

Multinational Environmental Agreements (MEAs)

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Outline of material

- Principles of MEAs
- An example of a successful MEA
- Some facts about MEAs
- MEAs and trade restrictions
- Game theory and MEAs

Principles of MEAs (review)

- Prevention of damage/loss
- Precautionary principle: lack of conclusive scientific evidence does not justify inaction.
- Subsidiarity: action should be at the "lowest level" practical, e.g. a local problem should be addressed by local rules.
- Common but differentiated responsibility: burdens should not be the same for rich and poor countries.
- Openness: transparency and public participation.
- Polluter pays principle. (Remember the Coase Theorem and the discussion of "incidence of taxes")

North Pacific Fur Seal Treaty: an early MEA

- Seals are a “transnational resource”: they cross borders.
- History of sealing in North Pacific:
 - i) In the early 1700's Russian explorer, Vitus Bering, discovered Commander Island, which contained seals' breeding grounds.
 - ii) The main seal breeding grounds were discovered in 1786 on St George Island.
 - iii) Seals are easy to hunt on land -- they can be herded like cattle and then clubbed to death.

Background, continued

- Within a few years of the discovery, excessive harvesting reduced the population of seals and wiped out the population of sea otters.
- Czar Paul granted a monopoly to the Russian-American Company in 1799. This company harvested 2.5 million seals during the next several decades without endangering the population. The common property problem was (temporarily) solved.
- Harvesting rules required that only "surplus males" were taken.
- In 1821 Russia claimed the right to seas within 100 miles of its land territory, in order to increase its control of the industry. The US and Britain rejected the claim.

Background, continued

- The US acquired Aleutian Islands (including Pribiloffs) under the Alaska Treaty of 1867, leading to the resumption of uncontrolled harvesting.
- Within three years the US established a monopoly, with rules for hunting. This monopoly rented the rights to hunt on Russia's remaining seal breeding grounds on Commander Island.

Beginning of Pelagic sealing

- Seals spend half the year in open water, and even during breeding season they spend a part of their time feeding in the sea.
- Pelagic sealing (hunting seals on open seas), mostly by Canadian vessels, began around the time the US took control of the breeding grounds.
- Hunting on open seas leads to the death without capture of many seals. On open seas it is not possible to distinguish surplus males from females, leading to killing of females with pups (and the subsequent death of pups).

US - Canadian conflict

- The US objected to the Canadian pelagic sealing, and in an attempt to stop it seized Canadian ships.
- In the resulting in a legal conflict Britain represented Canadian interests.
- The dispute went to international arbitration in 1892.

The arbitration

- The US claimed that it needed to stop pelagic hunting in order to protect the seals, which the US considered its property by virtue of ownership of breeding grounds.
- Britain claimed that US had rights only to the breeding grounds.
- The tribunal agreed with Britain, and ordered the US to pay compensation for having seized Canadian ships.

Results of arbitration

- The tribunal recognized the danger to seal stocks and recommended:
 - i) a one year moratorium on hunting; a year-round prohibition of pelagic sealing within 60 miles of Pribiloff Islands (the breeding grounds);
 - ii) an extension of this prohibition between May - July in the Bering Sea and parts of North Pacific;
 - iii) prohibiting the use of nets, firearms, and explosives.
- The US and Britain-Canada agreed to these terms.

The problem of “leakage”

- During the one-year ban, ships moved to Russian breeding grounds, leading to another dispute that was settled by negotiation.
- Harvesting moved to other areas where seals migrated. In addition, the agreement was binding only on the parties to the arbitration. Ships flying other nations' flags did not have to abide by the restrictions.

Further attempts at solution

- The US tried to obtain a more comprehensive ban on pelagic sealing throughout the Bering Sea, but Britain (on behalf of Canada) rejected the proposal.
- The US threatened to kill off the entire population if an agreement could not be reached -- an example of a non-credible threat.
- There was not a "technical fix" to the common property problem. One (impractical) idea was to cage the seals on the islands.

Branding?

- Another suggestion was to brand the seals, in order to reduce the value of their pelts, thus reducing the incentive to hunt them. However, there was no point in branding only the females, as they were indistinguishable from younger males in the water, where the harvesting took place. Branding all the seals would destroy the value of the resource.

It gets worse...

- The US prohibited its citizens from pelagic sealing.
- Japan entered the industry, causing Canadian profits to plummet.
- Japan also had its own breeding grounds.
- All countries realized that without an agreement, stocks would collapse and the sealing fleet (a sector-specific asset) would lose value.

