A Reexamination of the Partial Competitive Equilibrium Analysis of Export Subsidies

Dunz, Karl

American University of Paris

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by

Karl Dunz

Department of Economics

The American University of Paris

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Abstract

This paper re-examines the standard partial competitive equilibrium analysis of an export subsidy. In the conventional analysis the price of the good in the country imposing an export subsidy will exceed the world price by the amount of that subsidy. However, that analysis either ignores the fact that in such a situation foreign producers will want to sell their output in the country with the subsidy rather than on the world market or implicitly assumes that something prevents this possibility from happening. This paper examines the possible kinds of partial competitive equilibria that can arise in a market when there is no barrier to prevent foreign firms from selling in a market with a price above the world price. In this paper the only trade distortion is due to export subsidy of one country. It is shown that in such a situation there are 3 types of possible equilibria: one where the price in the country with the subsidy differs from the world price by the amount of the subsidy, one where this difference is strictly positive but less than the amount of the subsidy, and one where the two prices are equal. A characterization of which type of equilibrium will occur for a given set of usual demand and supply curves is given. Furthermore, a simple demand and supply curve example is presented showing that it is possible that an export subsidy by a large country can increase that country's net welfare.

1 Introduction

The standard partial competitive equilibrium analysis of an export subsidy (such as Asheghian [1], Feenstra [3], Pugel [4], and Salvatore [5]) argues that an export subsidy will cause the domestic price of the good to exceed the world price by the amount of the subsidy. The reason is that domestic firms will not sell their output in their home market unless the price they receive there equals the world price plus the subsidy. However, that analysis ignores the reaction of foreign firms. If the price of a good is higher in one country then all foreign firms would want to sell all of their output in that country. If the country imposing the export subsidy is small then this foreign supply will cause the price to remain equal to the world price. In order to have a higher price in a small country with an export subsidy, there must be some kind of restriction on imports or sufficiently high trade costs for foreign firms exporting to that country. Therefore, the usual analysis is not of the effect of an export subsidy alone. Instead, it is an analysis of an export subsidy in combination with some restriction preventing the importation of the subsidized good. None of the texts cited explicitly state that some restriction on imports is being made. This paper analyzes a situation where an export subsidy is the only deviation from free trade and foreign producers are free to sell their output in any market without any trade costs.

The previous paragraph describes what would happen if a small country imposes an export subsidy. If foreign firms can sell their output in the small country then an export subsidy will not change the price of the good. One implication of this is that the effect on price of an export subsidy would be the same as a production subsidy. Of course, if the subsidizing country's price is the same as the world price then all of its domestic firms will want to export all of their output. So, that country's demand would be completely satisfied by foreign suppliers and all of its domestic production would be exported. Therefore a small country export subsidy would change the pattern of trade but not the price or total quantity in the markets.

The remainder of this paper focusses on a large country whose demand and supply can affect the world price. It is shown that the usual equilibrium where the domestic price is higher than the world price by the amount of the export subsidy is possible in the large-country case. However, it is not the only possible kind of equilibrium. In the large-country case there are 3 types of equilibria: the usual one, one where the domestic price is higher than the

world price but by less than the amount of the subsidy, and one where the world price equals the domestic price. Which equilibrium occurs depends on the relative size of the foreign supply and the domestic demand. This paper provides a characterization of when each type of equilibrium occurs.

Furthermore, an example is presented showing that it is possible that an export subsidy by a large country can increase domestic net welfare using a standard partial competitive equilibrium demand and supply model. In [3], Feenstra states that this has previously only been shown in models with more than 2 goods or with a noncompetitive market structure. For example, in [2], Feenstra shows that an export subsidy can improve net welfare in the country imposing an export subsidy if there are three commodities. His analysis uses a differential approach (i.e. a "small" subsidy is imposed) starting at a free-trade equilibrium with net export supply functions. Such an approach implicitly assumes that the export subsidy does not change where a country's producers sell their output. Output just moves along the given export supply functions. The example given below considers a country that imposes an export subsidy on a good that it imports under free trade. It also has the property that the export subsidy does not cause the subsidizing nation's price to be higher than the world price. Therefore the export subsidy will cause all of that nation's firms to want to export all of their output. This will be true even for a small subsidy. Therefore, the usual differential approach does not apply since there is a discontinuity in the net export function.

In section 2, the model is presented and how it differs from the usual analysis is discussed. The large-country case is discussed in section 3, which gives examples of each of the 3 different types of possible equilibria. Section 4 provides a characterization of when each of these 3 possible types of equilibrium occurs. The example showing that a large country might be able to increase its domestic net welfare with an export subsidy is in section 5. Section 6 presents some concluding remarks.

2 The Model and Equilibrium Conditions

The model used in this paper is a standard perfectly competitive partial equilibrium model with a single homogeneous commodity. The country that imposes a per unit export subsidy on this good will be denoted by the subscript h. The amount of this subsidy is denoted s. The market for this good will be referred to as the "home market". There is also a foreign or world

market consisting of the rest of the world. The price in this market will be called the "foreign price". Demand and supply curves in the foreign market will be denoted with the subscript f. For example, $D_f(P_f)$ is the quantity demanded in the foreign market at prices P_f. There will be no trade costs and the only barrier to free trade is the export subsidy. In particular, all (foreign and home) producers will sell their output in the market with the higher (net) price.

In [2], Feenstra uses differentiable net export supply functions to analyse the effect of a small export subsidy imposed starting from a free-trade equilibrium. In addition, the home and foreign supply functions depend the home prices and the foreign prices, respectively.[2] His other equilibrium conditions are that the world market for each good clears and trade is balanced.

