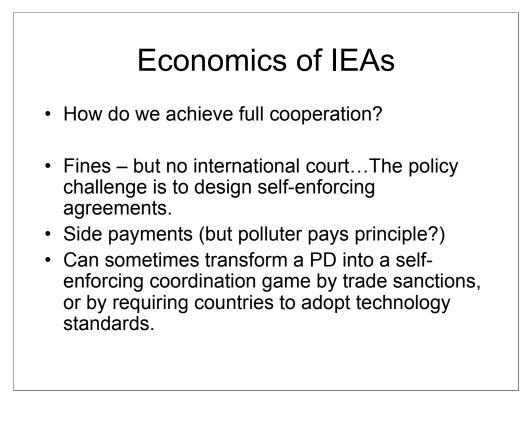
International Environmental Agreements and Global Public Goods

Economic	CS OF IEA	Pollute
Recall the Prisoners' Dilemma game: Abate [Pollute, pollute] is a Nash equilibrium. It is a dominant strategy for country i to pollute.	1,1	-1,2
	2,-1	0,0

Neither player could do better by deviating from this strategy.



If the game is repeated, then can obtain full cooperation from

-trigger strategy (non-cooperate forever if other pollutes)

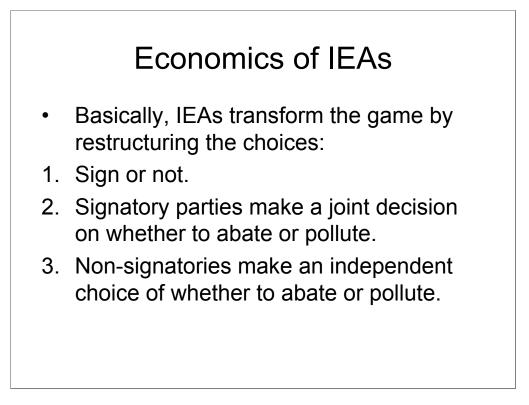
-tit-for-tat strategy (non-cooperate for one period if other pollutes)

Can change the above PD by adding a payment of a fine of 2 to the other country if a country chooses "pollute" when the other country chooses "abate". Nash equilibrium is now [abate, abate]. But it requires third-party enforcement.

Limited possibilities for side-payments: cannot make everyone gain, but can make free-riding costly.

In some cases, it is only a matter of coordination (symmetric, but multiple equilibria): If the pure coordination game below was played sequentially then [abate,abate] is the only outcome.

2,2	-1,1
1,-1	0,0



One type of EIAs: Convention followed by protocols which specify binding emission reductions. Example:

United Nations' Convention on Long-Range Transboundary Air Pollution 1979

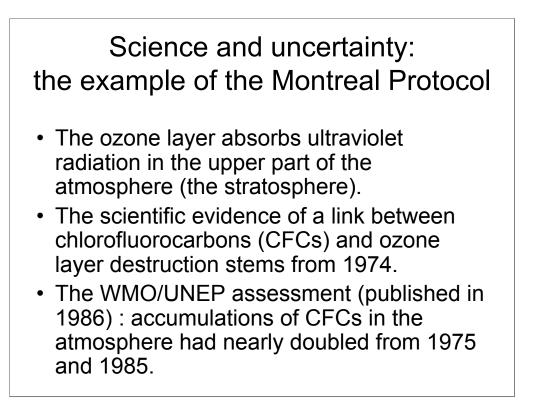
1985 Helsinki Protocol (30% club)

1988 Sofia Protocol (reduction objectives for NOx emissions)

1994 Oslo Protocol (SO2 emission reductions according to critical loads)

1998 Heavy metals and persistent organic pollutants

2001 Stockholm Convention on Persistent Organic Pollutants (wider coverage than in 1998)



Molina and Rowland (Nobel Prize in chemistry, UC)

The economics of CFCs

- In 1985, the U.S. accounted for 30% of world output of CFCs 11 and 12. Home of DuPont (25% of world production).
- The EU accounted for 45%.
- Other producers: Japan (11-12%), the Soviet Union (9-10%), Canada, China, Australia, Venezuela and India.

The negotiation process

- The Vienna Convention for the Protection of the Ozone Layer (March 1985): signed by 20 countries plus the European Commission.
- Negotiations began in December 1986.
- The Montreal Protocol was agreed upon in September 1987. Significant revisions took place in 1990 (London amendments).

In 1977: UNEP convened an International Conference on the Ozone Layer.

London 1990: Second meeting of the Parties.

By the start of the London negotiations 65 countries had signed the MP.

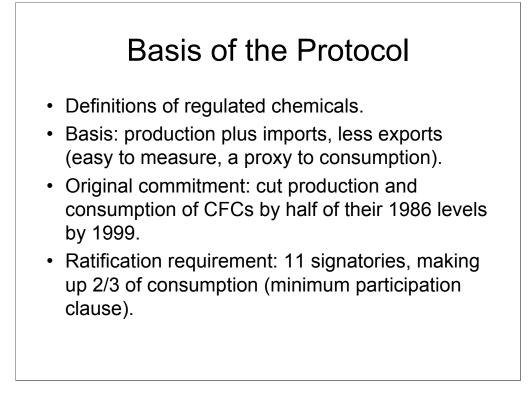
London amendments made India and China sign (burden-sharing).

