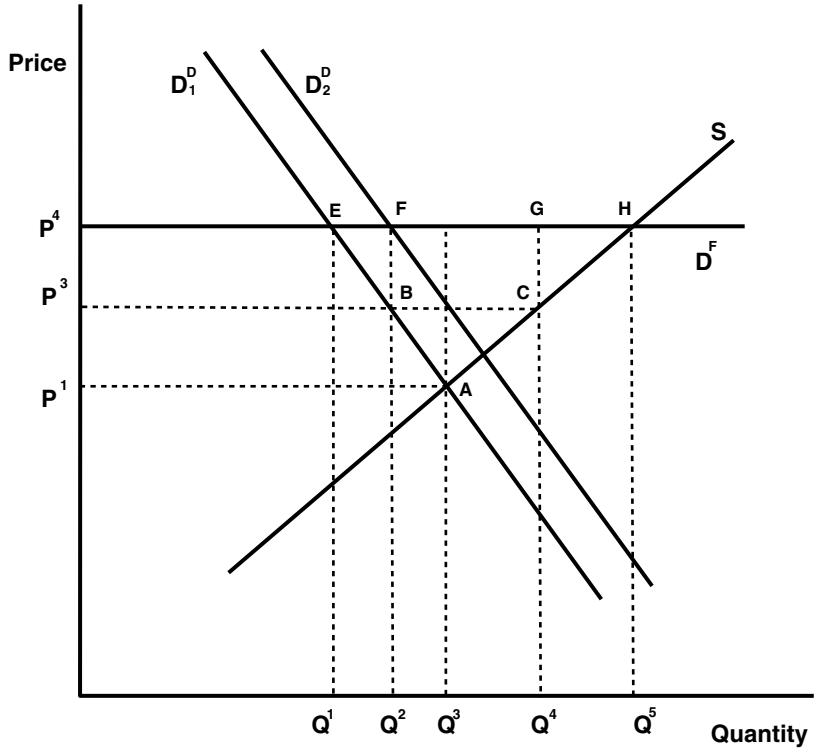
Consumption subsidy programs for foods are typically introduced in countries to address food security or availability concerns among the nation's poor. Food security concerns in India, for example, have been addressed with various programs. These have included subsidized domestic distribution programs for food grains, which are being expanded under the National Security Act passed in 2013.

In figure 3, assume again that the world price for the good in question is P^4, such that with free trade the country exports $Q^5 - Q^1$ of the good. An ad valorem export tax of rate $(P^4 - P^3)/P^4$ reduces the domestic price to P^3, such that $Q^4 - Q^2$ is now exported. As an alternative to the export tax, the country could subsidize the domestic purchase/consumption/use of each unit of the good by $P^4 - P^3$. This subsidy shifts the demand curve from D_1^D to D_2^D, where the vertical distance between the two curves equals the per unit subsidy. The quantity of the good purchased now equals Q^2, the quantity produced Q^5, and exports $Q^5 - Q^2$. Compared to free trade with no subsidy, the export volume is lower by $Q^2 - Q^1$, but compared to the export tax, the export volume is higher by $Q^5 - Q^4$. (Throughout the rest of this report, "free trade" means trade with no market intervention (subsidy or tax) involving the exported good.)

A consumption subsidy of $P^4 - P^3$ has exactly the same effect on consumers as does an export tax with the rate of $(P^4 - P^3)/P^4$. Compared to free trade, both policies increase consumer purchases from Q^1 to Q^2, lower the "real" consumer price from P^4 to P^3, and raise consumer welfare by P^3P^4EB. The consumption subsidy has exactly the same effect on producers as free trade, as they produce Q^5, sell at P^4, and have no change in their welfare. However, compared to free trade, the government must bear the cost of the consumption subsidy with an expenditure of P^3P^4FB.

Given the government loss (expenditure) with the subsidy of P^3P^4FB and the consumer welfare gain of P^3P^4EB, the subsidy results in a net welfare loss to the economy compared to the free trade situation of BEF. However, the net welfare loss with the export tax is BEF + CGH. Compared to the export tax, the consumer subsidy therefore increases the country's net welfare by CGH. As mentioned before, the consumer subsidy also expands total exports by $Q^5 - Q^4$, which benefits the rest of the world. In the large-exporter case where the volume of the country's exports is big enough to affect the world price, the additional exports would lower the good's world price, to the added benefit of foreign consumers.

Figure 3
Market effects of a consumption subsidy, small-exporter case



Source: USDA, Economic Research Service analysis.

Table 3 summarizes the market welfare effects of the consumer subsidy compared to the export tax. The consumer subsidy leaves consumers unaffected compared to the export tax (that is, achieves the same welfare-enhancing objectives of the tax vis-à-vis consumers), increases the welfare of producers (again relative to the tax), and raises the country's net economic welfare. However, the subsidy has the drawback, compared to the export tax, that the Government incurs expenditure, rather than gains revenue.

