MSc in Economics for Development

Trade Theory for Development

Week 8 Class

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Consultation hours: Friday 2-3pm

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Preliminaries

- Problem set
- Questions from Trade Class 1

References

- Deardoff's Glossary of International Economics
  - http://www-personal.umich.edu/~alandear/glossary/
    - See 'figs' in menu.

- Feenstra, R. C., 2004, *Advanced International Trade: Theory and Evidence,* Princeton University Press
  - Chapters 7 and 8 (especially pages 215-20, 281-3)

- Krugman, P., and Obstfeld, M., 2006, *International Economics: Theory and Policy,* Pearson International
  - Chapter 8

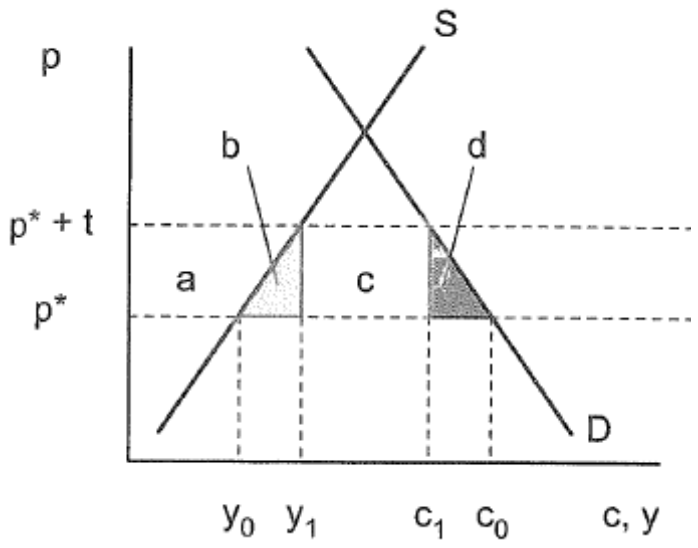
Overview: Taxes and Subsidies on Trade

- Import tariffs have three potential effects on the total welfare of an economy: deadweight loss, terms of trade and firm profit effects:
  - In perfectly competitive small countries there are only deadweight losses
  - In perfectly competitive large countries there are deadweight losses and terms of trade effects
  - In imperfectly competitive large countries there are deadweight losses, terms of trade and firm profit effects
- These can be shown both diagrammatically and algebraically
- As well as total welfare effects, trade taxes have distributional effects as we saw in the Lerner Diagram in Week 6.
- Import quotas are equivalent to a certain level of tariff under perfect competition, though this is relaxed under imperfect competition or quality choice
- Export subsidies also have three potential effects on the total welfare of an economy: deadweight loss, terms of trade and firm profit effects:
  - In perfectly competitive small countries there are only deadweight losses
  - In perfectly competitive large countries there are deadweight losses and terms of trade effects
  - In imperfectly competitive large countries there are deadweight losses, terms of trade and firm profit effects which depend on the nature of imperfect competition

Import tariffs in a perfectly competitive small country lead to deadweight losses

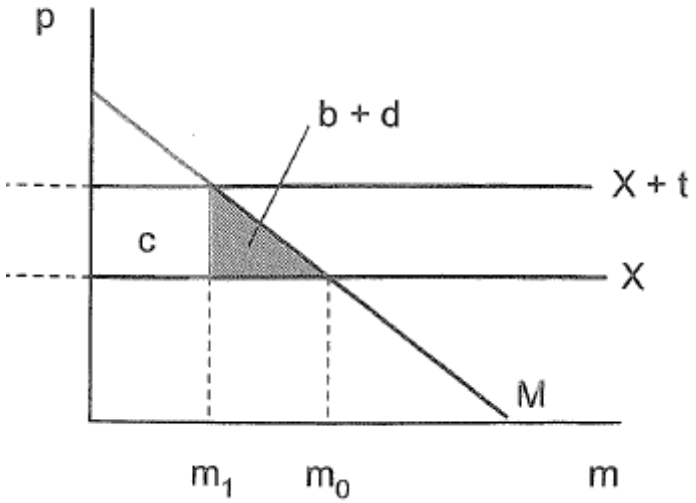
Effects of an import tariff on domestic and import markets for a single good

Domestic market



- The world price $P^* < P^E$, otherwise the tariff would have no effect
- $D(P^*) > S(P^*)$ with the difference imported at the world price $m_0 = c_0 - y_0$.
- Effects of a tariff: consumer loss -(a+b+c+d), producer gain +(a), tariff revenue +(c), deadweight loss -(b+d).

