BOSTON UNIVERSITY
Global Development Policy Center
Economics in Context Initiative

Trade and the Environment

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An ECI Teaching Module on Social and Environmental Issues in Economics

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Suggested citation: Roach, Brian and Jonathan M. Harris. 2021. "Trade and the Environment." *An ECI Teaching Module on Social and Economic Issues*, Economics in Context Initiative, Global Development Policy Center, Boston University.

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NOTE – terms denoted in **bold face** are defined in the **KEY TERMS AND CONCEPTS** section at the end of the module.

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1. ENVIRONMENTAL IMPACTS OF TRADE

Thirty percent of global economic production is traded across national boundaries.[1] As world trade has expanded in recent decades, the relationship between trade and the environment has received increasing attention. Is trade good or bad for the environment? How will trade affect the exporting country, the importing country, and the world as a whole? Who is responsible for responding to environmental impacts associated with trade? The answers to these questions are sometimes complex, and economics can help us to understand the social and environmental implications of trade policy.

International attention first focused on these issues in 1991, when the Mexican government challenged a U.S. law banning tuna imports from Mexico. The U.S. Marine Mammal Protection Act prohibited tuna-fishing methods that killed large numbers of dolphins and banned tuna imports from countries, including Mexico, that used such fishing methods. The Mexican government argued that the U.S. prohibition on Mexican tuna imports violated the rules of the **General Agreement on Tariffs and Trade (GATT)**.

Created in the 1940s, the GATT was an international agreement to reduce tariffs and other barriers to trade. The GATT was replaced in 1995 by the **World Trade Organization (WTO)**, which we will discuss in more detail later in the module. According to the free-trade principles that provided the basis for the GATT, and later for the WTO, countries could not restrict imports for environmental reasons except in limited cases such as protecting the health and safety of their own citizens. A GATT dispute panel ruled that the United States could not use domestic legislation to protect dolphins outside its own territorial limits, and thus could not prohibit imports of tuna from Mexico. Although Mexico did not press for enforcement of this decision, the tuna/dolphin decision opened a long-running controversy over issues of trade and environment.

General Agreement on Tariffs and Trade (GATT) a multilateral trade agreement providing a framework for the gradual elimination of tariffs and other barriers to trade; the predecessor to the World Trade Organization.
World Trade Organization (WTO) an international organization dedicated to the expansion of trade through lowering or eliminating tariffs and nontariff barriers to trade.

This debate has expanded to cover many international environmental issues, including forest protection, ozone depletion, hazardous wastes, and global climate change. All these issues are linked, to some extent, to international trade policies. If individual countries are prohibited from using trade measures to protect the environment, as in the tuna/dolphin case, then international trade law seems to favor expansion of trade over environmental quality. On the other hand, international agreements on trade can also be structured so as to promote environmental goals.

At the national level, the standard economic policy response to environmental impacts is to implement policies that internalize externalities. At the international level, however, the picture is more confusing. The burden of environmental externalities associated with trade may be

[1] Trade in goods and services, based on 2019 data from the World Bank's World Development Indicators database.

borne in both the importing and exporting countries, as well as other countries. The authority to formulate and enforce environmental policies usually exists only at the national level. This can create significant problems when environmental impacts are transnational, because provisions for environmental protection in international trade agreements are often weak or nonexistent, as we'll discuss later in the module. To address these issues, we first turn to an examination of the basic economic theory relevant to the trade/environment nexus, combining elements of the standard economic theory of trade with the theory of environmental externalities.

1.1 Comparative Advantage and Environmental Externalities

A basic principle of standard economic theory is that expanded trade is generally beneficial, promoting increased efficiency and greater wealth among trading countries. Known as the theory of **comparative advantage,** this analysis demonstrates that two trading countries will both gain by specializing in producing those goods and services that they can produce most efficiently, and then trading with each other. Both countries will be able to achieve a consumption level that is unattainable without trade. But what if expanded trade causes environmental damage? How will this affect the analysis of costs and benefits from trade?

comparative advantage the theory that trade benefits both parties by allowing each to specialize in the goods that it can produce with relative efficiency.

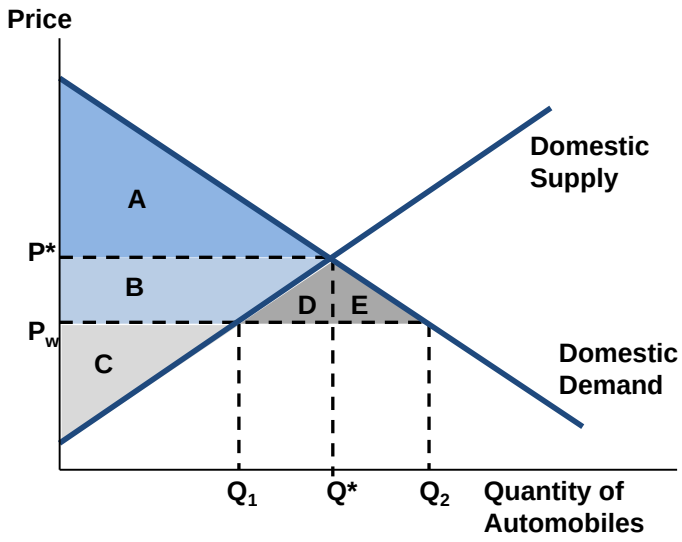
We can use economic welfare analysis to analyze the gains and losses associated with the environmental effects of trade. We start by introducing a graphical welfare analysis of trade without considering the environmental externalities created by producing and consuming goods and services. Consider Figure 1, which uses automobiles as an example of an imported good's welfare effects on consumers and producers.

In the absence of trade, domestic supply and demand would be in equilibrium at a quantity of Q^* and with a domestic price of P^*. We can obtain the market welfare in this automobile market as the sum of consumer and producer surplus. Consumer surplus would be area *A* and producer surplus would be areas *(B + C);* thus, total welfare without trade is *(A + B + C)*.

Now let's assume this country can trade, and becomes an importer of some automobiles. With trade, both production and consumption of automobiles will change in this importing country. If there are no barriers to trade, automobiles can be imported at the world price P_w, which is typically lower than the domestic market price for the good. (We assume for this example that the country's demand is not large enough to affect the world price.)[2] With prices forced down to P_w by competition from relatively cheap imports, domestic producers are only willing to produce Q_1 automobiles. But at this lower price, the quantity of domestic demand has increased to Q_2. The difference between Q_2 (demand) and Q_1 (domestic supply) indicates the quantity of imported automobiles. The resulting equilibrium is at a price of P_w and a quantity of Q_2.

[2] This example shows trade in a relatively small country whose demand has no significant effect on world price, so world price is shown as constant (technically, an infinitely elastic supply curve at P_w). For a country large enough to affect world price, the world supply curve would be shown as upward sloping.

Figure 1. *Welfare Gains and Losses from Importing Automobiles*



How does trade affect domestic economic welfare? With a lower price and a higher quantity consumed, consumer surplus increases from area *A* without trade to *(A + B + D + E)*. But domestic producer surplus decreases to area *C*, as domestic producers only sell Q_1 automobiles at a price of P_w. Total social welfare with trade is *(A + B + C + D + E)*, larger than the previous social welfare without trade of *(A + B + C)*. The net gain as a result of trade is the triangular area *(D + E)*. This essentially demonstrates the basic theory of comparative advantage, showing clear gains from trade. (Note that these are overall gains to the country; some groups can lose from trade, such as domestic auto workers who may lose their jobs when the industry contracts. The theory of comparative advantage says only that overall gains are larger than losses.)

