

# ECO364H1S: International Trade Theory

## Lecture 8<sup>1</sup>

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# ECO364H1S Part 2

- ▶ Part 1:
- ▶ Classical Trade Model:
  - Perfect Competition
    - Trade Based on Comparative Advantage
- ▶ Part 2:
  - Trade Policy
    - When are trade restrictions welfare improving? Why?
    - Trade with Increasing Returns and Imperfect Competition
      - "Pro-Competitive" Gains From Trade
    - Trade Policy With Imperfect Competition
- ▶ Today:
  - The Instruments of Trade Policy (KMO Ch. 9)
    - Appendix to KMO Ch 10 (Optimal Tariffs)

# The Instruments of Trade Policy

- ▶ **Outline For Today's Lecture**
- ▶ Tariffs
  - Intro and Definitions
  - Theory: Small country
  - Theory: Large country
- ▶ Other Instruments
  - Export subsidies
  - Quotas
  - Voluntary Export Restraints (VERs)

## Tariffs: Definitions

Broad definition: A tariff is a tax on imports. The tax can take a variety of forms:

- ▶ **Specific tariff:** tax levied as a fixed charge for each unit imported
  - Revenue =  $(p - t)q$
- ▶ **Ad-valorem tariff:** tax levied as a fraction of the value being imported
  - Revenue =  $(1 - \tau)pq$
- ▶ **Compound duty:** mixture of specific and ad-valorem tariff
  - Revenue =  $(1 - \tau)(p - t)q$

# Tariffs in Practice

Tariffs have generally fallen over the last 20 years

- ▶ Canada: Average Tariff Rates
  - 1996: 7.82 %
  - 2014: 1.43 %
- ▶ United States: Average Tariff Rates
  - 1996: 4.44 %
  - 2014: 2.74 %
- ▶ China: Average Tariff Rates
  - 1994: 33.32 %
  - 2014: 7.74 %

Source: World Bank WITS database. All tariff rates are simple averages.

# Tariffs in Practice

Tariff rates vary widely by product group

- ▶ Canada: Average Tariff Rates in 2014 by Product Groups
  - Animals : 10.70 %
  - Textiles and Clothing: 8.77 %
  - Food Products: 8.03 %
  - Footwear: 7.33 %
  - Chemicals: 1.09 %
  - Fuels: 0.62 %
  - Capital Goods: 0.35 %
  - Minerals: 0.02 %

Source: World Bank WITS database. All tariff rates are simple averages.

# Tariffs in Practice

- ▶ Why do countries use tariffs?
- ▶ Why are many countries actively trying to cut tariffs?
  - **Trans-Pacific Partnership (TPP)**: Recently signed trade agreement between Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, the United States, and Vietnam
  - United States–Mexico–Canada Agreement (previously, **NAFTA**)
    - NAFTA significantly reduced tariffs on Mexico–USA exports
    - Removal of other non-tariff barriers (e.g. quotas)
    - Expansion of copyrights protection
- ▶ Is it beneficial for tariffs to fall?
  - Most trade agreements are met with protest
  - In general, there are *winners and losers* following trade agreements

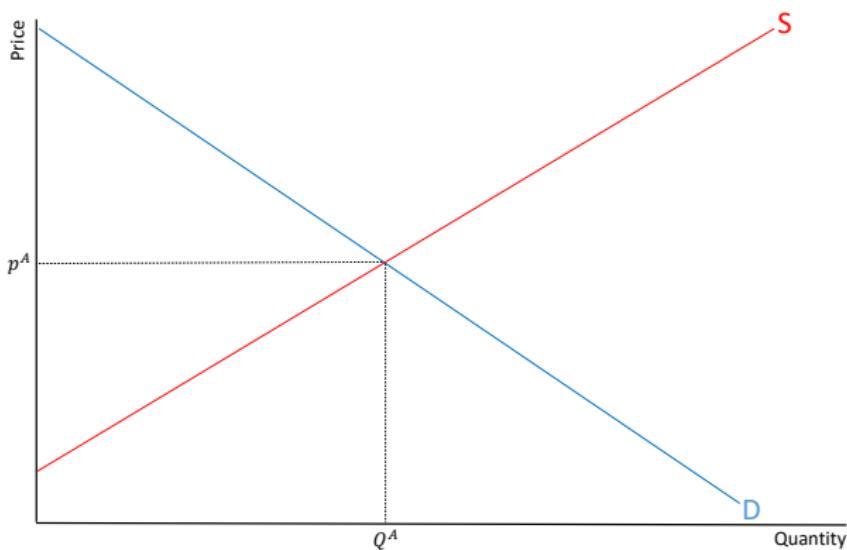
## Theory: Tariffs in partial equilibrium

- ▶ Up until now we have been considering a *general equilibrium* model of the economy.
- ▶ General Equilibrium: Multiple markets, equilibrium price vector chosen to clear all markets.
- ▶ We will now consider a *partial equilibrium* model of a single market.
  - Standard supply and demand framework (One good, one price per market)
  - We will assume the existence of supply and demand curves without explicitly deriving them from production and consumer optimization

# Costs and benefits of partial equilibrium analysis

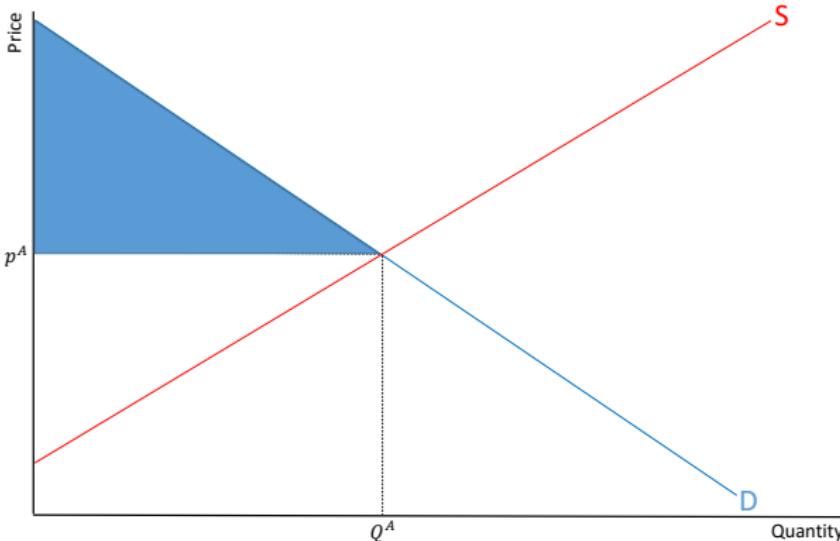
- ▶ Benefits of partial equilibrium
  - Simplifies analysis a great deal
  - We will be able to solve for the optimal tariff in closed form!
  - Much of the intuition carries over to the general equilibrium case
- ▶ Costs
  - We will have to ignore some secondary effects of the a tariff
    - Impact on the price of Home country's export good
    - Income Effects
- ▶ See extra reading (Bagwell and Staiger 2010) for analysis of tariffs in general equilibrium
  - Bit advanced for this course, but a good introduction for students who want to learn a bit more
  - Focus on terms of trade incentives to unilaterally introduce trade barriers

# Supply and Demand in a Single Industry and Single Country



- ▶ Equilibrium corresponds to the *autarky* price and quantity

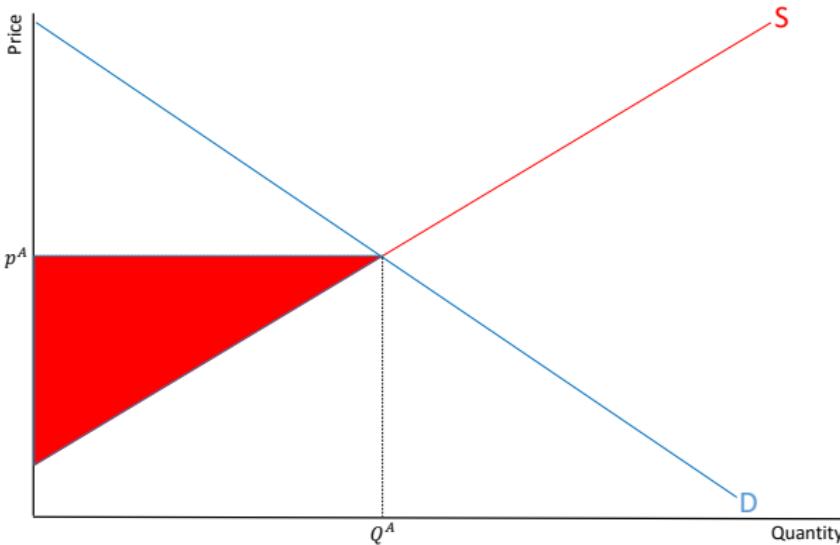
## Welfare In Partial Equilibrium: Consumers Surplus



