



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



IATRC

INTERNATIONAL AGRICULTURAL
TRADE RESEARCH CONSORTIUM

Working Paper

Modifying Export Taxes and Quotas

To Make Them Less Market-Distorting

William M. Liefert

Paul Westcott

John Wainio

July 2013

IATRC

Working Paper #13-04

International Agricultural
Trade Research Consortium

Modifying Export Taxes and Quotas
To Make Them Less Market-Distorting

William M. Liefert, Paul Westcott, and John Wainio*

Working Paper #13-04

The International Agricultural Trade Research Consortium is an informal association of University and Government economists interested in agricultural trade. Its purpose is to foster interaction, improve research capacity and to focus on relevant trade policy issues. It is supported by United States Department of Agriculture (ERS, FAS, OCE, and USITC), Agriculture and Agri-Food Canada and the participating institutions. The IATRC Working Paper series provides members an opportunity to circulate their work at the advanced draft stage through limited distribution within the research and analysis community. The IATRC takes no political positions or responsibility for the accuracy of the data or validity of the conclusions presented by working paper authors. Further, policy recommendations and opinions expressed by the authors do not necessarily reflect those of the IATRC or its funding agencies. For a copy of this paper and a complete list of IATRC Working Papers, books, and other publications, see the IATRC Web Site <http://www.iatrc.org>

A copy of this paper can be viewed/printed from the IATRC Web Site indicated above.

*The authors are economists with the Economic Research Service of USDA. They thank Barry Krissoff and Tim Graciano for helpful comments. The usual disclaimer applies. The views expressed in this paper are those of the authors, and may not be attributed to the Economic Research Service or U.S. Dept. of Agriculture.

Correspondence regarding this paper should be addressed to the author:

William Liefert
Economic Research Service
U.S. Dept. of Agriculture
355 E St, NW
Washington, DC 20024-3221
Phone: 202-694-5156
Fax: 202-245-4779
E-mail: wliefert@ers.usda.gov

July 2013
ISSN 1098-9210
IATRC
Working Paper #13-04

**Modifying Export Taxes and Quotas
To Make Them Less Market-Distorting**

William M. Liefert, Paul Westcott, and John Wainio
Market and Trade Economics Division
Economic Research Service, U.S. Dept. of Agriculture

International Agricultural Trade Research Consortium
Working Paper Submission

July 17, 2013

Abstract

This paper examines how conventional export taxes and quotas can be modified to make them less market-distorting, and thereby less welfare-diminishing. The modified policies achieve the same economic objectives of the tax or quota, such as reducing the domestic price of the exported good, increasing domestic purchases, and raising revenue, but also generate additional exports beyond the volume that the tax/quota alone would allow. Also, the policies do not involve any government subsidies to either producers or consumers. We examine two scenarios. The first is when a tax or quota is already in place, as in the case of longstanding export taxes that many countries maintain for exports of agricultural, fishery, and forestry products, minerals, and metals. The second scenario is when a measure is not yet in place but a country wishes to impose one, as in the case of short run agricultural export restrictions that countries have enacted in recent years to restrain increases in domestic food commodity prices. We also examine the outcome when the country does and does not have world market power in the exported good.

JEL Codes: F13, O24, Q17

Key words: trade policy, trade restrictions, export taxes, export quotas, export licenses, market power

The authors are economists with the Economic Research Service of USDA. They thank Barry Krissoff and Tim Graciano for helpful comments. The usual disclaimer applies. The views expressed in this paper are those of the authors, and may not be attributed to the Economic Research Service or U.S. Dept. of Agriculture.

Contact Author:

William Liefert
Economic Research Service
U.S. Dept. of Agriculture
355 E St, NW
Washington, DC 20024-3221
Phone: 202-694-5156
Fax: 202-245-4779
E-mail: wliefert@ers.usda.gov

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. According to information provided by Trostle (2008), FAO (2008), and Bouet and Debucquet (2010), during 2006-08 at least 17 countries wholly banned the export of at least one agricultural commodity, nine countries imposed export taxes, and 6 countries established export quotas or some other form of quantitative restriction. Sharma (2011) identifies that from 2007 to March 2011, 23 countries banned at least one agricultural product, and nine and seven created export taxes or quotas, respectively.¹ These restrictions were largely temporary, often lasting less than a year.

Another class of export control that has existed during the past few decades is medium to long term export taxes. From 1995 to 2002, the World Trade Organization (WTO) issued trade policy review (TPR) reports for 100 member countries. During this time, 39 of the 100 countries imposed an export tax on at least one product (OECD, 2003). Agricultural goods were taxed by 22 countries, the other taxed products being minerals, metals, and precious stones (17 countries), forestry products (13), fishery products (12), and leather, hides, and skins (9). An update of this study (Kim, 2010) showed that from 2003-09, 65 of 128 countries for which the WTO did TPRs applied export taxes – 36 countries on agricultural products, 28 on minerals, metals and precious stones, 17 on leather, hides, and skins, 15 on forestry products, and 13 on fishery goods. Bonarriva, Koscielski, and Wilson (2009) report that of 131 countries examined by a WTO TPR from 1994 to 2009, 72 (55 percent) imposed export taxes, with 90 percent of these 72 countries taxing agricultural products.² Both the temporary restrictions on agricultural exports of recent years and longstanding export taxes have been overwhelmingly created by developing or

emerging market economies rather than developed countries.

In this paper, we divide agricultural export restrictions into the two classes of temporary policy responses to food commodity price surges and more longstanding export taxes that have different (and more long term) economic motives (examined in the next section). However, the lists we just examined (giving the specific number of countries imposing restrictions) for these two types of controls are not mutually exclusive and can overlap. In particular, some measures enacted since 2006 are probably counted in both category lists.

Export restrictions impact countries' domestic markets – prices, the volumes of production, consumption, and trade of goods, and producer and consumer welfare – with the domestic consumers/users of the affected products benefiting and their producers losing. If countries have market power in the goods concerned, the reduction in supplies put on the market because of the measures also raise world prices. Foreign consumers and producers are impacted in the opposite directions of those in the countries imposing the measures. Countries that restricted agricultural exports during the surges in agricultural and food prices of 2006-08 and 2010-12 received strong criticism that their actions were further increasing world prices for food commodities, and thereby exacerbating food insecurity and poverty among the world's poorest.

Anderson and Nelgen (2011), Yu et al. (2011), and Martin and Anderson (2012) empirically examine how countries' policy responses to the recent surges in world agricultural and food prices (involving both export restrictions and relaxation of import controls) affected world markets. For example, Martin and Anderson find that during 2005-08, countries' trade policy responses accounted for 30 percent of the rise in the international wheat price, and 45 percent of the price increase for rice during 2006-08.

Our paper has a different focus, in that it examines how conventional export taxes and

quotas can be modified to make them less market-distorting, to both the countries that impose the measures and also world markets (if the enacting countries have world market power). More specifically, we attempt to identify policies that would achieve the specific objectives of export taxes and quotas, but in a way that allows more of the affected products to be exported, and thereby distorts markets less. Also, the modified policies do not involve any government budget subsidies to either the producers or consumers of the exported good.

We examine separately the cases of a temporary tax or quota created in response to rising world prices versus a longstanding export tax or quota. For both temporary and longstanding policies, the paper also analyzes scenarios involving the small and large country assumptions – that is, whether the country enacting the measure is a price-taker or has world market power in the exported product.

Our paper does not examine alternative policies to complete export bans, since that issue is the focus of Liefert, Westcott, and Wainio (2012). Nonetheless, much of our analysis is based on the framework of that earlier study. Although our focus is specifically on restrictions for agricultural exports, the analysis largely applies to export taxes and quotas for any type of product.

The paper is organized as follows. The next section examines countries' objectives in creating export restrictions, and their effects on both the domestic and world market. The subsequent two sections examine less-distorting alternative policies for the two types of export restrictions we have identified – short term measures and more long term taxes and quotas. The section before the Conclusion discusses challenges in implementing our proposed policies. Some of these challenges might come to the reader's mind in the earlier sections where the modified policies are first presented and examined. To maintain the paper's analytical flow, we

leave the discussion of most of these problems to the end of the paper.

The Market Effects of Export Taxes and Quotas

Objectives of Export Taxes and Quotas

Mitra and Josling (2009), Bonarriva, Koscielski, and Wilson (2009), and Anderson and Nelgen (2011) analyze the market effects of export bans, taxes, and quotas. However, the analysis is incomplete for our purposes, especially the handling of the case where the country has world market power. Given that the focus of our paper is to identify policies that would achieve the specific objectives of conventional export taxes and quotas, but allow more of the affected good to be exported, we must begin by identifying the main economic motives and goals of export taxes and quotas.

Drawing largely from Mitra and Josling (2009), Bonarriva, Koscielski, and Wilson (2009), Kim (2010), and Bouet and Debucquet (2010), we can identify four main reasons why a government might impose these measures: (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 its domestic price;³ and (4) if the exported good is an agricultural product, to improve domestic food security by increasing the volume of the foodstuff made available for domestic sale and restraining its price.

The first three motives identified – 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 have market power in world trade, while the other two motives are enhanced if the country has market power (because restricting outflow of the good raises its export price).

