Thematic Area 3:

International Trade Policy: Import Tariffs & Export Subsidies

MSc in ISFM

Introduction

- **Gains from trade are unevenly spread**. Industries, labor unions, economic groups often feel that the government should **do something to help limit their losses (maximize their gains) from international trade**

- This "**something**" is **trade policy: import tariffs** (taxes on imports), **import quotas** (quantity limits), **exports subsidies, qualitative import/export constraints, etc.**

Introduction: Tariffs in practice (I)

➢ EU Import Tariffs:

- **Brazil, Philippines, Vietnam:** €1114 per tone of imported bananas
- **The US:** 10% on US made cars
- **China:** 15% on Clothing & Textiles, 14% on Consumer Electronics, 14% on Foot-ware, 5% on Toys & Furniture, etc.
- **Australia:** € 32/hectoliter of still water, €9/hectoliter of sparkling wines
- **Thailand:** 7-20% on many fish and seafood products

Introduction: Tariffs in practice (II)

- **President Barack Obama levied an average tariff of 35% on imports of from China (September 11, 2009)**

- **Trade policy announcements by President Trump:**

- Withdrawal of the USA from the **Trans-Pacific Partnership**
- Renegotiate the **NAFTA Agreement**
- **New tariffs of approx. $200 bn** on Chinese imports to the US
- Threats for **punitive tariffs** on EU, Japanese and S. Korean exports to the US (cars, steel, electronics, etc.)

Introduction: Instruments of Trade Policy

The main instruments of trade policy are:

Tariffs (Imports)
Subsides (Exports)
Import / Export Quotas
Voluntary Export Restraints
Local Content Requirements
Administrative Polices
Antidumping Policies

Brief History of the World Trade Organization (WTO)

In the aftermath of WWII, representatives of the Allied countries often met to discuss trade issues such as the abolishment of high international trade barriers and volatile exchange rate parities

In 1947 the **General Agreement on Tariffs and Trade (GATT)**, was created. Its purpose: the reduction (potentially the elimination) of barriers on international trade among countries

Keystone Principles of GATT /WTO

1. A country **must impose uniform**, i.e., at the same level or rates, trade barriers at the same level or rate on trading partners members of the WTO

2. These trade restrictions must be justified as countervailing practices (duties) against unfair trade practices, e.g., **dumping**

3. **Dumping:** The sales of an exported commodity to another country at a price either (i) lower than that charged in domestic markets, or (ii) lower than its average (unit) cost of production (plus transportation costs)

4. Countries are not allowed **unilaterally** to restrict the volume (quantity) of exports or imports, i.e., not permitted to **unilaterally impose import or export quotas**

5. Countries **must declare to their trading partners the adoption of export subsidies** granted to specific firms and sectors of production. Article XVI states that countries must inform each other the level of export subsidies and investigate the possibility of their abolishment

6. Countries can temporarily raise tariffs for certain products. Article XIX, called the **safeguard provision** or the **escape clause**:

*The importing country can **temporarily** raise tariffs when domestic producers are "hurt" due to import competition*

Introduction: Instruments of Trade Policy

- **Question:** Why such policy measures? What are their economic implications both for the country imposing them, as well as for its trading partners, i.e., exports or imports of other countries affected by these policy measures

- **To answer we consider:** **(i) import tariffs** (quotas) and **(ii) export subsidies** (Agricultural, EU-CAP, Industrial subsidies)

- ***Country Framework:***
- **Small Open Economies (SOEs):** Economies which **cannot affect** their **terms of trade**, i.e., world commodity prices, through their economic policies
- **Large Open Economies (LOEs):** Economies which **can affect** their **terms of trade**, i.e., world commodity prices, through their economic policies

Free- Trade vs. Import Tariffs / Export Subsidies

Evaluating the economic implications of Import Tariffs / Export Subsidies **vis-à-vis Free-Trade** we examine the impact of these policies on (i) the country's national welfare (level of real income), (ii) welfare of the Rest of World (ROW)

Question: Will the adoption of such trade measures lead to a higher welfare for a country relative to its welfare in Free-trade? How do they affect welfare in ROW?

The analytical instruments to answer this question:

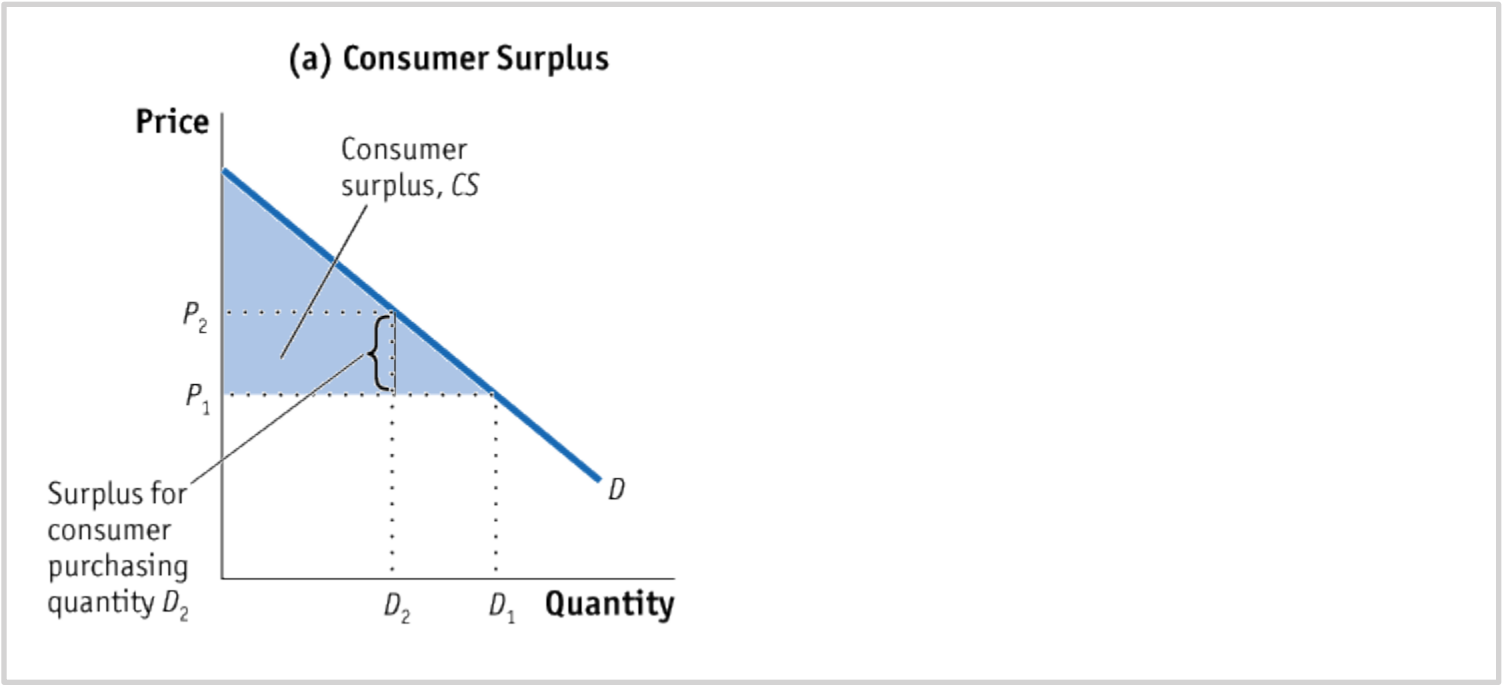
(i) consumer's surplus

(ii) producer's surplus

International Trade Policy: Import Tariffs

The Gains from Trade

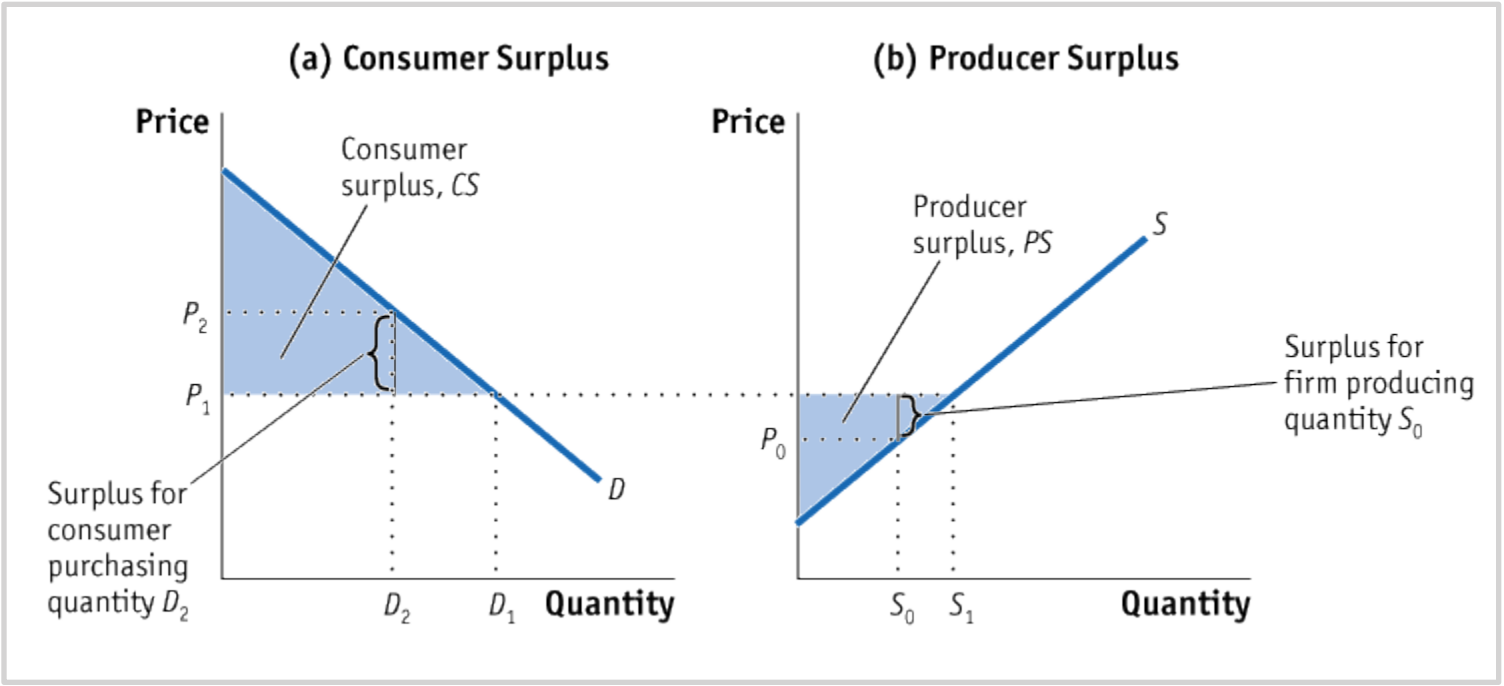
Consumer's and Producer's Surplus



Consumer and Producer Surplus

In panel (a), the consumer surplus from purchasing quantity D_1 at price P_1 is the area below the demand curve and above that price.

The consumer who purchases D_2 is willing to pay price P_2 but has to pay only P_1. The difference is the consumer surplus and represents the satisfaction of consumers over and above the amount paid.



Consumer and Producer Surplus (continued)

In panel (b), the producer surplus from supplying the quantity S_1 at the price P_1 is the area above the supply curve and below that price.

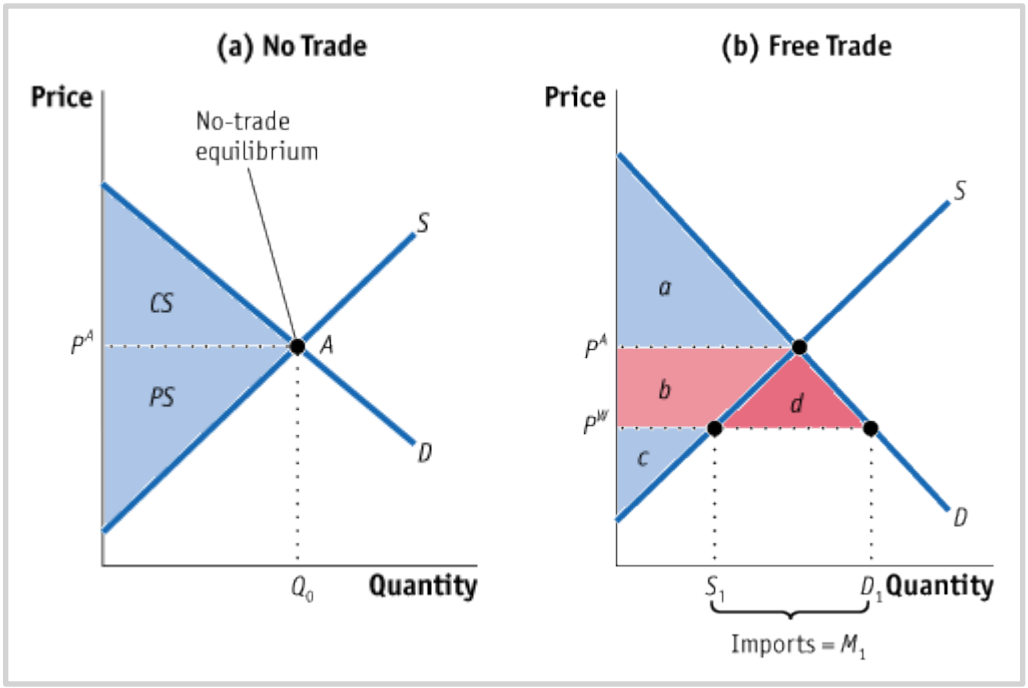
The supplier who supplies unit S_0 has marginal costs of P_0 but sells it for P_1. The difference is the producer surplus and represents the return to fixed factors of production in the industry.

The Gains from Free Trade

A **small country** is small in comparison to all the other countries buying and selling this product.

Home Welfare

No Trade, Free Trade for a Small Importing Country, Gains from Trade



Rise in consumer surplus: + (*b* + *d*)

Fall in producer surplus: − *b*

Net effect on Home welfare: + *d*

The Gains from Free Trade at Home **With Home demand of *D* and supply of *S*, the no-trade equilibrium is at point A, at the price P^A producing Q_0.**

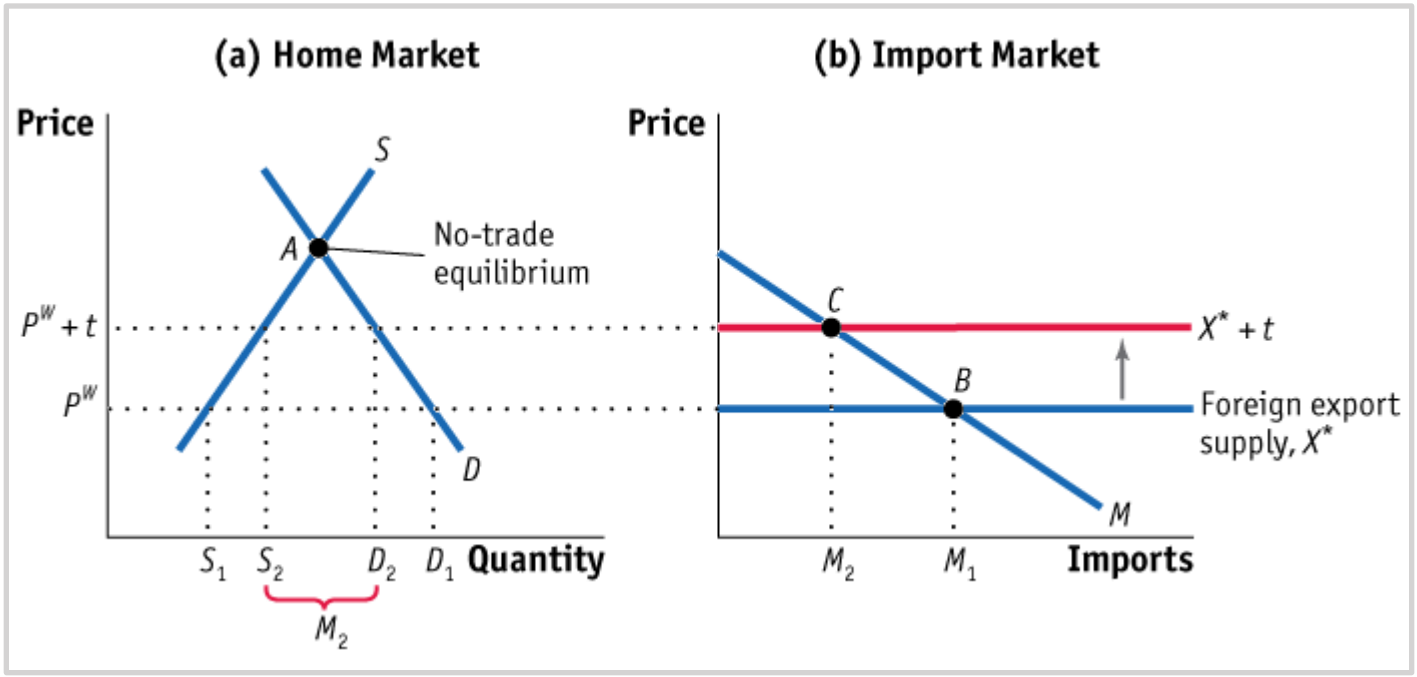
With free trade, the world price is P^W (imported good), so quantity demanded increases to D_1 ($D_1 > Q_0$) and quantity supplied falls to S_1 ($S_1 < Q_0$).

Since quantity demanded exceeds quantity supplied, Home imports $D_1 - S_1$.

Consumer surplus increases by the area *(b + d),* and producer surplus falls by area *b*.

The gains from trade are measured by area *d*.