The amendments increased the number of controlled substances from 8 to 20 (ten additional CFCs, methyl chloroform, and carbon tetrachloride) The London amendments came into force August 1992.

Copenhagen amendments of 1992 came into force 1994: CFCs were to be phased out by 1996; number of controlled substances increased from 20 to 94 (including HCFCs, to be capped and phased out by 2030).

Vienna 1995: methyl bromide phase-out.

Montreal 1997: methyl bromide phase-out brought forward to 2005. Beijing 1999: phase-out of bromochloromethane (95 controlled substances).



ODS: not only CFCs but also halons, CT (carbon tetrachloride) and MT (methyl chloroform), HCFCs. A basket of chemicals, each weighted by its ozone-depleting potential.

The original MP encompassed 5 CFCs and 3 halons.

Stabilize the use of certain halons at their 1986 level.

Can adjust the levels of reductions by two-third majority vote.

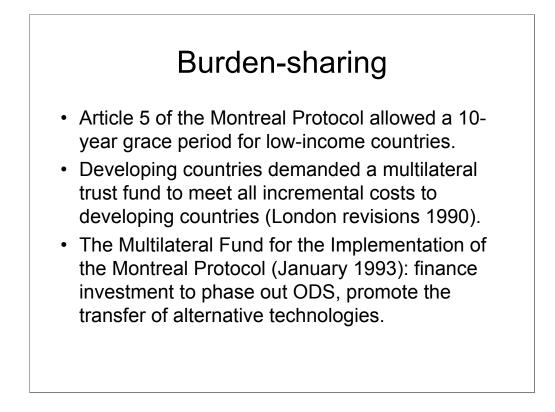
Minimum participation clause: necessary to reduce free-riding incentives (show prisoners' dilemma game).

Why did some countries sign the MP? What were the economic benefits and costs? Compare cooperative versus non-cooperative outcome.

Benefits: avoided deaths from increased incidence of skin cancer.

Costs: depends on available substitutes.

Turns out accession was a dominant strategy for US and European countries.



Countries with less than 0.3 kg/capita were allowed to continue use.

Currently, 129 out of 185 parties qualify for help under the Multilateral Fund which finances the incremental costs of developing technology.



Leakage is only a problem if participation is incomplete.

In theory, trade leakage could be either positive or (negative) –depends on whether pollution abatement is a strategic substitute or (complement).

The Montreal Protocol does not limit R&D transfers to non-parties, but the trade sanctions on import and exports of controlled substances have proven effective.



Article 8: Non-compliance (not specified in Montreal), but trade sanctions were there from the start.

WTO: discriminates non-Parties versus Parties. (violates the Most Favored Nation Principle)

Border tax adjustments not allowed based on production processes or methods, although the GATT Article XX allowed restrictions of trade to protect human, animal or plant life. Recall dolphins versus tuna case.

Failure? Can argue that the Montreal Protocol did little compared to the non-cooperative outcome (Murdoch and Sandler, 1996)... ...but the Protocol has been revised continuously and now implies larger and faster reductions in ODS compared to the 1987 treaty.

Environmental effectiveness: ODSs in the atmosphere peaked in 1994 and is decreasing. By around 2050 the stratospheric concentration of ozone is expected to have returned to its "natural" pre-1980 level.

Multilateral cooperation catching up with unilateral initiatives?

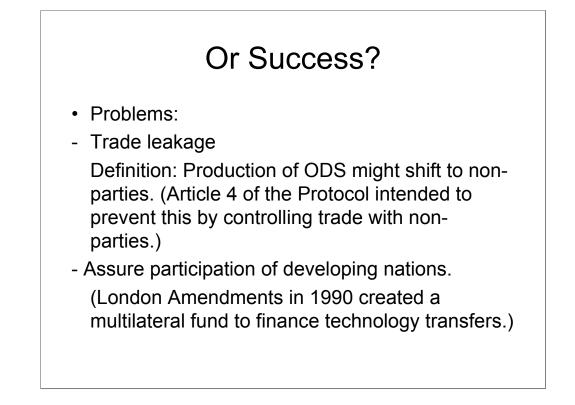
By 1990, the 20% reduction in CFCs required by the Montreal Protocol for 1993 had already been met by virtually all industrialized countries. Some announced they would make further cuts unilaterally.

It was in the U.S. self-interest to sign the Montreal Protocol.

Political economy arguments: Dupont was ahead of its competitors in the development of CFC substitutes. Its announcement in March 1988 of a unilateral production stop accelerated the negotiations.

Learning over time.

One measure of success is that the Montreal Protocol was negotiated under scientific uncertainty (the ozone hole was considered a special case at the time).



If leakage is severe enough, all the Protocol would do would be to shift production around and the environmental benefit would be insignificant. This is not an issue now since the Montreal Protocol basically has full participation.

The fear of trade leakage made the parties incorporate trade sanctions into the Protocol, and they have been proven effective to obtain virtually full participation in the Protocol.

Burden-sharing was dealt with in several ways: ten-year delay for developing nations in phasing out controlled substances. Funding of incremental costs of adoption of substitute technology. Ultimately, parties perceived the burden-sharing as fair after the London Amendments.

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