Production Tax

Before the wave of agricultural market liberalization and reforms that many developing economies implemented in the late 1980s and early 1990s, many countries imposed direct taxes on agricultural production. However, by the 2000s, direct taxes of agricultural production of the type described in this section were rare, with most taxation of agricultural producers taking the more indirect form of border measures (Anderson, 2009). Nonetheless, production taxes are an alternative policy to export taxes, as argued by Emran (2005).

In figure 4, assume that rather than imposing an export tax of rate $(P^4 – P^3)/P^4$, the government enacts a per unit production tax equal to $P^4 – P^3$. The per unit tax shifts the supply curve from S_1 to S_2, where the vertical distance between the two curves equals the per unit tax. The quantity produced equals Q^4, the quantity consumed Q^1, and exports equal $Q^4 – Q^1$. Compared to free trade, the export volume is lower by $Q^5 – Q^4$, but compared to the export tax, the export volume is higher by $Q^2 – Q^1$.

Table 3

Welfare effects of alternative policies to a conventional export tax, relative to the tax

Compared to a conventional export tax:

Consumption subsidy (where the per unit subsidy equals the per unit export tax)
Consumers unaffected: no change in consumer price or volume purchased
Producers gain: producer price higher and volume produced greater
Government/taxpayers lose: export tax revenue lost and governnment expenditure on subsidy required
Domestic economy gains: producer gain exceeds government/taxpayer loss
Foreign consumers gain: export volume greater and, in the large-exporter case, world price lower

Production tax (where the per unit production tax equals the per unit export tax)
Consumers lose: consumer price higher and volume purchased lower
Producers unaffected: no change in producer price or volume produced
Government/taxpayers gain: tax revenue greater
Domestic economy gains: government/taxpayer gain exceeds consumer loss
Foreign consumers gain: export volume greater and, in the large-exporter case, world price lower

Modified conventional export tax
Consumers unaffected: no change in consumer price or volume purchased
Producers gain: producer price higher and volume produced greater
Government/taxpayers unaffected: no change in tax revenue
Domestic economy gains: consumers and government/taxpayers unaffected, while producers gain
Foreign consumers gain: export volume greater and, in the large-exporter case, world price lower

Note: All welfare effects above are relative to the conventional export tax, not to free trade. With all three alternative policies, foreign consumers would gain from the increase in exports, but they would also gain from a decrease in the world price only in the large-exporter case where the exporting country has world market power.

Source: USDA, Economic Research Service analysis.

Figure 4

Market effects of a production tax, small-exporter case

Source: USDA, Economic Research Service analysis.

A production tax of $P^4 - P^3$ has exactly the same effect on producers as does an export tax with the rate of $(P^4 - P^3)/P^4$. Compared to the free trade situation, both policies decrease producer output from Q^5 to Q^4, lower the after tax per unit revenue of producers from P^4 to P^3, and reduce producer welfare by P^3P^4HC. The production tax has exactly the same effect on consumers as free trade, as they purchase Q^1 at P^4 and have no change in their welfare. The government benefits compared to the export tax, as its revenue from the production tax of P^3P^4GC exceeds the revenue gained from the export tax by P^3P^4FB.

Given that the production tax reduces producer welfare by P^3P^4HC while earning the government revenue of P^3P^4GC, the tax results in a net welfare loss to the economy compared to free trade of CGH. However, compared to the export tax, the production tax increases net welfare by BEF. By expanding exports by $Q^2 - Q^1$ compared to the export tax, the production tax policy also benefits the rest of the world. If the country is a large enough exporter in the world market, the drop in the world price from the added exports would further benefit foreign consumers.

See again table 3 for a summary of the welfare effects of the production tax compared to the export tax. The production tax earns the government more revenue and increases net domestic welfare relative to the tax. Producers do not gain or lose compared to the tax. However, the production tax has the disadvantage that it does not achieve a major objective of the export tax of helping domestic consumers by increasing the volume purchased and lowering the purchase price.

Modified Conventional Export Tax

As previously discussed, two of the main objectives of export taxes are (1) benefiting consumers by increasing the volume of the good they purchase and lowering their purchase price and (2) earning tax revenue for the government. The consumer subsidy policy has the disadvantage compared to an export tax of requiring government expenditure rather than earning the government revenue. The production tax policy has the drawback compared to an export tax of decreasing consumer welfare because consumers do not see an increase in the volume purchased nor pay a lower price, as they do with a conventional export tax.