An agreement

- The four parties, Russia, Japan, the US and Britain/Canada negotiated an agreement in 1911 to manage the resource and to share the harvest.
- Britain/Canada was the only party without a breeding ground, but they had a active fleet, so any agreement had to include them.
- Each country believed that without their participation, the agreement would not be reached; the alternative would be open access, and dissipation of rents from the resource.

The nature of the agreement

- The agreement restricted and shared the harvest. It required countries with breeding populations to monitor their stocks in order to detect non-compliance.
- Each country was required to enact domestic legislation to enforce the terms of the agreement on their citizens. (A country was not able to punish citizens of other countries for non-compliance.)
- Failure to comply with any portion of the agreement would threaten its continuation.

Enforcement

- Success of the agreement required the exclusion of ships under non-members flags (since those nations were not bound by the agreement).
- At this time, all seal skins were processed in London. Pelts harvested by non-members were not allowed to be imported into Britain, thus eliminating the incentive for non-members to enter the sealing industry. Thus, a single country, Britain, was able to impose a trade restriction that deterred entry and thereby sustained the agreement.
- An interesting question is why seal processors did not set up outside of Britain. Presumably, the costs of doing so would have been substantial.

Subsequently

- This agreement lasted until 1941, when it was abrogated by Japan on the eve of WW II. The treaty was revived after the war but has since been superseded.

Important features of the problem and solution

- Seals were a common property resource.
- A small number of countries were involved.
- Each recognized that their cooperation was essential, and that the lack of cooperation would destroy the resource.
- There was a “credible punishment” for non-cooperation - - credible because it did not involve one nation “cutting off its nose to spite its face”, but instead involved nations acting out of (narrow) self-interest.
- There was a mechanism for preventing other countries from entering (a kind of “leakage”) -- the UK control of processing.

Facts about MEAs

- There are currently about 225 MEAs, all but four of which were adopted after 1945. MEAs are a fairly recent innovation, and they are growing in importance. Their growth reflects the growing importance of multinational environmental problems.

Conventions and Protocols

- Some of these treaties are called "conventions" and others are called "protocols". There is no legal distinction between these two terms, although in several cases a general agreement is called a convention, and the specific manner in which it is to be implemented is called a protocol (e.g. the Framework Convention on Climate Change and the subsequent Kyoto Protocol; the Vienna Convention and the subsequent Montreal Protocol.)

Negotiations

- Some major treaties require consensus for their adoption; others, like the Law of the Sea require a two-thirds majority.
- Although the process of negotiation is typically confidential, international law outlaws secret treaties. This law was created in the post WWI period, in response to the political instability that had been exacerbated by secret treaties between various European powers in the pre-war period.

Signing and ratifying an agreement

- By signing a treaty, a state signals that it intends to seek ratification and to comply with the treaty, but signing the treaty does not entail a legal obligation to ratify the treaty.
- In the US, ratification requires a two thirds vote by the Senate; the Senate is not necessarily controlled by the executive, which has responsibility for negotiating the treaty.
- In the UK, ratification requires a simple majority in the lower House, which is controlled by the Prime Minister's party (possibly as part of a coalition).

Congressional involvement

- Although in the US the executive is responsible for negotiating the treaty, the Senate can signal its intentions prior to signing.
- In the negotiations for the Montreal Protocol, the US Congress drafted legislation requiring that the agreement impose trade restrictions on nations that refused to share the costs of reducing CFCs.
- In 1997 the US Senate voted 97 to 0 for a non-binding convention stating that they would not ratify a climate treaty that imposed costs on the US economy, unless developing countries were also required to reduce their emissions.

Verification and enforcement

- A successful MEA requires that countries fulfill their agreements.; this requires that countries report their actions, and that there be a system of verifying these reports, by means of monitoring.
- There were problems in getting countries to report their CFC emissions as required by the Montreal Protocol.
- In the 1960s, the Soviet Union, with the help of the KGB, grossly under-reported the number of whales that it had harvested.
- Most treaties do not permit "intrusive" verification of reports (e.g., coming on site and checking the amount of emissions.)

MEA objectives may change over time

- The initial objective of the International Whaling Convention was to harvest whales in a sustainable manner. The original 15 signatories were all involved in whaling.
- Other non-whaling countries (e.g. Austria) later joined with the express intention of stopping whaling, rather than sustainable harvesting. A group of whaling countries formed a splinter group, membership of which requires the permission of existing members.