Free Trade for a Small Importing Country and Effect of an Import Tariff (con'ed…)



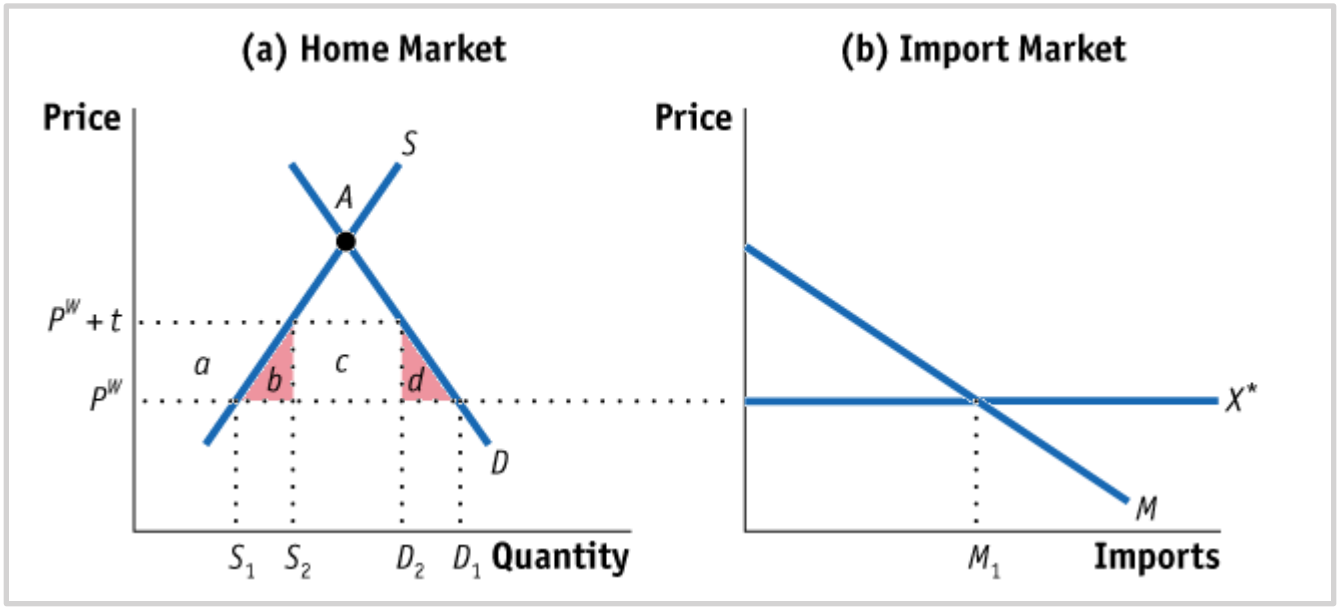
Tariff for a Small Country (continued)

Imports fall due to the tariff, from M_1 to M_2 in panel (b).

As a result, the equilibrium shifts from point *B* to *C*.

Free Trade for a Small Importing Country and Effect of an Import Tariff (con'ed)

Effect of Tariff on Consumer Surplus, Producer Surplus, Government Revenue, Overall Effect of the Tariff on Welfare, Production Loss and Consumption Loss



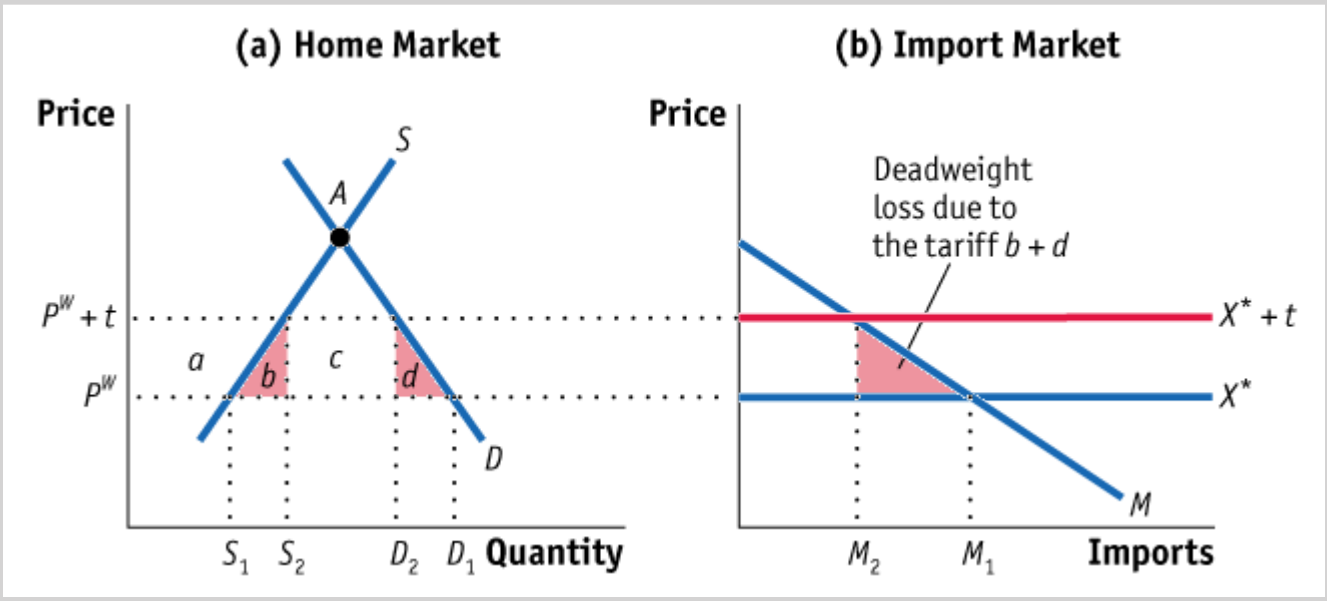
Effect of Tariff on Welfare

The tariff increases the price from P^W to $P^W + t$.

As a result, consumer surplus falls by (a + b + c + d). Producer surplus rises by area (*a*), and government revenue increases by the area (*c*).

Import Tariffs for a Small Country

Effect of Tariff on Consumer Surplus, Producer Surplus, Government Revenue, Overall Effect of the Tariff on Welfare, Production Loss and Consumption Loss (con'ed)



Fall in consumer surplus: − (*a* + *b* + *c* + *d*)

Rise in producer surplus: + *a*

Rise in government revenue: + c

Net effect on Home welfare: − (*b* + *d*)

The triangle **(*b* + *d*)** is a **deadweight loss**, or a loss that is not offset by a gain elsewhere in the economy

Effect of Tariff on Welfare (con'ed)

Therefore, the net loss in welfare, the deadweight loss to Home, is *(b + d)*, which is measured by the two triangles *b* and *d* in panel (a) or the single (combined) triangle *b + d* in panel (b).

Import Tariffs for a Small Importing Country

Summing up, the **deadweight loss** (triangle (*b* + *d*)),

- **The area of triangle *b*** equals *the increase in marginal costs for the extra units produced* and can be interpreted as the **production loss** (or the *efficiency loss*) for the economy due to producing at marginal cost above the world price

- **The area of the triangle *d*** is interpreted as *the drop in consumer surplus for those individuals who are no longer able to consume the units between D_1 and D_2 because of the higher price*. We refer to this drop in consumer surplus as the **consumption loss** for the economy

Why and How Are Tariffs Applied?

- **If a small country suffers a loss when it imposes a tariff, why do so many have tariffs as part of their trade policies?**

- One answer is that a developing country does not have any other **source of government tax revenue. Revenue from Import tariffs are "easy to collect"**

- A second reason is **politics**. The benefits to producers (and their workers) are typically more concentrated on specific firms and sectors than the costs to consumers, which are spread nationwide

Deadweight Loss Due to a Tariff

$$\Delta WL = \frac{1}{2} \bullet t \bullet \Delta M$$

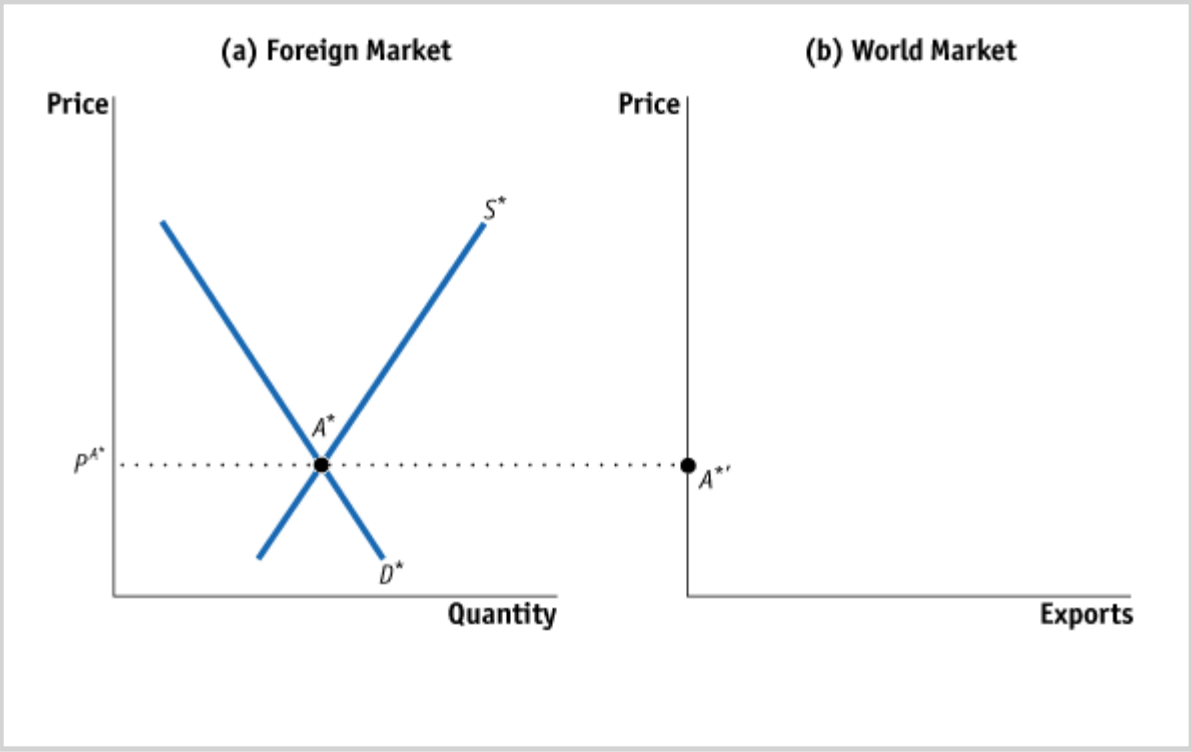
- **The deadweight loss relative to the value of imports equals:**

$$\frac{DWL}{P^W \bullet M} = \frac{1}{2} \bullet \frac{t \bullet \Delta M}{P^W \bullet M} = \frac{1}{2} \bullet \left(\frac{t}{P^W} \right) \bullet \%\Delta M$$