Consumer Surplus: Area under demand curve but above equilibrium price

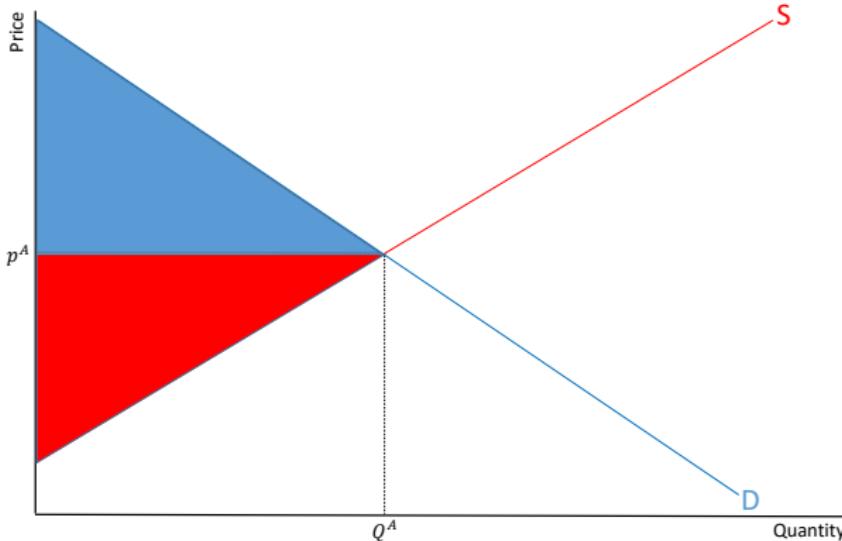
- ▶ Difference between willingness to pay for each marginal unit, versus what they actually pay

## Welfare In Partial Equilibrium: Producer Surplus



- ▶ Producer Surplus: Area above supply curve but above equilibrium price
  - Recall that supply curve is the marginal cost curve with perfect competition
  - Measures difference between the price earned per unit, versus the marginal cost for that particular unit

## Welfare In Partial Equilibrium: Total Surplus

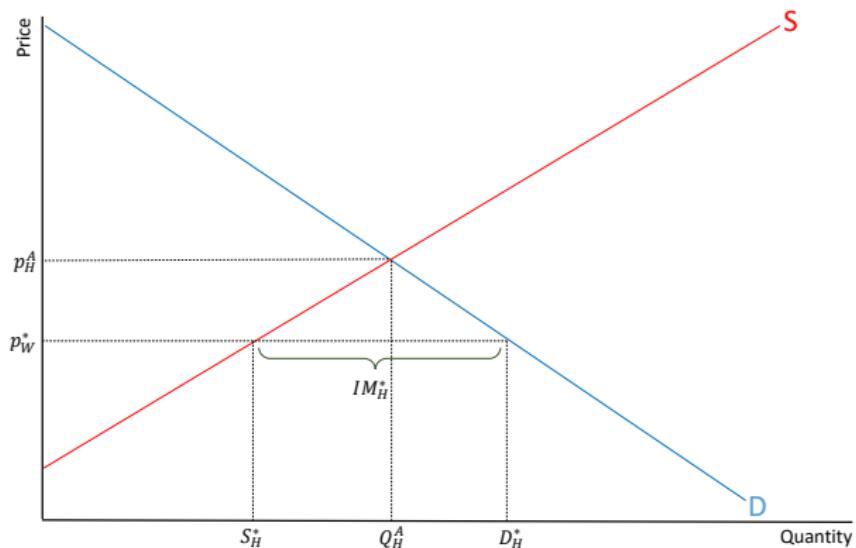


- ▶ Total Surplus: Add up consumer and producer surplus
  - Issues with this approach?

# Demand and Supply: Small Open Economy

- ▶ Small Open Economy
  - Takes world prices as given (exogenous)
    - Vatican City v.s. U.S.A., tariffs on cassocks
  - Price does not have to clear Home market!
- ▶ Consider a single small open economy called “Home”
  - Assume that world prices such that Home imports the good
  - This will only be the case if  $p_W^* < p_H^A$

# Supply, Demand, and Imports

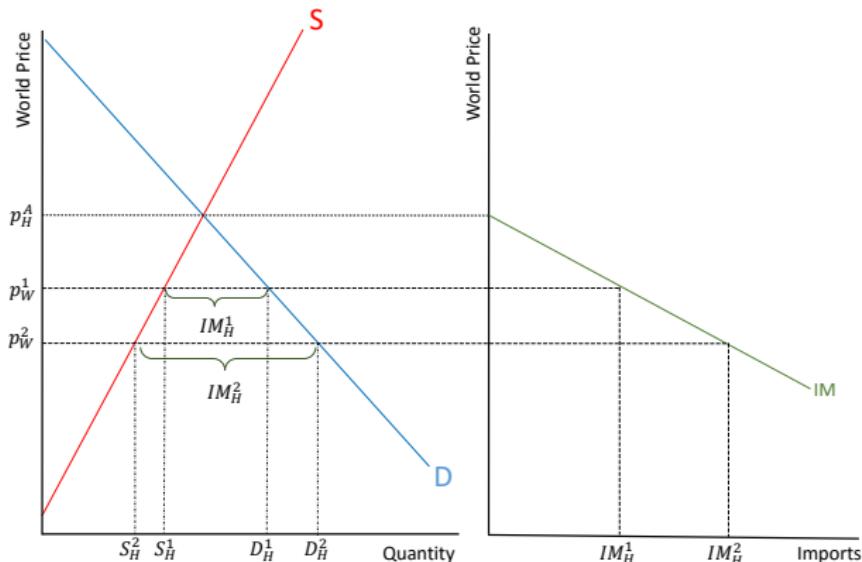


## Import Demand

- ▶ Note that imports will increase as the world price falls
- ▶ Take distance between demand and supply for each world price to obtain import demand curve