MEAs and trade restrictions

- According to Barrett, approximately one in seven of existing MEAs have some form of trade restriction. According to the UN document, one tenth of MEAs involve trade restrictions.
- Some treaties, such as the Basel Convention on Trade in Hazardous Waste and CITES, are explicitly about trade and trade restrictions. Other treaties, such as the Montreal Protocol involve trade restrictions as a means of persuading nations to join and adhere to the treaty.

A practical reason for trade measures in MEAs

- Sometimes it is easier to achieve an environmental objective using a trade measure.
- (Example of unilateral environmentally-related trade restriction) US imposes size limits on lobsters to prevent harvest of very young lobsters, to protect stocks.
- U.S. imposes the same limits on Canadian imports (a trade measure) because it is hard to distinguish a Canadian from a US lobster. If smaller Canadian lobsters were admitted, it would be more difficult to make sure that US lobsters didn't violate the size constraint.
- However, due to colder weather, Canadian lobsters grow more slowly, so a given size lobster from Canada is older.
- The same size limit implies a tighter environmental restriction when applied to Canadian lobsters. (Trade rules permit trade restrictions in some cases, but the restrictions should distort trade as little as possible.)

A second reason to include trade in MEAs: Trade is intrinsic to some environmental problems

- When supply and demand arise in different countries (e.g. ivory) trade is intrinsic to environmental problems
- Although it might be possible to stop poaching of elephants (a non-trade measure), it might be more efficient to cut off demand by restricting trade.
- There are environmental arguments against using trade restrictions as a means of protecting elephant stocks. The trade restrictions reduce the value of elephant herds, reducing incentive to protect them.

Trade sanctions might be used to enforce participation and compliance in MEAs

- Trade sanctions can be used to combat the problem of “leakage”.
- Although many MEAs do include trade measures, those sanctions are very limited (e.g. Montreal Protocol), and developing nations receive assistance to help them comply. There is a carrot as well as a stick.
- The big question: would it be possible/useful to use trade measures to enforce an agreement on greenhouse gasses?

What is the potential conflict between Kyoto Protocol and WTO?

- WTO Committee on Trade and Environment (1996)
“endorses ...multilateral solutions based on international cooperation ...as the best ...way for governments to tackle environmental problems of a transboundary or global nature.”
- What happens if the dispute arises between a member and non-member of MEA?
- A hypothetical: EC imposes carbon emissions limits and the US does not.
- Could the EC impose countervailing duties against US imports on the grounds that the US failure to reduce emissions is an implicit subsidy?

Other hypotheticals

- Could the EC object that the US failure to impose climate change costs represents an implicit subsidy on its domestic products, and there is an implicit barrier to imports?
- If the EC subsidizes its energy intensive firms to assist them in reaching Kyoto goals, could the US object that these subsidies violate the WTO agreement on subsidies?

A real dispute

- On 1998 Japan proposed reducing some taxes on lightweight fuel-efficient motors, ostensibly as a means to reach its Kyoto commitments.
- The EU objected these tax changes would disadvantage its Japanese car sales, since 80-90% of its exports were in the mid to heavy range.
- At the time of the dispute neither country had ratified Kyoto – that occurred in 2003.

Review the WTO Technical Barriers to Trade (TBT) Agreement

- TBT does not allow technical barriers to trade that are more trade-restrictive than necessary.
- TBTs can be used to pursue “legitimate objectives” including national security, protection of human health or safety, or the environment.
- A regulation adopted in pursuant to international standards is given a “presumption of consistency” with WTO rules.

EC- US dispute

- US “gas guzzler” tax levied on car models with lower than 22.5 mpg. Corporate Average Fuel Economy (CAFE) standards penalize manufacturers that don’t reach certain level of fuel economy. Manufacturers allowed to average over product line or fleet.
- Several EU auto producers with limited (luxury) lines were not able to take advantage of averaging.
- EU brought a GATT complaint.

The tribunal decision (which was not “adopted”)

- Panel did not consider cars that get more than 22.5 mpg “like” cars that get less than 22.5 mpg. It upheld gas guzzler tax because it applied equally to all “like” cars no matter where manufactured but it rejected CAFÉ standards.
- Implication: trade restrictions that discriminate between products based on energy efficiency might not conflict with WTO rules.
- The determining question is whether the measure is designed for or results in discriminatory protection for domestic production.