The policy we present in this section has the virtues that it increases exports, producer welfare, and net domestic welfare compared to the export tax, but it also benefits the country's consumers just as much (in figure 2 they purchase Q^2 at P^3) and generates the same government revenue (BFGC) as does the conventional export tax. In contrast to the two other alternative policies analyzed, a major domestic group (specifically, producers) benefits without any other group losing (consumers or the government/taxpayers).

The policy has two elements: (1) the export tax of rate $(P^4 - P^3)/P^4$ continues; and (2) once a combined total of Q^4 of output is either sold domestically or exported with the tax, producers can freely export more output.

Fulfillment of the condition component of element (2) will generate all the domestic market effects of a conventional export tax of rate $(P^4 - P^3)/P^4$. Returning to figure 1, the quantity Q^2 will be sold domestically at P^3, $Q^4 - Q^2$ will be exported at the world price of P^4 (though with an after-tax domestic producer price of P^3), and the government will earn tax revenue of BFGC. After selling Q^4 of their output in this way, producers will be permitted to export more than $Q^4 - Q^2$, with all the additional exports being free of any tax. For quantity greater than Q^4, producers return to supply curve S_1. Producers will produce up to Q^5 and export $Q^5 - Q^4$ of additional output at the world price of P^4. Compared to the economy's net loss from the export tax of BEF + CGH, the policy will reduce

the net loss to BEF, thereby salvaging some of the loss to the economy (CGH) from the unmodified tax. The increased exports will also reduce the negative impacts on the world market from the initial export tax. See again table 3 for a summary of the policy's welfare effects.

A potential challenge of this policy is that producers might not sell domestically or export with the tax enough of their production to meet the minimum sales requirement of Q^4 before further exports are allowed. To address this issue, in the rest of this report, output up to Q^4 whose cost of production is less than the domestic price P^3 will be referred to as low-cost production. Output beyond Q^4 whose cost of production is higher than P^3 will be termed high-cost production.

In order for the modified conventional tax policy to work, low-cost production of Q^4 must either be sold domestically or exported with the tax, because no untaxed exports will be allowed until this condition is met. Low-cost producers, however, will want to export their output without the tax, because untaxed exports earn a higher world price than the after-tax domestic price of P^3. In particular, some low-cost producers might try to be policy "free riders," hoping that the collective minimum sales condition necessary for additional untaxed export can be met without their involvement, permitting them to export their output at the higher world price.

The likelihood of the additional export policy working in practice is enhanced if low-cost producers also have some high-cost output. This is very probable for agriculture. Agriculture is characterized by increasing marginal cost of production, so all producers are likely to have an upward-sloping marginal cost of production curve. Consequently, each producer will produce up to the volume where the marginal cost of production equals the world price P^4. However, the policy can be further enhanced with a feature that increases the incentive for low-cost producers to meet the minimum sales requirement needed for additional untaxed exports.

Augmenting the Modified Conventional Export Tax With Export Licenses

The key elements of the export license addition are that when low-cost producers either sell their output domestically or export it with the export tax, the government gives them export licenses free of charge. After the low-cost producers meet the minimum sales requirement such that additional exports are allowed, producers can export only if they have a license to do so. The quantity of licenses issued will equal the volume of additional exports that the government desires. We assume that this desired additional volume equals the quantity of exports that will bring domestic production to the level that would occur under free trade—Q^5 in figure 2. This means that the quantity of licenses that the government issues to low-cost producers who sell Q^4 domestically or export with tax should equal $Q^5 - Q^4$. Assume that $Q^5 - Q^4$ equals one fourth of the volume of Q^4. For each unit of output that producers sell domestically or export with the tax, they will receive an export license for one-fourth of a unit (or more generally, a fraction of an export license equal to $(Q^5 - Q^4)/Q^4$).

Producers who earn export licenses can either use them for their own exports or sell them to other producers who want to export. A market for export licenses will facilitate any sales where low-cost producers who earn more licenses than needed to cover their own untaxed exports can sell them to high-cost producers who need licenses to export. The license market will increase the incentive for low-cost producers to satisfy the minimum sales requirement for additional exports by giving them something of value—the export licenses. The licensing scheme thereby enhances the compliance incentives of the modified tax policy, and with the country not only becoming better off (richer), but