Import market



- X is foreign exports (supply of imports)
  - Horizontal at P* as small country imports have no effect on supply
- M is domestic import demand (M=D-S)
- Deadweight loss depends on the square of the tariff

Source: Feenstra Fig 7.1

If we express welfare algebraically we can separate the different components of the welfare effect of tariffs...

Starting with the general social welfare fn

Social Welfare

- Welfare from numeraire

$$W(p, I) \equiv \sum_{h=1}^{H} (I_h - p d_h(p)) + U_h[d_h(p)]$$

...and import good

- Use numeraire to include effects of budget constraint, and "balance out" all effects not directly related to import good (eg wage)
- Summarise welfare as:

$$W[p, L + tm + py - C(y)] \equiv W(t)$$

Definitions

W	total social welfare
h=(1,H)	households
p=p+t*	price=world price + tariff
I	total income
	I=L+tm+py-C(y)
m=d(p)-y	imports
d(p)	domestic demand
L	labour supply (wages)
tm	tariff x imports
py	price x output
C(y)	cost of output

We can find the welfare effects of tariffs

Derivation

$$\frac{\partial W}{\partial p} = -\sum_{h=1}^{H} d_h(p) = -d(p) \text{ as } \frac{dU^*}{dp} = \frac{\partial U(d(p))}{\partial p}\Big|_{d(p)=d^*(p)} = 0$$

$$\begin{aligned}\frac{dW}{dt} &= -d(p)\frac{dp}{dt} + m + \left(t\frac{dm}{dp} + y\right)\frac{dp}{dt} + [p - C'(y)]\frac{dy}{dt} \\ &= m\left(1 - \frac{dp}{dt}\right) + t\frac{dm}{dp}\frac{dp}{dt} + [p - C'(y)]\frac{dy}{dt} \\ &= t\frac{dm}{dp}\frac{dp}{dt} - m\frac{dp^*}{dt} + [p - C'(y)]\frac{dy}{dt}\end{aligned}$$

Efficiency cost — Terms of Trade effect — Δ profit

Comments

By Envelope Theorem

Totally differentiate *W* w.r.t. *t*

Substitute *d(p)-y=m*

Use $p = p^* + t$ so $[1 - (dp/dt)] = -dp^*/dt$

...showing in a perfectly competitive small country the optimal tariff is zero

The welfare effects of tariffs...

$$\frac{dW}{dt} = t\frac{dm}{dp}\frac{dp}{dt} - m\frac{dp^*}{dt} + [p - C'(y)]\frac{dy}{dt}$$

Efficiency cost

Terms of Trade effect

Change to profits

...In a small country with perfect comp

Derivation

$$\frac{dW}{dt} = t\frac{dm}{dp}$$

$$\frac{dW}{dt}\Big|_{t=0} = 0$$

$$\frac{d^2W}{dt^2}\Big|_{t=0} = \frac{dm}{dp} < 0$$

Finding the size of a tariff's welfare effect

$$W(t) \approx W(0) + t\frac{dW}{dt}\Big|_{t=0} + \frac{1}{2}t^2\frac{d^2W}{dt^2}\Big|_{t=0}$$

$$W(t) - W(0) = \frac{1}{2}t^2\frac{d^2W}{dt^2}\Big|_{t=0} = \frac{1}{2}t^2\frac{dm}{dp}$$

$$\frac{W(t) - W(0)}{pm} = \frac{1}{2}\left(\frac{t}{p}\right)^2\left(\frac{dm}{dp}\frac{p}{m}\right)$$