Import Tariffs for a Large Importing Country

Foreign Export Supply

Large (enough) importing country: we might expect that its tariff will change the world price



Foreign Export Supply

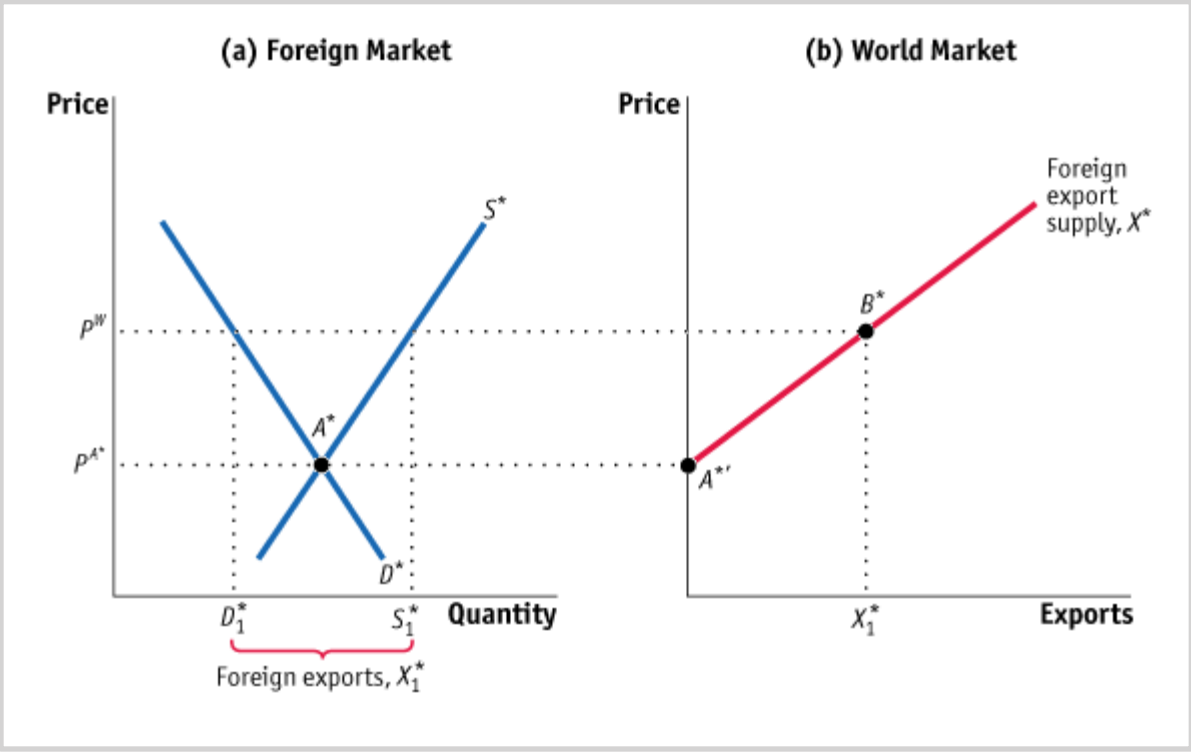
In panel (a), with Foreign demand of D^* and Foreign supply of S^*, the no-trade equilibrium in Foreign is at point A^*, with the price of P^{A^*}.

At this price, the Foreign market is in equilibrium and Foreign exports are zero—point A^* in panel (a) and point $A^{*\prime}$ in panel (b), respectively.

Import Tariffs for a Large Importing Country

Foreign Export Supply

If we consider a large enough importing country or a large country, we might expect that its tariff will change the world price



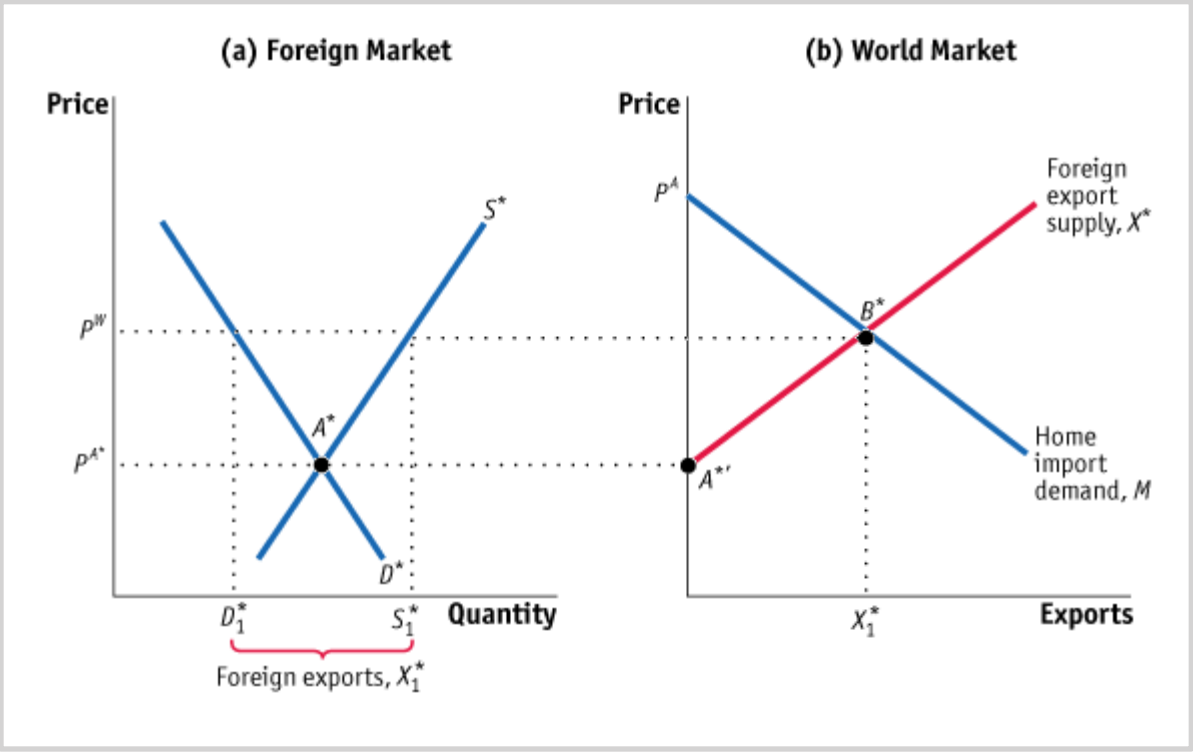
Foreign Export Supply (continued)

When the world price, P^W, is higher than Foreign's no-trade price, the quantity supplied by Foreign, S^*_1, exceeds the quantity demanded by Foreign, D^*_1, and Foreign exports $X^*_1 = S^*_1 - D^*_1$.

In panel (b), joining up points $A^{*\prime}$ and B^*, we obtain the upward-sloping export supply curve X^*.

Import Tariffs for a Large Importing Country (con'ed)

Foreign Export Supply

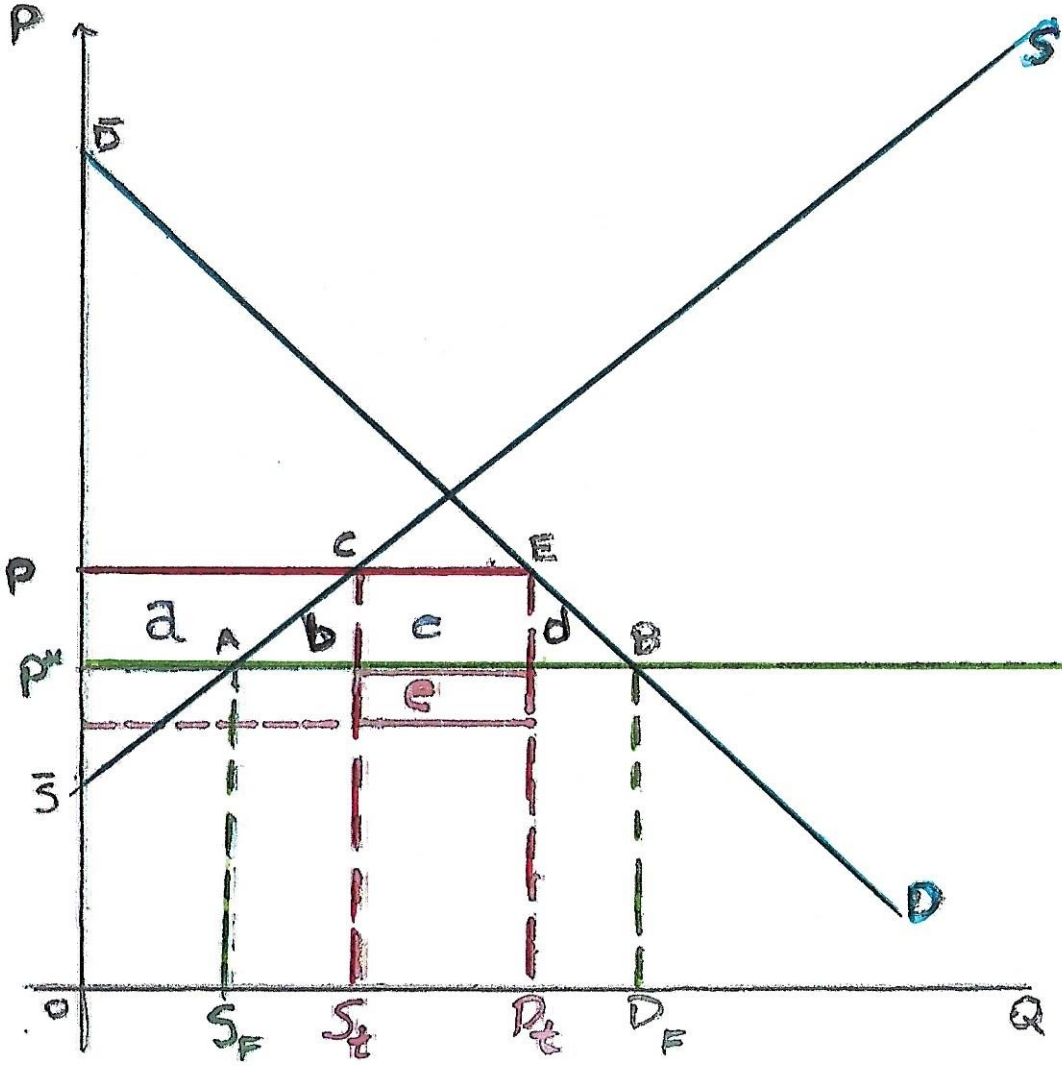


Foreign Export Supply (continued)