$$IM(p_W) = D(p_W) - S(p_W)$$

# Supply, Demand, and Import Demand

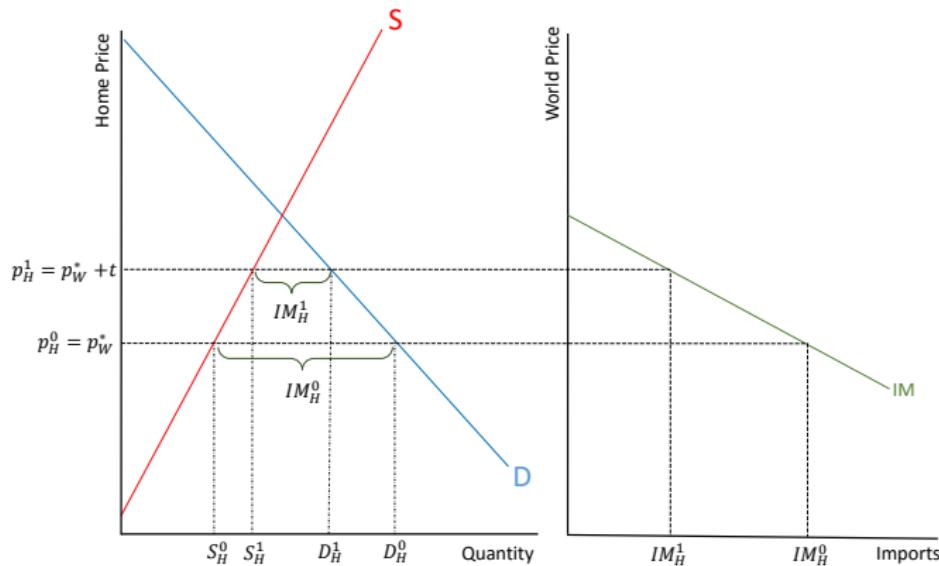


# Impact of Tariffs for Small Open Economy

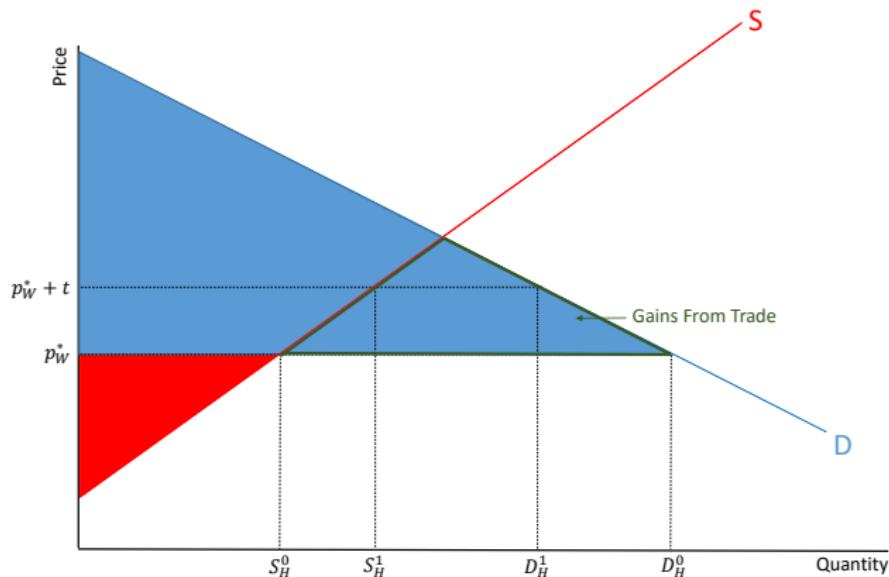
- ▶ For simplicity, we just consider specific tariffs,  $t$
- ▶ Specific tariff generates a wedge between the equilibrium world price  $p_W$ , and the Home price  $p_H$ 
  - Suppliers on the world market only willing to ship to this market if they receive enough to compensate them for the tariff
    - $p_H - t \geq p_W$
  - Home price cannot be too low, otherwise all world suppliers would ship to the Home market!
    - $p_H - t \leq p_W$
  - Must be that in equilibrium:  $p_H - t = p_W \rightarrow p_H = p_W + t$

Can show that this leads to a fall in imports, as well as welfare

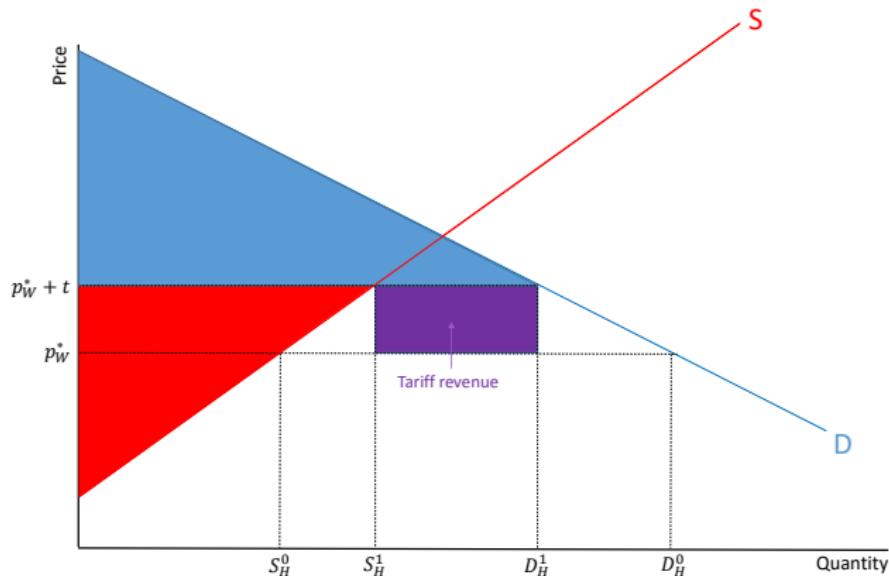
# Tariffs for Small Open Economy: Prices and Imports



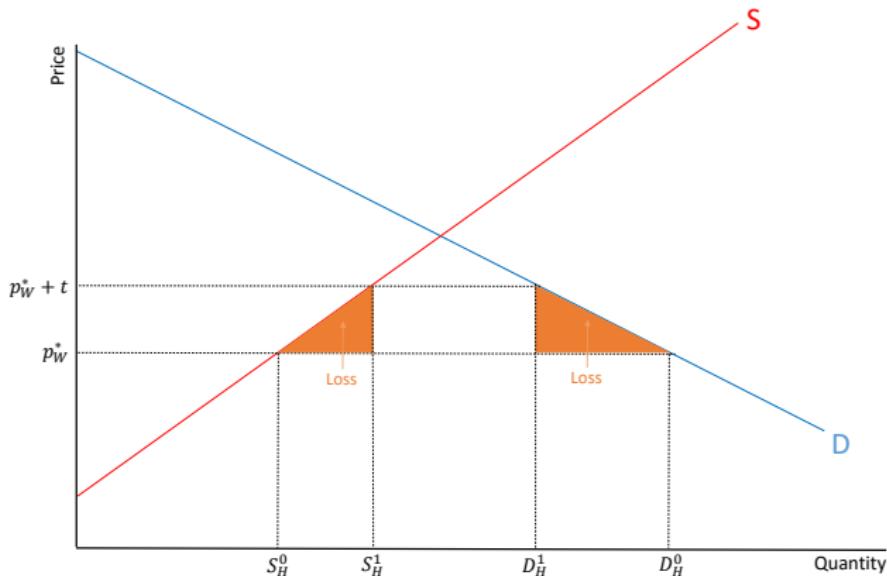
# Tariffs for Small Open Economy: Pre-Tariff Surplus



# Tariffs for Small Open Economy: Post-Tariff Surplus



# Tariffs for Small Open Economy: Fall in Surplus



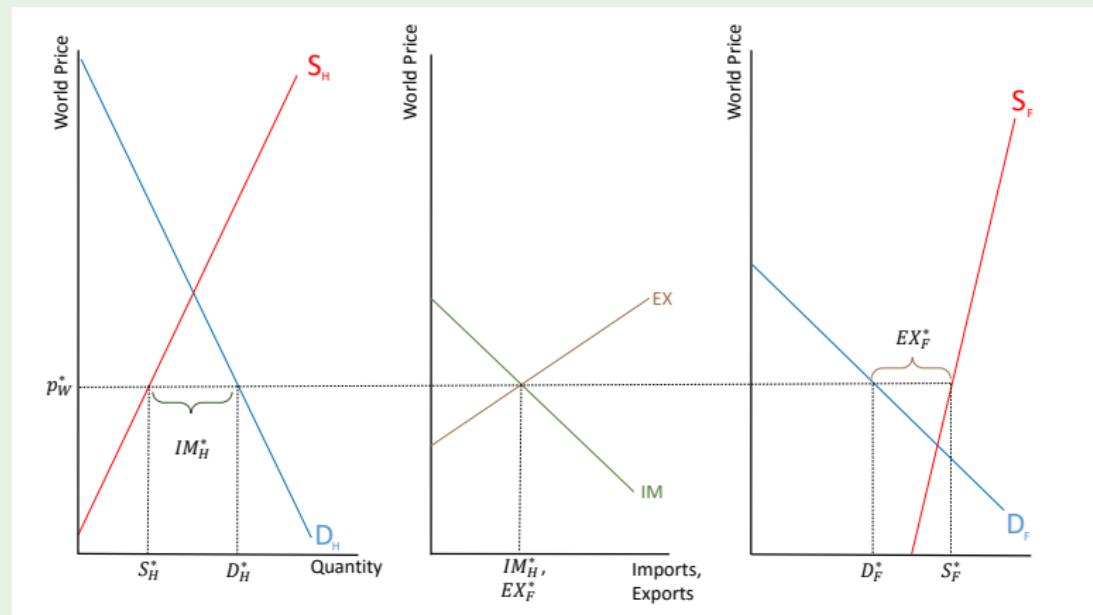
## Tariffs in a large open economy

- ▶ Tariffs non-optimal for a small open economy!
- ▶ So why do we see them?
  - Terms of trade considerations!
    - Tariff barriers can drive down the world price of the import good, benefiting consumers
    - For this to be true, economy needs to be “large” (i.e., its behaviour must affect world prices.)
- ▶ We now turn to a large country model to understand the potential benefits of tariff barriers

## Free-Trade Equilibrium with a Large Open Economy

- ▶ For simplicity, we suppose there are two **large** economies: Home ( $H$ ) and Foreign ( $F$ )
- ▶ Equilibrium free-trade price,  $p_W$ , is the price such that import demand of one country is equal to the export supply of the other country
- ▶ Suppose Home imports, Foreign exports
- ▶ Equilibrium given by the following conditions:
  1. Imports = Exports
    - $D_H(p_w) - S_H(p_w) = S_F(p_w) - D_F(p_w)$
  2. World Demand = World Supply
    - $D_H(p_w) + D_F(p_w) = S_H(p_w) + S_F(p_w)$
- ▶ Note that (1) is just (2) rearranged, so we can use either condition to solve for equilibrium.