Comments

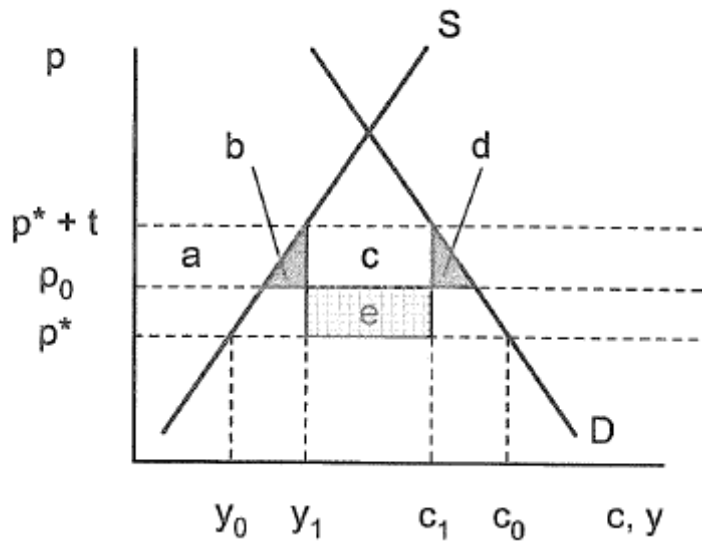
- Efficiency cost effect only
  - Other terms go to zero
- Equals zero when t=0 (W maximised)

- Second-order Taylor series expansion
- Expanding d^2W/dt^2 and evaluating expansion at *t=0*
- Depends on square of t
- $dm/dp=d'(p)-(1/C'')<0$ by concave utility and profit max.`

Import tariffs in a perfectly competitive large country lead to both deadweight losses and a terms of trade effect

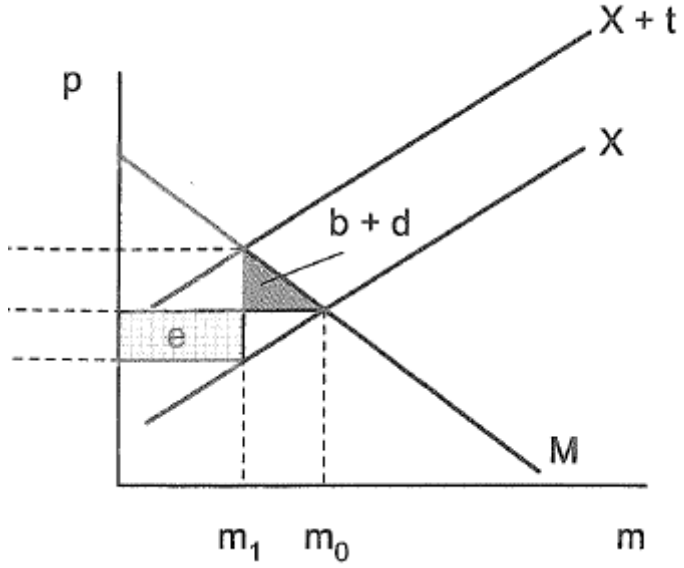
Effects of an import tariff on domestic and import markets for a single good

Domestic market



- Tariff shifts $X \rightarrow X+t$
- $p_0 \rightarrow p^*+t$ and $m_0 \rightarrow m_1$
- As p hasn't risen by the entire tariff t, the world price p^* has fallen. This is the terms of trade effect of the domestic economy on the world market (e)

Import market



- Foreign supply now upward sloping as domestic imports are large enough to affect foreign supply
- As domestic import demand affects foreign supply there is a positive terms of trade effect e
- Optimal tariff depends on balancing deadweight loss and terms of trade effect (similarly w export tax)
  - Depends on the elasticity of foreign supply

Source: Feenstra Fig 7.2

Algebraically we can see how the deadweight loss and terms of trade effect offset in a large country

The welfare effects of tariffs...

