

# Week 6 & 7: Trade and the Environment (Ch.13)



# 1. Is free trade anti-environment

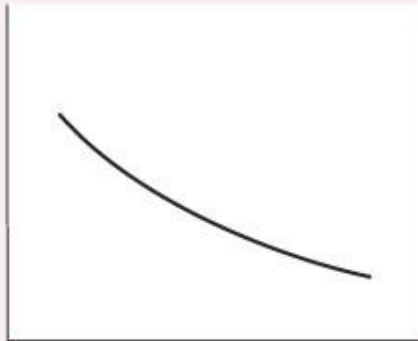
- Free trade will change the composition of production and consumption in each country. As the composition changes, the total amounts of pollution will change.
- There are gains from trade, which set up two different effects
  - The size of the economy is larger, which implies more pollution, *ceteris paribus*
  - The higher income can lead to more pressure on governments to enact tougher environmental laws

# Is free trade anti environment

- Which effect is larger: harm from the size or the environmental protection from the income effect?
- There are three basic patterns depending on the environmental problem we are examining:
  - Environmental harm declines with rising income per person (i.e. lead)
  - Environmental harm rises with rising income per person (i.e. emissions of carbon dioxide)
  - The relationship is an inverted U (i.e. air pollution and water pollution)

**A. Declining Environmental Problem**

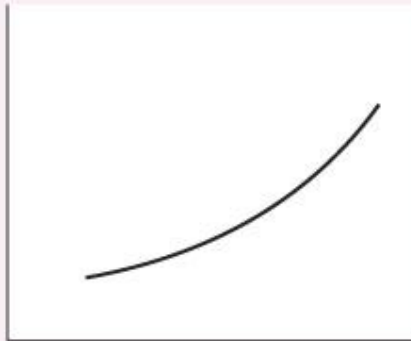
Environmental harm



National income per person

**B. Rising Environmental Problem**

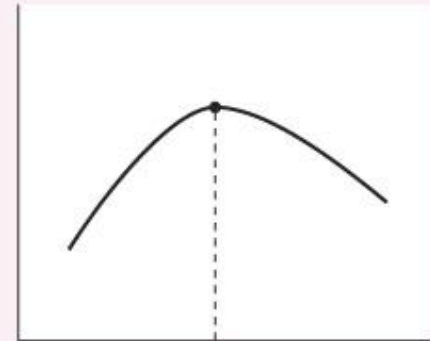
Environmental harm



National income per person

**C. Inverted-U Relationship**

Environmental harm



Turning point National income per person

## Environmental effects of the Uruguay Round (% change in emissions)

	Sulfur Dioxide			Suspended Particulates			Nitrogen Dioxide			Carbon Monoxide		
	Comp <sup>1</sup>	S & I <sup>2</sup>	Total <sup>3</sup>	Comp	S & I	Total	Comp	S & I	Total	Comp	S & I	Total
United States	0.4	-0.7	-0.3	0.2	-0.8	-0.6	0.1	0.0	0.1	0.1	-0.6	-0.5
European Union	0.3	-0.4	-0.1	0.2	-0.3	-0.1	0.1	0.2	0.3	0.2	-0.3	-0.1
Japan	2.0	-0.6	1.4	0.3	-0.5	-0.2	0.3	0.1	0.4	0.3	-1.0	-0.7
Latin America	0.5	0.7	1.2	0.4	0.6	1.0	0.6	0.9	1.5	0.2	0.8	1.0
China	-1.8	2.1	0.3	-0.9	2.0	1.1	-0.3	1.6	1.3	-0.1	1.8	1.7
East Asia	-3.1	1.8	-2.2	-3.0	1.7	-1.3	-0.1	2.0	1.9	-1.9	1.9	0.0
South Asia	-0.6	1.3	0.7	-0.4	1.4	1.0	-0.5	1.0	0.5	-0.5	1.3	0.8
Africa	-0.1	2.8	2.7	0.0	2.7	2.7	0.2	2.0	2.2	0.0	2.4	2.4
World	-0.3	0.2	-0.1	-0.1	0.1	0.0	0.1	0.5	0.6	0.0	0.1	0.1

<sup>1</sup>Composition effect.

<sup>2</sup>Combined size effect and income effect.

<sup>3</sup>Total change = Composition effect + Combined size effect and income effect.

Source: M. A. Cole, A. J. Rayner, and J. M. Bates, "Trade Liberalization and the Environment: The Case of the Uruguay Round," *World Economy* 21, no. 3 (May 1997), pp. 337-47.

