Lecture # 27 – Trade and the Environment

I. Globalization and the Environment

- Four key questions:
  - First, how does international trade affect environmental quality within a country?
    - For example, does it make it more difficult to strengthen environmental regulations?
  - Second, should environmental issues be included in international trade agreements?
  - Third, can sanctions using trade policy be useful to address global environmental problems, such as climate change?
  - Fourth, how does industrial policy supporting local industry affect the environment?
- Classification of environmental objectives
  - Environmental damage internal to the household or firm
    - Indoor air pollution from smoke is an example
    - Higher incomes generally improve the situation
  - National externalities
    - Most pollution falls here
    - External to the individual causing the pollution
    - Damage felt within the country
    - Government intervention necessary to address
  - International externalities
    - Pollution that crosses borders
      - Acid rain
      - Greenhouse gases
      - Habitat destruction that reduces biodiversity

- We'll discuss ways in which trade and globalization affect the environment. Examples include:
    - Examples of trade improving environmental quality.
        - Consumer power
            - It is through importing Mexican tuna that Americans can influence Mexican fishermen to use dolphin friendly nets
        - Increased competition improves efficiency
        - Trade policy could be used to encourage reduced emissions (e.g. tariffs on dirty imports)
        - New knowledge
            - Countries can learn from other nation's experiences
            - Trade encourages innovation
                - Innovation could benefit the environment
            - Multinational corporations (MNCs) bring state of the art production techniques to host countries
                - Prefer to use the same processes in all locations
                - Want to avoid negative publicity
                - Concerned about liability for meeting standards
    - Examples of trade harming the environment
        - More consumption: trade leads to more economic activity and more exploitation of resources
        - Race to the bottom
            - Fear that trade pressures countries to weaken environmental standards
                - Concerns of workers that stronger domestic regulations will make firms less competitive globally
            - Note that does not require a weakening of regulations. It may just slow the pace at which regulations become more stringent
        - Increased transport costs
- These examples illustrate that international trade can have multiple effects on environmental quality. These can be summarized by the following three effects of economic growth or trade on the environment:
    - Scale effects
        - Higher incomes => increased pollution due to greater consumption.
    - Composition effects
        - Higher incomes=> preferences for cleaner goods.
            - E.g. an economy that, over time, switches from agriculture to manufacturing to service as the dominant sector.
    - Technique
        - Higher incomes => cleaner production processes.

II. Evidence

- Because trade can affect the environment in multiple ways, we turn to empirical evidence to see which effect dominates
- Evidence on pollution haven hypothesis
    - Early studies looked at variation in pollution abatement costs and trade flows in a cross-section
        - These studies found no relationship
        - Suggested race to the bottom not a concern
    - Critique: Doesn't account for unobserved heterogeneity across industries
        - Later studies address this using more disaggregated data
        - Example: Levinson *et al*. ("Footloose and Pollution Free", *Review of Economics and Statistics*, 2005)
            - They argue that aggregate data miss effects in specific industries.
            - Their work proposes three reasons why others find little effect
                - Most trade is between similar countries (North/North)
                    - If look specifically at North/South trade, find an effect.
                    - They divide countries into low and high environmental costs
                        - When US environmental costs rise, net imports to low cost countries increase. Elasticity is 0.2 (10% increase in US costs => 2% increase in imports)
                - Not all industries are mobile
                    - Industries are mobile if:
                        - Low benefits to agglomoration
                        - Low transport costs
                    - Industries that are mobile are more sensitive to environmental costs
                - Not all industries are pollution intensive
                    - Surprisingly, they do not find a bigger effect of environmental costs on pollution intensive industries, unless they control for mobility.
                    - *It appears that pollution intensive industries are also less mobile!*
                        - However, this also means that the argument that there is no pollution haven effect because most PACE costs are insignificant is not sufficient.

- Aichele and Felbermayr (2012, 2015)
  - Study effects of Kyoto Protocol on trade and emissions from 1995-2007
    - Use input-output tables to attribute the emissions from production in each country to where the goods are consumed
    - Compare countries that ratify the Kyoto Protocol and must reduce emissions to those that don't
  - 2012: Countries that ratify the Kyoto Protocol shift emissions to developing countries
    - Emissions in country fall by 7%, but import of carbon increases by 14%
    - Suggests carbon footprint increases by about 7%
  - 2015: Study the carbon content of trade from 1995-2007
    - Use a gravity model
    - In bilateral pairs of countries with importer committed to Kyoto and exporter not committed, Kyoto Protocol led to a 5% increase in imports
- Tanaka et al. (2021) examine the relocation of lead-acid battery recycling to Mexico in response to the imposition of more stringent U.S. air quality standards.
  - Upward trend in US exports of used lead-acid batteries increased after a 2009 policy change
  - Found a 39% increase in low birthweight incidence (a consequence of lead exposure) near battery-recycling plants in Mexico after the change