$$\frac{dW}{dt} = t\frac{dm}{dp}\frac{dp}{dt} - m\frac{dp^*}{dt} + [p - C'(y)]\frac{dy}{dt}$$

Efficiency cost — Terms of Trade effect — Change to profits

...In a large country with perfect comp

Derivation

$$\frac{dW}{dt} = t\frac{dm}{dp}\frac{dp}{dt} - m\frac{dp^*}{dt}$$

$$\frac{dW}{dt}\Big|_{t=0} = -m\frac{dp^*}{dt} > 0$$

So, there is an optimal tariff. This is:

$$\frac{dW}{dt} = 0$$

$$\frac{t^*}{p^*} = \left(\frac{dp^*}{dt}\frac{m}{p^*}\right) / \left(\frac{dm}{dp}\frac{dp}{dt}\right)$$

$$= \left(\frac{dp^*}{dt}\frac{x}{p^*}\right) / \left(\frac{dx}{dt}\right)$$

$$= 1 / \left(\frac{dx}{dp^*}\frac{p^*}{x}\right)$$

Comments

- Efficiency cost effect and terms of trade effect
  - Final term go to zero due to perfect comp
- Doesn't equal zero when t=0.

- Setting first derivative to zero. We have seen second derivative is negative

- Letting domestic imports (m) equal foreign exports (x)
- Optimal tariff equals inverse elasticity of foreign export supply
  - Small country, infinite elasticity, zero tariff

With imperfect competition in a large country, tariffs lead to deadweight losses, ToT and profit effects

The welfare effects of tariffs...

$$\frac{dW}{dt} = t\frac{dm}{dp}\frac{dp}{dt} - m\frac{dp^*}{dt} + [p - C'(y)]\frac{dy}{dt}$$

Efficiency cost

Terms of Trade effect

Change to profits

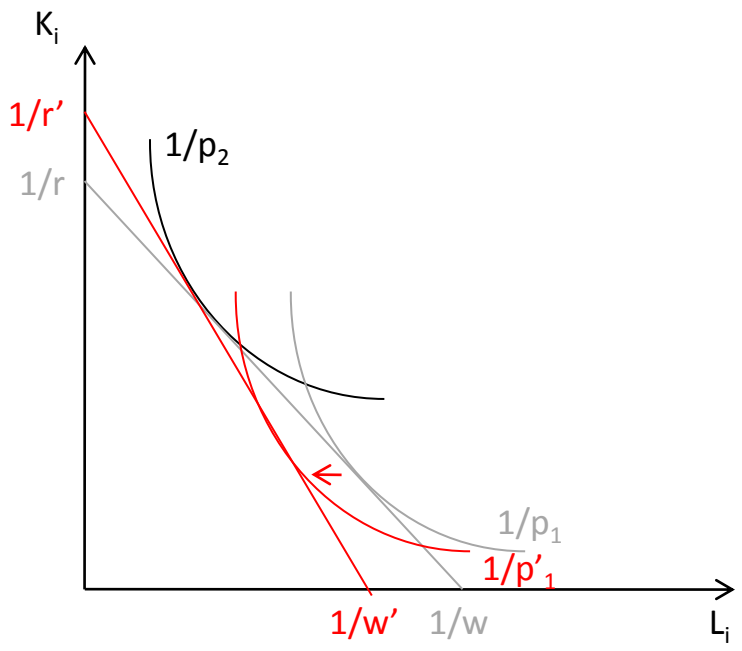
...In a large country with imperfect competition

- Leads to a reduction in the monopoly distortion of an foreign exporter if domestic firms output increases, increasing welfare
  - Change in output of home firms is of ambiguous sign
  - ToT effect is best indicator of effect of small tariffs.