# Equilibrium with a Large Open Economy: Diagram



# Solving for Free Trade Prices and Quantities

- ▶ Need to know who will export and who will import
  - Solve for equilibrium prices *in autarky*. The country with the lowest price will be the exporter
    - Why?
  - Solve for Import Demand  $D_i - S_i$  and Export Supply  $S_j - D_j$  curves
  - Set Import Demand equal to Export Supply, solve for prices
  - Substitute prices back in to Import Demand (or Export Supply) to get trade levels

Note: Can also use World Demand = World Supply Condition

## Effect of Tariff for Large Open Economy.

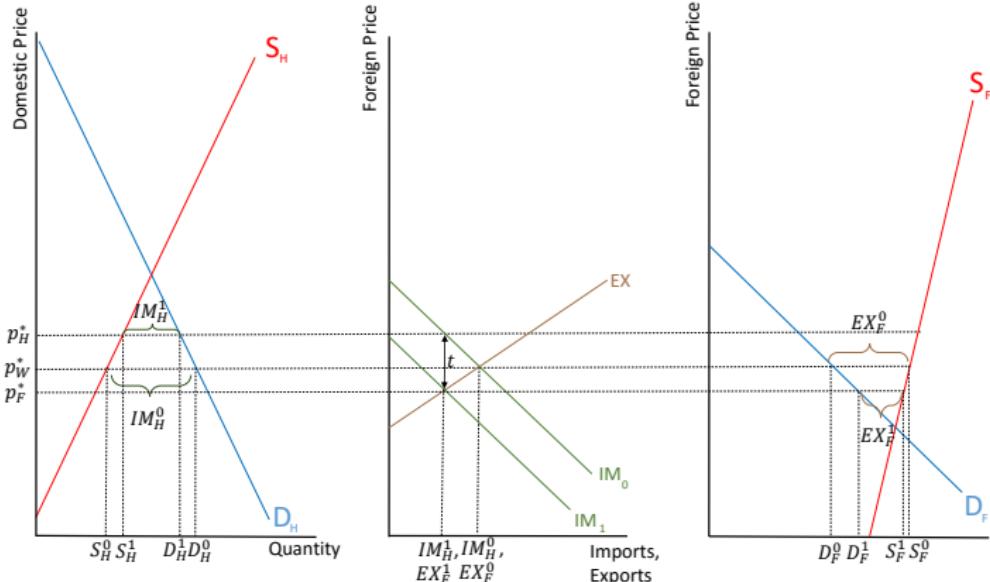
- ▶ Specific tariff,  $t$ , introduces a wedge between the *Foreign* price ( $p_F$ ) and the *Home* price ( $p_H$ ).
  - If we have two countries with two different prices, not clear what the world price is
  - Instead of one endogenous world price, we have two endogenous *local* prices
- ▶ Equilibrium condition
  - Exporters (Foreign Suppliers) still need to be compensated for the extra cost associated with selling in the Home market
    - Must be that  $p_H - t = p_F$  or  $p_H = p_F + t$

## Effect of Tariff for large Open Economy

Since  $p_H = p_F + t$ , effective price at home needs to be higher for every candidate value of  $p_F$

- ▶ Can be represented as a shift inwards in the import demand curve, treating  $p_F$  as the new “world price”
  - Mathematically: Instead of taking  $p_W$  as given, take  $p_F + t$  as given, and re-derive import demand curve
    - $IM_H(p_F + t) = D_H(p_F + t) - S_H(p_F + t)$
    - Note: Before tariff:  $p_W = p_F$
  - Side Note: Could instead treat  $p_H$  as the world price, in which case the export supply curve shifts

# Effect of Tariff for Large Open Economy



## Solving For Prices and Quantities with Tariffs

- ▶ Solve for equilibrium  $p_F$ 
  - Set new  $IM_H(p_F + t) = D_H(p_F + t) - S_H(p_F + t)$  equal to  $EX_F(p_F)$ , and solve.
- ▶ Must have  $p_H = p_F + t$
- ▶ Trade flows obtained by substituting  $p_F$  into  $EX_F(p_F)$
- ▶ Quantities demand and supplied obtained by plugging the appropriate price into the demand and supply functions

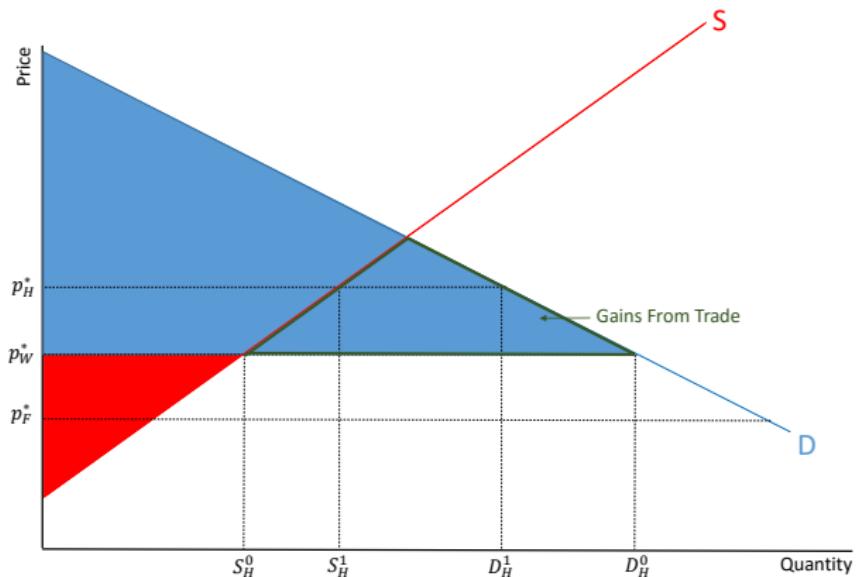
## Aside: Terms-of-Trade Gain

- ▶ **Definition:** Welfare gains arising from lower price of foreign good due to tariff
- ▶ Terms-of-trade = Price of exports / Price of imports
  - How much import a country can buy with its export income
- ▶ Similar idea to real wages
- ▶ If you can sell a good to the international market at a high price but imports are very expensive, then your terms-of-trade is low

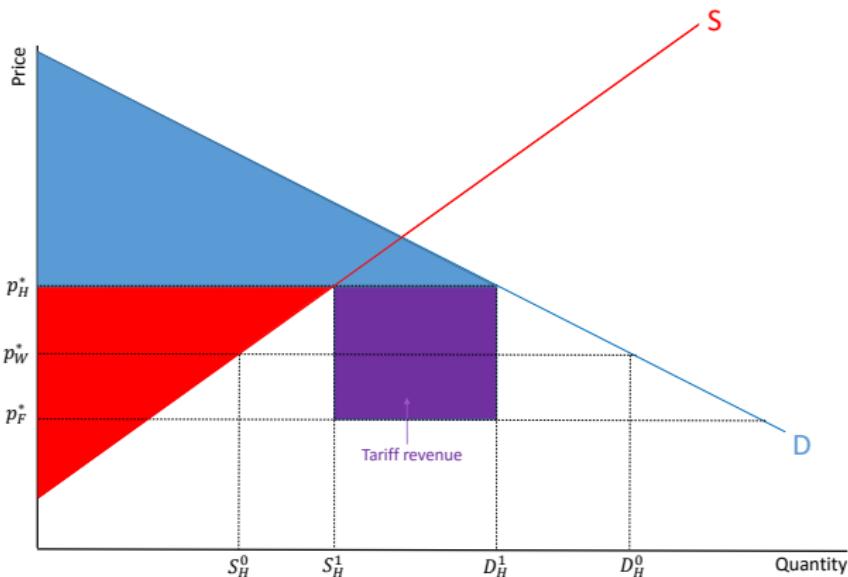
## Effect of Tariff for Large Open Economy

