

SUSTAINABLE DEVELOPMENT

The Impact of Trade on the Environment

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AUGUST 2002 · ISSUE BRIEF 02-28



RESOURCES
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Trade and environment have become closely entwined in public debate chiefly because of a series of jurisdictional clashes in which market access rights created in trade talks came into conflict with policies aimed at environmental protection. Such conflict suggests a need for policy coordination, even if it could be guaranteed that trade liberalization *per se* has no environmental impact. There is, however, no such guarantee. In the heated debate, environmentalists have helped make prominent several hypotheses indicating trade may harm the environment, while free-traders have pointed to some reasons trade may actually help. What follows is a brief review of those arguments and the state of the evidence in their favor.

We must begin by distinguishing two broad questions that are often confused. The first is what effect trade has on *where* environmental damage occurs; the second is what effect trade has on *how much* environmental damage occurs. Almost everyone will agree that if a policy results in more pollution overall, that is a reason to oppose it—although perhaps not a decisive one. There is no such universal agreement about a policy that merely shifts pollution from one place to another (the “pollution havens” hypothesis). The evidence for each class of hypothesis is considered in turn, followed by a brief discussion of what it all signifies for policy.

Trade Liberalization and the Location of Environmental Damage: The Pollution Havens Hypothesis

The pollution havens hypothesis essentially states that firms in polluting industries will tend to locate in countries with relatively lax environmental enforcement. This is based on a theoretical argument that is not only sound, but fundamental—that is, it would seem to apply to most firms under most circumstances. Under perfectly free trade, the price of a firm’s output is independent of where it is produced. In reality, there are always transport costs and there are still trade barriers, but trade liberalization serves to make the output price closer to uniform, as it makes it easier to buy goods where they are cheap and sell them where dear. When the output price is uniform, the decision of where to locate production will be made purely on the basis of cost. If countries are all alike in every way except for their environmental standards, then polluting firms will choose to locate production in the countries where standards are most lax—these countries are the “pollution havens”.

This seems to imply that—if there are no offsetting difference among nations—all production facilities would eventually end up in the pollution havens, except those that do not pollute at all. Concern that such scenarios might become commonplace has been expressed many times by those arguing for policies to “create comparative advantages” or to impose tariffs on countries with lower standards. This concern is, however, based on an error. The error lies in reasoning on the basis of what happens when “all else is equal” without considering that some of the “all else” is itself shaped in the same market process that ultimately determines the pattern of firm location. The matter of wages will suffice to illustrate.

Suppose that, today, firms deciding where to put new plants are seeing wages are the same everywhere, but environmental standards differ. The firms will, of course, locate in the pollution havens. In doing so, they will bid up the wages in those havens, so that firms making their location decisions tomorrow will have to choose between countries with cheap labor and expensive environmental regulations, and those with cheap regulations but high wages. Eventually, an equilibrium will be reached in which the wage differential has adjusted so that, from the

viewpoint of the average company, it exactly compensates for the difference in environmental compliance costs.

That is just to illustrate, of course. The real concern expressed is that countries with both lax standards *and* cheap labor will absorb a disproportionate share of the world's capital. This is based, however, on the same error as the example—the failure to ask why labor is so cheap in the developing world. The answer is immensely complex, but certainly such countries lack the skilled labor needed by modern industry and the local institutions—such as protection of property from government seizure—that would protect firms; the absence of these benefits raises production costs well above what would be calculated based on wages and environmental compliance alone.

The hypothesis that pollution havens will leave countries with stricter environmental standards bereft of capital, then, does not hold up under careful reasoning. But that is not true if we ask instead about the type of production that occurs in each country—what economists call the “pattern of specialization.” Many rigorous investigations have confirmed the intuitively sensible proposition that, under free trade, pollution havens will end up with more of the dirtiest industries—and fewer of the cleanest. Also, pollution havens will end up with somewhat higher gross domestic product (GDP) than they would if they were not havens, as long as the effect of the pollution is to make people merely unhappy rather than unproductive (so this disregards, for example, the impact of air pollution on worker productivity).

Most empirical studies of potential pollution havens have not found any statistically significant impact from environmental stringency on industry location. This body of evidence has sometimes been characterized as a refutation, or rejection, of the pollution havens hypothesis, but that interpretation goes too far. The failure to observe a phenomenon is not evidence that it does not exist—you could be looking in the wrong place, or simply not have enough data. Almost all these studies have fairly small data sets, and some pool all manufacturing industries together, which is almost certainly an example of looking in the wrong place. For the reasons outlined above, a pollution haven should be expected to have fewer of the cleanest industries, as well as more of the dirtiest, so that when these industries are pooled together nothing will be observed, no matter how strong the actual impact may be.