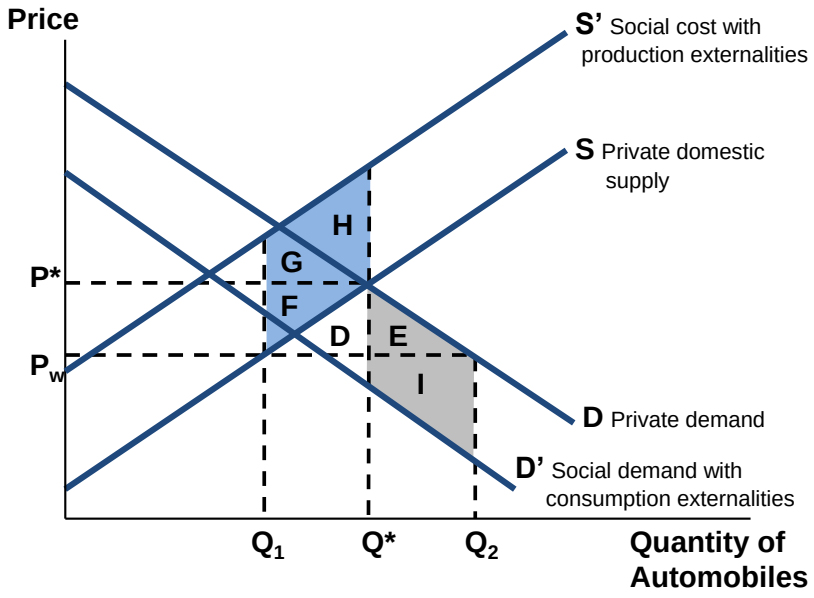
But this basic theory leaves out any environmental externalities associated with trade. We can differentiate between **production externalities**, caused by automobile production, and **consumption externalities**, resulting from automobile use (e.g., burning gasoline) and eventual disposal. Production externalities can be represented as an additional cost to the private supply curve. This is shown in Figure 2, with the social cost of supply given by *S'*. Note that the externalities associated with the production of the *imported* automobiles are not shown in this graph, as we are only considering welfare impacts in the importing country for now. (We will consider the environmental impacts associated with exporting in another example.)

production externalities externalities associated with the production of a good or service, such as emissions of pollutants from a factory.
consumption externalities externalities associated with consumption of a good, such as pollutant emissions from vehicles.

The welfare effects of a negative production externality are represented by a parallelogram between *S* and *S'* up to the quantity of automobiles produced domestically. Prior to trade, this parallelogram would have extended up to *Q**. But with trade, and lower domestic production, the negative production externality only extends up to Q_1. Thus trade results in lower production externalities, by areas *(F + G + H)*—the blue-shaded region in Figure 2. Thus in

addition to the gains from trade accruing to market participants, areas *(D + E)*, the reduction in production externalities also provides a welfare gain.

Figure 2. *Welfare Impacts of Importing Automobiles with Externalities*



But we also need to consider consumption externalities. The total quantity of automobiles sold increases from Q^* to Q_2 with trade. So we will have more air pollution from burning gasoline, more oil runoff into streets, more highway congestion, increased carbon emissions, and more vehicles entering the waste flow once their useful life is over. These additional consumption externalities will, at least to some extent, offset the welfare gains from lower domestic production externalities.

To present consumption externalities in our graph, first recall that a demand curve represents the marginal benefits of consumers. But with the presence of consumption externalities the social benefits associated with automobile consumption are lessened. Just as we added production externalities as an additional social cost to the private supply curve, we can subtract consumption externalities from the private benefits to obtain the true social benefits of automobiles.

In Figure 2 we can subtract the consumption externalities from private demand to obtain curve *D'*—the social marginal benefits of automobile consumption, showing lower benefits than the unadjusted demand curve *D*. Consumption externalities would be represented by the parallelogram between *D* and *D'*, up to the quantity of automobiles consumed. Prior to trade, this parallelogram would have extended to Q^*. But after trade it extends further, to Q_2. The increase in consumption externalities as a result of trade would be areas *(E + I)* in the graph—the gray-shaded region.

We can then assess the overall welfare effects of trade in this country, based on all three factors: the change in market benefits, the reduction in production externalities, and the increase in consumption externalities. The net welfare effects are:

$$\textit{Net change in welfare} = (D + E) + (F + G + H) - (E + I)$$

$$= (D + F + G + H) - I$$

Before we considered environmental externalities, welfare theory indicated that trade unambiguously provided overall net welfare gains in an importing country. Now, whether trade actually increases net welfare or not depends on whether $(D + F + G + H)$ is greater than area I. The way we have drawn Figure 2, it appears that $(D + F + G + H)$ is significantly greater than I, and trade results in net benefits even with consideration of externalities. But this need not always be the case. In the case of automobiles, we might find that the consumption externalities per vehicle far exceed the production externalities. This would increase the size of area I relative to areas $(F + G + H)$, and possibly result in trade lowering overall social welfare in the importing country.

Our results have important implications for trade theory. In the basic trade case without externalities, we can unambiguously claim overall gains from trade. Even though some groups lose (e.g., automobile producers and workers), consumer gains outweigh these losses. After we introduce externalities, however, we can no longer be so sure of net gains from trade, as it depends on the size of the production and consumption externalities. Policy actions by an importing country, such as a tax on automobile use, could internalize these external costs, but unless we know that such policies will be implemented, we cannot be sure of a net gain from trade.

1.2 Exports and Environmental Externalities

We now turn our attention to the welfare effects of trade on an exporting country. Again we will start with a welfare analysis of trade in the absence of externalities, and then consider how inclusion of environmental impacts changes social welfare. Here we use timber exports from a developing country as our example, as shown in Figure 3.

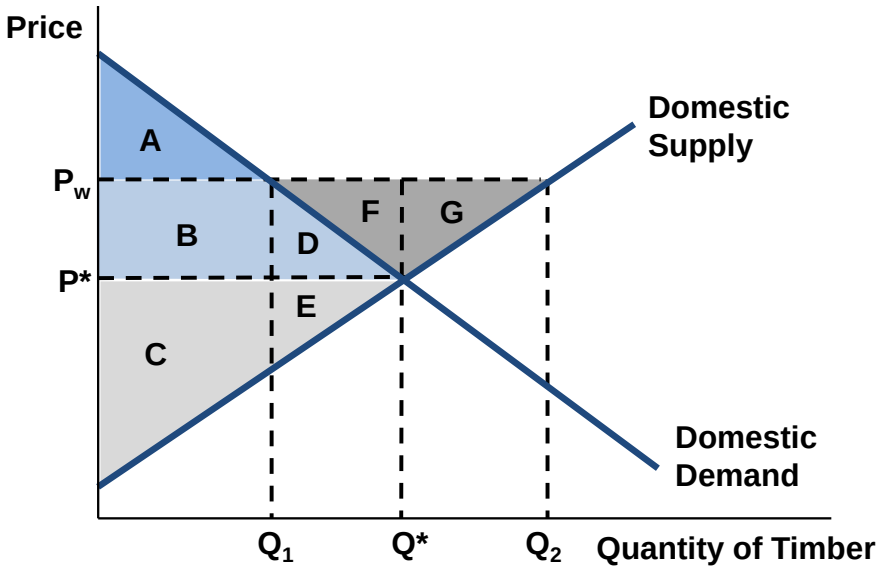
In the absence of trade, the domestic price of timber is P^* and the quantity of timber sold is Q^*. Consumer surplus is $(A + B + D)$ and producer surplus is $(C + E)$. Now suppose the country can export timber, and that the developing country can get a higher price for its timber on the world market, which includes demand from richer nations. Given access to world markets and a higher price of P_w, timber suppliers in the country will raise their domestic prices to P_w as well. In other words, suppliers will no longer be willing to sell to domestic consumers at the former domestic price of P^*, because they can always export their timber at a price of P_w.[3]

Faced with a higher price, domestic consumers reduce their timber purchases to Q_1. consumer surplus thus declines to area A. At a price of P_w suppliers are willing to sell a quantity of Q_2. The difference between Q_1 and Q_2 represents the amount of timber that is exported. As a result

[3] Similar to our analysis of an importing country, here we assume that the exporting country can sell all the timber they want at the prevailing world price.

of greater sales at a higher price, producer surplus increases from *(C + E)* to *(B + C + D + E + F + G)*. The gain in producer surplus *(B + D + F + G)* more than offsets the loss of domestic consumer surplus *(B + D)*, for a net social gain of areas *(F + G)*. Once again, the theory demonstrates overall gains from trade without considering environmental externalities. (And once again, there can be some losers from trade – in this case domestic consumers).