Small Country Scenario

We first examine the effect on the domestic market of an export tax, when the tax-imposing country is small in the world market (no market power in the exported good). In the domestic market panel of figure 1, D_D and S^1 are the domestic demand and supply curves. Assume that the product's world price is P^4 , such that the foreign demand curve for the export is the horizontal line D_F anchored at P^4 . With free trade, the country produces Q^6 , domestically purchases Q^1 , and exports $Q^6 - Q^1$. In the export market panel of the figure, D_E is the foreign demand curve for the export (as faced by the country), and S_E^1 is the curve for the supply of the export that the country puts on the world market. At any price above P^1 , S_E^1 gives the horizontal distance between S^1 and D_D . At world price P^4 , equilibrium is determined by the intersection of D_E and S_E^1 at V , such that exports equal E^3 ($Q^6 - Q^1$ in the domestic market).

Assume now that the country imposes an ad valorem export tax, with the tax rate equaling $(P^2 - P^1)/P^2$, which also equals $(P^4 - P^3)/P^4$. 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. S^2 gives the quantity of the good produced (whether sold to domestic or foreign consumers) at any *world price* above P^2 .⁴

The tax creates a new market equilibrium where D_F and S^2 intersect at point G . The tax lowers the domestic price to P^3 , increases domestic purchases to Q^2 , reduces production to Q^4 , and decreases exports to $Q^4 - Q^2$. Domestic consumer surplus rises by P^3P^4EB , producer surplus falls by P^3P^4HC , and the government gains tax revenue of $BFGC$. The country suffers a net

welfare loss of BEF and CGH.

In the export market, the tax creates a new policy-conditional export supply curve S_E^2 , derived as follows. An export tax of rate $(P^2 - P^1)/P^2$ would preclude any exports at any world price below P^2 . This is because at such a price, the after tax per unit revenue that 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 export tax creates a domestic price lower than the world price, but higher than P^1 . That domestic price generates a greater quantity of the good produced and a lesser quantity domestically purchased. The difference between those two quantities equals the excess supply available for export, which yields the point on S_E^2 in the export market associated with the given world price. For example, with an export tax of rate $(P^2 - P^1)/P^2$, a world price of P^4 generates domestic price P^3 . This creates the excess supply of $Q^4 - Q^2$ put on the world market, or E^1 in the export market. The new equilibrium is given by the intersection of D_E and S_E^2 at point O, such that E^1 is exported ($Q^4 - Q^2$ in the domestic market panel).

If the export tax were per unit rather than ad valorem, S^2 in the domestic market would be parallel to S^1 , with the vertical distance between them equaling the per unit tax. If an export quota were imposed instead of a tax, say of $Q^4 - Q^2$, then a different and vertical policy-conditional supply curve S^3 would be created beginning at point C, as well as a new corresponding S_E^3 in the export market. Market equilibrium would again occur at point G in the domestic market and at O in the export market. An export quota of $Q^4 - Q^2$ is the quota equivalent of an export tax rate of rate $(P^2 - P^1)/P^2$, and therefore yields the same equilibrium prices, volumes, and welfare effects as the tax, including the same government revenue (if the

quota licenses were sold at a per unit price of $P^4 - P^3$).

Export quotas require that the state sells export licenses, and figure 2 presents the market for them. The export quota creates a vertical license supply curve S^1 anchored at L^1 , where L^1 equals $Q^4 - Q^2$ (or E^1) in figure 1. The license demand curve D^1 is derived as follows. For output over the range from Q^3 to Q^6 , the maximum price that any producer is willing to pay for an export license is given in figure 1 by the difference between the world price the producer would get from exporting (P^4) and his marginal cost of producing the good. For the first export license within this range, a producer would pay a price virtually equal to $P^4 - P^1$, which equals R^2 in figure 2.

For output over the range of Q^1 to Q^3 , the maximum price that any producer is willing to pay for an export license is given by the difference between the world price (P^4) and the price the producer would get alternatively from selling domestically (the vertical distance between D_F and D_D). For example, for export licenses equal to $Q^4 - Q^2$ (L^1 in figure 2), producers will pay $P^4 - P^3$ (R^1 in figure 2). This is because P^3 is the marginal cost of producing Q^4 of output, as well as the price at which Q^2 of output could alternatively be sold domestically.

From another point of view, with a license price of $P^4 - P^3$, producers will demand a license volume of $Q^4 - Q^2$ (L^1 in figure 2). With a license price of 0, producers will demand $Q^6 - Q^1$ of licenses (L^3).⁵ Market equilibrium for the export licenses is given in figure 2 by point A, creating an export license price of R^1 ($P^4 - P^3$).

The export tax (or quota equivalent) in figure 1 can achieve three of the four objectives of export restrictions identified earlier. It raises government revenue (by BFGC). The tax/quota also lowers the domestic purchase price (by $P^4 - P^3$). If the good is used as an intermediate input by a domestic processing industry, the tax/quota gives the processors a cost advantage vis-à-vis

foreign competitors. If the good is a foodstuff, the tax/quota reduces the price and increases the purchases of domestic consumers (by $Q^2 - Q^1$). The only goal not achieved is raising the export price and thereby improving the country's terms of trade, which is unrealizable because of the small country assumption.

The producer loss from the export tax or quota can be divided into two parts. The first is that by selling part of Q^4 domestically at P^3 and exporting the rest for an after tax per unit revenue also of P^3 , producers lose surplus of P^3P^4GC over this level of output. Part of this surplus loss is captured by the consumer surplus gain of P^3P^4EB and part by the state revenue of $BFGC$, resulting in a net welfare loss to the country of BEF . The second producer loss is that the drop in production and exports of $Q^6 - Q^4$ from the tax/quota eliminates the producer surplus of CGH , without any countervailing gain to domestic consumers or tax revenue.

Our article focuses on whether the government could modify a conventional tax/quota policy such that it would benefit the country's consumers just as much (they purchase Q^2 at P^3) and generate the same government revenue ($BFGC$) as would the standard export tax or its quota equivalent, but also allow producers to produce and export more output (specifically $Q^6 - Q^4$) at the world price of P^4 . Such an expanded policy would salvage some of the loss to producers (CGH) compared to the pure export tax or quota.

A country could try to achieve some of the objectives of export taxes/quotas with budget subsidies. A per unit subsidy to domestic consumers of P^3P^4 would motivate them to purchase Q^2 at price P^4 . (The subsidy would shift D_D upward such that it intersects D_F at point F.) However, because of the subsidy, consumers would pay a net "price" of only P^3 . Producers would produce Q^6 , sell Q^2 domestically, and export $Q^6 - Q^2$ at world price P^4 .

However, the subsidy would cost the government/taxpayers P^3P^4FB . Rather than gaining

revenue of BFGC, the government would incur expenditure. The country would also suffer a net welfare loss of BEF compared to the free export outcome, though the welfare loss would be lower (by CGH) than the net welfare loss from a complete export ban. A consumer subsidy therefore would be preferable to an export tax or quota on welfare grounds, but it would require that governments have the budgetary revenue and political support to enact the policy. Our goal therefore is to identify policies that would result in (1): Q^2 being sold to domestic consumers at P^3 ; (2) $Q^4 - Q^2$ being exported with either an export tax or quota, earning the state revenue of BFGC; (3) $Q^6 - Q^4$ being exported with no tax or quota at world price P^4 ; and (4) no subsidies being given to consumers or producers.

Large Country Scenario

We next examine the market effects of an export tax or quota with the large country assumption, that is, when a country has world market power in the exported good. Figure 3 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, though it appears in the export market panel as D_E . In the domestic market, D_T^1 is the total demand curve for the good, where total demand is the horizontal sum of domestic and foreign demand. Free trade market equilibrium is determined by the intersection of D_T^1 and S^1 at point H. The price (both domestic and world) is P^4 , quantity produced Q^6 , quantity domestically purchased Q^1 , and quantity exported $Q^6 - Q^1$.⁶ In the export market, equilibrium occurs with the intersection of D_E and S_E^1 at V, creating exports of $E^3 (= Q^6 - Q^1)$.

Assume now that the government imposes an export tax of rate $(P^5 - P^1)/P^5$ (which also equals $(P^7 - P^3)/P^7$). The export tax creates a new policy-conditional total demand curve D_T^2 for

all world prices above P^1 . This is because over that range of world prices, the export tax increases domestic demand, and thereby total demand. The following fleshes out this result.

An export tax of rate $(P^5 - P^1)/P^5$ would prevent any exports for all world prices below P^5 . This is because at such prices, the after tax per unit revenue that domestic suppliers would receive from producing and exporting the good would fall below the domestic autarky price P^1 . Consequently, producers once again would not export. Given that world prices below P^5 discourage export, for the world price range between P^1 and P^5 , market equilibrium is the autarky outcome determined by point A. Q^3 of production is sold domestically at P^1 . Consequently, for the world price range between P^1 and P^5 , as the world price rises, the quantity domestically purchased does not drop, but rather remains fixed at Q^3 . This means that for world prices between P^1 and P^5 , the total demand curve shifts right from D_T^1 to D_T^2 by the horizontal distance between D_D and the vertical line anchored at Q^3 . For example, at price P^5 , D_T^2 lies to the right of D_T^1 by $NR = LM$.

However, a kink occurs in D_T^2 at point R, given that this is the point on the curve associated with the world price of P^5 . As the world price moves above P^5 , the after tax per unit revenue that producers would receive from exports rises above the autarky price P^1 . A rise in the world price above P^5 would thereby increase the domestic price above P^1 , such that S^2 comes into play. S^2 is the policy-conditional supply curve that gives the total quantity of the good produced at any world price above P^5 , given the existing tax. The rising domestic price increases the quantity of the good produced, as well as decreases the quantity domestically purchased. This means that for all world prices above P^5 , D_T^1 shifts right by the horizontal distance between D^D and the vertical line anchored at Q^3 , *minus* the drop in the domestic quantity demanded of the good from the domestic price increase. For example, at world price P^7 , D_T^1 shifts right at point T

by UY (the distance between D_D and the vertical line anchored at Q^3) minus XY (which equals $Q^3 - Q^2$). That is, D_T^1 shifts right by $(UY - XY) = UX$, which equals TZ .