- These recent studies provide evidence of a Pollution Haven effect
    - Environmental policy affects trade flows
    - But does trade affect environmental outcomes?
        - Here there is less evidence
    - Levinson (2009, 2015) studies by measuring technique, scale, and composition effects
        - Scale and composition effect measured using observed data
        - Technique effect calculated as residual of total observed effect minus scale and composition effects
            - Compares actual pollution levels to what they would have been if:
                - Pollution intensities remained the same (e.g. no technique effect)
            - But manufacturing output (scale effect) and mix of goods produced (composition effect) allowed to change
        - Figure 1 in the 2009 paper is an example
            - Scale effect: US manufacturing increased by 24% from 1987 to 2001
            - Total SO2 emission from US manufacturing fell by 27%
            - If emissions per unit of output held constant (e.g. no technique effect), pollution would have increased by 12%
            - Pollution would have increased 12%
                - The difference between this increase and the increase in manufacturing is due to the change in composition of production.
                - The composition effect reduced pollution by 12%.
            - The remaining difference is the technique effect
                - Leads to a 39% drop in emissions
                - Explains 77% of the total gap between emissions and output
            - Trade plays a smaller role
                - Increased imports between 1987 and 2001 accounts for less than 1/3 of the shift in US manufacturing

- These results are consistent with other recent studies. Small composition effects suggest trade has little effect on emissions
    - Copeland *et al*. (2021) calculate scale, composition, and technique effect for several countries.
        - Magnitude of composition effect generally smaller than scale effect, and direction varies by country
            - E.g. in China, composition increased CO_2 emissions, but decreased NO_X
        - In almost every country, the technique effect is larger than the composition effect
            - Often larger than the scale effect as well.
    - How to reconcile small net effects with the empirical studies mentioned earlier showing how environmental regulations affect trade flows
        - May be that effect of trade is statistically significant, but small magnitude
        - Competition encourages improvements in technique
            - Barrows and Ollivier (*JEEM* 2018) find the composition effect similar in magnitude to the technique effect in India.
            - Gutierrez and Teshima (*J Dev. Econ.* 2018) found that after Mexico lowered tariffs, firms selling to the local market faced more competition
                - Lead to increased energy efficiency
                - Both results suggest evolution of emissions may differ in developing and developed countries

III. Should Trade and the Environment Be Linked?

- Should environmental policy be addressed in trade agreements? Should trade and environmental policy be linked?
    - Or should each be kept separate: use environmental policy to deal with environmental problems and trade policy to deal with trade issues?
        - Keeping these issues separate assumes we have policy instruments that can deal with all relevant distortions
    - Does trade policy influence environmental outcomes?
        - Shapiro (2021): trade policy is biased towards increased carbon emissions
            - Equivalent to an implicit subsidy to carbon emissions of $85-$120/ton
            - Barriers to trade are lower on upstream goods than on final products
                - But upstream goods are more carbon intensive
            - Suggests trade policy could be reformed to improve environment
    - How are trade policy and environment becoming linked?
        - World Trade Organization (WTO) rules limit environmental considerations.
            - Environmental measures should minimize the effect on trade
            - Must be applied in a non-discriminatory way. Can't favor local firms.
            - Usually does not approve of discrimination based on how products are made
        - As a result, countries are using bilateral trade agreements to address environmental concerns.
            - The EU refuses to sign new trade deals with countries that have not ratified the Paris Agreement
            - The European Free Trade Association offers Indonesian palm-oil exporters lower tariffs if they meet certain environmental standards.
            - In 2018, China banned the import of plastic waste. Forced rich countries to take more responsibility for the waste they generate

- **Question:** Is this appropriate? Consider first local pollutants. Should local environmental conditions be part of negotiations? Should trade agreements require all participants to have minimum environmental standards?
    - By setting policy unilaterally, a country can impose costs on foreign firms
        - For example, lowering an environmental standard for an industry that competes with imports
        - Will lower prices in the domestic market
            - Affects the importer as well as the domestic firm
        - Standards may not be efficient globally if these costs to others are not considered
            - Little empirical evidence of a race to the bottom, however
    - Note that when trade agreements limit tariffs, countries can use environmental policy as a means to help domestic firms
    - Market access and national sovereignty – if pollution in one country does not affect another, should trade partners dictate environmental policy in other countries?
    - Note relevant political economy issues
        - In most cases, both sides (e.g. industry and environmentalists) are represented in policy debates
        - But if a good is produced in foreign countries, foreign producers receive less weight in the debate
            - As a result, environmental regulation can discriminate against foreign firms
            - Example: Europe and GMO crops
                - Note that GMO seeds were developed by US companies
                - They would have less voice in the European political process