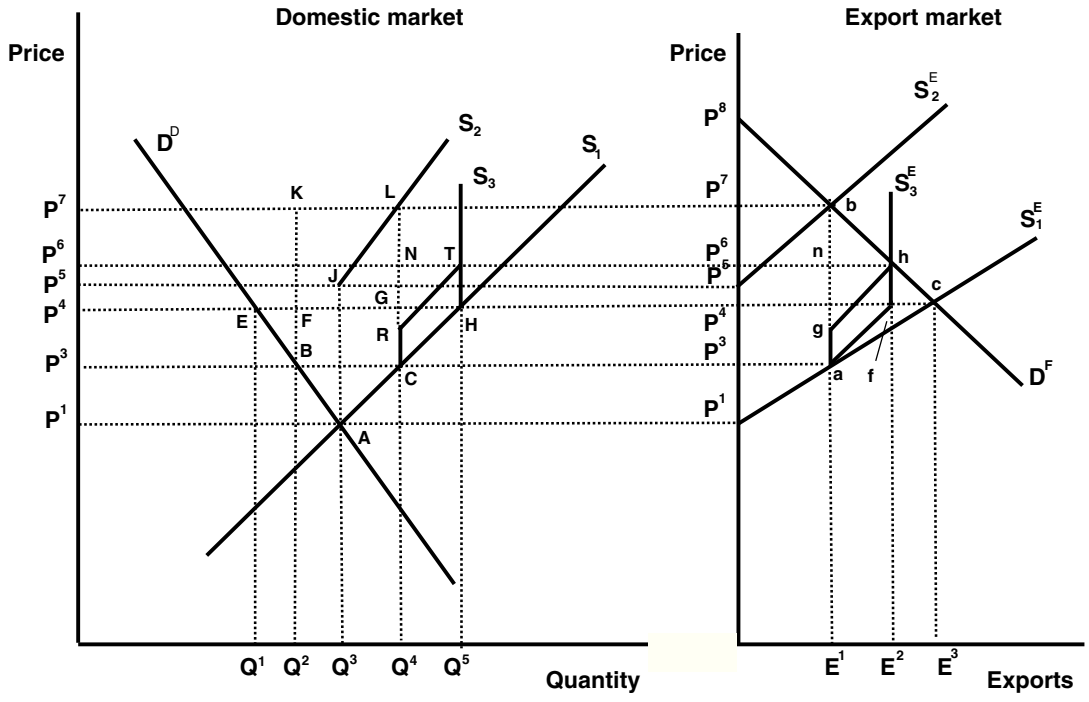
in a way whereby no one gains at the expense of others. That is, some can be made better off without others becoming worse off.

The market for the export licenses is generated from the domestic market for the exported good. We analyze the latter market with export licenses using the large-exporter (world market power) case. This is because world market power increases the welfare gain to both the domestic and world economy from the modified tax policy (compared to the conventional export tax), and also because the working of the policy is more illuminating in the large-exporter case.

Figure 5 builds on figure 2 for a conventional export tax in the large-exporter case, by adding the modified policy that allows additional exports, augmented with the policy feature of export licenses. In the export market panel of the figure, the opportunity that producers have to export more output creates another policy-conditional export supply curve S_3^E, which begins at point a on S_1^E. S_3^E identifies the additional exports that the country would supply on the world market. Since the domestic purchase volume of Q^2 will not change when tax-free exports are permitted, S_3^E in the export panel is parallel to S_1 in the domestic panel.

At point f on S_3^E, the license volume of $Q^5 - Q^4$ (which equals $E^2 - E^1$) makes the export supply curve vertical. S_3^E intersects D^F at point h, such that the additional exports sell on the world market at P^6. In an analogous fashion, in the domestic market panel at point H, the license volume of $Q^5 - Q^4$ creates the vertical policy-conditional supply curve of S_3. Given that these exports are sold at P^6, the domestic market equilibrium for the sale of these exports occurs on S_3 at point T.

Figure 5
Market effects of the modified conventional export tax with private export licenses, large-exporter case



Source: USDA, Economic Research Service analysis.

This policy modification increases producer surplus by CNTH in the domestic market panel of figure 5 (in contrast to only CGH in the small-exporter case, if the world price were P^4). The cost of an export license equals the world price at which the additional exports are sold (P^6) minus the price associated with Q^5 of output (P^4). That is, the export license price equals $P^6 - P^4$. Why is that the case? Over the output range of $Q^5 - Q^4$, the area between the world price at which the additional exports are sold (P^6) and the supply curve S_1 (which identifies the marginal cost of producing the additional output of $Q^5 - Q^4$) equals the profit (or surplus) that producers earn from producing and exporting this added output. This area equals CNTH. The license price is the difference between the world export price and the marginal cost of producing Q^5. As owners of the licenses that give producers the right to export additional output, the low-cost producers who earn these licenses can reap much of the new profit (surplus). Liefert et al. (2013) examines how the market for the export licenses is generated from figure 5 and shows how that market determines the license price of $P^6 - P^4$.

Over the range of $Q^5 - Q^4$, the export license price pushes the supply curve up from the line segment CH to RT. Because of the license scheme, high-cost producers who buy licenses and export transfer some of the producer surplus, equal to CRTH, to low-cost producers who earn export licenses by meeting the policy sales requirement for additional exports. High-cost producers gain the rest of the producer surplus, equal to RNT.