Two ways around these vagaries are to examine the location decisions of firms with high environmental compliance costs (as in the paper by John List and Catherine Coe in *Further Readings*), or look across all industries and ask whether the dirty ones are the ones that get imported into countries with tight regulation. Even most of these studies do not find a significant pollution havens effect, which is to say that the evidence is consistent with the conjecture that there is no effect at all; and where the effect is statistically significant, it tends to be small in its economic impact. The outlier among high-quality papers is a still-unpublished study by Arik Levinson and M. Scott Taylor (see *Further Readings*) of the relationship between an industry's pollution abatement costs in the United States and how much of that industry's market is satisfied by imports (net of exports). Unlike most previous work, this paper controls both for unobserved differences among industries (by considering changes over time) and the influence of industry location on environmental policy (by considering where industries locate within the United States). Pollution havens are found to be not only statistically significant, but economically important—for example, if pollution abatement costs increase in an industry by 1%, then U.S. net imports of that industry's output will rise by a bit more than .5%.

It should be mentioned that several studies have found evidence for *the opposite* of the pollution havens hypothesis—that is, dirty industries appear to export *more* from countries with tight regulations. These results are probably spurious, but if that should prove not to be the case, they would constitute evidence for the “Porter hypothesis” (named for the Harvard Business School professor who first suggested it). Under some circumstances, a firm may be unaware of production strategies that could lower costs by saving material or energy. In that case, an environmental regulation can push the firm into doing what it would have done anyway were it not stuck in its ways, and thus lead to lower cost. Porter’s conjecture is that this situation may be sufficiently prevalent to render environmental regulation cost reducing. This is generally viewed skeptically by economists, but it cannot, at present, be completely ruled out.

In sum, then, we have a large number of studies indicating the pollution havens effect is too small to measure, a few that find some impact, and one which indicates the effect could be quite substantial. It is dangerous to place too much faith in an unpublished study. But we must add to this study the evidence of (smaller) effects from other studies, and the fact that pollution havens are a direct implication of the assumptions that firms seek maximum profit, and pollution compliance costs money. The way to bet right now is that pollution havens are real, and will become more prominent if environmental standards continue to get stronger.

Does Trade Liberalization Alter the Total Amount of Environmental Damage?

The Race to the Bottom Hypothesis

The race to the bottom hypothesis is that countries will compete to become pollution havens—that is, will set environmental standards lower than they otherwise would in order to attract or retain investment. Those opposing tight environmental management often assert that jobs will be driven abroad if the policies they dislike are adopted, and a race to the bottom would certainly ensue if this rhetorical device always worked. But suppose that national governments function reasonably well—weighing the benefits of a cleaner environment, as valued by their citizens—against the reduction in output caused by pollution control. Can such a race still occur?

Under some circumstances, yes. One such set of circumstances stems from “economies of scale”—technological features that cause production to become cheaper as output increases. If a country can become home to an industry that enjoys substantial economies of scale, it can export at prices well above the cost of production without inviting competition from abroad, where production costs would be higher. Part of the gain from hosting such an industry is a transfer of wealth from other countries. Lowering environmental standards is one strategy nations may use as they compete to host the industries that will allow them to receive such transfers, which is what is meant by a race to the bottom. A similar race can occur if the environmental damage is not confined to the country setting the standards, as with climate change. In this case, each government rationally disregard ignores the impact of its environmental policy decisions on foreigners—but this would be true even if there were no international trade.

Actual governments, of course, are not ideal, and some of the imperfections of actual government may also cause a race to the bottom. Politicians, who are generally not punished for what happens after they leave office, may place too much weight on the short-term employment benefits from attracting an industry as compared to the usually longer-term environmental damage.

The gains from attracting a firm may be concentrated on relatively few people—those who get jobs or own land or other firms that rise in value—while the environmental costs are spread among the whole population. In this case, the small group of winners is more likely to be organized than the large group of losers, each of whom may be quite unaware of what he or she has lost. Finally, there is some evidence that governments suffer from “fiscal illusion,” overweighing those costs and benefits that are part of the government budget as compared to those that impact citizens directly. In this case, the tax revenues from attracting a firm would count for more than the health and amenity damages done by its pollution.