Market equilibrium with the tax is determined by the intersection of D_T^2 and S^2 at point Z . Q^4 is produced, Q^2 sold domestically at P^3 , and $Q^4 - Q^2$ exported at the new world price P^7 . The export tax earns the government revenue of $BXZC$.

In the export market, the tax creates the export supply curve S_E^2 . It is derived as before in the small country scenario. A world price above P^5 generates a corresponding lower domestic price, which motivates a 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_E^2 corresponding to the world price. Export market equilibrium occurs where D_E and S_E^2 intersect at point O , such that $E^1 (= Q^4 - Q^2)$ is exported.

The export quota equivalent of an export tax of $(P^5 - P^1)/P^5$ is a quota of $Q^4 - Q^2$. The export quota creates the vertical policy-conditional supply curve S^3 beginning at point C . The quota also generates a new policy-conditional demand curve D_T^3 , derived as follows. For any world price between P^1 and P^3 , the quota is non-binding, because the domestic market will generate exports less than $Q^4 - Q^2$. For every world price above P^3 , the quota is binding, and restricts exports to $Q^4 - Q^2$. Also for every world price above P , the export quota fixes domestic purchases of the good at Q^2 . This means that for every price above P^3 and beginning at point K , the total demand curve shifts right from D_T^1 to D_T^3 by the horizontal distance between D_D and the vertical line anchored at Q^2 . For example, at P^4 the total demand curve shifts right by HI , which equals EF .

Given the quota of $Q^4 - Q^2$, D_T^3 identifies the total quantity of the good demanded at any world price above P^3 . It lay to the right of D_T^1 because for any world price greater than P^3 , the

quota increases the quantity of the good domestically demanded above the quantity that would be demanded without the quota. Market equilibrium occurs where D_T^3 and S^3 intersect at Z.

In the export market beginning at point W, the quota creates S_E^3 . The new equilibrium occurs where D_E and S_E^3 intersect at O. The quota once again generates the same domestic and world equilibrium prices, production, consumption, and export volumes, and welfare effects as an export tax of rate $(P^5 - P^1)/P^5$, including the same government revenue (if the quota licenses are sold at a per unit price of $P^7 - P^3$).

In the market for the state-sold export licenses in figure 2, the license supply curve again is S^1 , anchored at L^1 ($Q^4 - Q^2$). However, world market power for the export shifts the demand curve for licenses upward from D^1 to D^2 . This is because with market power, restricting exports to $Q^4 - Q^2$ allows the country to raise the price at which it sells the exported good on the world market. This in turn increases the price exporters are willing to pay for export licenses.

More technically, the demand curve for export licenses in figure 2 can be derived from the export market panel in figure 3. The maximum price that an exporter is willing to pay for an export license equals the vertical distance between D_E (the maximum price a foreign buyer is willing to pay for that additional unit of the good exported) and S_E^1 (the minimum per unit revenue a producer must receive to export that unit). For the first unit of the good to be exported, the maximum price a producer is willing to pay for an export license equals $P^8 - P^1$, which equals R^4 in figure 2. At an export license price of 0 in figure 2, the quantity demanded of export licenses is L^3 , which equals E^3 in figure 3 (and $Q^6 - Q^1$ in the domestic market panel). Area P^1P^8V in the export market panel of figure 3 equals area OR^4L^3 in figure 2.

With license supply fixed at L^1 , the new license market equilibrium is determined in figure 2 by point B. This yields a license price of R^3 , which in figure 3 equals $P^7 - P^3$.

The analysis shows that if a country has world market power in the exported good, an export tax or quota not only fulfills the main objectives of an export restriction, but also brings greater economic gain to the country compared to no market power. First, the tax/quota generates government revenue of BXZC, compared to only BFGC without market power. Second, it allows the country to flex its market power by raising the price at which it sells the export to foreigners from P^4 to P^7 , which improves the country's terms of trade. Third, the tax/quota improves the competitiveness vis-à-vis the foreign competition of domestic processors who use the exported good as an input, 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 creates a gap between the domestic and world price for the good of $P^7 - P^3$, compared to only $P^4 - P^3$ without market power. Fourth, the tax/quota decreases the domestic price from P^4 to P^3 and increases domestic purchases from Q^1 to Q^2 . If the main goal of the tax/quota is to help domestic consumers in this way which is independent of any world market effects, the economic benefits with respect to this objective are no different whether or not the country has world market power.

As in the no market power scenario, the export tax/quota results in welfare losses to the country of BEF and CGH. However, the tax/quota increases government revenue by FTZG more compared to the no market power scenario, a magnitude so large that it exceeds BEF plus CGH. This demonstrates how an export tax/quota combined with world market power can result in net welfare gain to a country. Yet, our goal once again is to identify policies that will yield all the market results of a tax/quota as demonstrated in figure 3, but also allow domestic producers to export $Q^6 - Q^4$ more of the good at the world price, and thereby not suffer the welfare loss of CGH.

Modifying Export Taxes and Quotas when a Restriction is Already in Place

In the Introduction, we divided agricultural export restrictions into two groups: those which are longstanding (typically taxes) and those which are temporary responses to current conditions (such as rising food commodity prices). In considering how to modify or augment these policies to increase the gains from trade (or more specifically, reduce the welfare loss from the export restriction), the key difference is that with longstanding policies a measure is already in place, while with a temporary policy response a new measure must be created. This means that with the former type of policy, the government has the key advantage that it already knows how the policy restriction affects the market, while with the latter policies it does not. With the former policy, producers also have the advantage of being familiar with it, knowing how the policy works and what to expect.

In this section, we examine ways to modify conventional export taxes and quotas to make them less market-distorting, when a tax or quota already exists. In the subsequent section, we examine modified policies to conventional quotas and taxes when a restriction is not yet in place, such that initially there is free export of the good, but the government wishes to implement a tax or quota.

Small Country Scenario

We begin by examining how to modify an export tax to make it less market-distorting, when the tax is already in place and the country is too small to have world market power in the exported good. Figure 4 reproduces and adds to figure 1. Assume again that the world price for a country's exported good is P^4 and an export tax already exists of rate $(P^2 - P^1)/P^2$, such that Q^4 is produced, Q^2 domestically purchased at P^3 , $Q^4 - Q^2$ exported, and the government earns export tax revenue of BFGC. We propose a less-distorting policy that will achieve these market outcomes but also allow additional exports at world price P^4 . The policy has three elements: (1)

the export tax of rate $(P^2 - P^1)/P^2$ continues; (2) a combined total of Q^4 of output must be either sold domestically or exported with the tax; and (3) once element/condition (2) is achieved, producers can freely export more output. Fulfillment of condition (2) will generate all the market effects of a conventional export tax of rate $(P^2 - P^1)/P^2$: Q^2 will be sold domestically at P^3 , $Q^4 - Q^2$ will be exported, and the government will earn tax revenue of BFGC. After disposing of Q^4 of their output in this way, producers will export $Q^6 - Q^4$ at world price P^4 , with the government taking none of the added revenue earned.

In the rest of this paper, output whose marginal cost of production is less than the domestic price P^3 will be called low cost production (output up to Q^4). Output whose marginal cost of production is higher than P^3 will be called high cost production (output beyond Q^4). In order for this policy to work, low cost producers must either sell domestically or export with the tax *all* their low cost production (Q^4), because no untaxed exports will be allowed until this condition is met. However, low cost producers will want to export all their output without the tax, because untaxed exports earn the higher retained per unit revenue of P^4 rather than P^3 .

The main risk and weakness of this policy is that low cost producers might not sell domestically or export with the tax all their low cost production to meet the requirement that allows further exports. Some low cost producers might try to be policy “free riders,” in that they hope condition (2) can be met without their involvement, freeing them to export all their output at the higher world price. Other low cost producers might think that if enough of them withhold their product from the domestic market or from taxed exportation, they can break the policy, such that the government will drop it and allow completely free export. To be credible, the government must convince all low cost producers that it will absolutely maintain the ban on additional export until the minimum sales condition is met.

Because of these incentive problems, this modified policy might not work in practice. However, the likelihood that the policy would succeed increases if all low cost producers have some high cost output. This is very probable, at least for agriculture and energy and metals extraction. All producers in these industries should have an upward-sloping marginal cost of production curve, such that each will produce up to the volume where the marginal cost equals world price P^4 .

The incentives for the modified policy to work would be even stronger if each producer had a linear marginal cost curve that began at the origin, though not necessarily with the same slope (though each producer would have a constant price elasticity of supply equal to 1). This would result in the ratio of each producer's high to low cost production being equal, that is, for each producer the ratio of $Q^6 - Q^4$ to Q^4 would be the same. Because each producer could export the same fraction of his output at the world price if each sold his low cost output domestically or exported with the tax, incentives might be sufficiently strong for producers to dispose of all their low cost output as required by the policy. However, it is unlikely that all producers would have linear marginal costs.