Summary Points of the Modified Conventional Export Tax With Export Licenses

In the domestic market panel of figure 5, the initial tax creates a policy-conditional supply curve of S_2, while the additional untaxed exports combined with the privately traded licenses generate the policy-conditional supply curve S_3 (which contains the line segment RT and becomes vertical at point T). The domestic market panel of figure 5 has three different market equilibria: (1) the domestic market equilibrium at point C, with price at P^3, production of Q^4, and domestic purchases of Q^2, all generated by the initial export tax; (2) world market equilibrium at point L for $Q^4 - Q^2$ exported with the tax, with the exports sold at P^7; and (3) a second world market equilibrium at point T for $Q^5 - Q^4$ of output exported with privately traded licenses, with these exports sold at P^6. The equilibrium price for the privately traded export licenses is $P^6 - P^4$. The export tax decreases exports from $Q^5 - Q^1$ to $Q^4 - Q^2$ (with the export decline equal to $E^3 - E^1$ in the export panel), while the modified policy restores $Q^5 - Q^4$ of the exports lost with the tax (corresponding to $E^2 - E^1$ in the export panel).

Note also in figure 5 that the country's world market power results in price discrimination in the export market by creating different markets (separated by a selling time interval) for exports of $Q^4 - Q^2$ and $Q^5 - Q^4$. The country sells $Q^4 - Q^2$ on the world market at P^7, while it sells $Q^5 - Q^4$ at the lower P^6. Just as domestic producers cannot export additional output unless they meet the requirement to dispose of Q^4 of output through a combination of domestic sales and taxed exports, foreign purchasers cannot buy additional exports (beyond $E^1 = Q^4 - Q^2$) unless they first purchase exports of $Q^4 - Q^2$ ($= E^1$), at the world price of P^7. The requirement that domestic producers must satisfy to allow additional exports and the requirement that foreign consumers must satisfy to allow additional exports mirror each other. The requirement that the modified conventional tax policy imposes on foreign consumers allows the exporting country to price discriminate against them on the world market. On the other hand, if the minimum sales requirement at price P^7 were not reached, no untaxed exports at the lower price of P^6 would occur, which provides an incentive for foreign

consumers to accept the price discrimination. Further, the additional exports increase the welfare of foreign consumers by the area nbh in the export panel of figure 5.[7]

We are not aware of any countries that have export taxes and have also adopted policies similar to the modified tax policy discussed here in order to increase exports. However, both the former Soviet Union and China enacted policies involving the domestic production and sale of agricultural output that shared the key feature of the modified tax policy. In the postwar period, Soviet farms were required to sell a minimum (quota) volume of output to the State at predetermined prices, but for many goods they could receive higher prices for output sold above that volume (Treml, 1982). A major facet of China's agricultural reforms that began around 1980 is that once farmers met a quota of output that had to be sold to the State at set prices, they were free to sell any output above that volume at higher market prices (Jinglian and Renwei, 1987), a practice that was later extended to State-owned industrial enterprises. This policy liberalization was a critical element behind the growth in Chinese agricultural productivity and output in recent decades. These Soviet and Chinese policies share the key feature of the modified tax policy discussed here, in that, once producers dispose of a minimum volume of output in a way determined by the State, they are free to sell any additional output, either to the State or on the free market, at higher prices.

Further Challenges in Implementing the Modified Tax Policy

The incentives for the additional export policy to work will probably be enhanced if the policy is adopted after a longstanding tax has already been in place for a number of production (market) periods. In that case, the tax will have already generated a steady and known volume of output and exports.[8] Producer reluctance regarding this policy might be reduced because the program's potential benefits will be more readily apparent. Low-cost producers will be able to see that if they continue to market their low-cost output as before at the same per unit net revenue, the augmented policy will allow them to earn additional revenue from selling the private export licenses given to them by the government or using those licenses for their own additional untaxed exports.

A related issue is that high-cost producers will face uncertainty about whether the requirement for additional exports will be met. This in turn means they will be uncertain about how much, if any, of their high-cost output they should produce. This situation is more likely if the additional output is sold as part of export agreements done through contracts. For example, assume that high-cost producers produce some of their high-cost output, but low-cost producers do not satisfy the minimum sales requirement that allows untaxed export of this additional high-cost production. In this case, to fulfill their export contracts, high-cost producers would have to sell their high-cost output at a loss in the taxed export market (at an after-tax per unit revenue below the marginal cost of production).