- ▶ Imports fall, as in the open economy case
- ▶ However, the foreign price of the good *falls*
- ▶ Wedge between foreign and home price generates a *terms-of-trade gain*
  - Fall in foreign price means imports are cheaper for the country
  - Home consumers actually pay a higher price because of the tariff
  - Gains from cheaper imports show up in the tariff revenue
    - Government revenue can be transferred to consumers

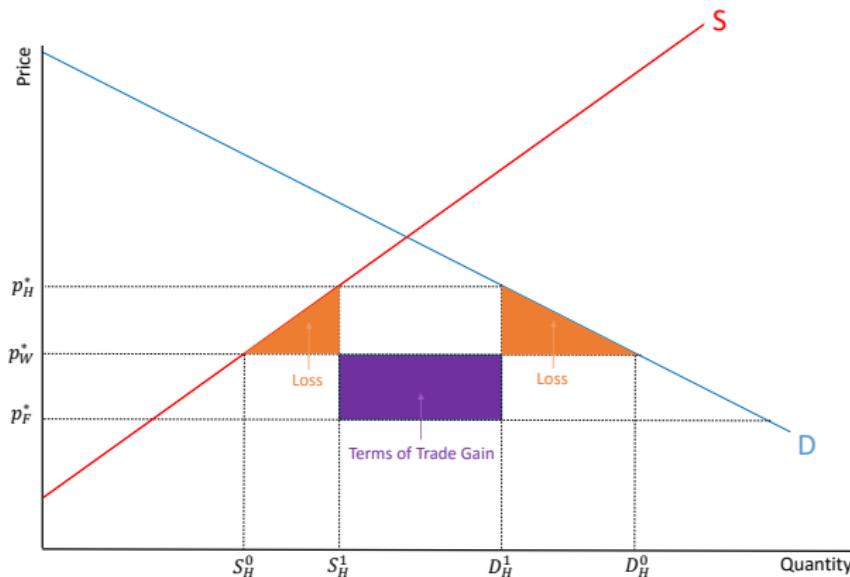
# Tariffs in Large Open Economies: Pre-Tarif Surplus



# Tariffs in Large Open Economies: Post-Tarif Surplus



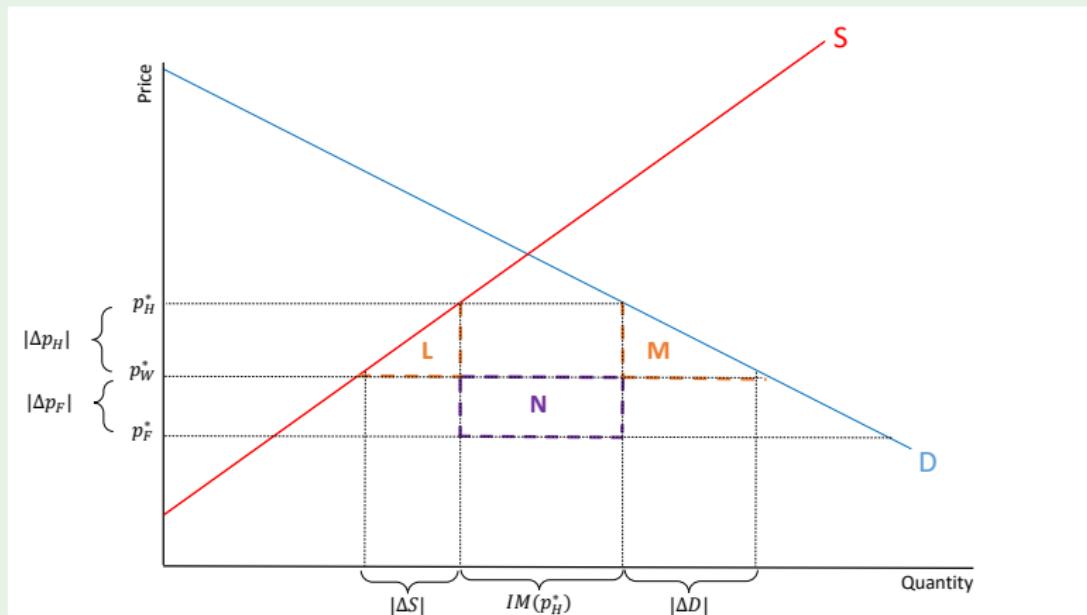
# Tariffs in Large Open Economies: Net Surplus



# Can Tariffs Increase Welfare?

- ▶ Existence of the *terms of trade gains* means that tariffs *could* lead to welfare gains.
  - Is the purple region ever bigger than the two orange regions?
- ▶ We shall now see that there will indeed be welfare gains for some positive levels of tariffs.
  - Can we find the *optimal tariff*?
    - Straightforward to do when demand and supply are linear
- ▶ Reference: Appendix to Chapter 10 in KOM

# Calculating Welfare



# Can Tariffs Increase Welfare?

Suppose:

- ▶ Home Demand:  $D_H(p) = A - B \times p$
- ▶ Home Supply:  $S_H(p) = C \times p$
- ▶ Export Supply:  $EX_F = J + K \times p_F = J + K \times (p_H - t)$

Solve for equilibrium prices with free trade and without:

- ▶  $p_w^* = \frac{A-J}{B+C+K}$
- ▶  $p_H^* = p_w^* + \frac{K}{B+C+K} \times t \rightarrow |\Delta p_H| = \frac{K}{B+C+K} \times t$
- ▶  $p_F^* = p_w^* - \frac{B+C}{B+C+K} \times t \rightarrow |\Delta p_F| = \frac{B+C}{B+C+K} \times t$

Also note:

- ▶  $|\Delta D| = D_H(p_w^*) - D_H(p_H^*) = B \times (p_H^* - p_w^*) = \frac{BK}{B+C+K} \times t$
- ▶  $|\Delta S| = S_H(p_H^*) - S_H(p_w^*) = C \times (p_H^* - p_w^*) = \frac{CK}{B+C+K} \times t$
- ▶  $IM(p_H^*) = (A) - (B + C) \times p_H = A - \left( \frac{B+C}{B+C+K} \right) (A - J + K \times t)$

# Can Tariffs Increase Welfare?

- ▶ Part L:  $\frac{1}{2} |\Delta p_H| \times |\Delta S| = \frac{C}{2} \left( \frac{K}{B+C+K} \right)^2 \times t^2$
- ▶ Part M:  $\frac{1}{2} |\Delta p_H| \times |\Delta D| = \frac{B}{2} \left( \frac{K}{B+C+K} \right)^2 \times t^2$
- ▶ Part N:  $|\Delta p_F| \times IM(p_H) = \frac{B+C}{B+C+K} \times t \times \left( A - \left( \frac{B+C}{B+C+K} \right) (A - J + K \times t) \right)$

Total change in Welfare given by:

- ▶  $\Delta W = \text{Part N} - \text{Part L} - \text{Part M}$

Can Show:

$$\Delta W = Xt - Zt^2$$

- ▶ Where:

- $X = \frac{(B+C)(AK+JB+JC)}{(B+C+K)^2}$
- $Z = \frac{K(B+C)(2B+2C+K)}{2(B+C+K)^2}$

# Can Tariffs Increase Welfare?

$$\Delta W = Xt - Zt^2$$

- ▶ Note that the change in welfare is a quadratic in  $t$
- ▶ Since  $Z > 0$  (see previous slide), this function is *concave* in  $t$ , so there is a global maximum for some finite  $t$
- ▶ Is the maximum somewhere with  $t > 0$ ?
  - Take FOC for maximum:
    - $X - 2Zt^* = 0 \rightarrow t^* = \frac{X}{2Z}$
    - Yes, since  $X > 0$ .

A large open economy can be better off if they choose to implement an (optimal) positive tariff!