We can expand the policy in a way that increases the incentives for low cost producers to meet the requirement for additional export. With this stronger policy, the same conditions apply as before, but with this added change: after low cost producers sell Q^4 domestically or export it with the tax, producers can export more, but they must have an export license. These licenses are given to producers for free when they sell domestically or export with tax, and the quantity of licenses the government issues would equal the volume of additional exports that the government desires of $Q^6 - Q^4$. For example, assume that $Q^6 - Q^4$ equals one quarter the volume of Q^4 . For each unit of output that producers sell domestically or export with tax, they would receive an

export license for one-fourth of a unit (or more generally, a fraction of an export license equal to $(Q^6 - Q^4)/Q^4$).

Producers who earn export licenses could either use them to export themselves, or sell them to other producers who want to export. If we again assume that all producers have linear marginal cost (supply) curves that begin at the origin, all producers would earn the exact quantity of licenses needed to cover their own additional, untaxed exports. Yet, we mentioned earlier that this cost condition is unlikely to hold in the real world. Some producers would be mainly low cost producers and some mainly (or even exclusively) high cost producers.

This policy therefore requires that a market exist for the export licenses whereby low cost producers who earn a surplus of licenses (more than needed to cover their own exports) can sell them to high cost producers who need licenses. This license market would increase the incentive for low cost producers to satisfy the requirement for additional exports by giving those who do their part something of additional value — the export licenses.

Figure 5 examines the market for these licenses. Assume that D^1 is the demand curve for the export licenses, derived from figure 4. The price that any high cost producer is willing to pay for an export license is given in figure 4 by the vertical distance between the world price the producer would get from free export (P^4) and his marginal cost of producing the good for export. The triangle OR^4L^2 in figure 5 is the same (inverted) triangle CGH in figure 4 (with figure 5 drawn at larger scale than figure 4). This means that R^4 in figure 5 equals $P^4 - P^3$ in figure 4 and L^2 equals $Q^6 - Q^4$. Also, the area OR^4L^2 in figure 5 (the maximum “surplus” high cost producers could gain if they were given the licenses for free) equals the producer surplus area CGH in figure 4 that producers could potentially achieve from exporting $Q^6 - Q^4$.

We mentioned earlier that if the government desires additional exports of $Q^6 - Q^4$ in

figure 4, it would distribute export licenses equal to this quantity (L^2 in figure 5). Yet, issuing such a volume would be self-defeating. Figure 5 shows that if L^2 of export licenses were issued, the supply curve for licenses (S^1) would be vertical at that volume. The market would drive the price of licenses down to 0. With the licenses being worthless, low cost producers in figure 4 would have no license-related incentive to sell domestically or export with tax the volume Q^4 .

In order for the licensing program to create some incentive, the government must issue a license volume less than $Q^6 - Q^4$ in figure 4 (or L^2 in figure 5). Assume in figure 4 that the government issues licenses equal to $Q^5 - Q^4$, which corresponds to L^1 in figure 5. This would create a license price in figure 5 of R^1 , thereby giving the licenses value to the low cost producers who earn them. Consequently, in figure 4 $Q^5 - Q^4$ of additional output would be produced for export at world price P^4 . In order to create value for the licenses and thereby have the licensing scheme work in providing incentives to low cost producers to meet the condition for more exports, the government must reduce the initially desired volume of additional exports ($Q^6 - Q^4$).

The licensing program creates another policy-conditional supply curve in figure 4, S^4 , which covers the additional exports (with S^2 continuing to exist from the export tax). Because high cost producers must buy a license to export, the supply curve for production beyond Q^4 shifts up by the price of the license ($CL = NM$ in figure 4 = R^1 in figure 5). For prices above the world price P^4 , S^4 becomes vertical, because no more export licenses are available. Market equilibrium occurs where S^4 intersects D_F at point M.

In the export market panel of figure 4, the policy creates a new export supply curve of S_E^4 for exports beyond E^1 . Between E^1 and E^2 , S_E^4 is the line segment TR, and at export volume E^2 , S_E^4 becomes vertical, again because the export license volume is now fixed. The export market

equilibrium is given by point R, and the additional export volume of $E^2 - E^1$ equals $Q^5 - Q^4$ in the domestic market.

This policy modification increases producer surplus by CGMN in the domestic market. High cost producers gain surplus of LGM. However, because of the license scheme, high cost producers who buy licenses and export transfer some of their potential surplus equal to CLMN to low cost producers who earn export licenses by meeting the policy requirement for additional exports. The loss of producer surplus of CGH with the pure export tax policy has been reduced to NMH.

As mentioned earlier, in order to create a price for the export licenses, the policy requires that the state issue licenses by a volume less than $Q^6 - Q^4$. However, given that we are proposing a modification to the preexisting policy of an export tax of rate $(P^2 - P^1)/P^2$, the government will not know beforehand exactly where point H is on the supply curve, that is, where S^1 intersects D_F . It therefore does not know the exact volume of $Q^6 - Q^4$ (L^2 in figure 5) to use as the base for determining the actual number of export licenses to distribute of $Q^5 - Q^4$. Given that a license supply greater than $Q^6 - Q^4$ drives the license price down to 0, the government would need first to estimate $Q^6 - Q^4$, and then issue a license volume less than this amount to create a license market price.

Assume now that rather than an export tax initially being in place, an export quota already exists of $Q^4 - Q^2$. A policy can be created which achieves all the market outcomes of this quota, but also allows high cost producers to export $Q^5 - Q^4$. This policy is identical to that just examined when an export tax initially is in place, except that the requirement for allowing exports beyond the quota of $Q^4 - Q^2$ is that Q^4 must either be sold domestically or exported with a license purchased from the state (at price $P^4 - P^3$). Such a policy would yield exactly the same

market outcomes and welfare effects as when the policy involves an initial export tax of rate $(P^2 - P^1)/P^2$.

If our proposed modified policy involves an initial export quota rather than a tax, one market (figure 2) will exist for the export licenses that must be purchased from the state (called state-sold licenses) to export $Q^4 - Q^2$, and a separate market (figure 5) will exist for the licenses that high cost producers must purchase from low cost producers for export of $Q^5 - Q^4$ (called private licenses). Note that low cost producers earn some of these private licenses by purchasing state-sold licenses for export of $Q^4 - Q^2$, with the rest of the private licenses being earned from selling output domestically.

Large Country Scenario

Our modified policy in the case of an initial export tax or quota in the large country scenario is largely the same as in the small country case. Figure 6 reproduces and adds to figure 3, and gives the domestic market equilibrium for a conventional export tax of rate $(P^5 - P^1)/P^5$ or export quota of $Q^4 - Q^2$ when the country is large enough to have world market power. Recall that market equilibrium in each case occurs at point Z, with Q^4 produced, Q^2 domestically sold at P^3 , and $Q^4 - Q^2$ exported at P^7 , and government revenue equals $BXZC$ from either the tax or sale of export licenses.

The policy in the large country scenario that will allow exports beyond $Q^4 - Q^2$ is largely the same as in the small country case: (1) the government maintains the initial export tax of $(P^5 - P^1)/P^5$ or quota of $Q^4 - Q^2$; (2) Q^4 of output must either be sold domestically or exported with the tax or state-sold quota licenses as a requirement for additional exports; and (3) exports beyond $Q^4 - Q^2$ require an export license, which are distributed to the producers who satisfy condition (2) and can be freely traded.

If condition (2) is satisfied allowing additional exports, what will be the volume of increased exports, and at what world price will they be sold? Recall that in our earlier analysis, the export tax shifts the total demand curve in the domestic market from D_T^1 to D_T^2 , while the export quota shifts D_T^1 to D_T^3 . However, we are now analyzing how the market changes if additional exports are allowed after the tax or quota *has already generated* exports of $Q^4 - Q^2$ sold at P^7 . Exports fixed at $Q^4 - Q^2$ from the tax/quota create a policy-conditional total demand curve equivalent to D_T^3 .⁷ Given that the tax/quota has fixed domestic purchases at Q^2 , at any world price above P^7 , D_T^1 shifts right to D_T^3 by the horizontal distance between D_D and the vertical line anchored at Q^2 .

D_T^3 intersects S^1 at point Φ , where the world price is P^5 and producers want to produce and export $Q^7 - Q^4$ more output.⁸ The increase in the world price from P^4 to P^5 at which these additional exports could be sold, which results from the country's market power, shifts the demand curve for the privately-traded export licenses (distributed to producers who satisfy the condition for additional exports) from D^1 to D^2 in figure 5. R^5 in figure 5 equals $P^5 - P^3$ in figure 6, and L^3 in figure 5 equals $\Pi\Phi$ in figure 6.

Assume, however, that the government has issued private export licenses of volume $Q^6 - Q^4$ (L^2 in figure 5). This creates the license supply curve S^1 in figure 5. S^1 and D^2 in figure 5 intersect at point B, which creates a license price of R^2 . This means that market power solves the problem of creating value for the licenses without the government having to restrict the license volume below the desired level of $Q^6 - Q^4$ (L^2 in figure 5), as it had to restrict in the no market power scenario.

If the government issues private export licenses equal to only $Q^6 - Q^4$ rather than $Q^7 - Q^4$, a new vertical policy-conditional supply S^4 is created in figure 6 at point H (associated with

output Q^6). The equilibrium for the additional exports is determined by the intersection of D_T^3 and S^4 at point N, which further raises the world price for these exports from P^5 to P^6 . In figure 5, this additional rise in world price shifts the demand curve for private licenses from D^2 to D^3 . The license price in figure 5 increases from R^2 to R^3 , where R^3 equals $CL = HN = P^6 - P^4$ in figure 6.