Figure 3. *Gains and Losses from Exporting Timber*

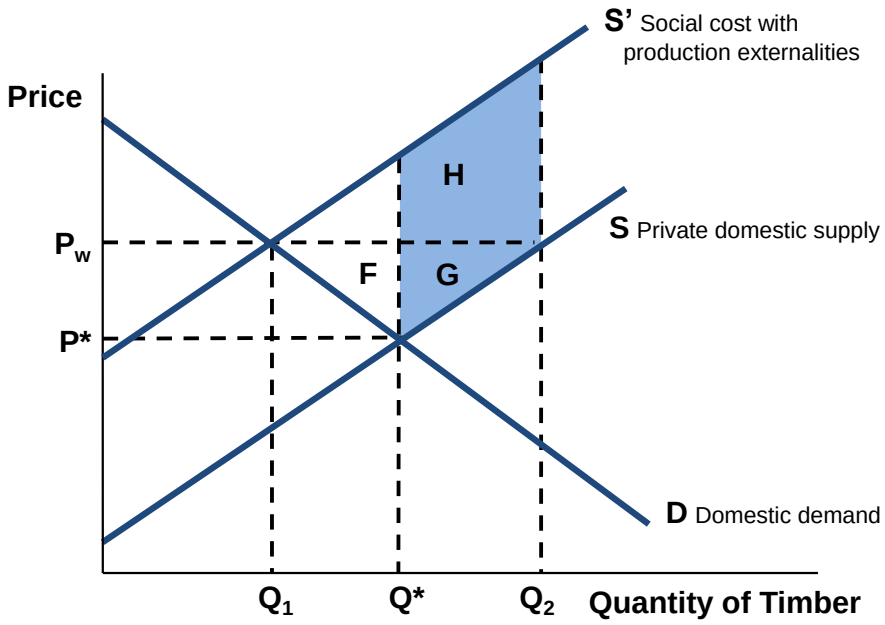


As you might guess, the situation is not so unambiguous when we introduce the externalities of timber production—which include land and watershed degradation as well as reductions in use and nonuse values. These production externalities are shown in Figure 4, represented by the difference between the private supply curve and the social cost curve *S'*, which shows the production costs plus environmental externalities. Prior to trade, the production externalities of timber would have been a parallelogram between these two curves extending up to a quantity of *Q**. With trade and expanded production, these externalities extend further, up to Q_2. The increase in production externalities is area *(G + H)*. There could also be changes in consumption externalities associated with lower domestic consumption of timber, but since these are probably much less significant than in the case of automobiles, we omit them from Figure 4.

Taking into account these environmental externalities, we cannot say unambiguously that there are net benefits from trade to this exporting country. Market benefits have increased by *(F + G)* but externalities have increased by *(G + H)*. The net change in welfare is *(F – H)*. If area *F* is greater than area *H*, then there will be a net social gain from trade, but if area *H* is greater than area *F* there will be a net loss. As we've drawn Figure 4, there appears to be a net loss of welfare, implying that in this case the environmental damages from timber production outweigh the net market gains from trade. As with the earlier example of imports, whether there is a net benefit or loss for any specific export will depend on the size of the different market and external effects.

Our examples, of course, represent a very simple model of trade, but the conclusion that environmental costs may seriously affect net gains from trade is far-reaching. In the real world, countries trade trillions of dollars' worth of products. Where there are significant environmental externalities, trade will reallocate these externalities among countries, and may increase externalities overall due to expanded production.

Figure 4. *Welfare Impacts of Exporting Timber with Externalities*



One implication of this analysis is that it may be possible to **export pollution** by importing goods whose production creates heavy environmental impacts, effectively shifting these emissions to other countries. It is often the case that pollution is exported from developed to developing countries, as we'll discuss later in the module. Trade also necessarily involves energy use for transportation, with resulting air pollution and other environmental consequences such as introduction of alien invasive species.[4] Indirect effects of trade might also occur, for example when larger-scale export agriculture displaces peasant farmers onto marginal lands such as hillsides and forest margins, leading to deforestation and soil erosion. Specific kinds of trade, such as trade in toxic wastes or endangered species, can have obvious negative environmental impacts.

exported emissions/pollution shifting the impacts of pollution to other countries by importing goods whose production involves large environmental impacts.

Trade can also have some environmentally beneficial effects. Freer trade may help spread environmentally friendly technology. Trade tends to promote more efficient production, which

[4] See Gallagher, 2009.

reduces materials and energy use per unit of output. In addition, trading countries may come under pressure to improve environmental standards when product quality or trans-boundary impacts are at issue, such as pesticide residues on food or water pollution in rivers that cross national boundaries.

We sometimes hear trade issues presented as a conflict between those who are "pro-trade" and those who are "anti-trade." But international trade is an established part of modern economic life. The important question for our purposes is how we can balance the economic gains from trade against the reality that trade shifts environmental impacts, sometimes increasing and sometimes decreasing total external costs? (There is a similar debate about the social impacts of trade; we will not explore this in depth here, but the issues often overlap with those of environmental impacts). To help us answer this question we need delve further into the current policy context of trade issues.

2. TRADE AND ENVIRONMENT: POLICY AND PRACTICE

Let us consider some practical examples of the environmental impacts of trade. Many developing countries grow agricultural crops for domestic sale as well as for export. As global trade has increased developing countries have devoted more land to growing export crops. We see in Figure 5 that the quantity of agricultural exports among countries classified as low-income food-deficit[5] by the Food and Agriculture Organization was relatively stable up to the 1990s. These countries face widespread food insecurity, and are also vulnerable to food supply shocks, such as price changes or natural disasters, that can put vulnerable populations at high nutritional risk.[6] Despite these risks, we see that since 1990 their food exports have increased by about a factor of five. In many cases developing countries increase agricultural exports due to "structural adjustment" policies required by international agencies such as the International Monetary Fund (IMF) and the World Bank. The goal of expanding exports is to bring more revenue and economic growth to the country. But some economic analyses find that agricultural exports are relatively ineffective at stimulating growth.[7] Even if agricultural exports increase economic growth, we need to consider the social and environmental costs in order to determine if such trade is actually beneficial for an exporting country.

What are some of the environmental impacts of expanded agricultural exports? Expansion of export agriculture can lead to deforestation as tropical forests are cleared to grow crops such as coffee, palm oil trees, and soybeans, as well as create pasture to raise livestock for meat exports. This deforestation contributes to global climate change. A 2019 analysis found that the expansion of agriculture and tree plantations for exports is responsible for about 30-40% of all deforestation-related carbon emissions.[8] In addition to the loss of biodiversity and ecosystem services associated with deforestation, expansion of export crops often places