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[7]In discussing ways the WTO might handle export taxes and other restrictions, Anania (2013) presents another alternative to (or modification of) a conventional export tax. He suggests that countries that impose export taxes be required to export the same amount of the product as in recent years, or at least export a given minimum proportion of recent domestic production. In figure 5, this requirement would probably yield an export volume between the export-tax quantity of $Q^4 - Q^2$ and the free trade quantity of $Q^5 - Q^1$, and a domestic price between P^3 and P^4. Anania's policy suggestion would increase exports compared to the initial export tax and raise the country's overall economic welfare, though also reduce both consumer welfare compared to the export tax (the consumer price rises and the volume purchased falls) and government revenue from the tax. Nonetheless, Anania's policy alternative is in the spirit of the modified conventional tax policy discussed here, in that countries could retain the use of certain export restrictions, but take additional actions to reduce the measures' market distortion.

[8]The market might expand or contract over time, such that the exact volumes of production and exports that occur with the initial tax change somewhat between production (market) periods, especially if the world price changes.

This production uncertainty may pose a particular problem for producers of agricultural crops. Crop producers must commit at the start of (or at least early in) the production season to the amount of key inputs they will use during that production cycle (mainly land and seeds, but also, to some degree, inputs such as fertilizer and pesticides).

This uncertainty and potential financial risk can be minimized if producers initially adopt a conservative approach to expanding their high-cost output. In the first market period in which the new policy is enacted (say a year for a crop), some high-cost producers might expand marginally or not at all. Consequently, high-cost production in this period might be less than the full volume possible. Assume, though, that in this period, low-cost producers meet the minimum sales condition for additional exports. As the benefits from the policy for high-cost production are observed, there will be less uncertainty and more incentive to produce high-cost output in future market periods. In this way, the economy can move over time to the full amount of high-cost output that can be profitably produced and exported under the modified policy.

Another potential problem of the modified tax policy is that low-cost producers might initially sell domestically, for example, to wholesalers who do not intend to resell to domestic consumers or intermediate-product users, but rather export at the higher world price (with purchased privately sold export licenses) once additional exports are allowed. With the following administrative procedure, the government can ensure that the minimum sales requirement is not circumvented in this way: whenever output is initially sold (for example, to wholesalers), it can be officially recorded one of three ways: (1) output for domestic sale; (2) output for taxed export; or (3) output for untaxed export requiring a privately sold export license. Untaxed exports with a privately sold license would need to show documentation of that status.

Such procedures raise the question of whether many countries, especially emerging economies, have the administrative capacity for successful implementation. A particular challenge might be the information-gathering and accounting demands of managing the policy. How much market information does the government need to administer the modified tax policy effectively?

The information-gathering requirements for effective implementation of the policy are, in fact, fairly small. As discussed throughout this report, producers under this policy can be divided into three groups: (1) low-cost producers who sell their output domestically; (2) low-cost producers who export their output with the export tax; and (3) high-cost producers whose exports require a private export license. Successful implementation of the policy does not require that the government administrators know the output volumes associated with these three producer categories. The only output-related volume the policy administrators must determine is the total quantity of output that must be either sold domestically or exported with the tax as the minimum sales requirement for additional exports.[9] This volume should equal the quantity of production that will occur if the policy is just the conventional export tax (Q^4 in figures 1-5, that is, all low-cost production). Even if the specific sales volume that the government sets differs somewhat from this conceptually desired level, the policy can still work. However, this policy challenge will be minimized if a longstanding export tax has been in place, thereby providing the government with market information regarding the volume for the minimum sales requirement (Q^4).

[9]Consistent with this point, effective administration of the policy does not require that, with respect to figures 1-5, government officials know the position and shape of the three key curves that determine the market for the good: the total supply curve (S_1), domestic demand curve (D^D), and foreign demand curve (D^F).

Another challenge is the accounting requirements to accurately record and aggregate all output that is sold domestically and exported with the tax in meeting the minimum sales requirement.[10] However, just as low-cost producers have incentive to meet their minimum sales requirement that allows additional export, they also have incentive to report those sales to make the modified tax policy work administratively. Policy administrators will not have to identify and go to these low-cost producers. Instead, producers will have an incentive to report their sales for domestic use or taxed export to the government in order to obtain the private export licenses they have earned.

The administrative aspects of implementing the modified policy raise a more general point that the policy may face challenges if countries suffer from weak governance or corruption. Although this policy may encourage rent-seeking and corruption, conventional export taxes can do so as well. The modified tax policy can increase countries' overall economic welfare. The main effect of corruption and rent-seeking with this policy would be to redistribute the gains from trade, in particular who gets to export, at what price, and who keeps the tax revenue. The modified tax policy can increase that gain, even if some of its distribution is not as intended.

[10]Given that many countries have effectively implemented export and import quotas and tariff-rate quota regimes, most countries probably have the capacity to record the required export volumes. Recording all domestic sales would almost certainly be more challenging. An effective accounting system would need to be designed around each country's specific data-gathering and administrative systems.