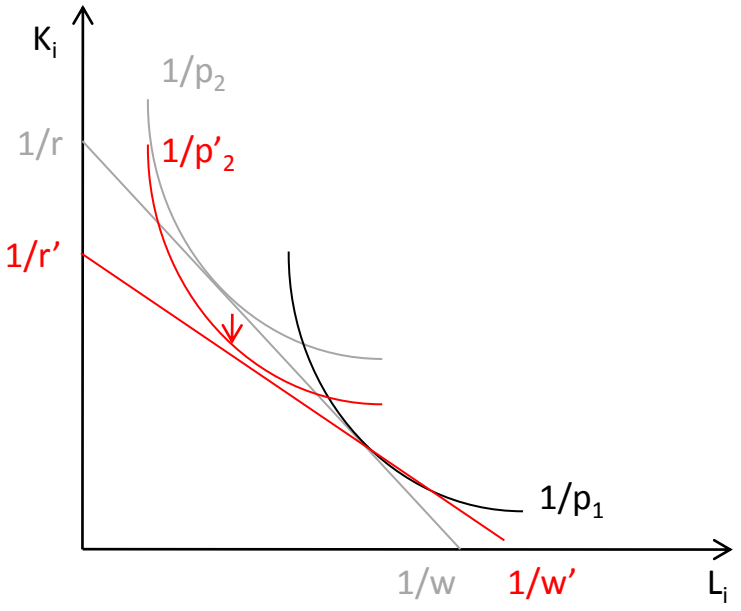
For further reading see Feenstra Ch 7

As well as total welfare effects, trade taxes have distributional effects as we saw in the Lerner Diagram last week.

A rise in price of the labour intensive good increases the wage and reduces the rent



A rise in price of the capital intensive good increases the rent and reduces the wage



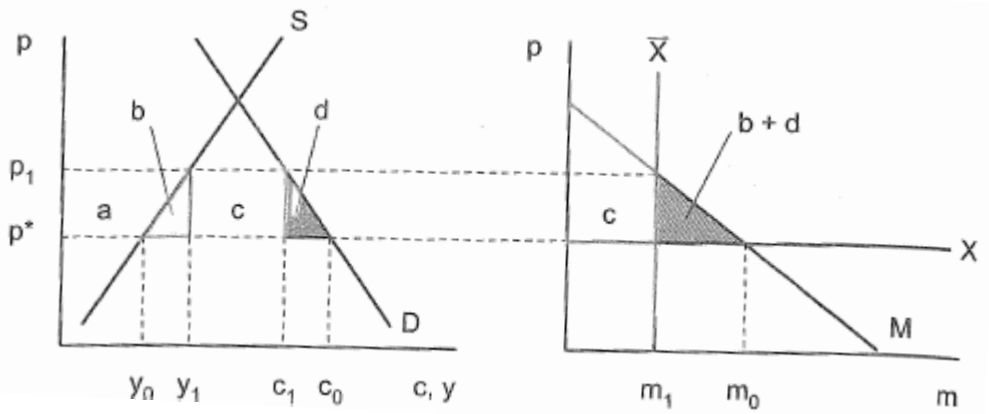
Stopler Samuelson (1941) Theorem

"An increase in the relative price of a good will increase the real return to the factor used intensively in that good, and reduce the real return to the other factor"

Import quotas are equivalent to a certain level of tariff under perfect competition