The assumptions of this paper are essentially the same, except this is a partial equilibrium analysis, so that only one good is considered and we only assume continuous demand and supply curves. In fact, we do not have differentiability. This is essentially because we are assuming that producers decide where to sell their output based on the prices in both the home and foreign markets. For example, if the foreign price is less than the home price then foreign producers will want to sell all of their output in the home market. However, the the foreign price exceeds the home price then they will want to sell none of their output in the home market. Both of these statements are true no matter how small the price difference is. Therefore the net export functions are not differentiable. This is also true for home producers as they compare the foreign price plus the subsidy to the home price in order to determine where to sell their output.

Next, the equilibrium conditions for various cases are described. These cases will depend on the relationship between the prices in the home and foreign markets. The relationship between these prices will determine where producers sell their output, which will determine how to write the equilibrium condition in terms of the demand and supply. The following cases describe all of the possible relationships between the foreign market price, P_f, plus the subsidy, s, and the home market price, P_h.

Case 1: $P_h > P_f + s$

In this case, both home and foreign producers will want to sell their output in the home market. Therefore there cannot be an equilibrium since

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[2]Both functions also depend on the utility level of the representative home and foreign consumer, respectively.

no output is sold in the foreign market.

Case 2: $P_h = P_f + s$

In this case, home country producers are indifferent between selling in the home market or the foreign market. On the other hand, foreign country producers will want to sell all of their output in the home market. In order for there to be an equilibrium in this case, the foreign supply at P_h cannot be larger than the home country demand at that price. Otherwise, there is excess supply in the home market. Therefore, P_h (with $P_f = P_h - s$) will be an equilibrium in this case if:

$$S_f(P_h) \leq D_h(P_h) \tag{1a}$$

$$S_h(P_h) + S_f(P_h) = D_h(P_h) + D_f(P_h - s) \tag{1b}$$

Case 3: $P_f < P_h < P_f + s$

Home country producers will sell only in the foreign market and foreign producers will only sell in the home market in this case. Therefore, in equilibrium, we must have the supply of home producers equal to foreign demand and the supply of foreign producers must equal the home demand. In other words, P_h and P_f are equilibrium prices in this case if they satisfy:

$$S_h(P_f + s) = D_f(P_f) \tag{2a}$$

$$S_f(P_h) = D_h(P_h) \tag{2b}$$

Case 4: $P_h = P_f$

Here, foreign producers are willing to sell in either market. However, home country producers will sell only in the foreign market. So, the supply of home producers must be less than or equal to the foreign demand at the equlibrium price. Otherwise, there will be excess supply in the foreign market. So, $P_h = P_f$ will be an equilibrium price if:

$$S_h(P_h + s) \leq D_f(P_h) \tag{3a}$$

$$S_h(P_h + s) + S_f(P_h) = D_h(P_h) + D_f(P_h) \tag{3b}$$

Case 5: $P_h < P_f$

In this case, both home and foreign producers will want to sell their output only in the foreign market. Therefore, there can be no equilibrium with the foreign price higher than the home price.

The following table describes what each producer will do for the possible relationships between the foreign market price, P_f, plus the subsidy, s, and

the home market price, P_h. It also gives the market clearing condition in each of the possible cases.

Case	h Producers sell in	f Producers sell in	Equilibrium Conditions
$P_h > P_f + s$	h only	h only	No Equilibrium
$P_h = P_f + s$	either market	h only	$S_f(P_h) \leq D_h(P_h)$ and $S_h(P_h) + S_f(P_h) = D_h(P_h) + D_f(P_h - s)$
$P_f < P_h < P_f + s$	f only	h only	$S_h(P_f + s) = D_f(P_f)$ and $S_f(P_h) = D_h(P_h)$
$P_h = P_f$	f only	either market	$S_h(P_h + s) \leq D_f(P_h)$ and $S_h(P_h + s) + S_f(P_h) = D_h(P_h) + D_f(P_h)$
$P_h < P_f$	f only	f only	No Equilibrium

3 Large-country Case

3.1 Usual analysis

This section examines the large-country case. In this paper the demand and supply curves of both the domestic and foreign markets are presented on the same graph. This is not how this is usually done. The analysis is usually presented as in [3] with one graph for the domestic market and another for the "export market". However, since the characterization of the different types of equilibria depends on the relationship between the domestic demand and foreign supply, it is more convenient to draw all demand and supply curves on the same graph.