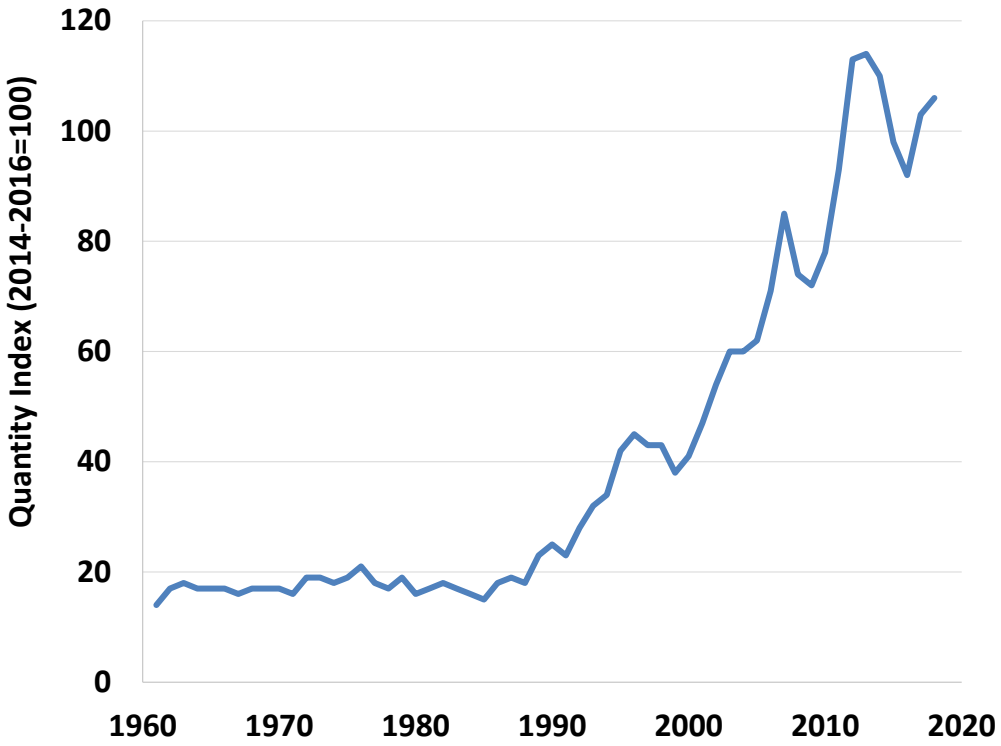
[5] Most low-income food-deficit countries are in Africa, as well as some in Asia and other regions. As of 2021 there were 51 such countries.
[6] World Health Organization, http://apps.who.int/nutrition/landscape/help.aspx?menu=0&helpid=401.
[7] See, for example, Sanjuán-López and Dawson, 2010.
[8] Pendrill *et al.*, 2019.

greater demands on a country's water resources, as many export crops require intensive irrigation.[9]

Expansion of agricultural exports is also likely to increase a country's use of agricultural chemicals. A 2008 study found that a significant positive relationship between a country's export-focused agricultural production and its use of fertilizers and pesticides. The paper concludes:

> [Traditional economic models] assume that free trade will allow market mechanisms to diminish environmentally degrading production practices and create a more resource efficient system of trade. Our results do not give compelling indications that this process is occurring in relation to trade in agricultural products and the use of fertilizer and pesticides . . . Our results at least suggest that the claim of international organizations, such as the WTO, that increasing export agriculture will benefit the welfare of national populations and the environment, should receive further scrutiny.[10]

Figure 5. *Real Agricultural Exports, Low-Income Food-Deficit Countries, 1961–2018*



Source: Food and Agriculture Organization, FAOSTAT database.

[9] Schaeffer, 2009.
[10] Longo and York, 2008, p. 101.

A 2020 paper reviewed 43 studies of the relationship between agricultural trade and the environment, including local pollution and carbon emissions.[11] The authors found that 21 of those studies concluded that agricultural trade has a negative impact on the environment, 10 studies indicated that trade has a positive impact on the environment, and the other 12 studies suggested that the relationship was ambiguous or insignificant. Negative environmental impacts were most likely to occur in developing countries, while any positive impacts tended to benefit developed countries. Importing countries can also experience negative environmental impacts. For example, a 2018 article found that countries that increase their reliance on imported soybeans tend to shift to crops that are more environmentally damaging, such as corn and rice that require more water and cause more water pollution.[12]

dualistic land ownership an ownership pattern, common in developing countries, in which large landowners wield considerable power and small landowners tend to be displaced or forced onto inferior land.

Social and environmental impacts often depend not on trade alone but on domestic political conditions. **Dualistic land ownership**, with large landowners wielding considerable political power and small farmers being displaced by export-oriented agriculture, can be doubly damaging to the environment. In Central America, for example, improved transportation and trade infrastructure led to "a technical shift to higher-profit, input-dependent farming. Maize and beans gave way to cotton, tomatoes, strawberries, and bananas. The value of farmland naturally increased, which benefited privileged landowning elites but led many poor farmers to be promptly evicted. These farmers had no choice but to move on to drier lands, forests, hillsides, or lands with shallow and less fertile soils." At the same time, the affluent farmers "use their influence to demand environmentally damaging input subsidies, which in turn lead them to over-mechanize, over-irrigate, and overspray."[13]

Health and safety issues that arise from trade are not always easily resolved at either the domestic or international level. For example, domestic regulations that prohibit the sale of toxic pesticides may not apply internationally. "Goods that are restricted in domestic markets, on the grounds that they present a danger to human, animal or plant life or health, or to the environment, may often be legally exported. This may cause a problem for the importing country, where information is lacking on whether and why the product is banned: exporters may make false declarations, customs authorities (particularly in developing countries) may lack adequate product testing facilities."[14]

According to the **WTO's Article XX**, countries may restrict trade in order to "conserve exhaustible natural resources" or to protect "human, animal or plant life or health." However, interpretation of this special exception to free trade rules has led to strongly contested disputes among countries. For example, starting in the 1990s, European countries refused to allow imports of U.S. and Canadian beef produced with hormone supplements. The United States and Canada argued that since there is no proven harm to human health from beef hormones, this ban constituted an illegal barrier to trade. The Europeans, however, cited the

[11] Balogh and Jámbor, 2020.
[12] Sun *et al.*, 2018.
[13] Paarlberg, 2000, p. 177.
[14] Brack, 1998, p. 7.

precautionary principle: Because their consumers are concerned about the possible effects of hormones, shouldn't they have the prerogative to decide what they will allow for domestic consumption? The long-standing trade dispute was eventually settled in 2012, with an agreement that allowed the European Union to maintain its ban on imports of hormone-treated beef, in return for increasing its quota for imports of high-quality beef from the United States and Canada.[15]

WTO's Article XX a World Trade Organization rule allowing countries to restrict trade in order to conserve exhaustible natural resources or to protect human, animal, or plant life or health.
precautionary principle the view that policies should account for uncertainty by taking steps to avoid low-probability but catastrophic events.

2.1 Product and Process Issues

A similar issue has arisen over the use of genetically engineered crops. Although unlabelled genetically engineered foods are allowed in the United States, they are widely opposed in Europe. Should European countries be able to ban the importation of genetically engineered foods? The issue has enormous implications both for agribusinesses that see great profit potential in genetic engineering and for many consumers who strongly oppose it.

The issue is further complicated because the opposition to genetic engineering is based in part not on human health effects (which, if proved, would be a valid reason for trade restrictions under Article XX) but on the likely environmental impacts of genetically engineered crops. Pollen from such crops can spread into the environment, disrupting fragile ecosystems, endangering neighboring organic farms, and possibly creating "superweeds" resistant to herbicides. But under WTO rules, the process by which a product is produced is not an acceptable cause for trade restrictions. Only if the product itself is harmful can a country impose controls. This is known as the **process and production methods (PPM)** rule.

For example, if pesticide residues at dangerous levels are detected on fruit or vegetables, imports of those products can be banned. But if the overuse of pesticides is causing environmental damage in the producing areas, the importing country has no right to act. Similarly, if rainforests are being destroyed by unrestricted logging, it is not permissible for countries to impose a ban on the importation of unsustainably produced timber.

The PPM rule removes an important potential weapon for international environmental protection. If a country fails to act to protect its own environment, other countries have no trade leverage to promote better environmental practices. Only if a specific **multilateral environmental agreement (MEA),** such as the Convention on International Trade in Endangered Species (CITES), is in place are import restrictions permissible.