## 2. Specificity rule again

- An externality leads to an inefficient allocation of resources, and there is a role for government intervention in the market
- The specificity rule is a useful policy guide
- The specificity rule says to intervene at the source of the problem

# 3. Guidelines for policy prescriptions

- Following the specificity rule, if the externality is pollution, make pollution itself more expensive.
- See Figure 13.3
- The figure contains two sets of best-feasible prescriptions:
  - The whole world acting as one government
  - A single nation unable to get cooperation from other governments

### 3. Guidelines for policy prescriptions

- If the world acts as one government there is no need for international trade policy (i.e. taxes on exports and imports): taxes are on production and consumption.
- According to the specificity rule, taxes are near the source of the pollution.
- If a nation must act alone, then trade barriers could be an appropriate solution.



Figure 13.3: Type of externalities and product market prescriptions

<b>Source of External Costs (e.g., Pollution) Harming Our Nation</b>	<b>Examples</b>	<b>If the Whole World Had Only One Government, Its Best Product-Market Policy Would Be</b>	<b>Best Product-Market Policy for Our Nation Acting Alone</b>
Just our own production	Chemicals	Tax our production	Tax our production (as in Figure 13.4)
Just foreign production	Acid rain across borders; tuna and dolphins; ivory	Tax foreign production	Tax our imports
World production	CO <sub>2</sub> buildup from fossil fuels; CFCs	Tax world production (or consumption)	Tax our production and imports
Just our own consumption	Fossil fuels, tobacco, narcotics	Tax our consumption	Tax our consumption
Just foreign consumption	Fossil fuels	Tax foreign consumption	Tax our exports
World consumption	Fossil fuels	Tax world consumption (or production)	Tax our consumption and exports

Note: *Tax* here means “impose government restrictions.” These could be taxes, quantitative limits, or outright prohibitions. Remember that only “best product-market policy” interventions are considered here. In many cases, a more direct approach would tax an input or specific technology (e.g., use of high-sulfur coal or fuel-inefficient automobiles) rather than the final product (e.g., electricity from power plants or road transportation). And in other cases, an optimal policy might manipulate more than one product market at once.

# 4. Trade and domestic pollution

- Domestic pollution occurs when the costs of pollution fall (almost) only on people within the country
- In this case, in the absence of any regulation:
  - Free trade can reduce the well-being of the country
  - the country can end up exporting the products that it should import
- See Figure 13.4

# 4. Trade and domestic pollution

- The top half of the figure shows:
  - Domestic supply curve (private MC of paper production)
  - Domestic demand curve (private MB of paper consumption)
- The bottom half of the figure shows the cost of pollution or marginal external cost (MEC) of producing paper.
- Marginal Social Cost (MSC) = Private MC + MEC

# 4. Trade and domestic pollution

- With no international trade, the paper market clears at  $P = \$1$  per ream and  $Q = 2$  billion reams.
  - With no recognition of pollution costs, this is an over production of paper
- Under free trade, the price rises to \$1.10, domestic production rises to 2.3 billion, domestic consumption falls to 1.8 billion (a fall of 0.5 billion)
- The free trade makes the country worse off: area  $a < \text{area } b$  (or the gain from trade is less than the cost of pollution)