A qualification to our earlier statement that S^4 begins at point H is that the export license price shifts the policy-conditional supply curve for high cost producers between Q^4 and Q^6 upward by the export license price. S^4 therefore runs from point L to N, and then becomes vertical. The modified policy increases total producer surplus by CUNH. LUN of this surplus goes to the high cost producers and exporters of volume $Q^6 - Q^4$. CLNH of the surplus goes to the low cost producers who earn private export licenses by either selling domestically or exporting with the tax or state-sold export licenses. By increasing the world price at which the country exports, world market power should strengthen the policy's incentives for low cost producers to satisfy the requirement that allows additional exports.

In the export market in figure 6, the additional exports with private licenses create another policy-conditional export supply curve S_E^4 that runs from point F to G and then becomes vertical. The equilibrium for these additional exports is determined by the intersection of S_E^4 and D_E at G, and $E^2 - E^1$ equals $Q^6 - Q^4$.

The following are summary points of our analysis for the large country scenario, and similar points hold for the small country scenario. In the domestic market, the initial tax or quota creates a policy-conditional supply curve (either S^2 or S^3), while the additional exports combined with the privately-traded licenses generate the policy-conditional supply curve S^4 . Once domestic market equilibrium has been determined with the initial tax or quota, the total demand

curve becomes D_T^3 . The domestic market panel of figure 6 presents three different market equilibria: (1) the domestic market equilibrium, with price P^3 , domestic purchases of Q^2 , and production of Q^4 ; (2) world market equilibrium at point Z for $Q^4 - Q^2$ exported with either a tax or state-sold licenses (if a quota is imposed), with the exports sold at P^7 ; and (3) world market equilibrium at point N for $Q^6 - Q^4$ of output exported with privately-traded licenses, with the exports sold at P^6 . If the initial export restriction is a quota, there are separate markets for the state-sold and privately-traded licenses. The equilibrium license price for the former is $P^7 - P^3$ (R^3 in figure 2), and the equilibrium license price for the latter is $P^6 - P^4$ (R^3 in figure 5).

Note that world market power gives the country the capability to price discriminate on the world market, by creating different markets (separated by a selling time interval) for exports of $Q^4 - Q^2$ and $Q^6 - Q^4$. With either an export tax of rate $(P^5 - P^1)/P^5$ or quota of $Q^4 - Q^2$, the country sells $Q^4 - Q^2$ (E^1) on the world market at P^7 , while it sells $Q^6 - Q^4$ ($E^2 - E^1$) at the lower P^6 .

Modifying Export Taxes or Quotas When a Restriction is Not Already in Place

We now examine how to modify a conventional tax or quota policy to make it less market-distorting (more export and welfare-enhancing) when a tax/quota is not yet in place but the government wishes to impose one. We begin with the scenario where the country lacks world market power in the exported good. For this analysis we return to figure 4, where once again the world price is P^4 and the free trade market outcome is production of Q^6 , domestic purchases of Q^1 , and exports of $Q^6 - Q^1$. The government again wants to reduce the domestic price to P^3 , increase domestic purchases to Q^2 , and raise revenue of BFGC (or at least achieve a market outcome close to these results). A tax of rate $(P^2 - P^1)/P^2$ or an export quota of $Q^4 - Q^2$ would achieve these objectives. What policies could the government adopt to reach these goals,

though also generate more exports beyond $Q^4 - Q^2$?

Given that a tax or quota is not yet in place, the government does not know the market equilibrium price or volumes that a newly created tax/quota would generate. This creates problems for devising a modified policy to a conventional tax/quota that will achieve the above goals but also allow additional exports. Assume that the government tries to adopt the same modified policy that we discussed for when an export tax (of rate $(P^2 - P^1)/P^2$) was already in place, again using that exact export tax. Recall that the key element of our modified policy is the requirement that Q^4 of output must either be sold domestically or exported with the tax before any exports beyond $Q^4 - Q^2$ were allowed. If the tax were already in place, the government would know the volume for Q^4 to set as the policy parameter, that is, the government would already know the quantity of output (associated with point C) that the export tax would generate. But if the tax were not already in place, the government would not know Q^4 (the location of point C), unless it knows the exact shape of the domestic supply curve S^1 .

What happens if the government sets as the policy parameter an estimated volume for Q^4 greater than the actual Q^4 ? Given that an export tax of rate $(P^2 - P^1)/P^2$ creates a domestic market equilibrium of price P^3 and output Q^4 , the requirement that more than Q^4 be either sold domestically or exported with the tax would entail that those high cost producers who produce beyond Q^4 do so at a marginal cost above P^3 . They consequently would not, and the requirement for additional export would not be met.

What happens if the government sets an estimated volume for Q^4 that is less than the actual Q^4 ? In this case, more low cost producers than are necessary could meet the requirement to either sell domestically or export with the tax (because their marginal cost of production would be less than P^4). Many low cost producers therefore might not sell domestically or export

with the tax in the hope that enough other low cost producers would do so, such that the former could free-ride on the latter. If enough try to free-ride in this way, the requirement that Q^4 either be sold domestically or exported with the tax again might not be met.

Assume now that rather than use an export tax, the government tries to achieve its policy goals with an export quota, specifically of $Q^4 - Q^2$. If this export quota is not already in place, the government once again will not know the output volume Q^4 that an export quota of $Q^4 - Q^2$ would generate. As with an export tax, if the government, in setting the volume that must either be sold domestically or exported with state-sold licenses, tries to estimate Q^4 , too high or low an estimate could create serious incentive problems for producers with respect to meeting the requirement that allows additional exports.

Because of these challenges, if an export tax or quota is not already in place, we propose that governments consider imposing only an export quota, not a tax, but with a major modification. The following elements of our proposed policy are exactly the same as identified before when an export quota is already in place: (1) export licenses of $Q^4 - Q^2$ are made available for sale; (2) Q^4 must either be sold domestically or exported with a state-sold export license as a requirement for additional exports; and (3) exports beyond $Q^4 - Q^2$ (once allowed) also require export licenses, which are given for free to the producers who satisfy condition (2) and can be freely traded.

However, the policy requires a modification to address the problem just discussed of finding the volumes for exports of $Q^4 - Q^2$ and production of Q^4 that correspond, that is, put Q^4 on S^1 with exports of $Q^4 - Q^2$. For ease of analysis, we earlier examined the problem of non-correspondence between the two volumes as the government first determining the export volume $Q^4 - Q^2$ and then the policy parameter volume Q^4 . However, our proposed policy modification

for resolving this challenge involves the government first estimating Q^4 , with the estimated value identified as Q_e^4 , and then handling the export volume. The virtue of our policy is that little harm will be done if Q_e^4 deviates from Q^4 .

The volume of export licenses that the government initially makes available for sale should not equal its desired export volume of $Q^4 - Q^2$, but rather $Q_e^4 - Q^1$ (the pre-quota market situation should identify the volume Q^1). The purchase of export licenses by low cost producers will create a license price, and thereby drive the domestic price for output in figure 4 below the world price P^4 . The drop in the domestic price will increase domestic purchases of the good (movement along D_D from point E to B). The key element of our modified policy is that for each unit of output sold domestically, the government should reduce the supply of export licenses available for sale by one.

In this paragraph, we assume for simplicity of presentation that the government accurately estimates Q^4 , that is, Q_e^4 equals Q^4 . In the market for state-sold export licenses in figure 2, the volume of licenses initially made available for sale ($Q^4 - Q^1$ in figure 4) equals L^2 . Our policy of a sliding volume of export license supply creates the license supply curve of S^2 , which replaces S^1 . Reducing the export license supply by one for each unit of output sold domestically as the domestic output price falls results in movement along S^2 from L^2 to point A. When the domestic price of the good falls to P^3 such that Q^2 is domestically purchased, the volume of export licenses available for sale will drop to $Q^4 - Q^2$, or L^1 in figure 2. At the license price of R^1 (or $P^4 - P^3$), the quantity demanded of licenses (L^1) equals the quantity supplied.

This policy allows the markets for output and export licenses to work together to determine a volume of exports and production that correspond. In practice, the government's estimate for Q^4 (Q_e^4) will likely deviate from its actual value. This, however, will not pose any

incentive or mechanical problems for the operation of the policy. Rather, the consequences will be that the new domestic price and volumes of domestic production, purchases, and exports with the quota will all differ to some degree from the results given in figure 4, in particular the actual volume of licensed exports might differ from the government's desired volume of $Q^4 - Q^2$.

Once implemented, the policy should generate the same market results presented in figure 4, where a preexisting policy involving an export quota of $Q^4 - Q^2$ is modified to allow additional exports. (The same results occur if Q_e^4 equals the actual Q^4 ; if not, the new market equilibrium values and volumes will differ somewhat from those presented in the figure.) If the country has market power, it can adopt exactly the same modified policy (with the same policy elements) as in the case of a preexisting export quota, though with the identical policy modification as just explained when the country lacks market power. In figure 2, the export license supply curve becomes S^3 , running from L^2 to point B. The export license price of R^3 in figure 2 equals license price $P^7 - P^3$ in figure 6 (assuming again that Q_e^4 equals the actual Q^4).