Border tax adjustments (BTAs)

- WTO rules allow the same tax used domestically to be imposed on like imported products, and a rebate on exported products. (This is an example of the “Destination principle”, the idea that taxes are levied in consuming rather than producing nations.)
- These rules allow BTAs for direct but not for indirect taxes.
- Distinguish between energy products (e.g. petroleum) and products produced using energy (everything)

Implications for carbon taxes

- Suppose EC uses carbon taxes and the US does not. The tax is imposed on energy products that create carbon emissions.
- Under WTO, the EC can impose taxes on imported “like” energy products but (probably) not on goods produced using the energy.
- As a practical matter, measurement of the energy embodied in the final product is difficult/controversial.

Summary

- Steps taken to reduce greenhouse gas (GHG) emissions could give rise to trade conflicts.
- International standardization of policies to reduce GHG emissions, in consultation with WTO, can help reduce this risk.

Game theory models of IEAs

- All countries may be better off by agreeing to an IEA rather than continuing with non-cooperative status quo
- Countries have a temptation to free-ride on other countries' efforts to solve transboundary environmental problems.
- It is difficult to force sovereign nations to join an IEA.
- When is it an equilibrium strategy for a country to join an IEA?
- (See online notes: Participation games)

Meaning of Nash equilibrium

- A decision (or a “strategy”) is a Nash Equilibrium if this decision is optimal, taking as given the strategies of other players.
- In games under discussion, agents are assumed to be homogenous (identical) before their decisions. Obviously not descriptive.
- Not all agents make the same decision.
- The theory does not explain why identical agents make different decisions.
- Objective is to explain how many agents make one kind of decision or the other.

Review of prisoners' dilemma (The non-cooperative “pollute-abate game”)

Country y column Country x row	abate	pollute
abate	(1,1)	(-1,2)
pollute	(2,-1)	(0,0)

- Entries give payoffs to (x,y)
- Pollute is a “dominant strategy” (i.e. it is optimal to pollute regardless of what other nation does.)
- (pollute, pollute) is the unique Nash equilibrium, but (abate, abate) gives both countries a higher payoff

The participation game

- Consider the following three stage game:
 - (i) Stage 1 the countries decide (non-cooperatively) whether to participate in an IEA. This decision is binding. First stage is the “participation stage”. It determines number of IEA members: 0, 1 or 2.
 - (ii) Stage 2 the IEA decides what to do, *in order to maximize members’ joint welfare*.
 - (iii) Stage 3 the non-member(s) decide what to do.
- Agents have “rational expectations”: they understand how their decision in the current period will affect their own and others’ decisions in the future.
- Agents cannot make commitments other than those described by the game (above).

How to solve the game

- Agents anticipate how they and others will behave in each contingency (the rational expectations hypothesis).
- To incorporate this hypothesis in solution, we need to solve the game “backwards”, i.e. starting from third stage, to determine equilibrium actions, contingent on outcome of previous stage.
- The resulting equilibrium is “subgame perfect”.

The backwards solution

- Last stage is trivial: nonmember(s) have a dominant strategy: pollute.
- The second to the last stage is also trivial. If there are 0 or 1 members, the IEA does not abate.
- The payoff matrix in the first stage is shown here.
- Now the dominant strategy is to join the IEA.

Country X column Country Y row	Join IEA	Don't join IEA
Join IEA	(1,1)	(0,0)
Don't join IEA	(0,0)	(0,0)

What happens when there are $n > 2$ nations?

- Some notation:

c = cost of abatement for each country.

b = the benefit that each country obtains (regardless of whether the country is an IEA member) from the abatement of any country.

- There are n countries in total, so if k countries abate, the global benefit is $n(kb) - kc$.
- If k countries abate, the benefit for each IEA member is $kb - c$ and the benefit for each nonmember is $kb > kb - c$.
- Nonmembers have a higher payoff than members: the benefit of free-riding.

What is the solution to 3 stage game?

- In last stage, non-members have a dominant strategy: do not abate.
- In second stage, given k members, the IEA chooses $\max(0, kb-c)$. It chooses abate if and only if k greater or equal to c/b . Let $M =$ smallest integer greater than or equal to c/b (e.g. if $c=2.1$ and $b=1$, then $c/b = 2.1$ and $M=3$).
- In first stage, it is optimal for a nation to join if the number of (other) signatories is $M-1$. In this case, their payoff from joining is $bM-c$ which is greater than or equal to 0. Their payoff from not joining is 0. Equilibrium membership is therefore M .
- Note: M is an equilibrium outcome. If the IEA were to announce a “minimum participation size greater than M , that announcement would not be credible.

What is the incentive to join?