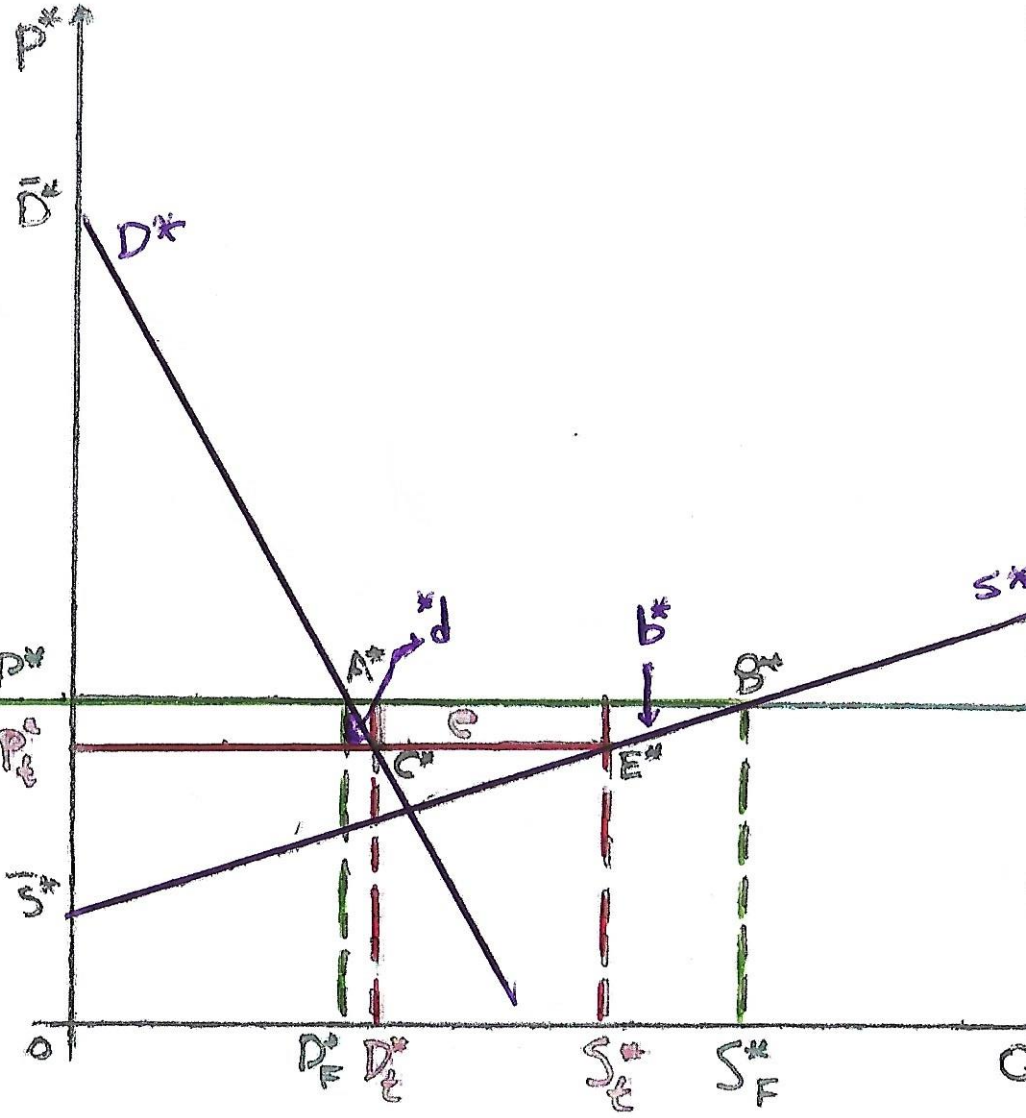
With the Home import demand of *M*, the world free-trade equilibrium is at point *B, with the price P^W.**

IMPORT TARIFF vs FREE-TRADE: GAINS and LOSSES

IMPORTING-COUNTRY



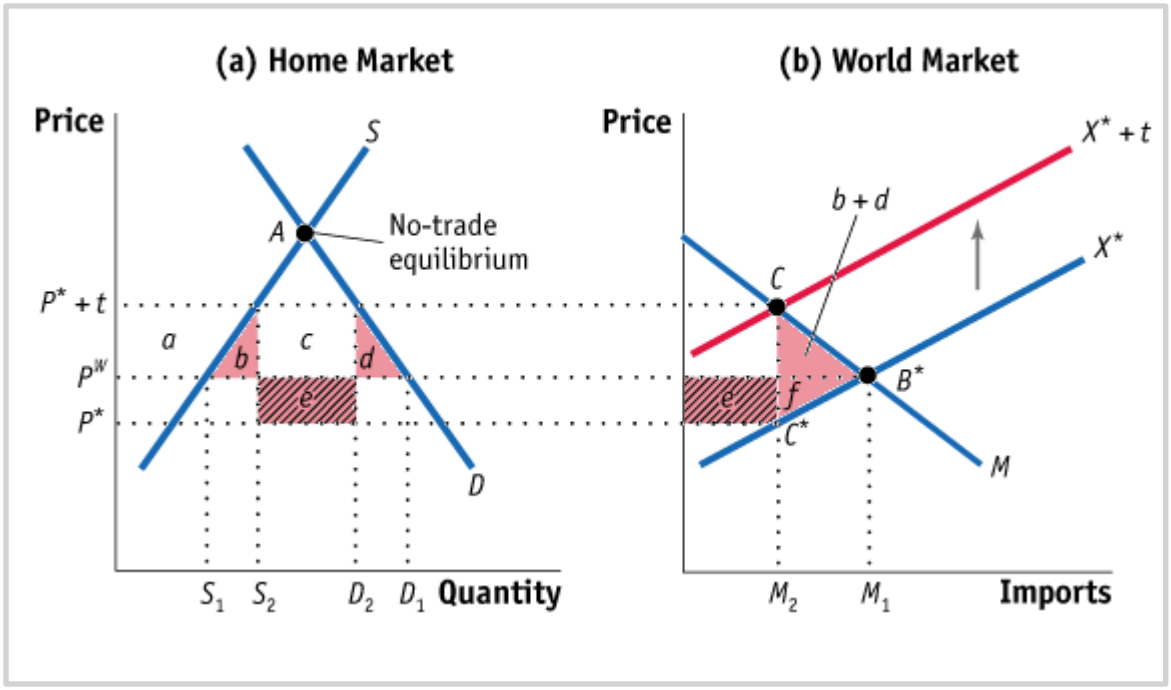
EXPORTING COUNTRY



Import Tariffs for a Large Importing Country (con'ed)

The **terms of trade** for a country as the ratio of export prices to import prices

Terms of Trade, Home Welfare, Foreign and World Welfare



Fall in consumer surplus: − (*a* + *b* + *c* + *d*)

Rise in producer surplus: + *a*

Rise in government revenue: + (*c* + *e*)

Net effect on Home welfare: *e* − *(b + d)*

Area *e* is a measure of the **terms-of-trade gain** for the importer.

Tariff for a Large Country

The tariff shifts up the export supply curve from X^* to $X^* + t$.

As a result, the Home price increases from P^W to $P^* + t$, and the Foreign price falls from P^W to P^*.

The deadweight loss at Home is the area of the triangle *(b + d)*, and Home also has a terms-of-trade gain of area *e*.

Foreign loses the area (e + f).

The net loss in world welfare is the triangle (b + d + f).

Why and How Are Tariffs Applied: The Large Country Case

Tariff(s) by a Large Open Economy:

- Benefits can only emerge when the tariff country is large, i.e., can influence -- **reduce** -- the world price(s) of the imported good(s) via its import tariff(s)

- **Reduction of world prices: Improvement in a country's terms of trade. *The terms of trade effect* of a tariff(s) +(e)**

- **But still**, terms of trade gains **+(e)** must be measured against the sum of domestic losses in production **-(b)** and consumption **-(d)**

- **Optimal (strategic) tariff:** Chosen so that

$$t^{optimal} \rightarrow \max \{e - (b+d)\}$$

International Trade Policy: Export Subsidies

Export Subsidies

An export subsidy is payment to firms for every unit exported (either a fixed amount or a fraction of the sales price). Governments give subsidies to encourage domestic firms to produce and export more in particular industries

By and large two broad categories of Export subsidies:

A. Agricultural Export Subsidies

B. High Technology (Industrial) Export Subsidies

EU maintains a system of agricultural subsidies known as the Common Agricultural Policy (CAP). But, also high industrial subsidies, e.g., Airbus-Industries

Other countries' subsidies. For example, the U.S. pays cotton farmers to grow more cotton and subsidizes agribusiness and manufacturers to buy the American cotton

Countries' Opposition over WTO Farm Protection

Countries, developed and developing alike, are divided over proposals for a new global trade deal freeing international trade in agricultural products from policy interventions, i.e., export subsidies, import tariffs/quotas

Countries often declare products "special" to shield them from full tariff / export or production subsidy cuts in the interests of food or livelihood security or rural development.