This principle was at issue in the tuna/dolphin decision, in which trade authorities ruled that countries had no jurisdiction over extraterritorial environmental issues. But such issues are

[15] See www.europarl.europa.eu/news/en/pressroom/content/20120314IPR40752/html/Win-win-ending-to-the-hormone-beef-trade-war/.

more and more common in an increasingly globalized world. Simply waiting for the producing country to "clean up its act" is likely to be insufficient.

Trade can affect domestic as well as international policy, weakening the autonomy of countries to define their own environmental and social policies. Concerns have arisen of a **"race to the bottom,"** in which countries reduce environmental and social standards in order to gain competitive advantage.

> Producers located in member states enforcing strict process standards will suffer a competitive disadvantage compared with producers located in member states enforcing less strict standards . . . [F]aced with the prospect of their industries suffering a competitive disadvantage when compared with companies located in low-standard jurisdictions, member states may choose not to elevate environmental standards or may even relax current standards.[16]

process and production methods (PPMs) international trade rules stating that an importing country cannot use trade barriers or penalties against another country for failure to meet environmental or social standards related to the process of production.
multilateral environmental agreements (MEAs) international treaties between countries on environmental issues, such as the Convention on Trade in Endangered Species.
"race to the bottom" the tendency for countries to weaken national environmental standards to attract foreign businesses or to keep existing businesses from moving to other countries.

Based on a review of economic studies, a 2009 analysis concludes that there is little empirical evidence of a widespread "race to the bottom" among competing nations.[17] But even if countries don't specifically lower environmental standards to gain a competitive trade advantage, multinational companies may seek to produce their goods in countries with relatively lax environmental regulations in order to produce at lower cost. This can result in a **pollution haven** effect, where foreign investment and pollution shifts to countries with lower environmental standards. Most empirical tests of the pollution haven hypothesis dating from the 1990s and early 2000s found little evidence that international trade levels in a country were related to the stringency of environmental regulations.[18] But several recent studies using more sophisticated statistical techniques provide supporting evidence, at least in some instances. For example, a 2015 paper found that foreign investment by the United States was negatively related to the degree of regulation of sulfur dioxide and carbon dioxide in a country. Further, stricter environmental regulations in surrounding countries will cause more foreign investment to flow into a particular country, as its environmental regulations appear comparatively weak.[19]

pollution haven a country or region that attracts high-polluting industries due to low levels of environmental regulation.

A 2016 analysis by the OECD found no overall evidence of the pollution haven hypothesis when all manufacturing goods were aggregated, but did find that strict environmental regulations created a comparative disadvantage in "dirty" industries such as chemicals and fuel

[16] Brack, 1998, p. 113.
[17] Frankel, 2009.
[18] Kellogg, 2006.
[19] Tang, 2015.

products. On the other hand, strict environmental regulations were likely to attract "clean" industries such as recycling.[20] Finally, a 2020 article found that foreign investment in developing Asian countries "may lead to an increase in dirty investments in these countries", which should be prevented by appropriate environmental regulations.[21]

Another concern is that competitive pressures may exert a "chilling" effect on countries considering strict environmental laws. The North American Free Trade Agreement (replaced by the United States-Mexico-Canada Agreement in 2020) produced cases in which corporations challenged environmental regulations as barriers to trade, using the investor-state dispute settlement (ISDS) system included in the treaty. The Canadian asbestos industry sought to remove U.S. restrictions on the sale of cancer-causing asbestos products, and the U.S. pesticide industry challenged strong Canadian pesticide regulations. In one case, Ethyl Corporation (based in the United States) successfully overturned a Canadian ban on the importation and sale of the gasoline additive MMT, a chemical suspected of causing nerve damage. Canada was required not only to eliminate the ban but also to pay $13 million to compensate Ethyl Corporation for legal costs and lost sales.[22]

A 2017 paper finds that trade agreements provide fossil fuel companies with a powerful tool to prevent action on climate change, as they can argue that overly strict environmental regulations unfairly reduce their profits. A potential solution to this problem is to clarify that international environmental agreements, such as the 2015 Paris Climate Agreement, take precedence over existing trade agreements.[23]

2.2 Environmentally Beneficial Effects of Trade

Trade expansion may also have direct or indirect beneficial effects on the environment. According to comparative advantage theory, trade causes countries to become more efficient in their use of resources, thereby conserving resources and avoiding waste. Trade liberalization may also remove **distortionary subsidies** and pricing policies, improving the efficiency of resource allocation. For example, widespread subsidies on chemical fertilizers and pesticides promote environmentally harmful farming methods, but trade agreements often prohibit such subsidies to domestic producers. Eliminating these subsidies would promote both economic efficiency and environmental sustainability.

distortionary subsidies subsidies that alter the market equilibrium in ways that are harmful to economic efficiency.

Trade may also encourage the spread of environmentally friendly technology. In energy production, for example, many developing and formerly communist countries depend heavily on old, inefficient, highly polluting power plants. Trade can facilitate the replacement of these plants with modern, highly efficient facilities or (as in India) encourage a growing wind-power sector. Multinational companies, often seen as offenders in the exploitation of developing country resources, can also introduce efficient technologies in industrial sectors. Multinationals

[20] Koźluk and Timiliotis, 2016.
[21] Guzel and Okumus, 2020.
[22] See www.cela.ca/article/international-trade-agreements-commentary/how-canada-became-shill-ethyl-corp/.
[23] Tienhaara, 2017.

may respond to domestic political pressures to develop cleaner industrial processes and then disseminate those processes throughout their worldwide operations.[24] Foreign investment in the manufacturing sector is particularly likely to result in the replacement of older technologies and equipment with newer production methods that are less resource- and pollution-intensive.[25]

2.3 Trade and Global Climate Change

Trade has important effects on emissions of carbon dioxide and other gases that contribute to global climate change. Increased transportation resulting from expanded trade results in higher transport-related emissions. Trade also shifts the patterns of carbon emissions, with a significant amount of exported pollution—carbon emissions associated with consumption of imported goods.

Some countries appear to have **decoupled** its CO_2 emissions from economic growth. For example, while GDP in the UK grew by a factor of about three between 1970 and 2019 its CO_2 emissions declined by nearly half. But the reduction in CO_2 emissions fails to account for exported emissions. If we account for the emissions from goods produced in other countries but exported to the UK, does the country still show a reduction in total emissions?

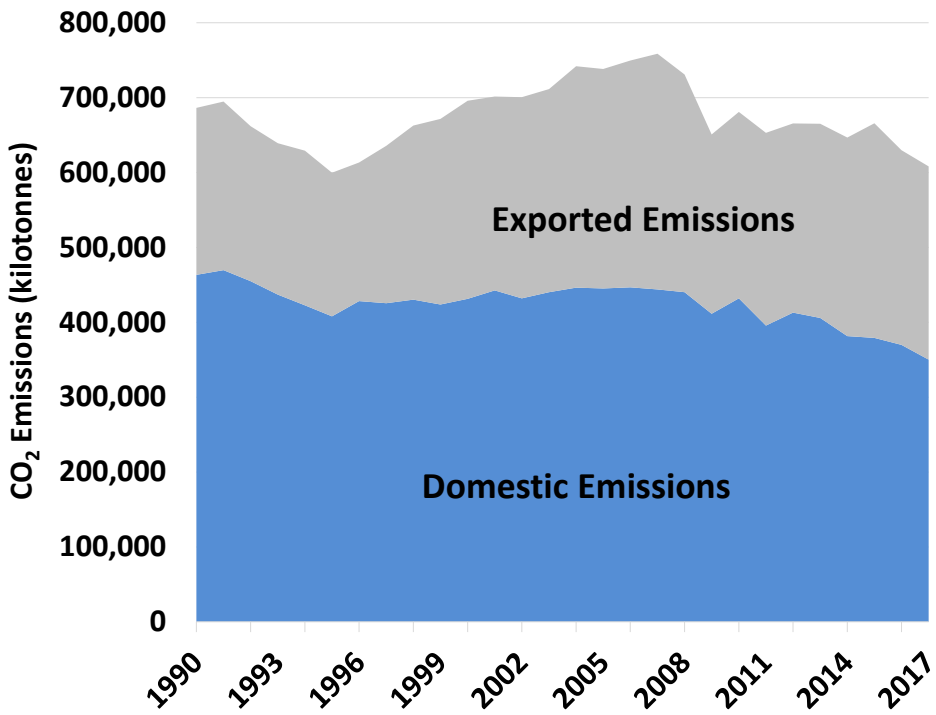
decoupling breaking the correlation between increased economic activity and similar increases in environmental impacts.