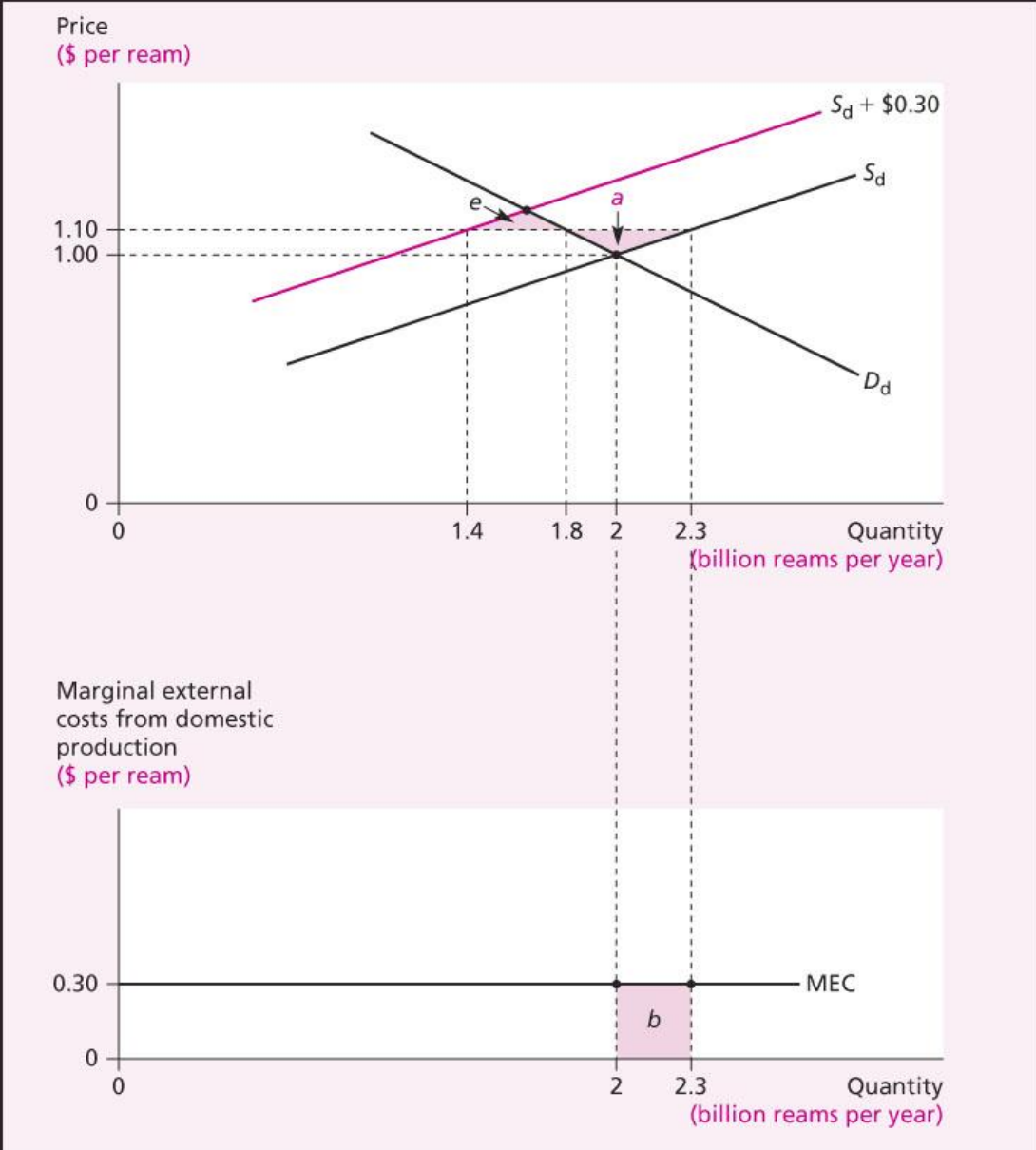
# 4. Trade and domestic pollution

- The government could impose a tax to tackle the pollution problem
  - The tax should equal the marginal external cost of production ( $t=MEC$ )
- The domestic supply curve shifts up by the amount of the tax. Now the new supply curve reflects all social costs ( $SMC=S_d+0.30$ ).

# 4. Trade and domestic pollution

- If there is this a tax
  - Domestic demand=1.8 billion
  - Domestic production=1.4 billion
  - The country should import ( $M=0.4$  billion) rather than export paper
  - The gain from trade is represented by the triangle  $e$
- With no government policy limiting pollution:
  - The country can end up worse off with free trade
  - The trade pattern can be wrong

Figure 13.4: When domestic production causes domestic pollution



# Trans-border pollution

- Many types of pollution have transborder effects (i.e. air pollution, sulphur dioxide drifts across national borders)
- It raises major issues for governments policy
- Suppose there are two countries: Germany and Austria
  - Suppose a German paper company builds a new paper mill on the Danube and dumps chemical waste into the river
  - The river flows into Austria and imposes external costs on Austrians



# Trans-border pollution

- How do we determine the optimum amount of pollution? (See Figure 13.5)
- The figure shows the Germany's benefits and Austria's costs from different rates of dumping waste into the river by the paper mill.
- In a free market with no government intervention, the firm will pollute until benefits are equal to zero (point A).
- This imposes a large costs on Austrians along the MC curve.

# Trans-border pollution

- Point A is also inefficient from a world perspective:  $MB < MC$
- But a total ban on river pollution is inefficient as well. At zero pollution  $MB > MC$ .
- The efficient level of pollution is 80 tons per year, where  $MB = MC$