Small country

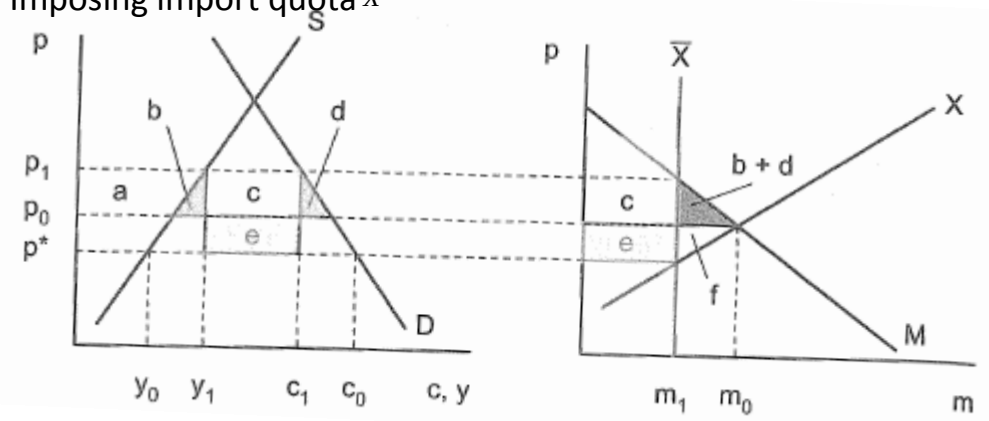
Imposing import quota $\overline{X}$



•Deadweight loss only. Rents to importer.

Large country

Imposing import quota $\overline{X}$



•Deadweight loss and terms of trade effect. Rents to importer. (f) is deadweight loss to foreign country

Area (c) no longer collected as a tax, but goes to importer. Can redistribute in four ways:

1. Quota licenses given to home firms to earn rents eg US dairy industry
2. Quota licenses lead to rent seeking behaviour, reducing rents eg overproduction
3. Quota licenses auctioned by govt so govt revenue equals value of the rents
4. Quota given to govt of exporting country – voluntary export restraint. This gives rents to foreign firms. Why? Prevent retaliation by other countries. Incentive compatibility: use when there is legitimate damage being done to domestic industry by imports

Source: Feenstra Fig 8.1-8.2

Import quotas are no longer equivalent to tariffs under imperfect competition or quality choice

Imperfect Competition

Quotas create a sheltered market for domestic firms, leading to higher prices and lower sales than under a tariff with the same level of imports

Quality choice

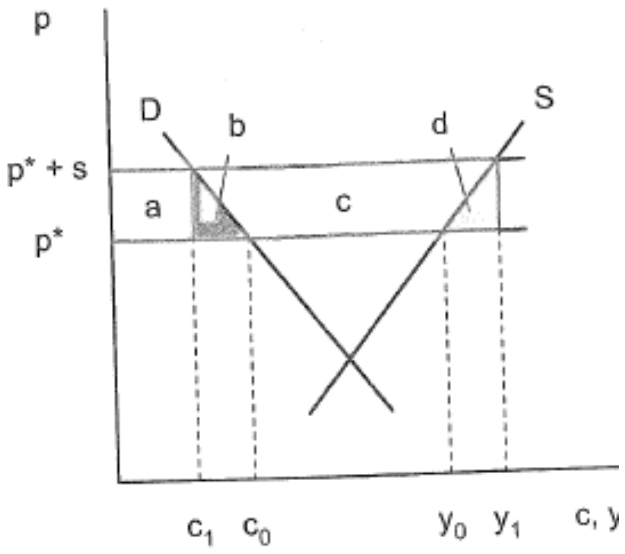
If the foreign exporting firm can choose both the quality and the quantity of its output, when it is constrained in quantity it may increase quality

For further reading see Feenstra Ch 8, Bhagwati (1965)

Export subsidies in a small country also lead to a deadweight loss

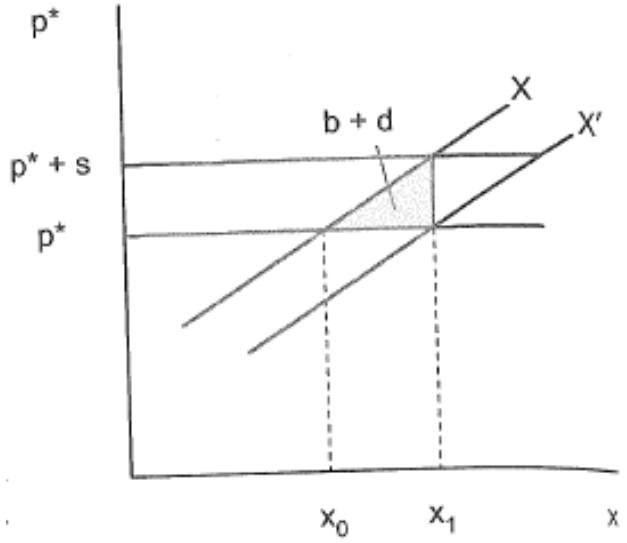
Effects of an import tariff on domestic and import markets for a single good