Figure 6 presents domestic as well as exported carbon emissions associated with UK residential and industrial consumption from 1997 to 2017. One conclusion of this analysis is that a significant portion of the emissions associated with UK consumption is generated outside of the country. In 2017 exported emissions, generated outside of the UK, account for 42 percent of the total carbon emissions generated by UK demand. The share of exported emissions has generally been increasing; it was only around 1/3 of emissions in the 1990s. A second conclusion is that the UK's progress in reducing its greenhouse gas emissions is not as significant as domestic emissions statistics indicate. Looking only at domestic emissions, Figure 6 shows that carbon emissions decreased by 25 percent between 1990 and 2017. But if we add in exported emissions, the UK's total emissions have declined by only 11 percent.[26] Detailed estimates of where the UK's exported emissions are generated show that they originate all over the world, with 23% originating in other European countries, 20% originating in China, 11% in the Middle East, and 9% in the United States.

Some countries, such as the UK, are net exporters of carbon emissions, meaning when both exported and imported goods are considered the country is truly responsible for more emissions than its domestic statistics indicate. Other countries, such as China, are net importers of carbon emissions, meaning demand in those countries is not responsible for as much emissions as official statistics indicate—a significant portion of measured emissions result from production for export.

[24] See Zarsky, 2004.
[25] Neumayer, 2001.
[26] Data from the UK Department of Environment, Food, and Rural Affairs, "UK's Carbon Footprint," https://www.gov.uk/government/statistics/uks-carbon-footprint.

Figure 6. *United Kingdom Domestic and Exported Emissions of Greenhouse Gases, 1990–2017*



Source: UK Department for Environment, Food, and Rural Affairs, "UK's Carbon Footprint," https://www.gov.uk/government/statistics/uks-carbon-footprint.

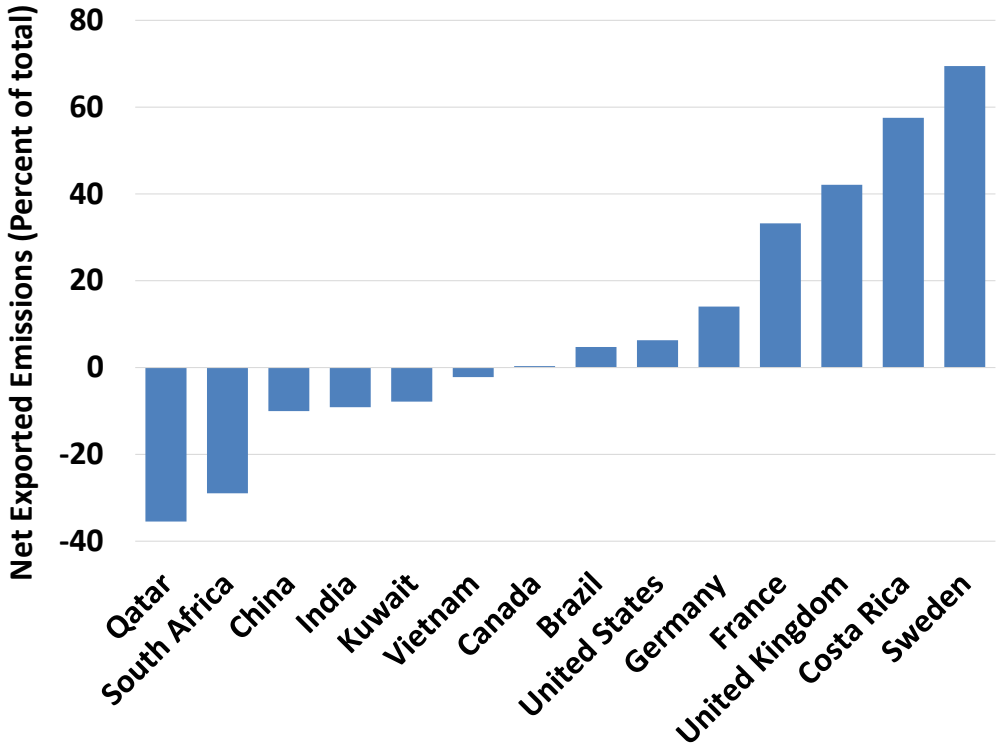
Figure 7 shows the results of net carbon emissions embedded in trade for select countries for 2018. In addition to China, we see that Qatar and South Africa are significant net importers of carbon emissions (those countries with negative values). In Qatar, as well as other Middle Eastern countries such as Bahrain and Kuwait, much of their carbon emissions from the extraction of fossil fuels is ultimately linked to demand by other countries. In addition to the UK, countries that are significant net exporters of carbon emissions include Sweden and Costa Rica. Both of these countries are known for making substantial efforts to reduce their domestic carbon emissions, but we see that much of their apparent success can be attributed to exporting their emissions to other countries.

This has important implications for international negotiations on global climate change. It would seem that those who consume the goods, not those who produce them, have the responsibility to reduce emissions.[27] The 2015 Paris Climate Agreement, however, adopted the traditional approach to measuring emissions, considering only where the emissions are generated. An alternative would be to hold net carbon exporters responsible for emissions linked to their consumption of goods produced elsewhere. This could be done by measuring the **carbon footprint** of a country**,** taking into account emissions associated with both domestically produced and imported goods.

[27] See Davis and Caldeira, 2010; Giljum and Eisenmenger, 2004.

carbon footprint total carbon emissions, direct and indirect, resulting from the consumption of a nation, institution, or individual.

Figure 7. *Accounting for Carbon Emissions Embedded in International Trade*



Source: Our World in Data, "CO2 Emissions Embedded in Trade", with data compiled from several sources.

3. TRADE AGREEMENTS AND THE ENVIRONMENT

A variety of institutional and policy approaches have been suggested to balance the goals of trade benefits and environmental protection, some similar to the standard free-trade model and others significantly different. We examine several of them.

3.1 The World Trade Organization Approach

This approach retains the overarching policy goal of free or "liberalized" trade, pursued for seven decades through "rounds" of trade agreements under the GATT, and its successor the WTO. The WTO, whose membership now comprises 164 countries, has worked to lower tariffs (taxes imposed on traded goods) and non-tariff barriers to trade as well as eliminate subsidies for export industries.

Although the WTO recognizes a special exception to trade rules under Article XX for resource conservation and environmental protection, its panel rulings have interpreted this fairly

narrowly. WTO authorities tend to be suspicious of "green protectionism"—the use of trade barriers to protect domestic industry from competition under the guise of environmental regulation. They are also unsympathetic to countries' efforts to affect environmental policy outside their borders through trade measures.

The WTO has established a Committee on Trade and the Environment, which has addressed some environmental concerns but in rather general terms. According to the WTO website, the committee "has contributed to identifying and understanding the relationship between trade and the environment in order to promote sustainable development."[28] But critics contend that the Committee has produced only "weak policy outcomes," and will continue to do so until environmental concerns become fully integrated into the WTO's mission.[29]

From the WTO perspective, environmental policy responsibility should remain primarily at the national level. As far as possible, decisions on international trade policy should not be complicated with environmental issues. This is consistent with an economic principle known as the **specificity rule**: policy solutions should directly target the source of the problem. Using trade measures to accomplish environmental policy goals is therefore not the most direct approach and likely to cause other, undesired effects such as economic losses from trade restriction.

specificity rule the view that policy solutions should be targeted directly at the source of a problem.