Policy Challenges

One potential problem of the modified policies is that low cost producers might initially sell domestically, say to wholesalers, who do not intend to resell to domestic consumers/users, but rather export at the higher world price (with purchased private export licenses) once additional exports are allowed. Such behavior would result in the domestic price not falling as much, and domestic purchases not rising as much, as the government desired. Also, the increased demand for private export licenses from this conduct would raise their price, and thereby reduce the volume of exports by high cost producers. The price of private export licenses could even rise so high ($P^4 - P^3$ in figure 4, for example) that high cost producers would purchase none of the licenses, and the policy would fail to motivate any additional exports

(beyond $Q^4 - Q^2$).

The government could preclude this potential behavior with the following administrative procedure. Whenever output is initially sold (say to wholesalers), it is officially documented one of three ways: (1) output for domestic sale; (2) output to be exported with a state-sold license; and (3) output to be exported with a privately-sold license. Any attempt to export output with a privately-sold license would have to show documentation of status (3).

As discussed throughout this paper, the main challenge of the modified policies is that low cost producers might have insufficient incentive to “get with the new program” by either selling domestically or exporting with a tax or state-sold license all of their low cost output, in the hope that they could export some low cost output with a purchased private export license, and thereby earn a higher per unit return. However, if the modified policy is part of a longstanding tax or quota that has motivated Q^4 of output and $Q^4 - Q^2$ of exports in previous production (market) periods,⁹ then habit and inertia among producers would probably help the modified policy to work. Rather than chancing or even considering that they could manage to export at the higher return with the modified policy, low cost producers might well continue to produce and dispose of Q^4 as before with the expectation of a per unit net revenue of P^3 , though now with the added incentive that if they “get with the new program,” they can earn additional revenue from selling the private export licenses given to them by the government.

Another (though related) problem if a modified policy is part of a longstanding export tax or quota is that high cost producers would face uncertainty as to whether the prerequisite for additional exports will be met. This in turn means they would be uncertain as to how much, if any, of their high cost output they should produce. For example, in the market power scenario in figure 6, should high cost producers try to supply all, or any part of, the output within the range

of Q^4 to Q^6 ? If low cost producers do not either sell all their Q^4 of output domestically or export it with a tax or a state-sold license, then the government will not allow export of any high cost output. This means that any production beyond Q^4 by high cost producers would have to be sold domestically at a loss (price below the marginal cost of production).

This output uncertainty could pose a particular problem for producers if the good is an agricultural crop. Crop producers must commit at the start of (or at least early in) the production season to the amount of certain key inputs they will use during that production cycle (mainly land, but also to some degree inputs such as fertilizer and pesticides). Should they plan for production of Q^4 or Q^6 ?

In the first market period in which a new modified policy is enacted (say a year for a crop), some wary high cost producers might not produce. Consequently, high cost production in this period/year might be less than $Q^6 - Q^4$. Assume, though, that in this period low cost producers meet the condition for additional exports.¹⁰ Once the risk averse non-producing high cost producers see their more ambitious peers benefit from the policy by producing and exporting their additional output, they would have more certainty and incentive in future market periods also to produce their high cost output. In this way over time, the economy could move to the full $Q^6 - Q^4$ of high cost output being produced and exported.

What about the case where the modified policy is part of a new tax or quota imposed for what is expected to be the short run (say just one production season)? In this situation, the best time for imposing a short run policy for agricultural crops is at the end of the production season, such that Q^6 has already been produced. If governments adopted, post-production, the same modified policies already examined, they could achieve the policies' same results and benefits. In particular, low cost producers would have the same motivation as before either to sell

domestically or export with tax or state-sold licenses the volume Q^4 that would allow added exports of $Q^6 - Q^4$.

The only problem with the policy if imposed post-production for crops would be in the small country scenario, concerning the private licenses issued to low cost producers. In figure 4, producers already would have produced Q^6 in the expectation that all their output would be either sold domestically or exported. Yet, for the licenses to have value, they would have to be restricted to a volume below $Q^6 - Q^4$ (say to $Q^5 - Q^4$). Consequently, $Q^6 - Q^5$ could not be exported and would have to be sold domestically at a loss (price below marginal cost), or stored. For this reason, a post-production policy should probably not be enacted in the small country case. However, a post-production policy would work in the large country case, because all of $Q^6 - Q^4$ could be profitably exported.

If the main objective of the short run export tax or quota is to combat rising food commodity prices caused by poor harvests in other producing countries, governments might also be most inclined to adopt such a policy at the end of the production season, because at that time they would best know how serious are the world supply and price problems. The two motives for enacting the policy at the end of the production season therefore would be mutually reinforcing.

The modified policies might cause challenges if countries suffer from weak governance, poor technical administration, and corruption. Recall that in the case of these policies being adopted without an existing tax or quota being in place, we propose that an export quota rather than tax be enacted (with appropriate modification). However, trade quota administration suffers from being less transparent than that for taxes, and also more amenable to corruption and rent-seeking (mainly from the distribution of the export licenses).

Although the modified policies could encourage corruption and rent-seeking, conventional export taxes and quotas can as well. The alternative modified policies could increase countries' overall economic welfare. The main effect of corruption and rent-seeking with these policies would be to redistribute the gains from trade, in particular who gets to export, at what price, and who keeps the tax or export license sales revenue. The modified policies could increase that gain, even if some of its distribution was not as intended.

Conclusion

This paper examines policies that modify conventional export taxes and quotas to make them less market-distorting. More specifically, the paper discusses policy modifications that fulfill the same objectives of taxes or quotas, in terms of reducing the domestic price of the exported good, increasing the volume of domestic purchases, and earning state revenue, but also allow additional profitable export of the good.

We examine scenarios covering the following situations: the export restriction is a tax or quota; an export tax or quota is already in place or newly imposed; the country does or does not have world market power in the exported good. The modified policies have the following elements. The government has three tasks: (1) it sets a conventional export tax or quota (or if such a restriction already exists, it retains the measure); (2) it sets a minimum volume of output that must either be sold domestically or exported with the tax or state-sold licenses; and (3) it gives those producers who contribute to meeting this minimum sales requirement free, and freely tradable, export licenses (as opposed to state-sold licenses), of a volume equal to the additional exports that the government wants to occur. Once the minimum sales condition in (2) is met, additional exports are allowed, using the licenses distributed in (3). Producers who receive these licenses use them to cover their own exports, or can sell them to other producers who use them

for export. Thus, those producers who contribute to meeting the minimum sales requirement capture part of the overall gain to the economy from exporting more output beyond that which the export tax/quota alone would generate.

A major challenge of the modified policies is whether producers will have sufficient incentive to meet the minimum sales condition required for additional exports. All producers would prefer to export at the higher world price rather than sell domestically at a lower price or export with the tax or state-sold export licenses. The possibility exists that some producers will try either to “free ride” on the policy or break it by not selling enough output to meet condition (2). With the former behavior, they hope that other producers will fulfill the requirement for additional export, and with the latter behavior they hope the government will drop the policy and allow free export. If producers succeed in either case, they would gain more than if they complied with the policy and earned export licenses, to either use themselves or sell to other producers.

The modified policies presented in this paper are easier to establish and administer, and probably have a better chance of working, if they are enacted when a tax or quota already is in place, as opposed to the situation where free export initially exists but the government wishes to restrict it by creating a new tax or quota. The main reason is that if an export/tax quota already exists, the government knows the market response to the tax or quota. The likelihood of policy success also increases if the country has world market power in the exported good. With market power, the initial tax or quota increases the world price, and thereby raises the price at which exports can be sold. This should enhance producers’ incentive to meet condition (2) that allows more exports.

Corruption and rent-seeking could also pose problems for implementing these modified

policies and reduce the intended gains from them. However, even if these institutional-type deficiencies exist, the modified policies have the potential to provide overall net benefits to the country relative to a more-restrictive conventional export tax or quota.

Endnotes

¹ Jones and Kwiecinski (2010) provides a list of agricultural export restrictions created by 10 major emerging markets, including China, India, and Brazil.

² One reason countries use export taxes rather than quotas is that agreements within the World Trade Organization seriously restrict quantitative trade controls. Taxes are also easier to administer than quotas and less likely to motivate rent-seeking and corruption. Korinek and Kim (2010) also examine longstanding quantitative export restrictions by countries, applied mainly to metals, and for strategic rather than economic reasons. One such strategic reason is that the metals are required for technologically sophisticated products.

³ This objective helps explain why most of the goods in the world subject to long term export controls are primary products (agricultural, forestry, fishery, mineral, and metal goods). Mitra and Josling (2009) add that a related reason why countries restrict exports of primary products is that they can keep more value-added production and income at home if they export processed rather than primary goods.

⁴ 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.

⁵ The demand curve for the export licenses can also be derived from the export market panel of figure 1. The maximum price that any exporter is willing to pay for an export license equals the vertical distance between D_E (the export's world price) and S_E^1 (the minimum per unit revenue the exporter must receive to export the unit of the good in question). Area P^1P^4V in the export market panel in figure 1 equals area OR^2L^3 in figure 2.

⁶ Although the left side panel in figure 3 is called the domestic market, it also covers the domestic market's integration into the world market.

⁷ D_T^2 is the policy-conditional total demand curve after an export tax is imposed but *before* the new domestic market equilibrium is reached (with the tax). D_T^3 is the policy conditional total demand curve that exists with an export quota. However, D_T^3 is also the policy conditional total demand curve when an export tax exists, though *after* the new domestic market equilibrium has been reached with the tax. This is because at the new equilibrium, the export tax fixes domestic purchase of the good at Q^2 (just as an export quota of $Q^4 - Q^2$ fixes domestic purchase at Q^2).