The usual large-country equilibrium with an export subsidy is given in Figure 1. As before, S_h and D_h represent the home market supply and demand, respectively. S_f is the supply function of foreign (rest of the world) producers and D_f is the foreign market demand. The world free-trade (with no export sudsidy) equilibrium price is P_w, which is the price at which world supply, $S_h(P) + S_f(P)$, equals world demand, $D_h(P) + D_f(P)$. The export subsidy can be described as shifting S_h downward by the amount of the subsidy. This shifted supply curve is denoted by S'_h, which is $S'_h(P) = S_h(P + s)$. In the usual case, S'_h is the relevant supply curve when there is an export subsidy since all output is sold at the same net price. The output is
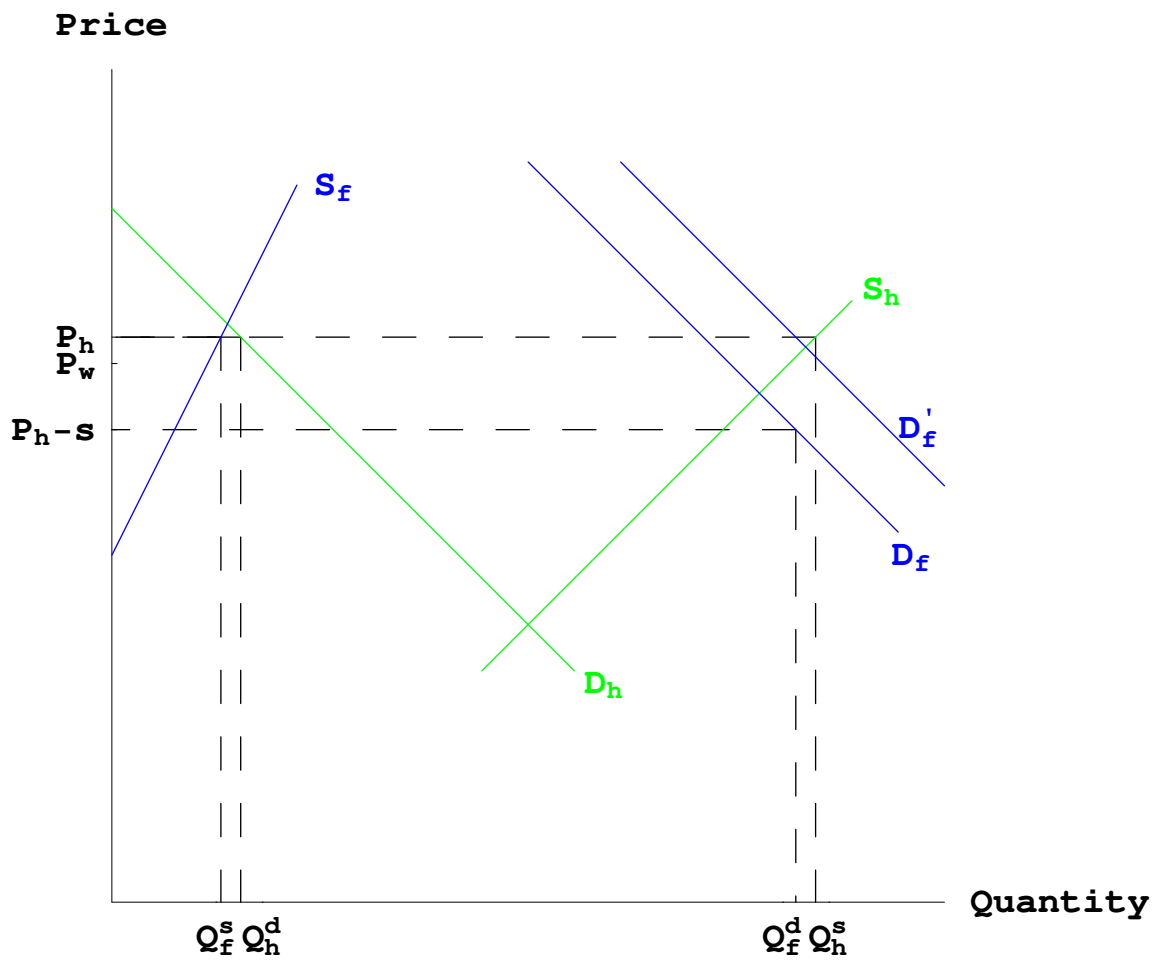
Price

Figure 1: Usual large-country free-trade equilibrium.

sold in the home market for P_h and the foreign market price is $P_f = P_h - s$. This new foreign price is lower than the free-trade equilibrium price since the export subsidy has increased the supply of home producers.

The foreign price in Figure 1 is determined by the demand equal supply condition, $D_f(P_f) = S'_h(P_f) - [D_h(P_f + s) - S_f(P_f + s)]$. Using the fact that $P_f = P_h - s$ and the definition of S'_h, this equation can be rewritten as $S_h(P_h) + S_f(P_h) = D_h(P_h) + D_f(P_h - s)$, which is equation (1b) in case 2 above.

The usual analysis stops here. However, for the above to describe an equilibrium when there are no restrictions on foreign producers selling their output in the home market, equation (1a), $S_f(P_h) \leq D_h(P_h)$, must also hold. This condition is needed since foreign producers will only sell in the home market. If their output was greater than the home market quantity demanded then the domestic price would have to be lower in order to clear the home market. However, if the home price is lower then home producers would no longer be willing to sell in the domestic market. Therefore $S_h(P_h)$ would not represent the output of domestic producers since if the home market price is lower than that shown in Figure 1 then $P_f + s > P_h$ and home producers would want to sell only in the foreign market. Then equation (1b) would not correctly represent the condition that world supply equals world demand. Therefore, other types of equilibria are possible. These are described in the next two subsections.

3.2 Other Types of Equilibrium

3.2.1 Home price higher by less than the subsidy

One other type of equilibrium is where the home market price is greater than the foreign price but the difference is strictly less than the export subsidy. In such an equilibrium, foreign producers will only sell in the home market, since its price is higher, and home producers will only sell in the foreign market, since the foreign price plus the subsidy exceeds the home market price. So such an equilibrium will have the home market price determined where S_f intersects D_h and the foreign market will be determined where S'_h intersects D_f.