- Should trade policy be used as an enforcement mechanism for climate change?
    - One challenge with climate policy is leakage
        - If a country reduces emissions at home, but then imports goods generating carbon emissions abroad, global emissions have not fallen
    - Moreover, countries have an incentive to free-ride by not partaking in climate agreements
    - Policy options include:
        - Subsidies
            - Can be used to protect industries that face unregulated competition abroad (e.g. in early years of EU-ETS)
            - Subsidies with domestic content requirements protect local industry and may help develop local supply chains
                - But these are more likely to violate trade agreements
            - But also raise costs to consumers
        - Climate clubs
            - Countries with ambitious policy prevent free-riders by penalizing countries with weak policies
                - Unlike a border adjustment mechanism, not meant to level the playing field, but to encourage ambition.
            - Challenges
                - Reaching agreement on what policies are equivalent
                    - Policy does not need to be a carbon price, but comparing carbon prices is most transparent
                        - E.g. do subsidies count?
                - Would it violate WTO rules for equal treatment of foreign and domestic producers?
            - Carbon border adjustments (discussed below)

- A border tax on carbon would penalize free-riders
    - Implementation options
        - Base the tariff on the carbon content of domestic production
            - Easier to calculate
            - Taxes goods from each country uniformly
            - Because domestic carbon content lower, tariffs would be smaller
        - Base the tariff on the carbon content of imports
            - Creates a level playing field for domestic firms whose costs increase due to climate regulation
            - But, difficult to implement
                - How do we know the carbon content of each good?
                    - Does it matter where the parts that make up a car come from?
            - Which emissions to include in a border tax adjustment (scope)?
                - Scope 1: only direct emissions from production of goods and services
                - Scope 2: emissions created from purchased energy
                - Scope 3: emissions created from purchased products and possibly from downstream combustion of fossil fuels
            - Calculating emissions
                - Emissions first assigned to a facility
                - Then assigned to the various products the facility produces
                    - Typically only applies to products above a minimum threshold emission intensity
            - What price to charge?
                - Typically related to a local carbon price or the price implied by other local policies
                    - Translating non-carbon-price policies into an equivalent carbon price will be challenging

- Tax imports or subsidize exports?
    - Import fee applied by nations where a product is sold
    - Export rebate given to producers by the home country government when exporting, so that local firms are not at a disadvantage
        - For example, the EU subsidizes producers of aluminum, cement, fertilizers and steel to compensate them for the cost of the EU-ETS
            - Will be phased out between 2025-2035, to be replaced with import fees
                - Note that this protects firms selling the EU from competition that faces weaker carbon policy, but exporters losing the subsidies will now have to complete in markets with lower carbon policy.
        - Potential for leakage if it makes goods cheaper where sold (e.g. because local producers lower price in response to competition)
        - Thus, export rebates less commonly proposed
- Benefits of a BCAM
    - Levels the playing field
    - Reduces leakage
    - Raises revenue
    - Could help encourage other countries to enact climate policy
- Costs of a BCAM
    - Difficult to implement. Administrative costs could be high
    - Requires quality data from foreign trade partners
    - Will it lead to retaliatory trade policy?
    - Poor countries at a disadvantage
        - Less likely to avoid tariffs by reducing emissions
        - The Paris Agreement requires rich countries to do more to reduce emissions than poorer ones
        - Note that different responsibilities conflict with trade agreements, which typically require equal treatment
    - Question: Are there ways to avoid the tax?
        - Could sell greenest imports to Europe and other goods elsewhere (“resource shuffling”)
            - *The Economist* notes a study finding that most African exports would go elsewhere, so that CBAM would reduce African GDP by just 0.91%
        - Could change supply chains – buy inputs from overseas that are not covered by tariffs on final goods.

- **Question:** Are border adjustment mechanisms a trade barrier? Is it legal under WTO rules?
    - If exporting to a country, that country must give your companies the same access to the market that local firms have.
    - Possible arguments
        - A BCA must have an objective methodology, cannot charge more than what domestic producers face on similar product, and the export rebate cannot exceed the domestic tax.
        - Importing nations cannot credit foreign countries that have more stringent regulations.
        - Could argue for an exemption from WTO rules by saying the lack of climate policy is an actionable subsidy
            - Must be seen as addressing leakage and not as a trade barrier
            - Thus, some importing countries will be exempt because they have satisfactory climate policy
- What about EU requirements on deforestation, requiring coffee beans sold in the EU to be traced to where they were grown. Does the EU have an obligation to assist countries hurt by its regulations?