# Tariffs and World Welfare

- ▶ While introducing a tariff barrier increases the welfare of Home, it *hurts* Foreign
  - You are asked to show this in assignment 3
- ▶ Introducing tariffs problematic for *world* welfare
  - Governments trying to maximize the welfare of their own citizens do not account for the welfare cost on foreign citizens
- ▶ Moreover, note that by a similar argument, Foreign will want to put a tariff on their imports as well!
  - Incentive for trade wars!
  - More on this later... (Chapter 10)

## A note on the optimal tariff and export supply

$$EX_F = J + K \times p_F = J + K \times (p_H - t)$$

$$t^* = \frac{X}{2Z} = \frac{AK + J(B + C)}{K(2(B + C) + K)} = \frac{A}{2(B + C) + K} + \frac{J(B + C)}{K(2(B + C) + K)}$$

- ▶ Note that the optimal tariff falls as  $K$  rises.
  - The more response exports are to price, the *less* you want to use tariffs.
    - Why? Less market power!
  - For *ad-valorem* tariffs, possible to show that in many environments the optimal tariff is given by the reciprocal of the export supply elasticity.
    - See Broda, Limao and Weinstein (2008)

# Export Subsidies

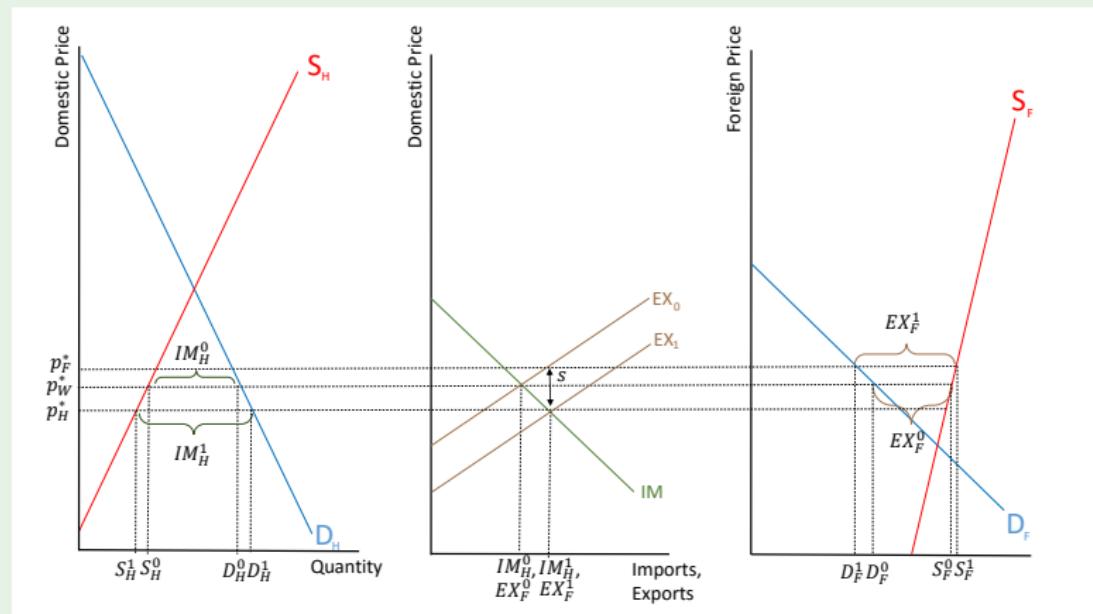
**Export Subsidies:** A payment to firms for shipping a good abroad

- ▶ Essentially the opposite of a tariff
- ▶ Again, we only consider the impact of specific export subsidies, rather than *ad-valorem* subsidies
  - Revenue per exported good:  $(p + s)q$

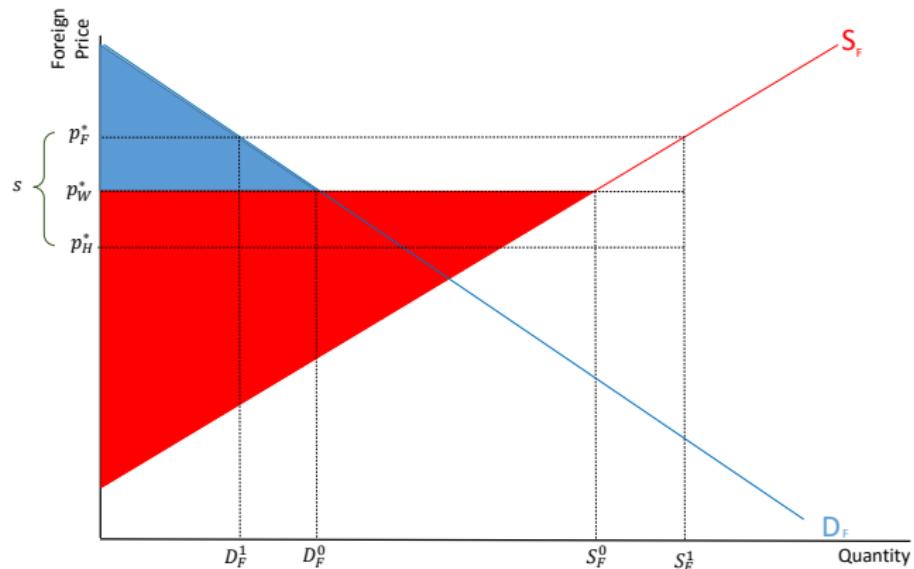
Suppose Foreign introduces an export subsidy (Where both Home and Foreign are “large”)

- ▶ Subsidy introduces a wedge between foreign and home price
  - $p_F = p_H + s$