Figure 2 shows such as equilibrium. If the demand and supply curves are as shown in this graph then the usual equilibrium will not exist. To see this, note that in Figure 2 if the domestic price is higher than the indicated P_h
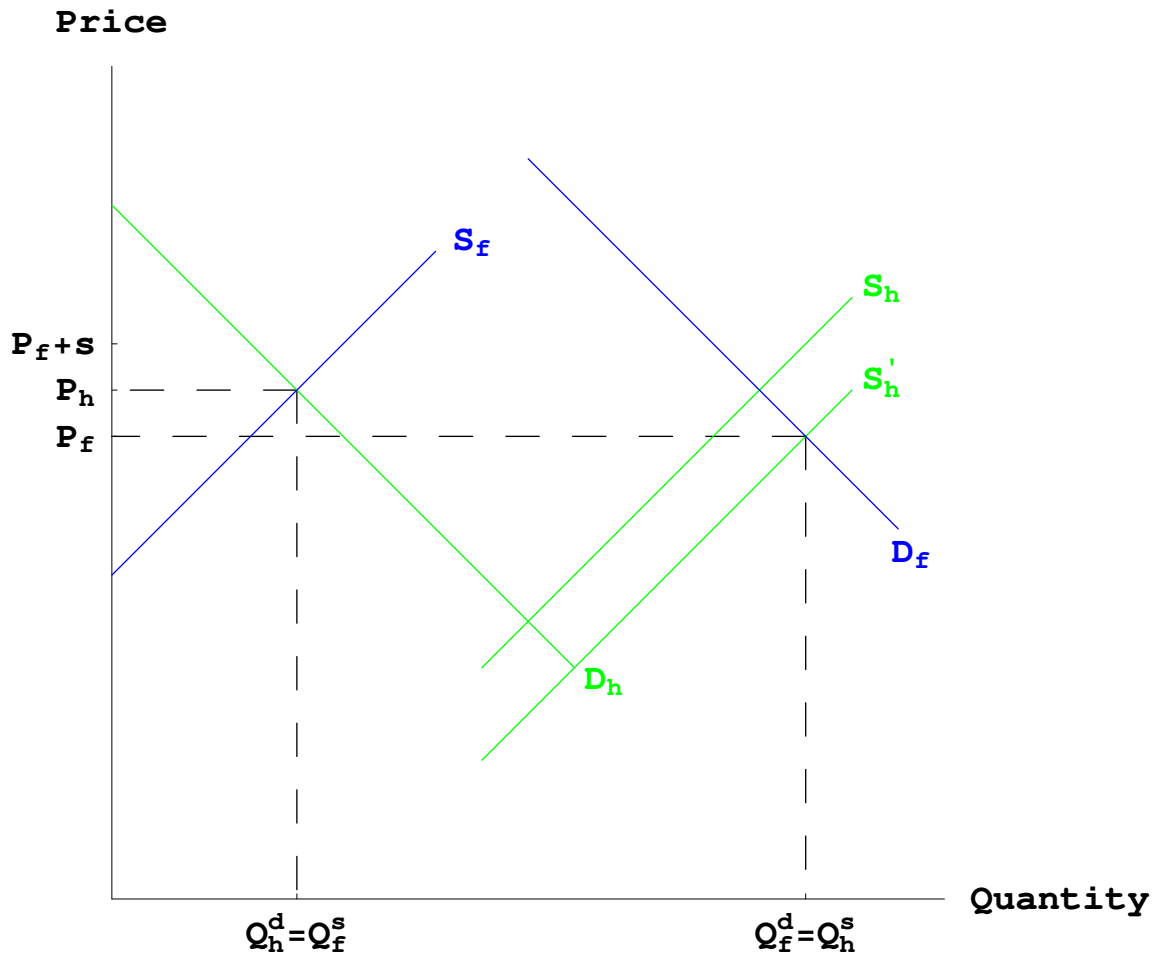
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Figure 2: Large-country with export subsidy. Domestic market price is higher than the world price, but by less than the amount of the subsidy.

then there is excess supply in the home market since foreign producers will always want to sell their output in the higher priced home market. Therefore, there cannot be an equilibrium with a home price higher than the indicated P_h. On the other hand, if the foreign price is less than P_f then there is excess demand on the foreign market since only home producers will want to sell in the foreign market. So there will be no equilibrium in which the foreign price is less than the indicated P_f. Therefore Figure 2 shows the only possible equilibrium with the given demand and supply curves.

Another feature of such equilibria is that it is possible, but not necessary, for the export subsidy to reduce the home price below the no-subsidy free-trade world price. This is true in Figure 2 since the price where $S_h(P) = D_f(P)$ is higher than P_h. This implies that there is excess demand in the world market at price P_h. Therefore the free-trade price P_w defined by $S_f(P_w) + S_h(P_w) = D_h(P_w) + D_f(P_w)$ is higher than P_h. In the usual case, export subsidy never lower the home market price.

3.2.2 Home price equal to the foreign price

When the foreign supply is large enough then a third type of equilibrium exists. If the foreign supply exceeds the domestic demand at the equilibrium home price then, in order for this to be an equilibrium, the home price must equal the foreign price. This must be true in order for foreign producers to have an incentive to sell some of their output in the foreign market. Since the home market and foreign prices are equal, home producers will only sell their output in the foreign market and foreign producers will only sell in the home market.

Therefore, at the common equilibrium price, $P = P_h = P_f$, the output of home producers, $S_h(P)$, must not be greater than the foreign market demand, $D_f(P)$. Otherwise there will be excess supply in the foreign market. The other condition for equilibrium is that world supply equals world demand, i.e. $S_f(P) + S_h(P + s) = D_f(P) + D_h(P)$. These two conditions are equations 3 in case 4 above. Note that these condition imply that $S_f(P) \geq D_h(P)$. This inequality says that foreign producers must produce at least as much as the home market demand, which must be true since only foreign producers will sell in the home market. An example of such an equilibrium is given in Figure 3.