Conclusions

This report examines the market effects of a conventional export tax, as well as alternative policies to the tax that are less market distorting, and thereby less welfare reducing. The alternative policies examined are (1) a consumer subsidy; (2) a production tax; and (3) a modification to the tax that allows additional exports after producers meet a minimum sales requirement for the domestic market and taxed exports. All three alternative policies result in a lower net welfare loss to the economy than does the conventional export tax and also increase the welfare of the rest of the world by increasing exports (compared to the export tax). If the exporting country is a large enough exporter of the good on the world market such that it has world market power, the increased exports will also benefit foreign consumers by lowering the world price at which they purchase the exports.

However, the three alternative policies to a conventional export tax analyzed here are all "second best" policies, with the first best policy being abolition of the export tax. Although the alternative policies may raise both domestic and world economic welfare beyond that achieved with the initial export tax, the increase in welfare will be less than that realized if the export tax were eliminated altogether.

The consumer subsidy policy also does not achieve a major objective common to many export taxes of earning the government revenue. Rather, it requires government expenditure for the subsidy. The production tax policy does not achieve another common goal of export taxes—that of benefiting consumers—because the purchase price is not lowered and the volume of the good purchased is not raised. The modified tax policy, however, does not compromise any of the goals typical of a conventional tax. Rather, this policy can achieve all the domestic objectives of the initial conventional export tax, but still increase exports, domestic producer welfare, net domestic welfare, and the welfare of the rest of the world.

The modified tax policy has the following three elements: (1) the original export tax is retained; (2) a minimum volume of output, set by the government, must either be sold domestically or exported with the tax; and (3) producers who contribute to meeting this minimum sales requirement are given free, and freely tradable, export licenses of a volume equal to the additional exports that the government desires. Once the minimum sales condition is met, additional untaxed exports are allowed using the government-issued export licenses. Producers who receive these licenses can use them for their own additional exports or sell them to other producers to use for their exports.

As a result of this policy structure, producers who contribute to meeting the minimum sales requirement capture part of the overall gain to the economy from the additional exports, thereby providing an economic incentive to meet the minimum sales requirement. In particular, producer incentives are enhanced because most producers have increasing marginal costs of production, so the export licenses will facilitate the profitable sale of some of their higher cost output. By disposing of their low-cost production in a way that satisfies the condition for untaxed export of their high-cost output, they serve their own interests. Alternatively, producers can capture the value of the export licenses they earn (from sales that meet the collective minimum sales requirement) by selling them to others. Further, if the country has world market power in the exported good, a third incentive exists for producers to comply with the policy: market power combined with the export tax allows the country to export at a higher world price than it would under completely free trade, even though that higher global price is lowered somewhat by the additional exports.

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Appendix: Models for Free Trade, an Export Tax, and the Modified Tax Policy

This appendix presents formal, equation-based models for markets involving an export tax. We examine models for three specific scenarios:

(1) The government allows free trade (export);

(2) The government imposes an ad valorem tax on exports;

(3) The government imposes an ad valorem export tax, allows additional untaxed exports once producers fulfill a minimum sales requirement set by the government, and institutes a private export licensing scheme for the additional exports.

For all scenarios, we present the model for the large-exporter (market power) case, as shown in figures 2 and 5.

We begin by defining the following variables for the good in question:

D^D is domestic demand;

D^F is foreign demand;

S is supply (domestic production);

S^E is the supply of exports to the foreign market;

P^D is the domestic price;

P^F is the foreign price;

t is the ad valorem export tax rate.

Model 1: Free Trade. We first present the market model when the government allows free trade (export). With free trade, the domestic price of the good P^D equals the foreign price P^F, such that $P^F = P^D = P$. The model consists of the following functions, each of which corresponds to a curve in figure 2 (where the corresponding curve in the figure is identified in the parentheses after each function name).

Domestic demand function (D^D): $D^D = D^D(P)$ (1a)

Supply function (S_1): $S_1 = S_1(P)$ (2a)

Export supply function (S_1^E): $S_1^E = S_1(P) - D^D(P) = S_1^E(P)$ (3a)

Foreign demand function (D^F): $D^F = D^F(P)$ (4a)

Market equilibrium occurs at the price where the quantity of the good demanded by foreign purchasers equals the quantity of the good supplied for export:

$$D^F(P) = S_1^E(P) \tag{5a}$$

In the export market panel of figure 2, this equilibrium occurs at point c, which corresponds to point H in the domestic market panel and which generates the equilibrium price P^4.