⁸ P^5 will not necessarily be the price where both (1) S^1 and D_T^3 intersect at point Φ and (2) the policy-conditional supply curve S^2 created by the export tax of rate $(P^5 - P^1)/P^5$ begins at point M. Rather, to avoid cluttering, the figure is drawn such that the two prices coincide.

⁹ The market might expand or contract over time, such that the actual volumes of Q^4 and $Q^4 - Q^2$ change a bit between production (market) periods, especially if the world price changes.

¹⁰ If all low cost producers fulfill the requirement for additional exports, but high cost producers produce less than $Q^6 - Q^4$ of output for expected export, the demand for private export licenses might be too low to generate any price for them. This would make the private export licenses worthless. This result could diminish the incentive of low cost producers “to get with the program” in the next market period, concerning at least incentives stemming from the part of the overall policy involving the private export licenses. On the other hand, the low cost producers might believe that in future market periods, high cost producers will produce enough output, and thereby have enough demand for export licenses, to generate a price for the private export licenses earned by the low cost producers.

References

Anderson, Kym, and Signe Nelgen. "Impact on World Prices of Many Countries Using Trade Policy to Stabilize Domestic Food Prices." Presented at Annual Meeting of the International Agricultural Trade Research Consortium, St. Petersburg, FL, December, 2011. Available at http://iatrc.software.umn.edu/activities/annualmeetings/themedays/pdfs2011/2011Dec-TD-AndersonK_paper.pdf

Bonarriva, Joanna, Michelle Koscielski, and Edward Wilson. *Export Controls: An Overview of their Use, Economic Effects, and Treatment in the Global Trading System*. Office of Industries Working Paper No. ID-23, U.S. International Trade Commission, Washington, DC, 2009. Available at http://www.usitc.gov/publications/332/working_papers/ID-23.pdf

Bouet, Antoine, and David Laborde Debucquet. *Economics of Export Taxation in a Context of Food Crisis: A Theoretical and CGE Approach Contribution*. IFPRI Discussion Paper 00994, International Food Policy Research Institute, 2010. Available at <http://www.ifpri.org/sites/default/files/publications/ifpridp00994.pdf>

Food and Agriculture Organization. *Soaring Food Prices: Facts, Perspectives, Impacts and Actions Required*. High-Level Conference on World Food Security: The Challenges of Climate Change and Bioenergy, Rome, June 3-5, 2008. Available at http://www.fao.org/fileadmin/user_upload/ISFP/HLC08-inf-1-E-ISFPBackground.pdf

Jones, Darryl, and Andrzej Kwiecinski. *Policy Responses in Emerging Economies to International Agricultural Commodity Price Surges*. OECD Food, Agriculture and Fisheries Working Papers No. 34, Organization for Economic Cooperation and Development, Paris, 2010. Available at <http://www.oecd-ilibrary.org/docserver/download/fulltext/5km6c61fv40w.pdf?expires=1351786446&id=id&accname=guest&checksum=48637DA17E6B629D457DAFFBE3658B33>

Kim, Jeonghoi. *Recent Trends in Export Restrictions*. OECD Trade Policy Working Papers No. 101, Organization for Economic Cooperation and Development, Paris, 2010. Available at <http://www.oecd-ilibrary.org/docserver/download/fulltext/5kmbjx63sl27.pdf?expires=1351785495&id=id&accname=guest&checksum=9B9AD5F3DB5CCC95D2E0EB44E88CDAE6>

Korinek, Jane, and Jeonghoi Kim. *Export Restrictions on Strategic Raw Materials and their Impact on Trade*. OECD Trade Policy Working Papers No. 95, Organization for Economic Cooperation and Development, Paris, 2010. Available at <http://www.oecd-ilibrary.org/docserver/download/fulltext/5kmh8pk441g8.pdf?expires=1351785530&id=id&accname=guest&checksum=B1470CDFBA99126394DC31A843760400>

Liefert, William, Paul Westcott, and John Wainio. "Alternative Policies to Agricultural Export Bans That are Less Market-Distorting." *American Journal of Agricultural Economics* 94, 2:435-441 (January 2012).

Martin, Will, and Kym Anderson. "Export Restrictions and Price Insulation during Commodity Price Booms." *American Journal of Agricultural Economics* 94, 2:422-427 (January 2012).

Mitra, Siddhartha, and Tim Josling. *Agricultural Export Restrictions: Welfare Implications and Trade Disciplines*. IPC Position Paper, International Food & Agricultural Trade Policy Council, 2009. Available at http://www.agritrade.org/documents/ExportRestrictions_final.pdf

Organization for Economic Cooperation and Development. *Analysis of Non-Tariff Measures: The Case of Export Duties*. Working Party of the Trade Committee, Paris, 2003. Available at [http://search.oecd.org/officialdocuments/displaydocumentpdf/?doclanguage=en&cote=td/tc/wp\(2002\)54/final](http://search.oecd.org/officialdocuments/displaydocumentpdf/?doclanguage=en&cote=td/tc/wp(2002)54/final)

Sharma, Ramesh. *Food Export Restrictions: Review of the 2007-2010 Experience and Considerations for Disciplining Restrictive Measures*. FAO Commodity and Trade Policy Research Working Paper No. 32, Food and Agriculture Organization, Rome, 2011. Available at <http://ictsd.org/downloads/2011/05/sharma-export-restrictions.pdf>

Trostle, Ronald. *Global Agricultural Supply and Demand: Factors Contributing to the Recent Increase in Food Commodity Prices*. Outlook Report WRS-0801, Economic Research Service, USDA, Washington, DC, 2008. Available at http://www.ers.usda.gov/media/218027/wrs0801_1_.pdf

Yu, Tun-Hsiang "Edward", Simla Tokgoz, Eric Wailes, and Eddie Chavez. "A Quantitative Analysis of Trade Policy Responses to Higher World Agricultural Commodity Prices." *Food Policy* 36, 5:545-561 (October 2011).