- If there are currently $M-1$ members any country knows that by joining it will change the behavior of the IEA (from non-abate to abate) and this change will benefit the new participant (whose payoff increases from 0 to $Mb-c$).
- Countries join because by doing so they affect the behavior of other countries in the next stage.
- This model has nothing to say about the identity of the signatories (since all countries are ex ante the same). The model only addresses participation level.

(Pessimistic) Implications of this model

- The amount of cooperation (measured by M) is “typically” small, i.e. less than n .
- Larger external benefits (larger b) decrease equilibrium membership.
- Larger costs of abatement increase membership. (Market-based policies that reduce costs of abatement can reduce equilibrium membership).

Potential versus actual gains from cooperation

- Membership tends to be low in circumstances where potential gains from cooperation are high.
- The potential gain from cooperation is $n(nb-c)$, which is *increasing in b and decreasing in c* .
- The equilibrium global welfare level is
$$nMb-kc=M(nb-c).$$
- The ratio of actual to potential gains is M/n , which is *decreasing in b and increasing in c* . (Recall definition of M .)

Summary of implications

- IEAs tend to have large membership (relative to number of potential members) in circumstances where the IEA potential benefit of IEA is small (because c is large and b is small).
- A reform that lowers “membership” costs (here, c) such as permitting trade in permits, can lower equilibrium membership.
- A successful IEA is unlikely to be achieved in this non-cooperative setting. Absent cooperation, a successful IEA may require an “external threat”, such as trade sanction against non-participants.

Is this model of IEA formation plausible and useful?

- Variants of this basic model are widely used.
- The model “sounds right” to economists because it assumes that agents follow their self-interest at each stage of the game – i.e. they behave noncooperatively.
- (In second stage the IES pursues collective self-interest of its members, but is non-cooperative with respect to non-members.)
- The “minimum participation size” is endogenous, i.e. the IEA is not able to make a “non-credible” commitment prior to the participation stage.

Focus on the assumption of second stage play

- Model assumes that IEA action is chosen contingent on number of members, and that nations know this when they make their participation decision.
- The rationale for this assumption is that IEA can not commit to action that is ex post non-optimal.
- However, in reality nations make their participation decision *after* knowing what participation entails. They do commit to taking specific actions upon ratification of IEA.

Other non-cooperative models are more realistic and have different implications

- Suppose that IEA specifies that membership requires abatement unless member pays a “fine”. (This is an “escape clause” in contract.)
- For example, at time of signing, country may not know whether its abatement costs will be high or low.
- The fine is returned equally to all members (regardless of whether they abate).

Alternative, continued

- A larger membership makes exercise of escape clause less attractive (because the country that exercise it gets a smaller rebate).
- By choice of the level of the fine, it is possible to induce many (possibly all) countries to join.
- By joining an IEA, the new member makes it less likely that other signatories will exercise the escape clause.
- As in the simpler model above, the incentive to join is to change the behavior of other signatories.

Conclude alternative

- Some countries that join might exercise the escape clause if they discover that they have very high abatement costs – but that may be the efficient decision.
- Inclusion of the escape clause helps to reduce risk from IEA membership (unexpectedly high abatement costs) and it also helps to increase membership. In this model, lower expected “membership cost” increases equilibrium membership size – contrary to simpler model.
- A properly designed IEA may be able to solve the participation problem without recourse to external (e.g. trade) threats.
- The “simpler model” is wrong about the timing of decisions regarding IEAs, and this mistake leads to a too pessimistic conclusion.

Summary of game models

- The game models recognize that a nation's participation decision is non-cooperative – sovereign nations can't be forced to sign.
- There is a cost to membership – signatories have lower payoffs than non-members, so there is an incentive to free-ride.
- A nation's incentive to join is to affect the decision of other nations at a subsequent stage.
- IEA membership entails a degree of cooperation. (Members behave differently than non-members.)

Summary, continued

- The predictions of the model are very sensitive to the assumptions about how decisions are made in the “abatement stage” (stage 2).
- If the IEA maximizes its members’ joint welfare, the model predictions are pessimistic: membership is low when potential benefits are large; decreasing cost of membership (abatement costs) will decrease membership size; a successful IEA is likely to require an external threat, e.g. trade sanctions.

- If the IEA members follow rules that were determined prior to membership decision (e.g. a contract that contains an “escape clause”) then those rules can be chosen to achieve large membership and efficient decisions of IEA.
- The rules can be chosen in such a way that a nation’s decision to participate will have a large effect on the equilibrium outcome of the IEA behavior.
- A properly designed IEA can succeed without the use of an external threat such as trade sanctions.