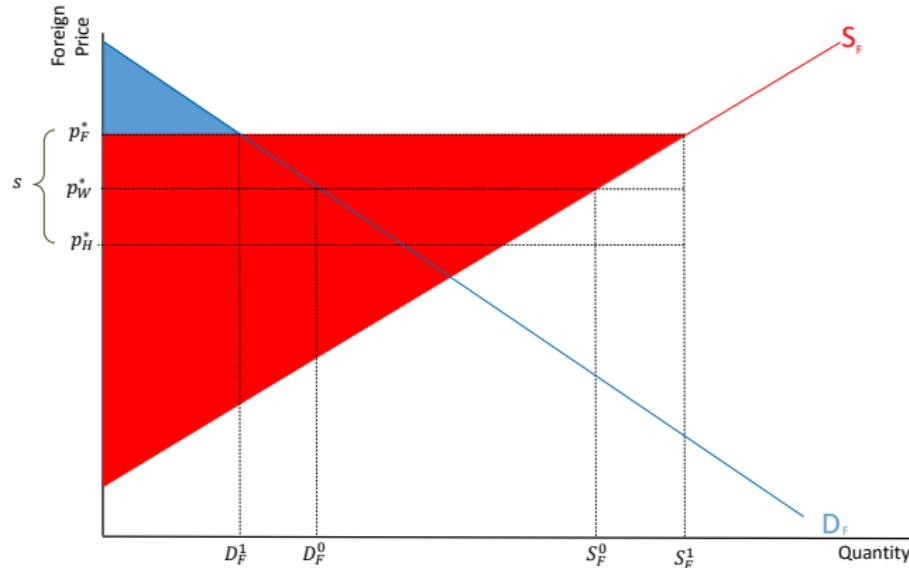
# Export Subsidies



# Export Subsidies and Foreign Welfare: Surplus pre-subsidy

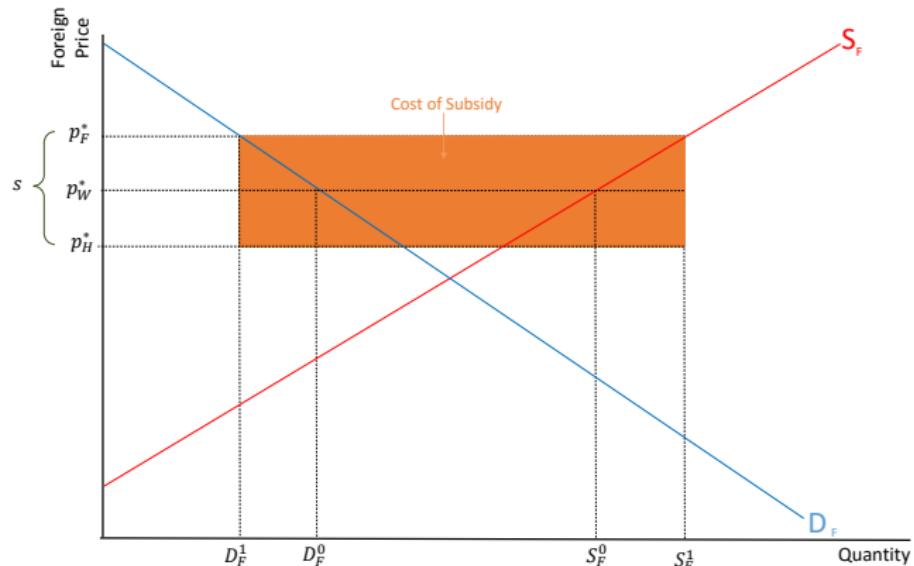


# Export Subsidies and Foreign Welfare: Surplus post-subsidy

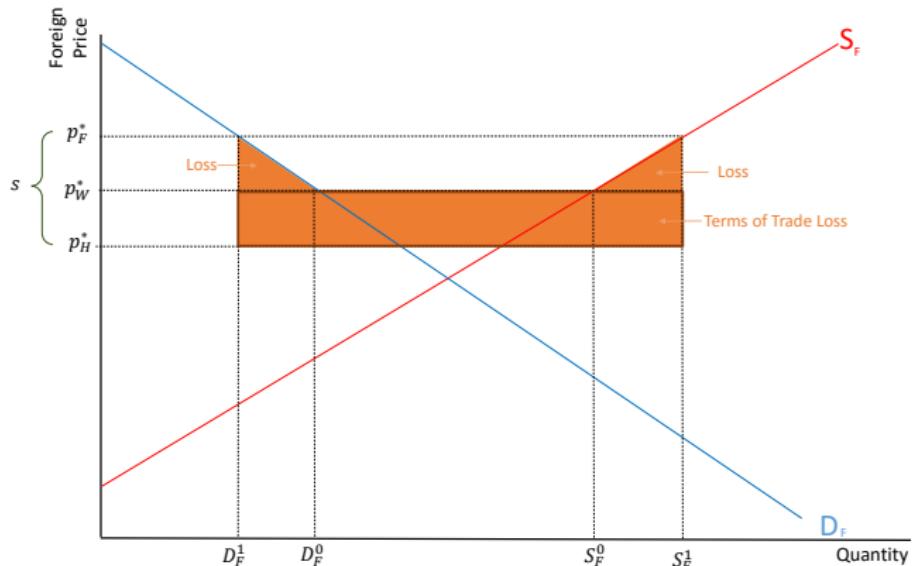


...However, recall that the subsidy must be paid by someone!

# Export Subsidies and Foreign Welfare: Cost of subsidy



# Export Subsidies and Foreign Welfare: Change in surplus



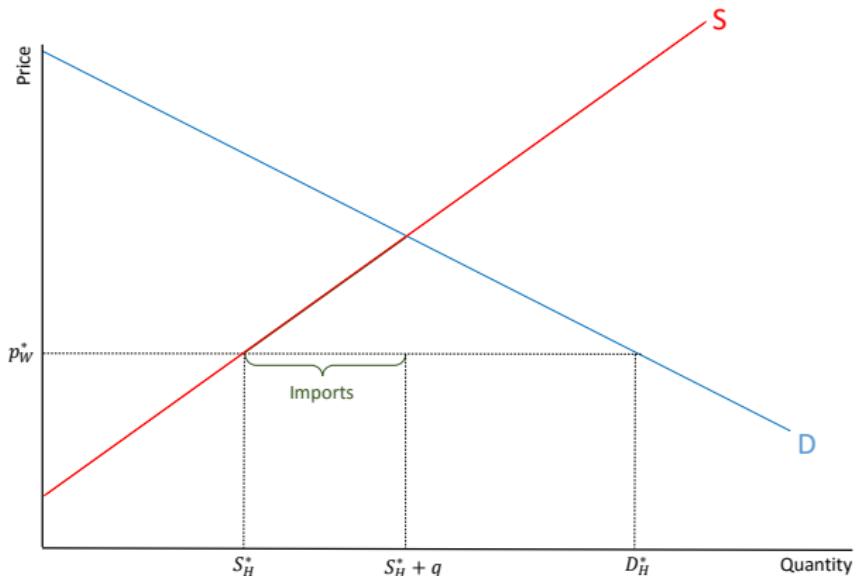
## Export Subsidies: Summary

- ▶ Foreign exports and Home imports rise
- ▶ Export subsidies cost the Foreign government money *and decrease* Foreign's terms of trade
  - The Foreign price of the good rises, while the Home price falls
  - Leads to an extra welfare cost for the Foreign country
- ▶ In general export subsidies do not benefit the exporting country
  - May be used to achieve distributional goals
    - Eg. European Common Agricultural Policy

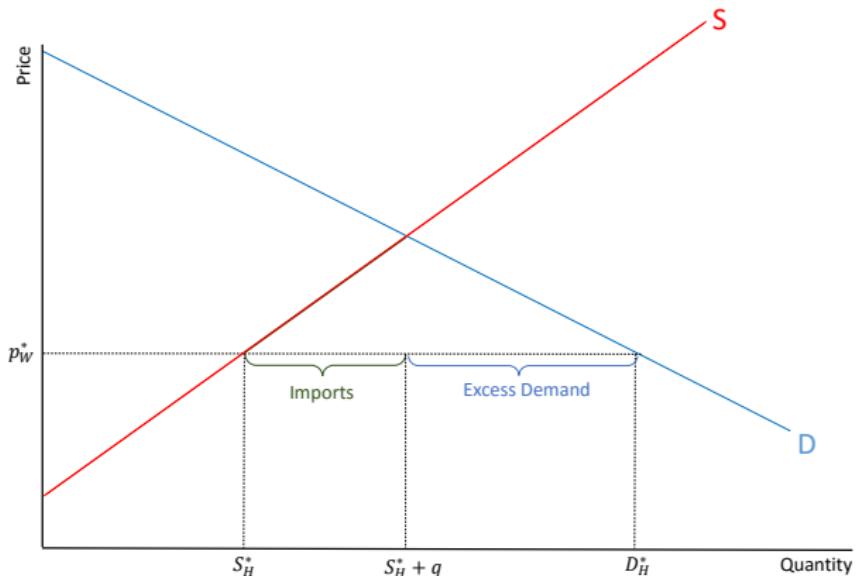
## Quotas

- ▶ **Import Quotas:** A government imposed restriction on the quantity of some good that may imported
  - U.S.A quota on imports of foreign cheese (only select firms can import some maximum amount each year)
- ▶ Usually enforced issuing import licenses to some limited number of firms
  - License allows them to import at most some limited quantity of a good
- ▶ Common misconception: Since we are only limiting the quantity of imports, no impact on prices
  - *A (binding) import quota always raises the domestic price of the imported good*
    - If import quota binding, then Demand > Supply, domestic prices will be bid up!