They are so-called: ***Products of "designation of origin" or of "geographical indication"***

Products of "designation of origin" or of "geographical indication"

China: ***Rice, Cotton and Sugar*** **declared as special products, hurting rice exporters like Thailand and India, and cotton exporters from West Africa.**

France: ***Brandy, Brie , Camembert , Champagne, Roquefort***

Greece: ***Feta cheese, Ouzo*** **(alcoholic beverage)**

Spain: ***Cabrales and Casin chesses, Jamón***

Germany: ***Black Forest Ham, Bratwurst (Nürnberger), Kölsch*** **(beer)**

Italy: ***Aceto Balsamico, Asiago, Gorgonzola, Parmegiano Regiano, Proscuitto (Modena, Parma)***

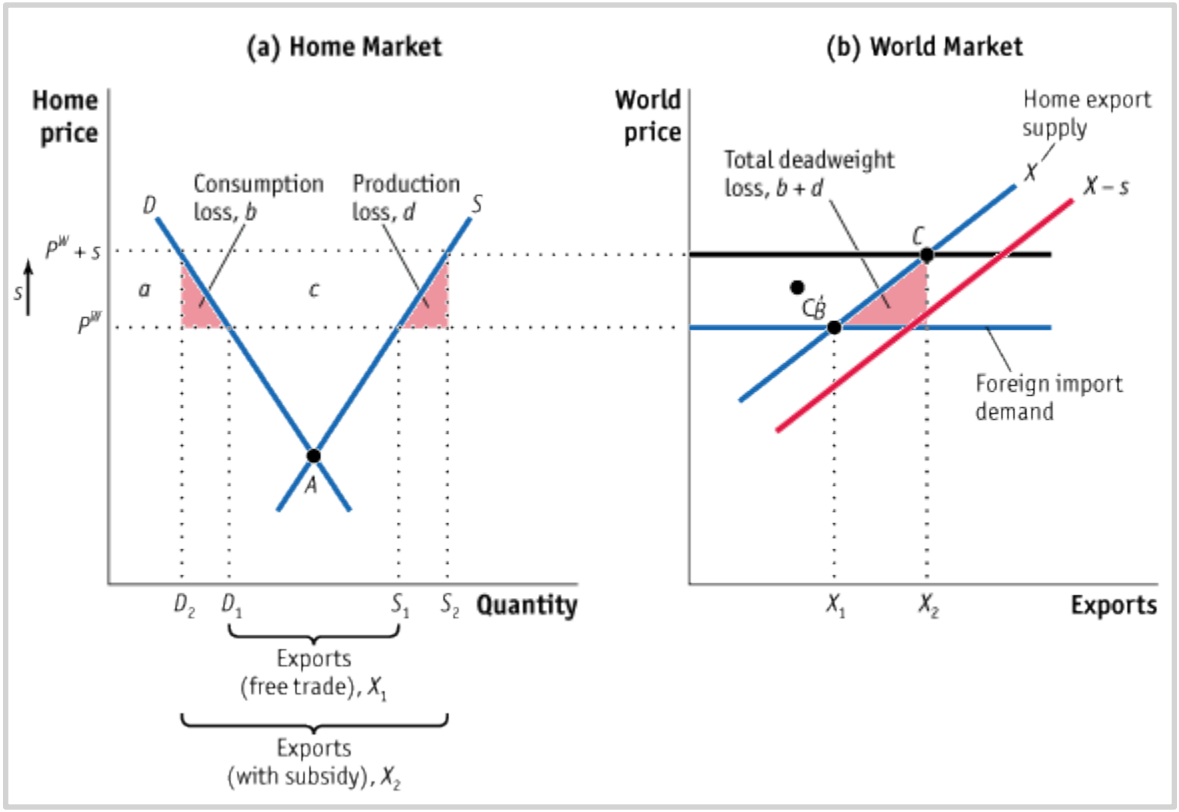
Mexico: ***Mezcal*** **(alcoholic beverage),** ***Tequila***

Brazil: ***Tequila***

Japan: ***Koji Rice, Kobe and Wagyu Beef, Sake***

……. *etc*. …. *etc*. ……

Export Subsidies in a Small Home Country



Exports rise as a result of the subsidy, from X_1 to X_2 in panel (b).

The Home **export supply curve shifts down** by exactly the amount of the subsidy since the marginal cost of a unit of exports decreases by exactly *s*.

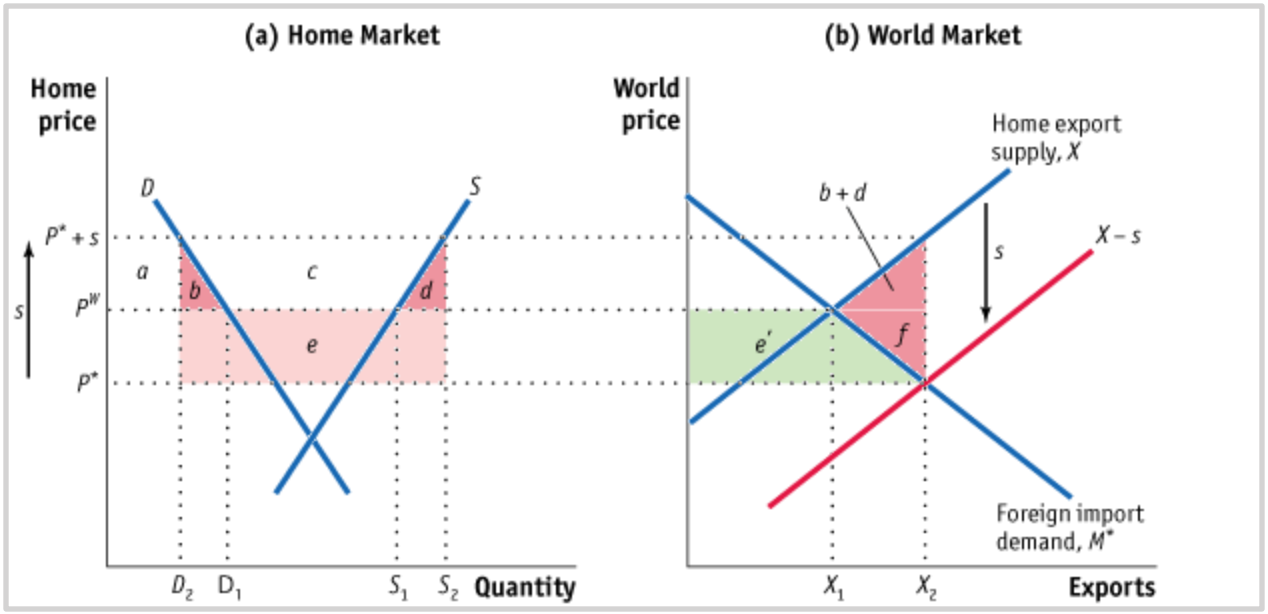
As in the case of a tariff, the **deadweight loss** due to the subsidy is the triangle (*b*+*d*), the sum of **consumer loss *b*** and **producer loss *d***.

BUT ……

Important difference:

***s*.(D_2 S_2) = (b+c+d) cost of export subsidy the government must finance**

Export Subsidies in a Large Home Country



Export Subsidy for a Large Country (continued)

In the world market, the Home subsidy shifts out the export supply curve from X to $X - s$, reflecting the lower marginal cost of exports.

As a result, the world price falls from P^W to P^*. The Foreign country gains the consumer surplus area e', so the world deadweight loss due to the subsidy is the area $(b + d + f)$. The extra deadweight loss f arises because only a portion of the Home terms-of-trade loss is a Foreign gain.

B. High-Technology (Industrial) Export Subsidies

Governments subsidize High-Technology Industries because they may create substantial benefits that spill over to other firms/sectors in the economy

That is, governments believe that **High-Tech Industry produce positive externalities** (positive consequences of an industrial, commercial or other economic activity which affects other parties, e.g., economic agents, sectors, without being reflected in market prices). That is, ….

externalities → spillovers

This argument for a subsidy to High-Tech Industries is similar to the argument used to justify protective tariffs

"Strategic" Use of High-Tech Export Subsidies

- In addition to the externalities (spillovers) argument, governments and industries also argue that export subsidies might give a **strategic advantage** to export firms that compete with a small number of **"big-rival-firms"** in international markets

- To examine whether countries can **use subsidies strategically**, we consider **imperfectly competitive markets** **(monopolistic, oligopolistic, or monopolistically competitive), e.g., automobiles, aeronautics, high tech-computers, military equipments and machinery, pharmaceuticals**

- **An example to study: Two (high-tech) firms in the world market (international duopoly).**

- The **"strategic decisions"** of the two firms is captured by a **"game approach"** capturing the **strategic interactions** between them as they choose actions that maximize their returns (profits)

Non-Competitive Markets and Interdependence of firms

- A "few" firms produce most or all the (world) markets output of a specific commodity

- **Every corporate decision made by one firm affects own profits BUT also profits of competing (big) rival firms**

- **Interdependence:**

➢ Each firm's profits depend on the decisions made by rival firms competing in the same market

➢ **Strategic Interaction / Behavior:** Actions that a firm takes (or convincingly threatens to take) to plan for, and react to the actions taken by competitor(s)

❖ *Knowing what (your) rival is going to do tells (you) much about what (you) should do!!*

Interdependence of firms, Strategic Behavior: "Game Theory"

- **Game Theory:**

➢ A methodological approach of making "strategic decisions" in situations involving "interdependence"

➢ How a firm makes the most profitable decisions anticipating the rival firm's decisions, e.g., Coca-Cola vs Pepsi-Cola, Lufthansa vs. Air France, Microsoft vs. Dell, Apple vs. Samsung, etc…..