Domestic market



- World price $P^* > P^E$, to ensure exports
- $D(P^*) < S(P^*)$ with difference exported at the world price $x_0 = y_0 - c_0$.
- Subsidy of s per unit. Home industry earns p+s per unit. Unwilling to sell for less than that at home. Domestic price also rises.
- As a result, supply increases and domestic consumption falls. More to export to world. *X*→*X'*
- Effects of a subsidy: consumer loss -(a+b), producer gain +(a+b+c), subsidy cost –(b+c+d). In total this is a deadweight loss -(b+d)

Import market



- X is domestic exports (X=S-D)
- M is foreign demand
  - Horizontal at P* as small country exports have no effect on demand

- Deadweight loss depends on the square of the subsidy
- The export subsidy increases the price received by domestic exporters.

Source: Feenstra Fig 7.1

Export subsidies in a large country lead to both a deadweight loss and a terms of trade loss

Effects of an import tariff on domestic and import markets for a single good

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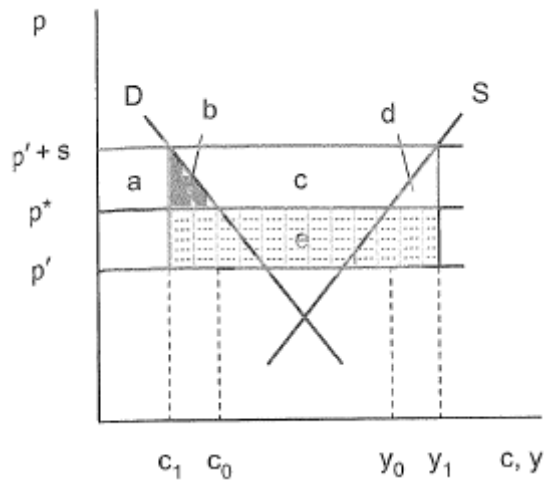
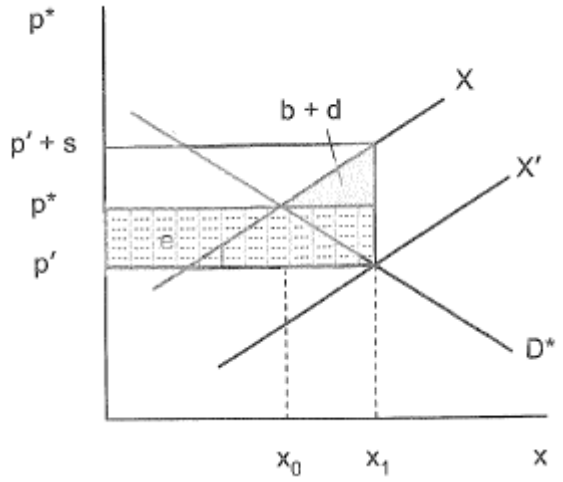


•Subsidy shifts *X*→*X′* as producers increase supply and domestic consumers reduce demand due to higher price
•*p**→*p′* as the exporters face downward sloping demand
• p doesn't rise by the entire subsidy, as *p** falls to *p′*. This is the terms of trade effect and causes a further welfare loss.

Import market



•Foreign demand now downward sloping as domestic exports are large enough to affect foreign demand
•As domestic exports affect foreign demand, there is a terms of trade effect (e)
•The terms of trade effect causes a further welfare loss
    •Depends on the elasticity of foreign demand

Source: Feenstra Fig 7.1

The strategic effects of export subsidies depends on the type of imperfect competition in the market

Theorem (Brander and Spencer 1985; Eaton and Grossman (1986)

- Under Cournot duopoly, a subsidy to exports raises home welfare
- Under Bertrand duopoly, a tax on exports raises home welfare

For further reading see Feenstra Ch 8

Overview: Taxes and Subsidies on Trade

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