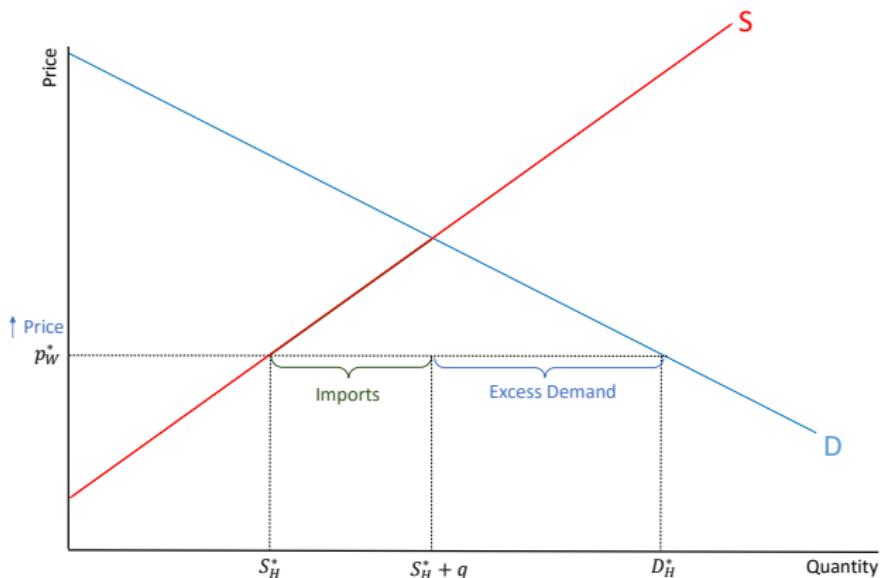
# Quotas: Small Open Economy



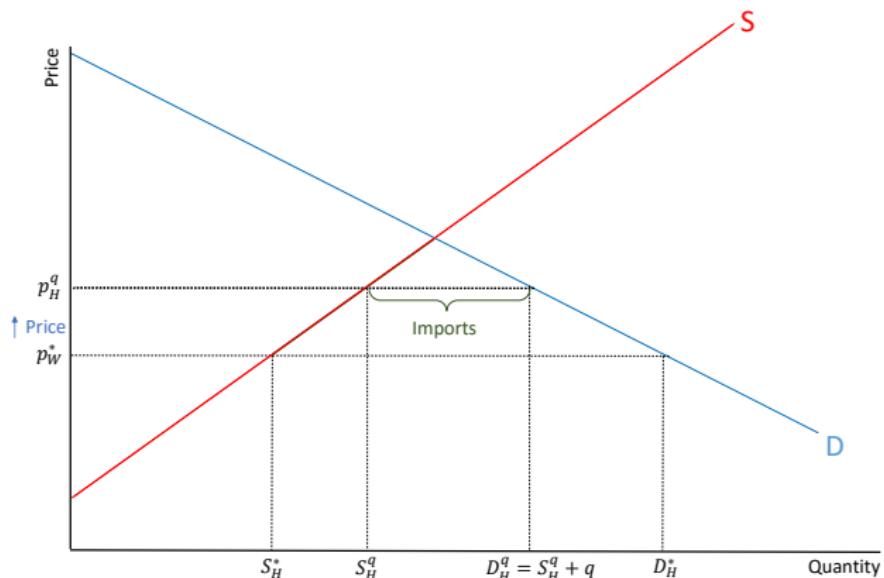
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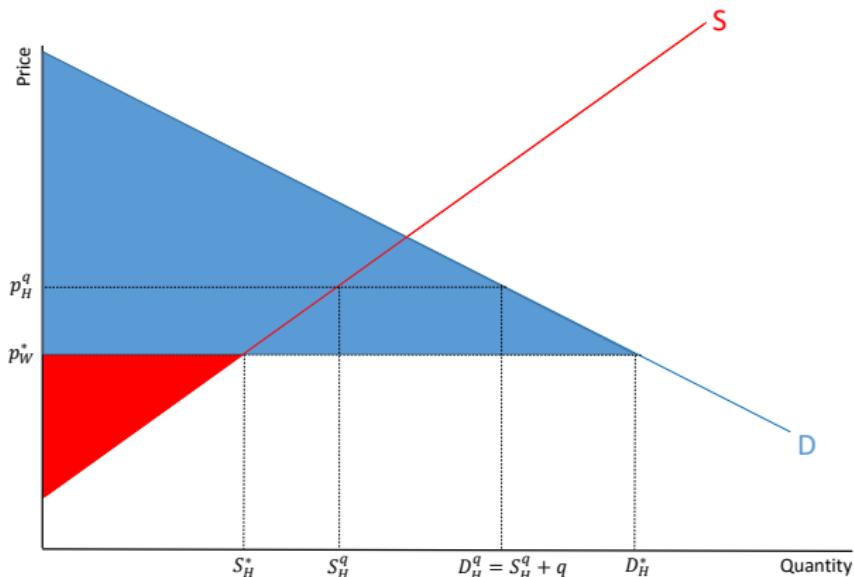
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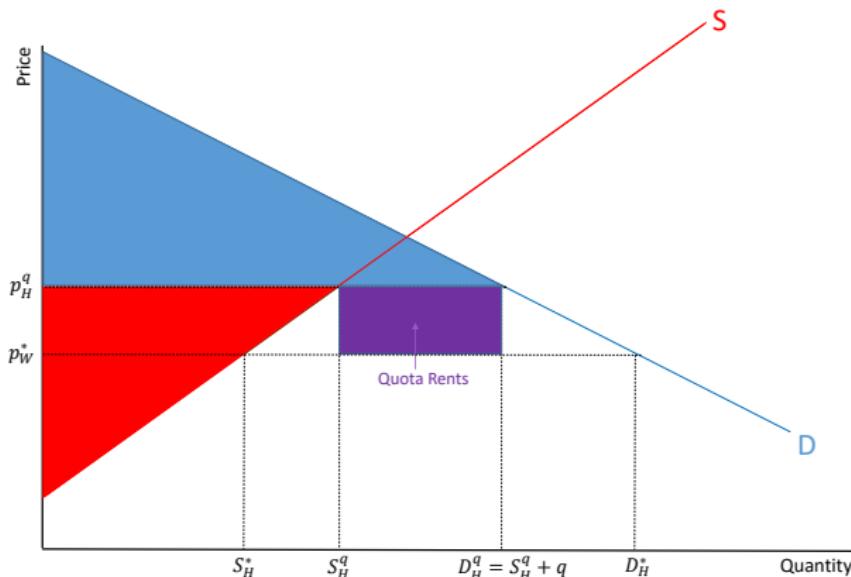
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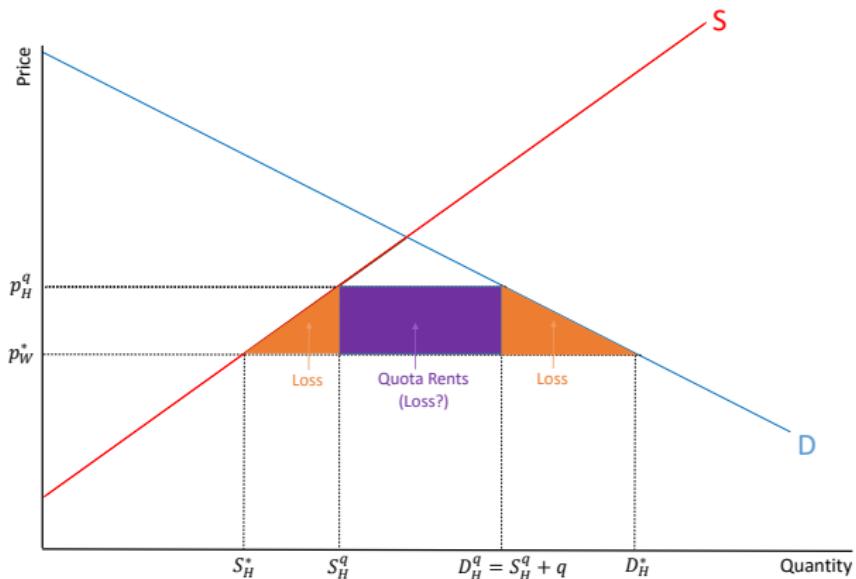
## Quotas and Welfare for SOE: Surplus Pre-Quota



## Quotas and Welfare for SOE: Surplus Post-Quota



# Quotas and Welfare for SOE: Change in Surplus



## Summary: Effect of Quotas on SOE

- ▶ Imports Fall
- ▶ Domestic Prices Rise
- ▶ Welfare Falls
  - Welfare falls by less if import licenses given to domestic firms, rather than foreign firms.

What would happen if this was a large open economy?

## Voluntary Export Restraints (VERs)

- ▶ Essentially a quota imposed on the side of exporting country.
- ▶ The impact on Home is identical to the quota considered before.
  - Except foreign country gets the quota (VER) rents.
  - Rather than implement a quota, convince exporter to voluntarily restrict trade by giving them some of the rents.
    - Less likely to lead to trade war?
    - Japanese exports of cars to U.S. in 1980s.

# Summary

- ▶ Tariffs
  - Theory: Small country
    - Tariffs tend to hurt small open economies
  - Theory: Large country
    - An optimally chosen tariff will benefit a large country
    - ... But will hurt other countries (Problem Set 3)
- ▶ Other Instruments
  - Export subsidies
    - Hurt large open exporters!
  - Quotas
    - Tends to increase domestic prices, hurts small open economies
  - Voluntary Export Restraints (VERs)
    - A quota imposed by a foreign country