This argument, which places the responsibility for environmental policies on national governments, has been criticized on several grounds. It fails to consider the competitive pressures that may encourage trading countries to reduce environmental protections, as well as the weak regulatory institutions in many developing countries. It is also inadequate for dealing with global environmental issues, such as climate change and biodiversity, that transcend national boundaries.

WTO Deputy Director-General Alan Wolff recently acknowledged that "WTO members need to engage in focused and constructive discussions on how to ensure that trade and trade-related measures contribute effectively to global ambitions on climate change. 'Conflicts will arise' if actions such as border carbon adjustment measures are not seen as fair and well-calibrated in terms of their trade impact, he warned."[30]

3.2 The NAFTA/USMCA Approach

In 1993, the United States, Canada, and Mexico signed the North American Free Trade Agreement (NAFTA), lowering trade barriers across North America. During negotiations, environmental groups argued strongly that freer trade could have negative environmental consequences, pointing to the severe environmental problems already affecting the *maquiladoras*, which are industrial zones along the Mexican border in which materials and equipment can be imported duty-free for assembly and re-export. As a result, the treaty

[28] https://www.wto.org/english/tratop_e/envir_e/wrk_committee_e.htm.
[29] Gabler, 2010.
[30] World Trade Organization, 2021, "Focused WTO talks needed on trade and climate change." https://www.wto.org/english/news_e/news21_e/ddgaw_14jan21_e.htm.

included the creation of the Commission for Environmental Cooperation (CEC) to "strengthen cooperation between the Parties to conserve, protect, and enhance the environment and address environmental challenges and priorities," and strengthen environmental regulation.[31]

Although this specific recognition of environmental issues persuaded some environmental groups in the United States to support the agreement, the CEC has had few enforcement powers. It may respond to a country's failure to enforce existing environmental regulations, but its role is generally limited to producing a fact-finding report and offering recommendations to the government involved.

The United States-Mexico-Canada Agreement (USMCA), which was signed in 2018 and went into effect in 2020, replaced NAFTA. The USMCA includes a chapter (Chapter 24) addressing environmental issues, and maintains the CEC. In some ways the USMCA strengthens the environmental provisions of NAFTA, addressing 30 additional environmental issues such as plastic pollution, wildlife trafficking, genetic resources, and contaminated lands.[32] The USMCA also added a prohibition of fishery subsidies that encourage overfishing and a recognition of the importance of biodiversity for indigenous peoples.[33] Another important change is that the USMCA makes it more difficult for foreign corporations to challenge national environmental laws under a revised investor-state dispute settlement clause (ISDS).[34] While the USMCA affirms each country's commitment to several international environmental agreements, it specifically leaves out any mention of climate change and the Paris Climate Agreement. Another significant omission is that it fails to address fossil fuel subsidies.

3.3 The European Union Approach

The European Union (EU) is unusual in being a free-trade area with its own legislative and administrative institutions. Unlike the North American CEC, the EU has the power to make environmental regulations binding on its member countries. This is known as **harmonization of environmental standards**. Note, however, that this policy solution involves more than free trade; it entails a supranational authority with the power to set environmental standards.

harmonization of environmental standards the standardization of environmental standards across countries, as in the European Union.

Regional trade area policies also raise the issue of "harmonizing up" versus "harmonizing down." Some countries may be forced to tighten their environmental policies to meet EU standards. But others may find their environmental standards weakened. The EU overturned a law requiring returnable bottles in Denmark as a barrier to trade, and Norway chose not to join the EU in part out of fear that it would be compelled to modify strict domestic environmental regulations.

It is relatively rare for trade agreements to include the kind of enforceable supranational environmental regulations that exist in the EU. Although the Standards Code adopted after the

[31] http://www.cec.org/about/agreement-on-environmental-cooperation/.
[32] Laurens et al., 2019.
[33] Vaughn, 2018; Simeu, 2020.
[34] Bernasconi, 2018.

Uruguay Round of GATT trade negotiations in 1992 calls for international harmonization of environmental standards, no basis exists for this process to be other than voluntary.

Following Britain's exit from the European Union in 2020 ("Brexit"), UK and EU researchers have identified a risk of "environmental regression in the UK**:** there are around 500 separate items of EU environmental law and policy which risk not being retained after Brexit, producing a gap in environmental protection."[35]

3.4 Multilateral Environmental Agreements (MEAs)

It has long been recognized that some environmental problems require international solutions. The first international treaty dealing with trade and the environment was the Phylloxera agreement of 1878, restricting trade in grapevines to prevent the spread of pests that damage vineyards. In 1906 an international convention was adopted banning the use of phosphorus in matches. Phosphorous was responsible for serious occupational disease among match workers, but it was the cheapest ingredient for matches. An international convention was required to prevent any exporting country from gaining a competitive advantage by using phosphorus in match production.[36]

Since then, numerous international treaties have responded to specific environmental issues, such as conventions protecting fur seals, migratory birds, polar bears, whales, and endangered species. Transboundary and global environmental issues have been addressed in treaties such as the Montreal Protocol on Substances that Deplete the Ozone Layer (1987), the Basel Convention on Hazardous Wastes (1989), the Antarctica Treaty (1991), the Convention on Straddling and Highly Migratory Fish Stocks (1995), the Convention on Biological Diversity (2002), the Minamata Convention on Mercury (2013), and the Paris Climate Agreement (2015). These international treaties have addressed the environmental consequences of production methods in ways that individual countries cannot.

Serious questions remain, however, about the compatibility of MEAs with WTO rules. Which set of international agreements should take precedence in case of a conflict? For example, the Paris Climate Agreement encourages the transfer of energy-efficient technology to developing countries—but this provision could violate the WTO's prohibition of export subsidies. (For more on potential conflicts between the Paris Climate Agreement and trade deals, see Box 1.) Whereas national laws such as the U.S. Marine Mammal Protection Act have been found incompatible with WTO rules, so far no major test case has addressed conflict between an MEA and a trade agreement. But some analysts have argued that the possibility of a conflict with WTO rules has a "chilling" effect on the ability of MEAs to achieve their objectives.[37]

[35] Lifegate, 2020, "Brexit and environment, risks and opportunities for the UK in an uncertain climate." www.lifegate.com/brexit-environment-risks-opportunities.
[36] Charnovitz 1996, pp. 176–177.
[37] Gallagher, 2009.

4. STRATEGIES FOR SUSTAINABLE TRADE

The emerging twenty-first-century global economy will be characterized both by greater attention to environmental sustainability and a more important role for developing countries. Global trade has increased rapidly over the last several decades, from about 12 percent of global economic production in 1960 to 20 percent in 1990 and 30 percent in 2019.[38] Global trade volumes are expected to continue increasing in the future, although at a slower rate than in the past.[39]

Expanded global trade will bring benefits in terms of increased efficiency, technology transfer, and the import and export of sustainably-produced products. But we must also evaluate the effects of trade in terms of social and ecological impacts, which can lead to conflicts between economic and environmental policy objectives.

BOX 1: THE PARIS CLIMATE AGREEMENT AND THE TRADE IN SERVICES AGREEMENT

Most of the public debates about trade focus on trade in goods, including agricultural products, fuels, manufactured products, and raw materials. But according to the WTO, over 20 percent of global trade is exports of commercial services, and this percentage has been increasing in recent years.[40] Major categories of services traded internationally include transportation, financial services, communication, and business services.