➢ **Strategic Behavior → Non-cooperative (Nash) Behavior**

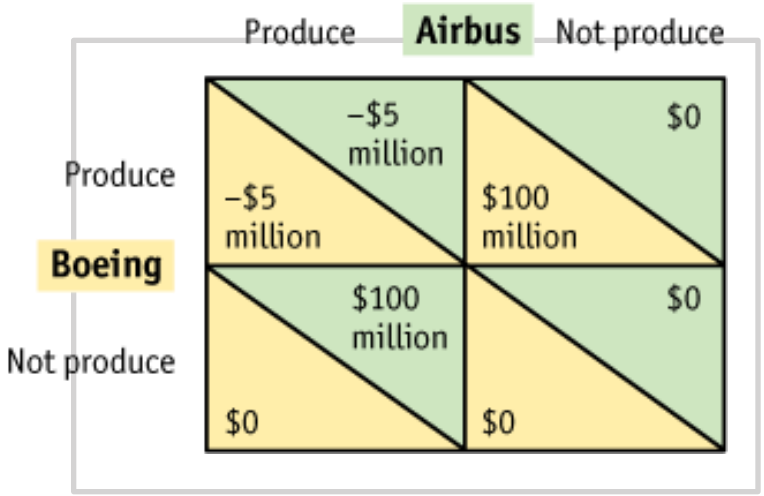
➢ **Games:**

(i) Players: "decision makers" who make a strategic decision among alternatives

(ii) Strategies: The set of available strategic actions to a player

(iii) Pay-offs: The final return (profit) to each player at the end of the "game"

Payoff Matrix: Boeing and Airbus, each deciding whether to produce a new aircraft



Payoff Matrix between Two Firms **The lower-left number in each quadrant shows the profits of Boeing, and the upper-right number shows the profits of Airbus. Each firm must decide whether to produce a new type of aircraft.**

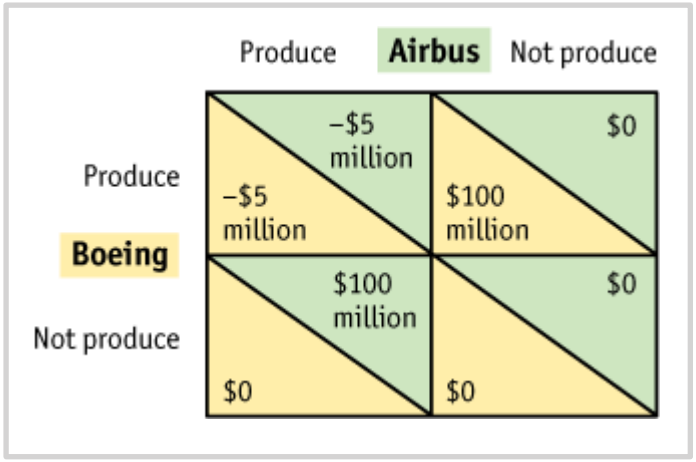
A NASH EQUILIBRIUM occurs when each firm is making its best decision, given the action of the other.

For this pattern of payoffs, there are two Nash equilibria, in the upper-right and lower-left quadrants, where one firm produces, and the other does not.

Non-cooperative Equilibrium: The idea is that each firm makes its own best decision, taking as given each possible action of the rival firm.

When each firm is acting that way, the outcome of the game is a **non-cooperative (Nash) equilibrium**. The action of each player is the best possible response to the action of the other player.

Payoff Matrix: Boeing and Airbus, each deciding whether to produce a new aircraft

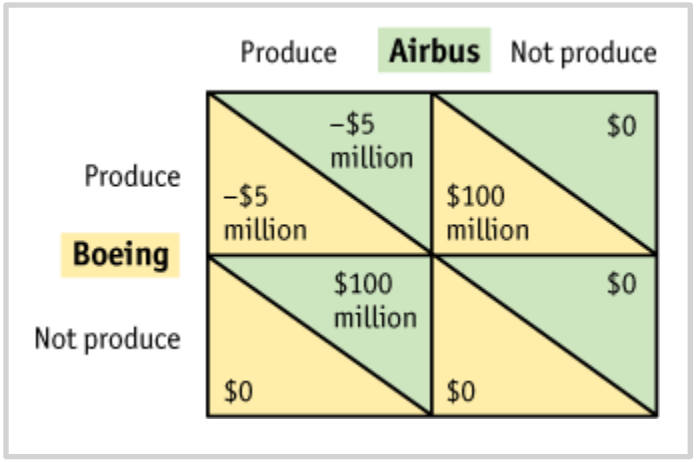


Best Strategy for Boeing If Airbus produces, then Boeing is better off not producing (upper-right quadrant). *H*aving both firms produce is not a Nash equilibrium. Boeing would never stay in production, since it prefers to drop out of the market whenever Airbus produces

Best Strategy for Airbus The decision illustrated in the lower-left quadrant, with Airbus producing and Boeing not producing,

Nash equilibrium because each firm is making its best decision given what the other is doing

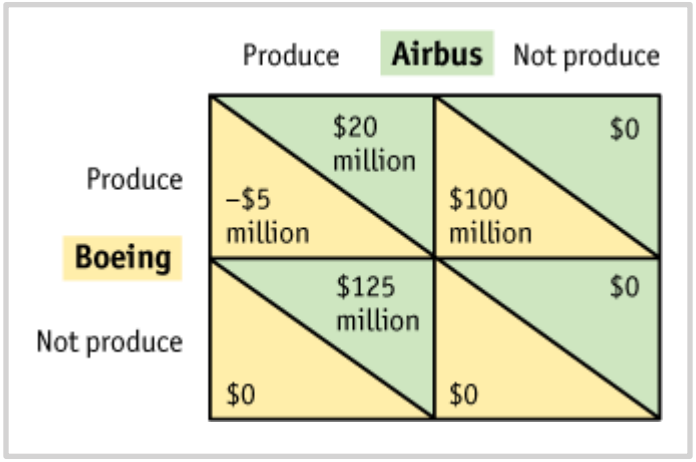
Payoff Matrix: Boeing and Airbus, each deciding whether to produce a new aircraft



Multiple Equilibria The upper-right quadrant, with Boeing producing and Airbus not producing, is *also a Nash equilibrium. When Boeing produces,* then Airbus's best response is to not produce, and when Airbus does not produce, then Boeing's best response is to produce

When there are two (multiple) Nash equilibria, there must be some **exogenous force** (from outside) which can determines in which equilibrium we are. An example of one such force is the **first mover advantage:** one firm is able to decide whether or not to produce before the other firm does

Payoff Matrix with Subsidy: Boeing and Airbus, each deciding whether to produce a new aircraft



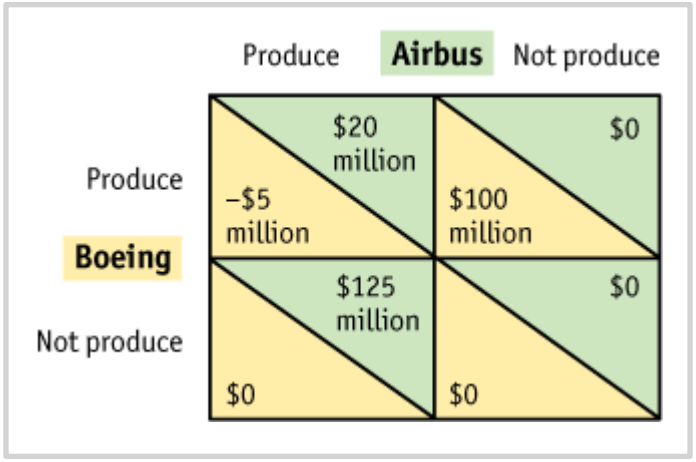
Payoff Matrix with Airbus Subsidy **When the European governments provide a subsidy of $25 million to Airbus, its profits increase by that much when it produces a new aircraft.**

Now there is only one Nash equilibrium, in the lower-left quadrant, with Airbus producing but Boeing not producing. The profits for Airbus have increased from 0 to $125 million, while the subsidy cost only $25 million, so there is a net gain of $100 million in European welfare.

Best Strategy for Airbus With the subsidy, Airbus now earns $20 million by producing instead of losing $5 million

Best Strategy for Boeing Boeing will want to drop out of the market. Once Boeing makes the decision not to produce, Airbus's decision doesn't change

Payoff Matrix with Subsidy: Boeing and Airbus, each deciding whether to produce a new aircraft



Payoff Matrix with Airbus Subsidy **When the European governments provide a subsidy of $25 million to Airbus, its profits increase by that much when it produces a new aircraft.**

With only one Nash equilibrium, in the lower-left quadrant, with Airbus producing but Boeing not producing.