Figure 1: Exports with tax or quota, small country assumption

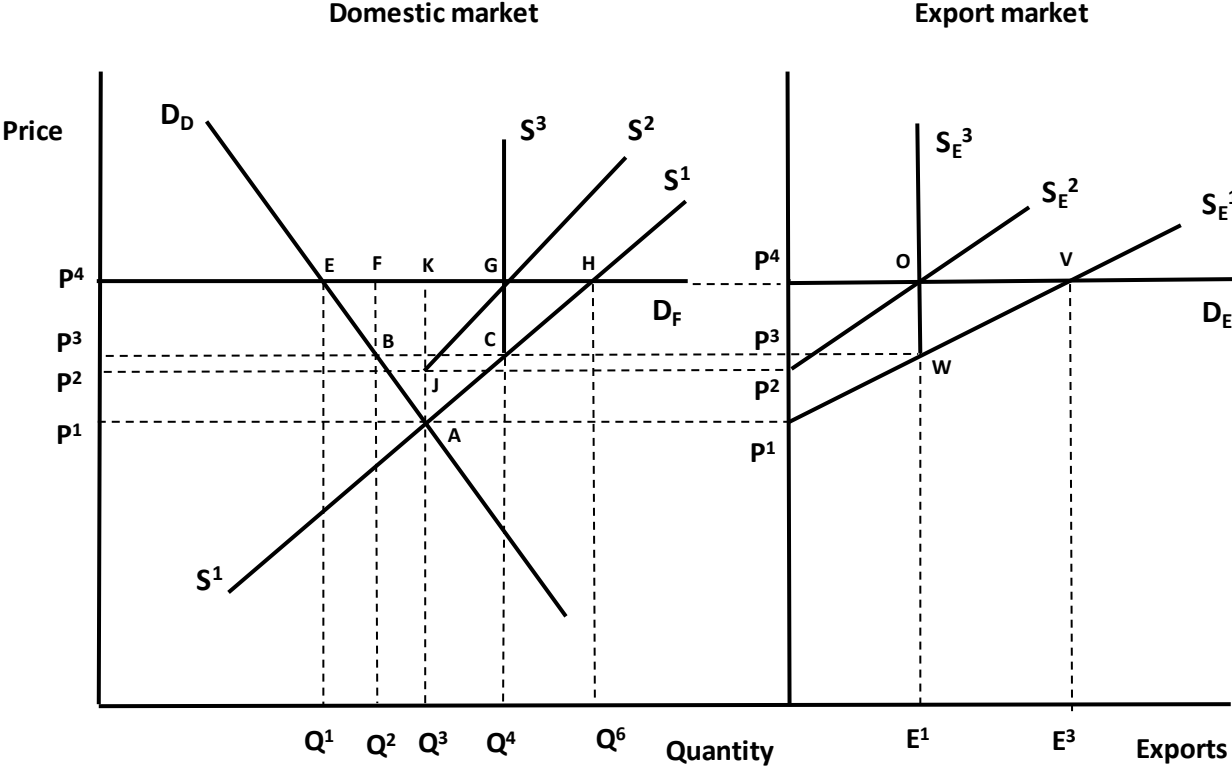


Figure 2: Market for state-sold export licenses

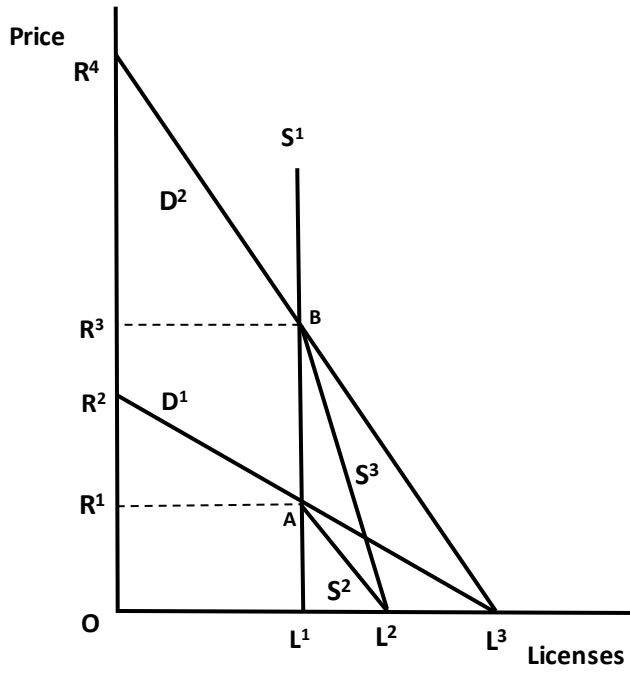


Figure 3: Exports with tax or quota, large country assumption

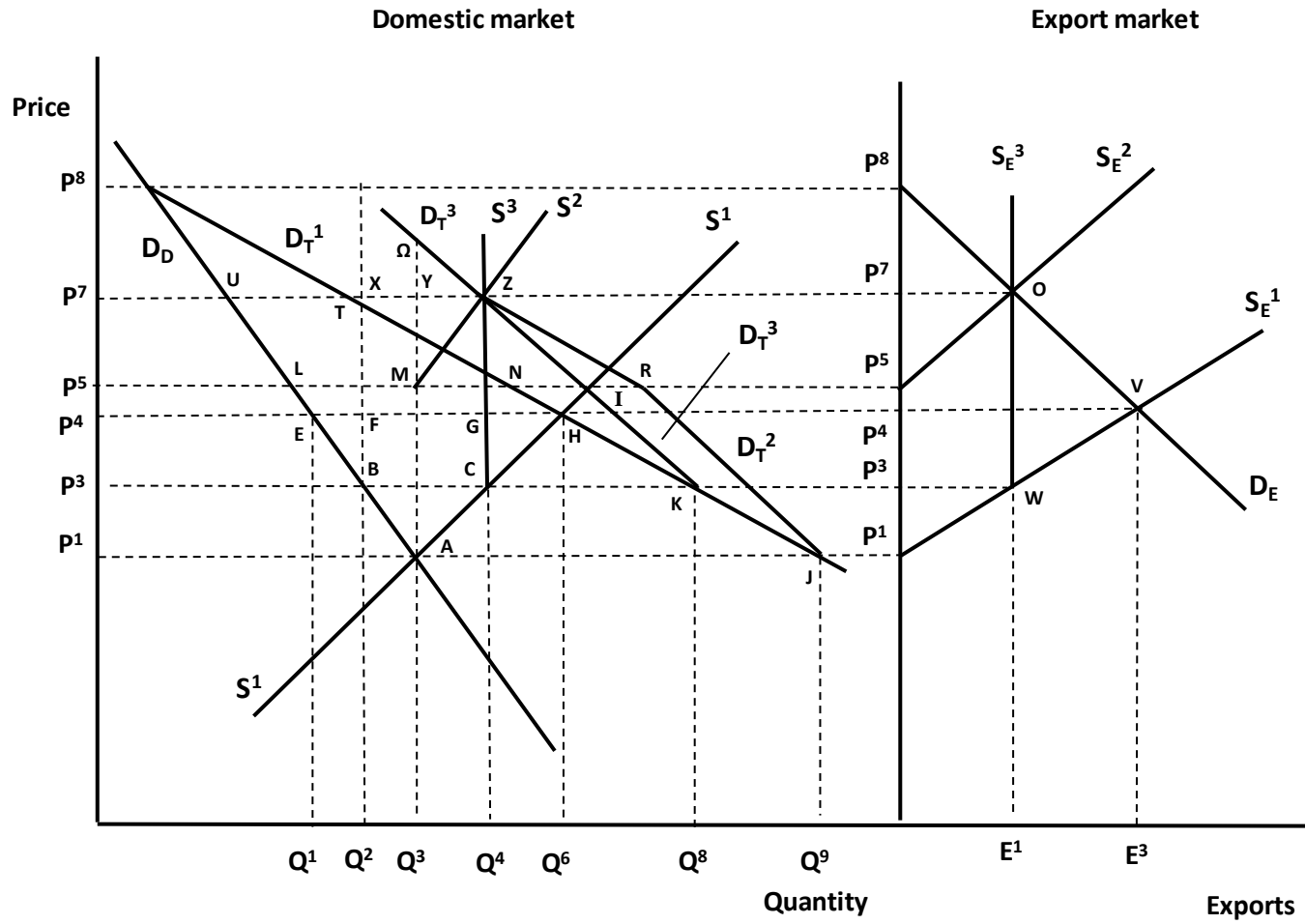


Figure 4: Exports with tax or quota, small country assumption, modified policy

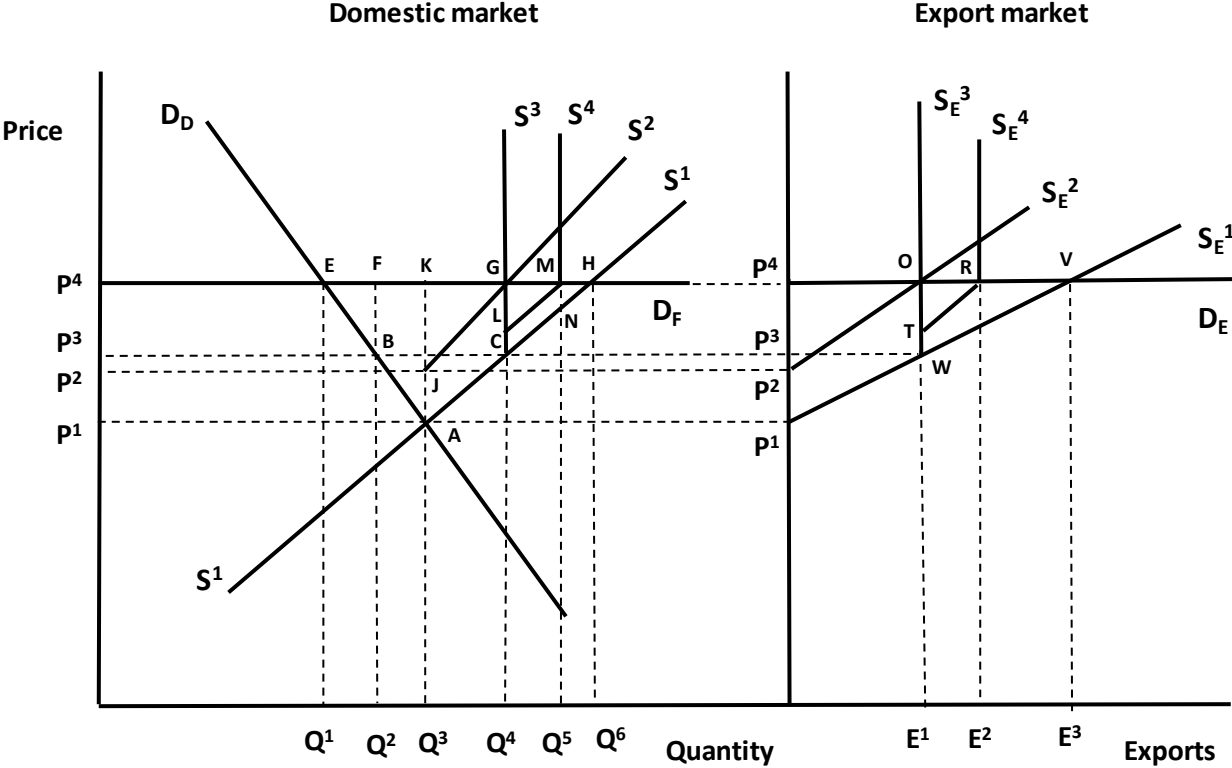


Figure 5: Market for private export licenses

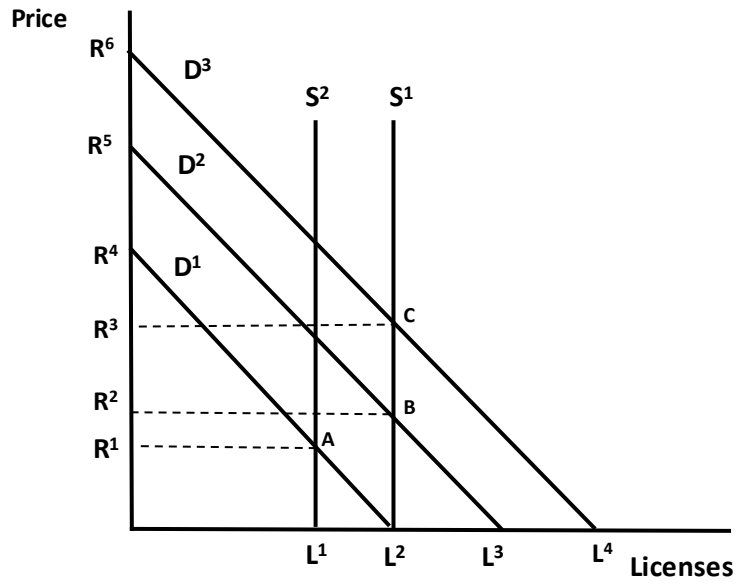


Figure 6: Exports with tax or quota, large country assumption, modified policy