IV. Industrial Policy

- What is “industrial policy”?
    - Government support for particular firms or industries
    - In addition to market failures, also motivated by strategic considerations
    - Policy tools include:
        - Subsidies
            - Note that consumer and producer subsidies can be different
            - Unless consumer subsidies include domestic content restrictions, consumer subsidies benefit both domestic and foreign producers
                - The effect of German feed-in tariffs on Chinese solar production is an example.
                - Note as well that local content requirements violate WTO rules
        - Trade barriers
    - Industrial policy traditionally viewed as “picking winners”
    - More recently, industrial policy seen as a possible response to urgent social problems.

- **Question**: What are the justifications for industrial policy pertaining to clean technologies?
    - Economic rationales for industrial policy address both global and local market failures
        - Global: could be addressed by industrial policy tools or other policy tools we’ve discussed this semester
            - Environmental externalities
                - Both producer and consumer subsidies can address
            - Knowledge spillovers
                - Both producer and consumer subsidies can address
            - Local
            - Marshallian externalities: local externalities from industrial production
                - Producer subsidies and trade barriers address
            - Strategic motives
                - Producer subsidies and trade barriers address
            - National security
                - Producer subsidies and trade barriers address

- Examples of industrial policy focusing on local economic rationales
    - Local content requirements on consumer subsidies
        - Biden EV subsidies required domestic content for EVs, solar, and wind
        - Tariffs on solar energy
    - Producer subsidies

- US experience with solar tariffs provides an example
    - Tariffs began in 2012 in response to China subsidizing solar PV cell production.
    - Extended in 2014 to include solar panels assembled from Chinese parts and solar panels assembled in China, regardless or origin of the cells
    - Expanded in 2018 to cover all PV imports
    - **Question**: What arguments are used by supporters of tariffs? Why might tariffs otherwise make sense?
        - US is large – not a price-taker
        - China shock
            - Trade with China had negative impacts on some US industries (e.g. apparel, textiles, furniture, electronics)
                - Levinson: Is this due to lowering tariffs, or other adjustments made by China?
            - But there is no established US solar industry
            - EVs are an in-between case
                - Levinson notes there are other policies in response (retraining workers, paying for early retirement, subsidizing US EV manufacturers
                - Tariffs, in contrast, raise prices to consumers, thus slowing an EV transition
        - National security
            - If this is the concern, is the solution tariffs or banning certain Chinese products?
            - If China did restrict solar panel exports, US could fall back on fossil fuels It wouldn't be a crisis.
        - Learning by doing
            - Can encourage US production with either tariffs or subsidies
            - In general, this is about who pays
            - But with positive externalities, raising costs slows diffusion and leads to more pollution
        - China is cheating
            - Theory assumes markets are working efficiently
            - Worldwide capacity utilization for solar cell manufacturing is about 50%. Compares to about 78% for most industries.

        - To stabilize a domestic clean energy industry, particularly since carbon taxes not viable politically
            - Goal is to internalize the externality
            - Industrial policy seen by some as necessary "when systemic problems reach sufficient scale and urgency; have substantial positive externalities, innovation, or coordination failures, or involve … distributional concerns' (p. 324)
            - Industrial policy could create a coalition of support for climate policy
            - Response:
                - Tariffs raise the cost of clean technology, and without a domestic price on carbon, aren't preventing leakage from imports
        - Pancotti and Tucker argue that trade with a monopolist is not efficient
            - Clean energy production is concentrated. China controls:
                - 80% of solar panel market
                - 59-72% of refining and processing of critical minerals for EV batteries
            - China used subsidies to gain this market power.
            - China primarily exports what it subsidizes.
            - But tariffs will raise prices further. How would that help?
        - Why does it matter where clean energy is manufactured?
            - Path dependencies: will continue on clean energy path
            - Spillover benefits
            - Diversifying supply chain helps national security
    - What happened?
        - China relocated production, but not to the US
            - The 2018 global tariffs were a response
            - After 2018, Asian producers shipped components to the US to assemble here
        - Prices increased
            - 10% after 2014 tariffs
            - 20% after 2018 tariffs
        - Net welfare decreased
            - Lost consumer surplus not made up by increased producer surplus or revenue to government
        - Solar jobs did not increase
            - More manufacturing jobs
            - Fewer installation jobs

- **Question***:* Does industrial policy's focus on local economic benefits help or hurt environmental outcomes?
- **Question:** Should industrial policy used for climate change be considered a WTO violation?