Non-cooperative (Nash) Equilibrium The lower-left quadrant is a unique Nash equilibrium: each firm is making its best decision, given the action of the other. Furthermore, it is the only Nash equilibrium

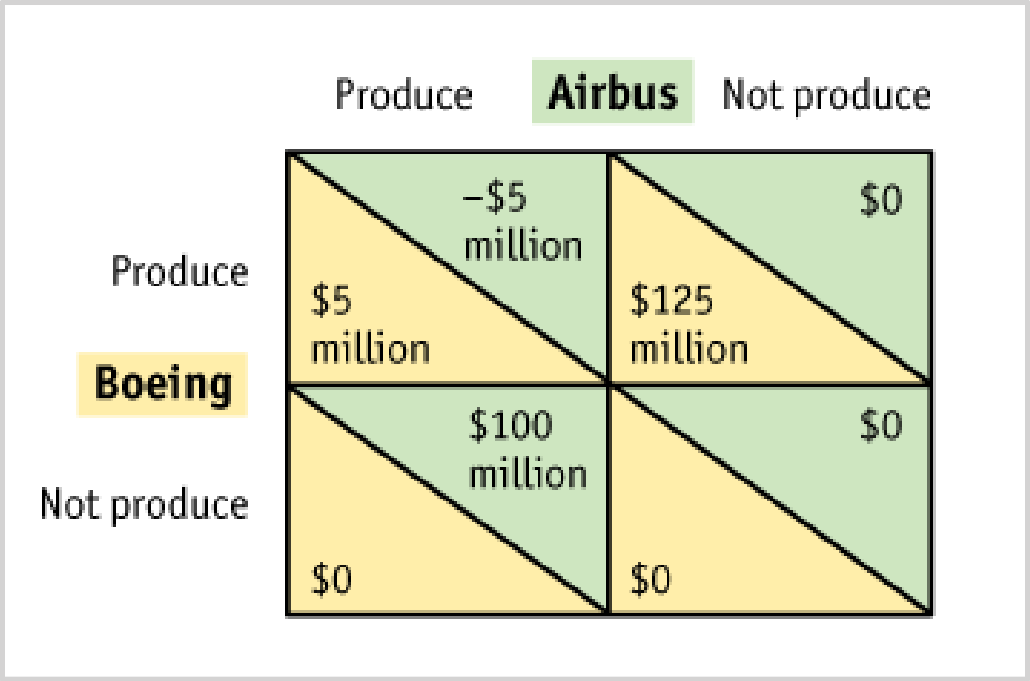
European Welfare

Producer profits after subsidy: + 125

Cost of subsidy to government: − 25

Net effect on European welfare: + 100

Payoff Matrix: Subsidy with Cost Advantage for Boeing

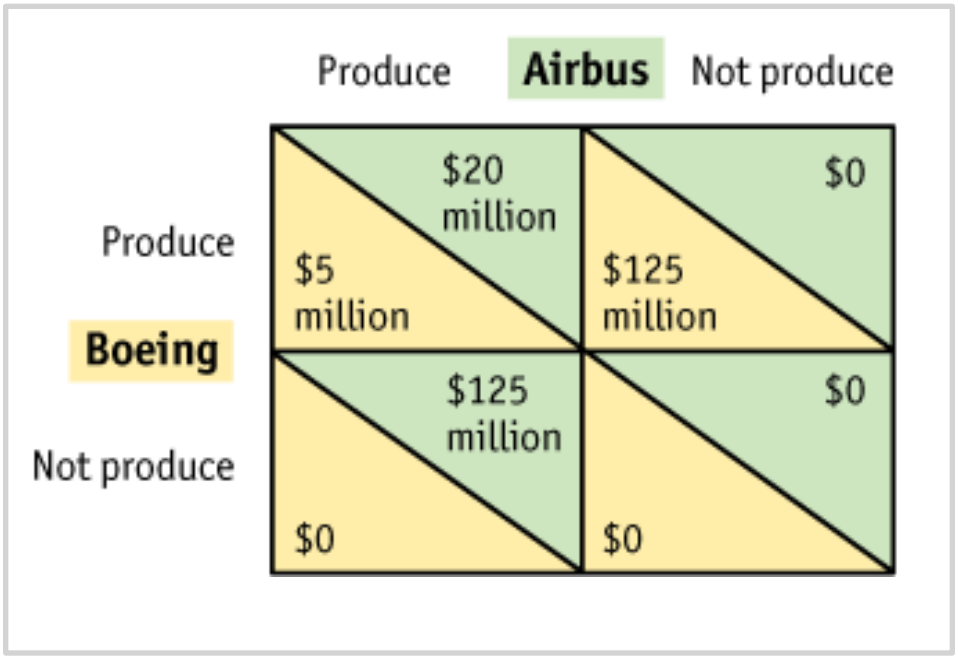


If Boeing has a cost advantage in the production of aircrafts, the payoffs are as shown here.

Boeing earns profits of $5 million when both firms are producing and profits of $125 million when Airbus does not produce.

Only one Nash equilibrium, in the upper-right quadrant, where Boeing produces, and Airbus does not

Payoff Matrix: Subsidy with Cost Advantage for Boeing



When the European governments provide a subsidy of $25 million to Airbus, its profits increase by that much when it produces.

The only Nash equilibrium is in the upper-left quadrant, where both firms produce

BUT …..

European Welfare

Producer profits after subsidy: + 20

Cost of subsidy to the EU: − 25

Net effect on European welfare: -5

Subsidies to Commercial Aircraft

Subsidies for the large commercial aircraft industry include:

- **indirect subsidies that arise in the production of civilian and military aircraft; direct subsidies for R&D, and**
- **subsidies of the interest rates that aircraft buyers pay when they borrow money to purchase aircraft.**

Subsidies to Commercial Aircraft

If both firms stay in the market and are subsidized by their governments, then it is unlikely that the subsidies are in the national interest of either the United States or the European Union; instead, the countries purchasing the aircraft gain because of the lower price, while the United States and Europe lose as a result of the costs of the subsidies

W.T.O. Says Aid to Airbus for A380 Was Illegal

A preliminary report by the World Trade Organization has found that Airbus received illegal subsidies.

- The report was in response to the United States filing a complaint on behalf of Boeing, arguing that the European Union and its governments funneled billions of dollars in illegal subsidies to Airbus from 1970 to 2004.

Boeing lawyers had said that a ruling against Airbus could mean that it will be required to either refinance those loans on commercial terms or otherwise restructure them.

Dreamliner Production Gets Closer Monitoring

Previously Boeing had designed and built its planes min-house, bearing the whole expense

But early this decade, when air traffic plunged after the Sept. 11 terrorist attacks, top Boeing executives balked at investing more than $10 billion to develop a new plane

As a solution, suppliers independently bankrolled their parts of the project, sharing costs and risk

When factory workers here started assembling the first Dreamliner, the system's flaws became clear as quality suffered and major components weren't completed

KEY POINTS – TARIFFS (1)

1. The government of a country can use laws and regulations, called "trade policies," to affect international trade flows. An import tariff, which is a tax at the border, is the most commonly used trade policy.

2. The rules governing trade policies in most countries are outlined by the General Agreement on Tariffs and Trade (GATT), an international legal convention adopted after World War II to promote increased international trade. Since 1995 the new name for the GATT is the World Trade Organization (WTO).

KEY POINTS - TARIFFS (2)

3. In a small country, the quantity of imports demanded is assumed to be very small compared with the total world market. For this reason, the importer faces a fixed world price. In that case, the price faced by consumers and producers in the importing country will rise by the full amount of the tariff.

4. The use of a tariff by a small importing country always leads to a net loss in welfare. We call that loss the "deadweight loss."

KEY POINTS - TARIFFS (3)

5. In a large country, the decrease in imports demanded due to the tariff causes foreign exporters to lower their prices. Consumer and producer prices in the importing country still go up, since these prices include the tariff, but they rise by less than the full amount of the tariff (since the exporter price falls).

6. The use of a tariff for a large country can lead to a net gain in welfare because the price charged by the exporter has fallen; this is a terms-of-trade gain for the importer.

KEY POINTS - TARIFFS (4)

7. The “optimal tariff” is the tariff amount that maximizes welfare for the importer. For a small country, the optimal tariff is zero since any tariff leads to a net loss. For a large country, however, the optimal tariff is positive.

8. The formula for the optimal tariff states that it depends inversely on the foreign export supply elasticity. If the foreign export supply elasticity is high, then the optimal tariff is low, but if the foreign export supply elasticity is low, then the optimal tariff is high.

KEY POINTS – EXPORT SUBSIDIES (1)

1. **Small exporting country:** an export subsidy lowers welfare. The drop in welfare is a deadweight loss and is composed of a consumption and production loss, similar to an import tariff for a small country

2. **Large-country:** an export subsidy lowers the price of that product in the rest of the world. This is a terms-of-trade loss for the exporting country. Welfare of the exporters decreases because of both the deadweight loss of the subsidy and the terms-of-trade loss. This is in contrast to the effects of an import tariff in the large-country case, which generates a terms-of-trade gain for the importing country

KEY POINTS - EXPORT SUBSIDIES (2)

3. **Export subsidiesby a large country** create a benefit for importing countries in the rest of the world, by lowering their import prices.

4. **Therefore, the removal** of these subsidy programs has an adverse affect on those countries. In fact, many of the poorest countries are net food importers that will face higher prices as agricultural subsidies in the European Union and the United States are removed.

KEY POINTS - EXPORT SUBSIDIES (3)

5. **Production subsidies** to domestic producers also have the effect of increasing domestic production. Consumers are unaffected. The deadweight loss of a production subsidy is less than that for an equal export subsidy, and the terms-of-trade loss is also smaller.

6. **Countries** often provide subsidies to high-technology industries (non-competitive). These subsidies can create a strategic advantage for their firms in international markets.

KEY POINTS - EXPORT SUBSIDIES (4)

7. Export subsidies can affect the Nash equilibrium of a game by altering the profits of the firms.

8. **IF a subsidy increases the profits** to a firm by more than the subsidy cost, then it is worthwhile for a government to undertake the subsidy.

9. **Subsidies are not always** worthwhile unless they can induce the competing firm to exit the market altogether, which may not occur.