In 2012 negotiations started between 23 parties, including the European Union, Mexico, and the United States, to draft a treaty known as the Trade in Services Agreement (TISA).[41] The negotiation process for TISA has been criticized for its high degree of secrecy, though a leaked draft of an "Energy Services Proposal" indicated that the TISA signatories would need to agree to "energy neutrality." This means that the member parties would not be allowed to create "market distortions" favoring renewable energy over fossil fuels.[42]

The 2015 Paris Climate Agreement calls for policies that make "finance flows consistent with a pathway to low greenhouse gas emissions," implying the need for economic policies such as subsidies that would favor renewable energy. Susan Cohen Jehoram, a spokeswoman for Greenpeace, responded to the release of the "Energy Services Proposal" by noting that "If we want to reach [the Paris Climate target], governments will need a toolbox of measures that can give incentives to cleaner energy. TISA . . . would increase the power of multinationals to prevent governments taking desperately needed measures to decrease CO_2 levels."

Much environmental damage is due to the increased scale of global economic activity. International trade constitutes a growing portion of that growing scale, making it increasingly important as a driver of environmental change. As economic globalization proceeds and the

[38] Data from World Bank, World Development Indicators database.
[39] WTO, 2016.
[40] WTO, 2015.
[41] European Commission, "Trade in Services Agreement," http://ec.europa.eu/trade/policy/in-focus/tisa/.
[42] Neslen, 2016.

global nature of many environmental problems becomes more evident, there is bound to be friction between the multilateral systems of law and policy governing both.[43]

The complexity of the international policy framework governing trade and environmental issues means that confusion often arises over which laws take precedence, or which organization has authority. These conflicts can be reduced if future trade agreements take environmental sustainability more explicitly into account. Introducing sustainability into trade policy will require institutional changes at global, regional, and local levels.

4.1 "Greening" Global Environmental Organizations

At the global level, advocates of institutional reform have proposed setting up a **World Environmental Organization (WEO)** that would counterbalance the WTO much as national environmental protection agencies balance departments of finance and commerce.[44] As a 2018 article explains:

> It is time that leadership emerges in the form of a global governance mechanism to assure a healthy global environment now and into the future. A well-structured and empowered World Environment Organization can provide such governance. The tragedy of the global environmental commons is happening, but it is not inevitable. It will take resolve, effort, and sacrifice to avert the full tragedy by heeding the clear scientific and moral callings to protect the environment through establishing a WEO to govern the Earth's resources and environmental commons.[45]

World Environmental Organization (WEO) a proposed international organization that would have oversight of global environmental issues.

A WEO could, for example, play a role in negotiating trade agreements on agricultural subsidies, seeking to redirect farm subsidies to soil conservation and development of low-input agricultural techniques. It could also provide more leverage to phase out fossil fuel subsidies. As global CO_2 emissions continue to rise, energy sector trade may need to accommodate a carbon tax or tradable permit scheme. Global agreements on forest and biodiversity preservation are also likely to involve specific trade restrictions, tariff preferences, or labeling systems. In all these areas, a powerful institutional advocate for environmental interests would have a major impact on the shaping of trade treaties and regulations.

Given that the creation of a WEO is currently unlikely, another approach would be to "green" existing institutions, broadening the environmental and social provisions of the WTO's Article XX, altering the missions of the World Bank and IMF to emphasize sustainable trade development objectives, and establishing standard environmental protection provisions for bilateral and multilateral trade treaties. With this approach, trade agreements could become a powerful tool for harmonizing environmental standards upward. It is also important that

[43] UNEP and IISD, 2005, p. 2.
[44] See Biermann and Bauer, 2005; http://www.unep.org/environmentalgovernance/PerspectivesonRIO20/ZakriAbdulHamid1/tabid/78591/Default.aspx.
[45] Rabb and Ogorzalek, 2018, p.34.

national and local governments have the capacity to institute environmental regulations that go beyond international standards. While blatantly protectionist policies could still be prohibited, such flexibility would address concerns about downward harmonization.

It is evident that there are many different approaches to reconciling the goals of trade and environment policy. An article reviewing the debate on trade and environment concludes that "there is no real choice about whether to address the trade and environment linkage; this linkage is a matter of fact . . . Building environmental sensitivity into the trade regime in a thoughtful and systematic fashion should therefore be of interest to the trade community as well as environmental advocates."[46] Achieving this goal will be a major challenge for trade negotiators at both the regional and global level for the foreseeable future.

5. SUMMARY

Trade expansion can often have environmental implications. Trade may increase environmental externalities at the national, regional, or global level. Although it is usually economically advantageous for countries to pursue their comparative advantage through trade, trade may have environmental repercussions such as increased pollution or natural resource degradation. Economic theory indicates that trade may not make a country better off once environmental impacts are considered.

Trade has both positive and negative impacts on the environment. Expanded agricultural trade has increased deforestation and the use of chemical fertilizers and pesticides. Research suggests that foreign investment motivated by trade can expand polluting industries. The increased transportation associated with trade results in greater greenhouse gas emissions. Positive impacts of trade on the environment include increased access to environmentally-friendly technologies and requirements for the phaseout of distortionary subsidies in trade agreements. International trade agreements make provisions for resource conservation and environmental protection, but these are usually limited exceptions to a general principle of free trade. In the World Trade Organization (WTO), countries may consider the environmental impact of a product but not of its production processes. This has led to numerous trade disputes over whether specific measures are justified on the grounds of protection of life and health or are simply disguised protectionism.

Policy responses to trade and environment issues can occur at the national, regional, or global level. The European Union is an example of a free-trade area that includes institutions for transnational environmental standards enforcement. The United States-Mexico-Canada Agreement (USMCA) incorporates several beneficial environmental provisions, but omits any discussion of climate change.

Multilateral environmental agreements (MEAs) address specific trans-boundary or global environmental issues. Conflicts between MEAs and WTO rules are possible, but have so far largely been avoided. A major challenge for the future is dealing with the implications of carbon emissions reduction for international trade, including "exported emissions" by developed countries. In addition to ideas for greening existing trade organizations, proposals

[46] Esty, 2001, pp. 114, 126–127.

have also been made for a World Environmental Organization to oversee global environmental policy and to advocate for environmental interests in the world trade system.

6. DISCUSSION QUESTIONS

1. What are the welfare implications of trade in toxic wastes? Should such trade be banned or can it serve a useful function? Who should have the power to regulate trade in toxic wastes: individual countries, local communities, or a global authority?
2. Can harmonization of environmental standards solve the problem of environmental externalities in trade? How would the issues of harmonization differ in the USMCA, the EU, and the WTO? Would harmonization promote economic efficiency as well as environmental improvement, or might it lead to lower environmental standards?
3. What should be done if the provisions of a Multilateral Environmental Agreement conflict with the principles of the WTO? Which should take precedence, and who should have the authority to decide? Which economic, social, and ecological principles should be used to decide such issues? What specific issues regarding trade are associated with international climate agreements?

7. KEY TERMS AND CONCEPTS

comparative advantage
consumption externalities
decoupling
distortionary subsidies
dualistic land ownership
exported emissions/pollution
General Agreement on Tariffs and Trade (GATT)
harmonization of environmental standards
multilateral environmental agreements (MEAs)
pollution havens
precautionary principle
process and production methods (PPMs)
production externalities
“race to the bottom”
specificity rule
World Environmental Organization (WEO)
World Trade Organization (WTO)
WTO’s Article XX

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2. **www.cec.org**. Homepage for the Commission on Environmental Cooperation, created under the North American Free Trade Agreement "to address regional environmental concerns, help prevent potential trade and environmental conflicts, and to promote the

effective enforcement of environmental law." The site includes numerous publications on issues of trade and the environment in North America.

3. **https://www.oecd-ilibrary.org/environment.** The web site for the environment division of the Organization for Economic Cooperation and Development, including many publications dealing with trade and environmental policy.
4. **www.iisd.org/library/environment-and-trade-handbook-second-edition**. This handbook, a joint effort of the International Institute for Sustainable Development and the United Nations Environment Programme, provides a guide to trade, environment, and development issues.
5. **www.fairtradefederation.org**. Homepage for the Fair Trade Federation, an organization dedicated to promoting socially and ecologically sustainable trade.