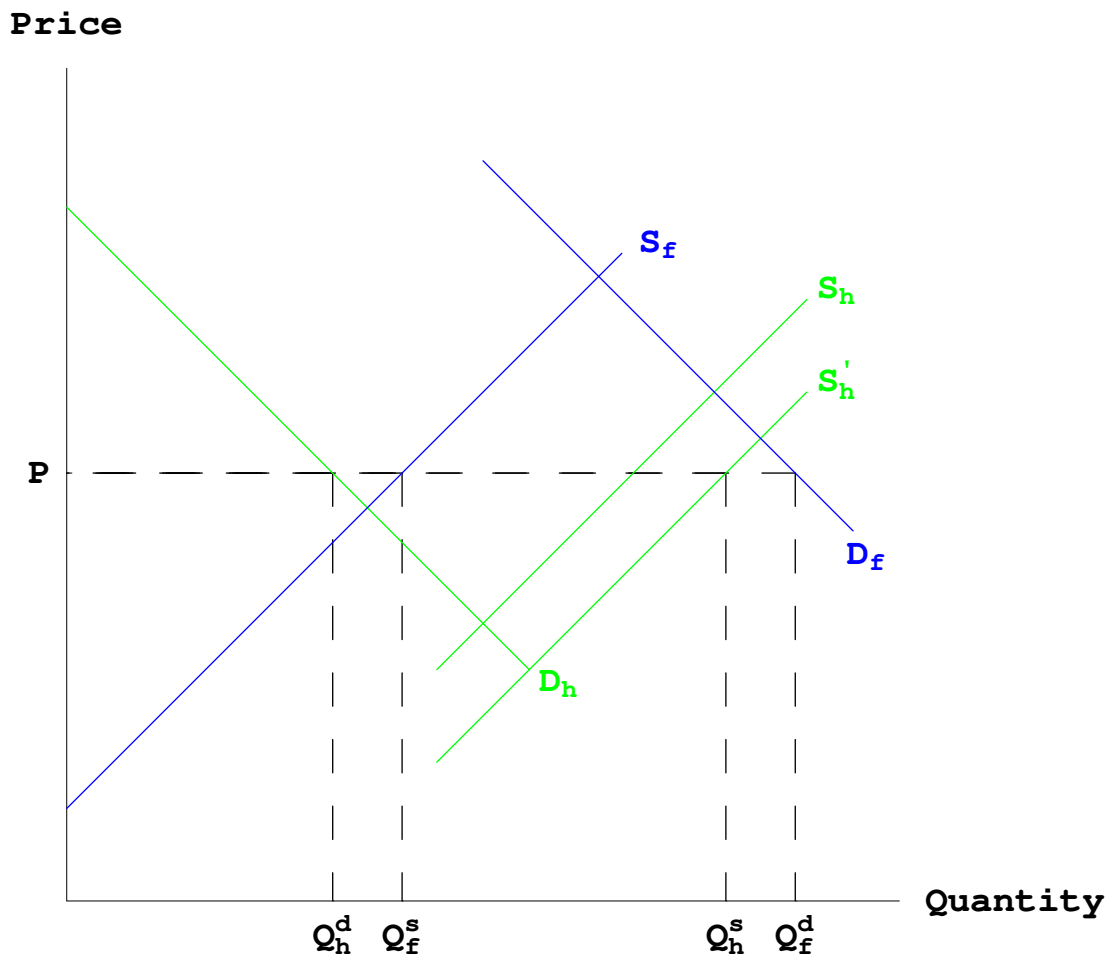In Figure 3 equations 3 imply that the differences $Q_f^s - Q_h^d$ and $Q_f^d - Q_h^s$

Figure 3: Large-country with export subsidy. Domestic market and world price are the same in equilibrium.

are equal. This common difference is the amount that foreign producers will sell in the foreign market. It is possible for this amount to be zero, in which case the equilibrium is like the previous type where foreign producers supply all of the domestic demand and domestic producers supply all of the foreign demand. However, here the prices in the two markets are identical. This common price will be below the no-subsidy free-trade world price. This is obvious since the subsidy increases the supply curve of the home producers.

With the demand and supply curves in Figure 3, there is no equilibrium with the home price higher than the world price by the amount of the subsidy. This is for similar reasons as why the example in Figure 2 does not have such an equilibrium. If the home price is higher than the indicated P then there is excess supply in the home market since S_f exceeds D_h and foreign producers will want to sell all of their output in the home market when its price exceeds the foreign price. Therefore, there cannot be an equilibrium with a home price higher than the indicated P. On the other hand, if the foreign price is less than P then there is excess demand on the foreign market since D_f exceeds S'_h and only home producers will want to sell their output in the foreign market when its price is less than the home price So there will be no equilibrium in which the foreign price is less than the indicated P.

Another feature of this type of equilibrium is that it is exactly the same as if the home country gave its producers an ordinary production subsidy equal to s per unit. This is because all of the home producers' output is exported and therefore receives the export subsidy. So S'_h is the relevant home producer supply curve in both the export subsidy and production subsidy case. If the demand and supply curves are as in Figure 3 then equilibrium price P is the same in both situations.

Finally, notice that since the home price declines in this case the export subsidy increases both home country consumer surplus and producer surplus. This gain is easily seen to be less than the cost of the export subsidy. However, the increase in consumer surplus is something that cannot happen in the usual case. This increase will be exploited to show, in section 5 that an export subsidy might yield a net welfare increase to a large country. But first the next section characterizes the three types of equilibrium that are described in this section.

4 Characterization of when each type of equilibrium occurs

This section describes when each type of equilibrium occurs. The examples in Figures 1-3 differ only in the supply curves of foreign producers. The key property is the relationship between the price at which the foreign supply intersects the domestic demand and the price where the domestic supply equals the foreign demand. The following proposition characterizes for which demand and supply curves each type of equilibrium discussed in the previous section occurs.