Model 2: Conventional Export Tax. Assume now that the government imposes an ad valorem export tax of rate *t*. The tax separates the values of P^D and P^F and makes P^D a function of P^F and *t*.

$$P^D = P^F(1 - t) = P^D(P^F, t) \tag{6a}$$

The market model changes to:

Domestic demand function (D^D): $$D^D = D^D(P^D) = D^D(P^D(P^F, t)) \tag{7a}$$

Supply function (S_2): $$S_2 = S_2(P^D) = S_2(P^D(P^F, t)) \tag{8a}$$

Export supply function (S_2^E): $$S_2^E = S_2\left(P^F, t\right) - D^D\left(P^F, t\right) = S_2^E\left(P^F, t\right) \tag{9a}$$

Foreign demand function (D^F): $$D^F = D^F(P^F) \tag{10a}$$

Market equilibrium now occurs where

$$D^F\left(P^F\right) = S_2^E\left(P^F, t\right) \tag{11a}$$

In the export market panel of figure 2, this equilibrium occurs at point b, which generates the higher price of P^7.

Model 3: Modified Tax Policy. Of the three alternative policies to an export tax examined in the report, we do not present the formal models for the consumption subsidy or production tax, given that the models for these policies are well established (see Varian, 2010). However, we do present the model for the modified tax, and when the model has the following features: (1) an export tax; (2) the government allows additional untaxed exports after domestic producers fulfill the minimum sales requirement; and (3) the government institutes a private export licensing system for the additional exports.

This model has the same variables and model equations as that involving just the export tax—that is, there are no fundamentally new variables or equations. However, most of the variables now divide into two groups, reflecting the fact that the export tax combined with the modified tax policy generates two markets: the first for production and exports with the initial export tax alone, and the second covering the additional production and exports allowed with the modified policy. As a result, new notation for the model variables is needed:

D_a^D is domestic demand;

D_a^F, D_b^F are foreign demand;

S_a, S_b are supply;

S_a^E, S_b^E are the supply of exports to the foreign market;

P_a^D, P_b^D are the domestic prices;

P_a^F, P_b^F are the foreign prices;

t is the ad valorem export tax rate;

L is the volume of private export licenses issued by the government.

The variables subscripted with *a* are the same as in model 2; that is, these variables (and corresponding functions) cover and are generated by the first market with just the export tax alone. The equilibrium condition in this first market (corresponding to point b in the export market panel in figure 5) is identical to that given in equation (11a), adjusted for the new notation:

$$D_a^F\left(P_a^F\right) = S_a^E\left(P_a^F, t\right) \tag{12a}$$

The variables subscripted with *b* cover and are generated by the second market for the additional output and untaxed exports with the modified tax policy. In figure 5, the relevant part of the supply curve S_1 for this market begins at point C (corresponding to prices above P^3), the supply curve for additional exports (S_3^E) begins at point a on S_1^E, and the relevant part of the foreign demand curve D^F begins at point b (corresponding to prices below P^7). Put another way, in the domestic market panel this second market begins at output quantity Q^4, and in the export market panel, this second market begins at the export quantity E^1. P_b^F is the foreign price at which the additional exports are sold (P^6 in figure 5 at equilibrium) and which producers receive for these exports. Given that all additional output is exported, the quantity domestically demanded and purchased remains unchanged at D_a^D, which means there is no D_b^D variable. D_b^F is the volume of additional exports demanded by foreigners with the modified policy, and S_b and S_b^E are the volumes of additional production/supply and exports supplied. Given that all additional output is exported, $S_b = S_b^E$.

The supply and export supply functions for this model/market are:

$$S_b = S_b^E = Min\{S_b\left(P_b^F\right); L\} \tag{13a}$$

Recall that the government restricts the volume of private export licenses distributed to low-cost producers to $Q^5 - Q^4$. In equation (13a), $L = Q^5 - Q^4$. For volumes of additional production/supply and exports less than $Q^5 - Q^4$, generated by prices between P^3 and P^4, the volume is determined by P_b^F. However, P_b^F values above P^4 will not generate additional production or exports, because the fixed volume of private export licenses precludes exports beyond $Q^5 - Q^4$. Therefore, for prices above P^4, the additional quantity produced and exported remains unchanged at L. This upper bound for additional supply and exports is reflected in figure 5 by the supply curve S_3 and export supply curve S_3^E both becoming vertical once $Q^5 - Q^4$ is produced for export. However, over the ranges of $Q^5 - Q^4$ and $E^2 - E^1$, S_3 and S_3^E both shift upward by the price of the private export licenses of $P^6 - P^4$.

Market equilibrium occurs at the price where foreign demand for additional exports equals the supply of additional exports:

$$D_b^F\left(P_b^F\right) = S_b^E = Min\{S_b\left(P_b^F\right); L\} \tag{14a}$$

In the export market panel of figure 5, equilibrium is determined by the intersection of D^F and S_3^E at point h, which determines the price at which the additional exports are sold of P^6. The additional exports equal $E^2 - E^1 = Q^5 - Q^4 = L$.