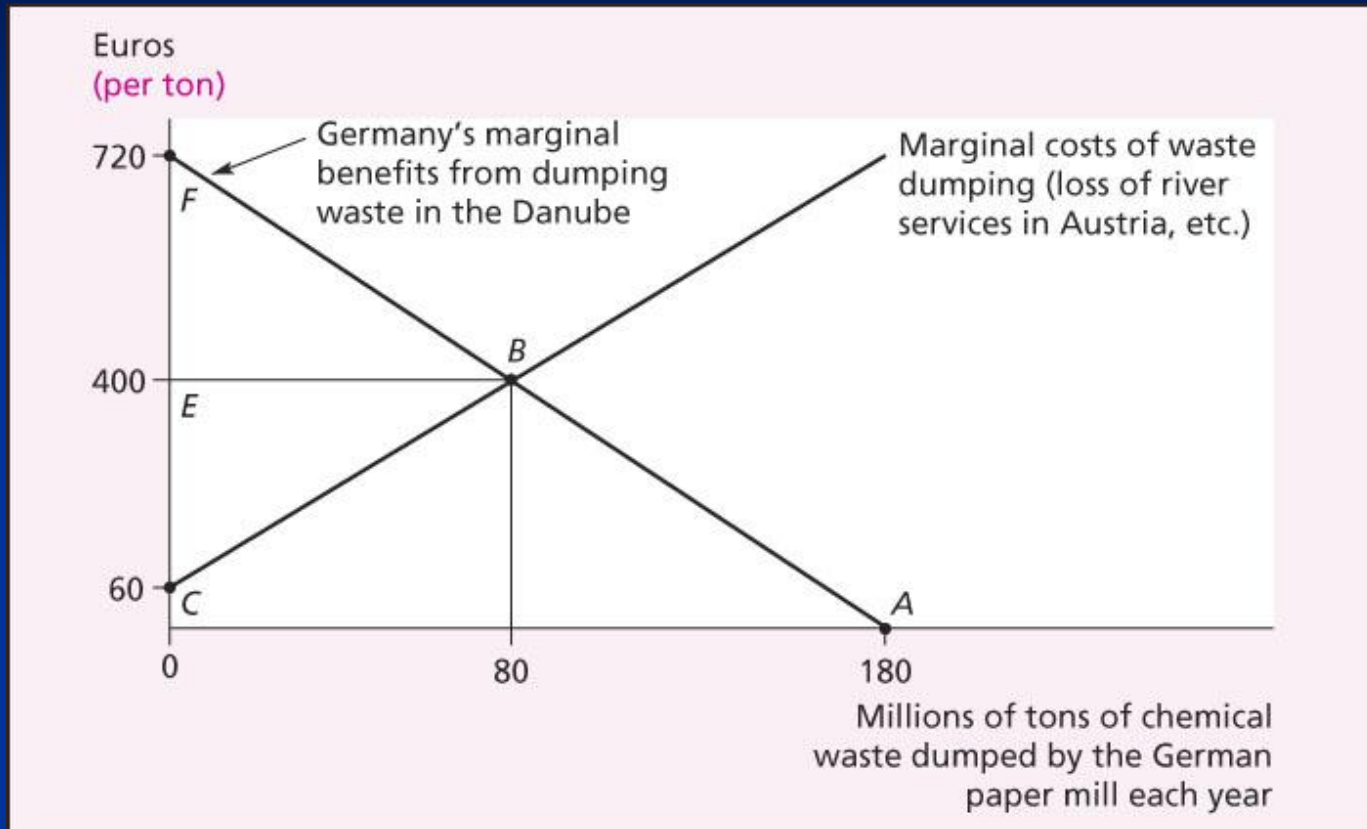
# Trans-border pollution

- A tax will not work in this situation because of the trans-border nature of the pollution
  - Austria has no direct taxing power over a paper mill in Germany
  - Germany might not tax the paper mill at all
- International negotiations between the two countries is required to achieve the efficient outcome

# Trans-border pollution

- If they fail, the Austrian government could attempt to reduce imports from Germany
- This could reduce pollution in the river if Austria is a major importer of paper from Germany
- Problem: WTO rules prohibit import tariffs such as this

Figure 13.5: International pollution



Country or Region	Annual CO <sub>2</sub> Emissions* (gigatons)			Real Annual National Income (U.S. \$ trillions)		
	2010	2040		2010	2040	
		Baseline	With CO <sub>2</sub> Tax		Baseline	With CO <sub>2</sub> Tax
United States	6.2	11.0	3.5	12.0	25.7	25.1
Western Europe	3.7	5.4	4.4	10.5	20.9	20.4
Other industrialized countries	2.3	3.8	2.6	6.1	11.2	10.9
Russia and Eastern Europe	3.0	4.8	3.8	3.9	8.6	8.3
OPEC countries	1.4	3.6	0.8	1.0	2.9	2.3
Other developing countries	8.7	35.4	8.7	8.0	32.4	31.3
World	25.3	64.0	23.9	41.5	101.6	98.2

\*From burning of fossil fuels.

Source: International Monetary Fund, *World Economic Outlook*, April 2008, Chapter 4. The author is grateful for data provided by Natalia Tamirisa.

# Global environmental challenges

- Extinction of species
- Overfishing
- CFCs and the Ozone Layer
- Greenhouse gasses and global Warming
- Kyoto Protocol
- Copenhagen accord
- A global approach

6. Consider the example of domestic pollution shown in Figure 13.4. Suppose that the marginal external cost of the pollution is \$0.05 per ream produced (instead of \$0.30).
- With this different MEC, does free trade make the country better off or worse off?
  - To gain the most from trade, should the country export or import paper? How much?