> **Proposition:** Let the foreign supply curve, $S_f(P)$, and the home supply curve, $S_h(P)$, be continuous and increasing. Let the foreign demand curve, $D_f(P)$, and the domestic demand curve, $D_h(P)$, be continuous and decreasing. Let the quantity supplied at $P = 0$ be strictly greater then the quantity demanded for each demand and supply curve. Let the quantity demanded at some strictly positive price be greater than quantity supplied for each demand and supply curve. Furthermore, define P_{fh} as the price that equates foreign demand with home supply given a subsidy of $s > 0$ per unit, i.e. $D_f(P_{fh}) = S_h(P_{fh} + s) \equiv S'_h(P_{fh})$. Given these assumptions, if P_{hf} is the price where $D_h(P_{hf}) = S_f(P_{hf})$ then the following are true.
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> 1. $P_{hf} > P_{fh} + s$ implies that the only equilibrium is where the home price is equal to the foreign price plus the amount of the subsidy. Furthermore, the equilibrium home price will be between $P_{fh} + s$ and P_{hf} and will be above the no-subsidy free-trade price. In such equilibria, home producers can sell in either market while foreign producers will sell only in the home market.
>
> 2. $P_{fh} + s \geq P_{hf} > P_{fh}$ implies that the only equilibrium is where the home price equals P_{hf} and the foreign price equals P_{fh}. In such an equilibrium, home producers will only sell in the foreign market and foreign producers will sell only in the home market. Also, the new home price can be either above or below the no-subsidy free-trade price.

3. $P_{fh} \geq P_{hf}$ implies that the only equilibrium is where the home and foreign market prices are equal. Furthermore, this equilibrium price will be between P_{hf} and P_{fh} and less than the no-subsidy free-trade price. In such an equilibrium, home producers will only sell in the foreign market and foreign producers can sell in either market.

Proof: The proof proceeds by examining each of the three cases. In each case the equilibrium price(s) must clear the world market. How this condition is written will depend on the case. This is because the relationship between the equilibrium home price and equilibrium foreign price will determine where the producers want to sell their output.

Figures 1-3 give examples of the three cases. Note that in each of these figures the country imposing the export subsidy has a comparative advantage in the good, i.e. its autarky price is less than the autarky foreign market price. This is the usual situation where the country imposing an export subsidy is an exporter of the good. However, nothing in the proof of this proposition relies on this. The proposition also applies to countries importing a good under free trade and imposing an export subsidy that turns it into a net exporter of that good.

Case 1: $P_{hf} > P_{fh} + s$

First, an equilibrium where $P_h = P_f + s$ will be shown to exist. If prices satisfy this equality then P_h is the net price received by both home and foreign producers. Therefore world supply can be written as $S(P_h) \equiv S_h(P_h) + S_f(P_h)$ and world demand can be written as $D(P_h) \equiv D_h(P_h) + D_f(P_h - s)$, since the foreign price will be lower than the home price by the amount of the subsidy.

By the definition of P_{fh} and the fact that $P_{hf} > P_{fh} + s$, we have $S_h(P_{hf}) > S_h(P_{fh} + s) = D_f(P_{fh}) > D_f(P_{hf} - s)$. Also, the definition of P_{hf} implies $S_f(P_{hf}) = D_h(P_{hf})$. Therefore, we have $S(P_{hf}) > D(P_{hf})$.

Similar reasoning gives $S(P_{fh} + s) < D(P_{fh} + s)$ [since $S_f(P_{fh} + s) < D_h(P_{fh} + s)$ and $S_h(P_{fh} + s) = D_f(P_{fh})$].

So there is excess world supply if the price in the home market is P_{hf} and excess world demand if the price in the home market is $P_{fh} + s$ [and the foreign market price is lower by the amount of the export subsidy]. Therefore the standard assumptions on demand and supply guarantee that there is a price, P_h, between $P_{fh} + s$ and P_{hf} such that $S(P_h) = D(P_h)$. The foreign equilibrium price will then be $P_h - s$. At such prices, foreign producers sell

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all of there output in the home market, but do not satisfy all of the home market demand. Home producers make up the difference and then export their remaining output to the foreign market. The condition that world demand equals world supply guarantees that both these markets clear.

Now it is shown that no other type of equilibrium is possible. There is no equilibrium where the home price exceeds the foreign price by more than the subsidy since no producer will want to sell in the foreign market. If the foreign and home price differ by less than s then domestic producers will want to sell only in the foreign market. So the home price must be P_{hf}, i.e. the intersection of the foreign supply curve and the domestic demand curve. This price exceeds $P_{fh} + s$ and therefore the foreign market price must be greater than P_{fh}. However, the output of domestic producers exceeds the foreign quantity demanded at such prices. Therefore the only possible equilibria have $P_h = P_f + s$.

Case 2: $P_{fh} + s \geq P_{hf} > P_{fh}$

In this case it is easy to see that a home price of P_{hf} and a foreign price of P_{fh} is an equilibrium. Since this home price exceeds the foreign price by less than the subsidy, home producers will sell only in the foreign market and foreign producers will sell only in the home market. By definitions of P_{hf} and P_{fh}, both markets will clear. It should also be obvious that these are the only equilibrium prices where the home price is less than the foreign price plus the subsidy.

To see that there cannot be an equilibrium where the home price is equal the foreign price plus the amount of the subsidy note that the home market equilibrium price cannot exceed P_{hf}. This is because foreign producers sell all of their output in the home market when the home price exceeds the foreign price and P_{hf} is the price at which foreign supply equals home demand. At higher prices there would be excess supply in the home market. If the home price does not exceed P_{hf} and the foreign price is s less than the home price then we would have the foreign price less than P_{fh}, since $P_{fh} + s \geq P_{hf} \geq$ the home price. However, at such prices there is excess demand in the foreign market since only home producers will sell in the foreign market. Therefore there cannot be an equilibrium in which the home price differs from the foreign price by the amount of the subsidy.

Case 3: $P_{fh} \geq P_{hf}$

First, it is shown that in this case there is an equilibrium where the home price is equal to the foreign price. This price, P, will be such that

world supply will equal world demand, i.e. $S(P) \equiv S_f(P) + S_h(P + s) = D_h(P) + D_f(P) \equiv D(P)$. Note that if the home price equals the foreign price then home producers will export all of their output and thus $S_h(P + s)$ represents their quantity supplied.

By definition of P_{fh}, we have $D_f(P_{fh}) = S_h(P_{fh} + s)$. Also, by the definition of P_{hf} and since $P_{fh} \geq P_{hf}$, we have $S_f(P_{fh}) \geq S_f(P_{hf}) = D_h(P_{hf}) \geq D_h(P_{fh})$. Therefore $S(P_{fh}) \geq D(P_{fh})$.

By definition of P_{hf}, we have $D_h(P_{hf}) = S_f(P_{hf})$. Also, by the definition of P_{fh} and since $P_{fh} \geq P_{hf}$, we have $S_h(P_{hf} + s) \leq S_h(P_{fh} + s) = D_f(P_{fh}) \leq D_f(P_{hf})$. Therefore $S(P_{hf}) \leq D(P_{hf})$.

So, by the standard assumptions on demand and supply there is a price between P_{fh} and P_{hf} such that world demand equals world supply. At such an equilibrium price, home producers will sell only in the foreign market while foreign producers can sell in both markets. Note that it is possible that $P_{fh} = P_{hf}$. In that case world demand equals world supply at this common price.

Finally, it is shown that there are no other equilibrium. Obviously there is no equilibrium with the foreign price higher than the home price since no producer would want to sell in the home market. Next it is shown that there cannot be an equilibrium where the home price exceeds the foreign price. First note that the home price cannot exceed P_{hf}; otherwise, there will be excess supply in the home market since foreign producers sell all of their output in the home market if its price exceeds the foreign price. So the home price cannot exceed P_{hf}, which does not exceed P_{fh} in this case. Therefore the foreign price would be less than P_{fh}. At such prices, home producers do not satisfy the foreign demand. Since they are the only ones selling in the foreign market when the foreign price is less than the home price, this cannot be an equilibrium. Therefore, when $P_{fh} \geq P_{hf}$ there are no equilibria with the home price greater than the foreign price. In particular, the usual equilibrium cannot exist in this case.

Note that the three cases in the proposition are mutually exclusive. For any given demand and supply curves (and size of the export subsidy) only one type of equilibrium will exist. This means that there are economies for which the usual equilibrium where the home price exceeds the foreign price by the amount of the subsidy will not exist.

5 Welfare Improving Export Subsidy

In this section an example of demand and supply curves, for which an export subsidy can increase net welfare as measured by the sum of consumer surplus and producer surplus, is given. Feenstra [3] says that this is not possible in this partial equilibrium competitive framework. However, Figure 4 shows that, in fact, it is possible for an export subsidy to increase domestic net welfare in a partial equilibrium competitive model. This example will exploit the fact that in certain situations an export subsidy can lower the price in the country giving the subsidy as in Figures 2 and 3. This will lead to an increase in consumer surplus which cannot occur in the usual equilibrium. However, it can be easily verified that in those Figures the cost of the subsidy still exceeds the increases in consumer surplus and producer surplus. So they are not examples of welfare-improving export subsidies. An additional modification must be made.

This additional modification is that unlike the other figures in this paper Figure 4 show a country that is a net importer of the good under free trade. I know of no paper that analyzes a country imposing an export subsidy on a good that it is importing. In this example, P_w is the free-trade equilibrium price. At this price $D_h > S_h$, so the country is a net importer of the good.

In Figure 4 $P_{fh} > P_{hf}$. So this is a case where the home price will equal the foreign price in equilibrium. This equilibrium price is denoted by P and is between P_{fh} and P_{hf}. It is also less than the orginal free-trade price, P_w. The fact that the price is the same in the home market and foreign market also means that all of the home producers' output will be exported to the foreign market. So, in this example, the export subsidy has the effect of turing an importer into an exporter.

In this example the cost of the export subsidy is sQ_h^s which is equal to the area $(a + b + c + d)$. The increase in home producer surplus is given by area a since the net price received by the domestic producers increases from P_w to $P + s$ as a result of the subsidy. The increase in home consumer surplus is given by the area $(c + d + e)$ since the price the consumers pay falls from P_w to P as a result of the subsidy. Therefore, the total change in net welfare (i.e. the sum of the increase in consumer surplus and producer surplus minus the cost of the subsidy) is equal to the area e minus the area b. It is certainly possible that area e exceeds area b, which would mean that the export subsidy has increased net welfare.

Price

P+s

P_w

P

a

b

c

d

e

S_h

S_f

$S_h^{'}$

D_h

D_f

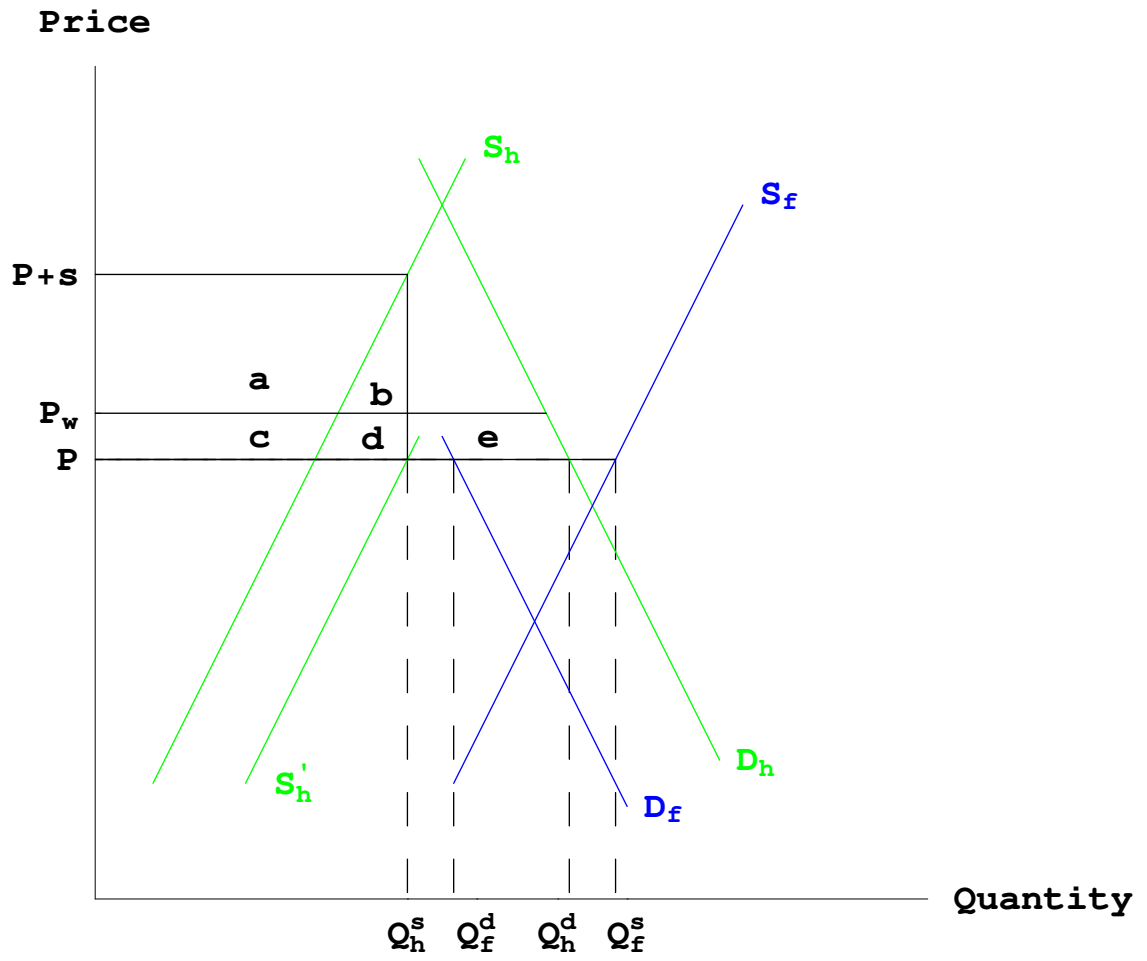**Quantity**

Q_h^s Q_f^d Q_h^d Q_f^s

Figure 4: Export subsidy that increases domestic net welfare of a large country.

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6 Conclusion

This paper has reexamined the partial competitive equilibrium analysis of an export subsidy. The usual textbook analysis ignores the incentives of foreign producers or it is implicitly assuming that there is some additional barrier to trade that prevents foreign producers from selling their output in the domestic market. If the price of the good is higher in one market than another then foreign producers will want to sell all of their output in the market with the higher price. The usual analysis assumes that this does not happen. Implicitly, the usual analysis does not describe the effects of an export subsidy alone. Instead, the usual analysis is of an export subsidy in combination with something that prevents foreign producers from selling all that they would want in the market imposing the subsidy. In practice, it is probably true that export subsidies usually exist in combination with some kind of other trade barrier, such as a tariff or quota. However, one might expect that the exact effect of such a combination of policies depends on the precise nature of the additional barrier to trade. This paper has examined the case of an export subsidy being the only deviation from free trade. In such a situation, equilibria different from that of the usual analysis are possible.

In the small-country case, an export subsidy alone cannot change the price in the domestic market. If it did raise the price then foreign producers would want to sell their entire output in the small-country market. This would drive the price back to the free-trade level. So this paper argues that the effect of an export subsidy imposed by a small country is the same as the effect of a production subsidy of the same amount. If the export subsidy has no effect on the home price then domestic producers will want to export all of their output.

For large countries, it has been shown that the usual equilibrium where the price in the large country exceeds the price in the foreign market by the amount of the export subsidy is a possible equilibrium. In such an equilibrium, foreign producers will want to sell their output only in the country imposing the subsidy while producers in that market can sell their output in either market. However, such an equilibrium does not always exist. Depending on demand, supply and the amount of the subsidy, two other types of equilibrium can exist instead. One possibility is that the difference in the prices is less than the amount of the subsidy. In this case, all producers will export their output to the other market. Another possibility is that the

export subsidy lowers the equilibrium price of the good in all markets. In this case, producers receiving the export subsidy will want to export all of their output while foreign producers can sell their output in both markets. Which type of equilibrium occurs depends on the relationship between the amount of the export subsidy, the equilibrium price in the country imposing the subsidy assuming the supply consists of only foreign producers, and the equilibrium price in the foreign market assuming the supply consists of only producers receiving the export subsidy.

This paper also gives an example showing that it is possible for a large country to increase its net welfare by the use of an export subsidy. The existing literature argues that this is not possible in such a partial equilibrium competitive model. The example given here exploits the fact that there can be an equilibrium in which the price in the country imposing the subsidy can fall and therefore consumers (as well as producers receiving the subsidy) can benefit. Another potentially important feature of this example is that the country imposing the export subsidy is a net importer of the good under free trade. I believe that this is a necessary feature in order to have export subsidies increase domestic net welfare; although, this is not proved in this paper. Of course, export subsidies still lead to a decline in world net welfare.

Another implication of this example is that it might provide an additional reason why export subsidies seem to be extremely common. The usual analysis explains this by appealing to some kind of political model where producers (who always gain from an export subsidy) have more power than consumers (who are usually thought to always lose from such a subsidy). However, if export subsidies can result in a gain in net welfare then it makes them more likely to be enacted no matter what the political institutions are. The example also shows that the partial equilibrium model is more symmetric between tariffs and export subsidies than usually thought. It is well known that a large country might be able to increase net welfare by imposing a tariff in a static partial competitive equilibrium model. Here, it has been shown that this is also true for export subsidies.

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