The possibility of a race to the bottom has been assessed in studies of American states and across nations. Most of these studies have defined a race to the bottom as an actual reduction in environmental stringency following a trade liberalization or policy decentralization. There is no convincing evidence that a race to the bottom, so defined, has ever occurred. These studies, however, are made against a background in which environmental stringency is increasing in most of the world. This suggests a somewhat more subtle hypothesis: that countries may become more strict less swiftly than they would have in the absence of trade, a hypothesis sometimes called “stuck at the bottom.” One study has found this phenomenon among rapidly industrializing low-income countries, but it is far from definitive. The obvious difficulty in testing this hypothesis—that we do not really know what policies a country would have pursued in the absence of competitive pressures—has not yet been adequately handled. Doing so will require the analysis of a larger set of countries, with the attendant difficulties of controlling for numerous, and largely unobservable, international differences.

Other Hypothesis Relating Trade to Aggregate Damage

Several reasons have been advanced to believe that freer trade leads to more environmental damage globally. The existence of pollution havens causes polluting industries to be located where they are least regulated, so that for a given world-level of output, those industries will pollute more than if they were spread among countries. Second, the main purpose of trade liberalization efforts is to enhance economic growth. If this actually occurs, and if economic growth causes an increase in environmental damage, then trade will lead to increased pollution. Third, the transportation itself does environmental damage, through the emissions and accidents in shipping and because organisms traveling on the ships—whether as trade goods or hitchhikers—can become invasive in the destination country.

The evidence that trade causes growth has been characterized as “moderately strong” by Frankel (see Further Readings), one of the authors of the best work on the question. The “moderate” part of that characterization is testament to the intrinsic difficulty of inferring anything about a system as complex and uncontrolled as world trade. The only proposition about that system for which evidence is stronger is that countries trade more with one another if they are in close proximity and rich. For the purpose of making decisions in 2002, it should be assumed that getting rid of trade barriers will enhance economic growth, perhaps by 2% per year—which is enough to double income in 35 years.

What effect that would have on global environmental quality is much less clear. Six billion people burning fuel like North Americans is a frightening prospect, but it is not on the immediate horizon. Optimists point out that, by many measures, the rich countries are cleaner than the poor. Should we then expect that the economic growth caused by trade will lead to a cleaner world?

The empirical study of the relationship between income and environmental damage has focused on the “Environmental Kuznets Curve” (EKC) hypothesis, which states that environmental damage rises as income rises for poor countries, but at some point levels out and then actually declines. This relation has been observed for more than 20 indicators of environmental damage. In most cases, however, the methods used to estimate the shape of the curve are built on manifestly false assumptions—among others, that all nations in the sample are following the same development path; that they are developing independently of one another; and that development can be treated like the “cause” of an environmental “effect.” Some false, simplifying assumptions underlie almost all econometric work, but this set seems, to many authors, including this one, like a lot to swallow. Examinations of the same data that seek to relax the problematic assumptions have generally not confirmed the EKC hypothesis.

The main reason not to dismiss the hypothesis as purely an artifact of simplistic analysis is that it makes theoretical sense. As countries have become richer, citizens have come to place more value on environmental quality, and government regulations reflect this change in value. There is every reason to hope that the same path will be followed by those countries that have not yet become rich, should their development efforts succeed. But as to the question of how much effort they will devote to clean-up at any given level of income, the results from the EKC literature tell us little. In any case, this theory applies only to those components of environmental damage that are suffered largely by the citizens of the country making the policy. For problems such as climate change and biodiversity loss, there is little reason to think that economic development will cure the problems it causes.

There also is no reason to think that the impact of growth on environmental quality is independent of what is causing the growth in the first place. For example, a fundamental source of growth is technological progress, in which case it matters greatly whether the new knowledge favors clean or dirty industries.

So what happens when trade is the cause of growth? The answer to this, too, is theoretically ambiguous. Economists have found it useful to divide the impact of trade on the environment into three effects: a *scale* effect, measuring the increase in environmental damage that would occur from trade-induced growth if all industries expanded equally using their old production methods; a *composition* effect, measuring the change in damage due to changes in the relative size of industries; and a *technique* effect, measuring the change caused by a shift to cleaner technologies as citizens grow richer and therefore more willing to sacrifice income growth for environmental quality. The best evidence on the aggregate impact of trade comes from a recent study of SO₂ emissions that measured each of these effects separately, then summed the totals across countries.

In that study, trade liberalization resulted in a cleaner world. SO₂, however, is something of a special case. The EKC measured for SO₂ turns downwards at a relatively low level of income—around \$4,000 per capita. It was likely, therefore, that technique effects would outweigh the scale effect for this pollutant, and the composition effect essentially washes out when the results are the sum from all countries. Replication of this work with other pollutants, for which the EKC does not start to slope downwards until very high levels of income are reached, is likely to turn up cases in which trade leads to greater global damage.

Finally, there is the damage done by trade itself, as opposed to the changes trade induces in industrial output and regulation. Ocean-going ships contribute more than 10% of global emissions

of combustion-derived nitrous oxides, and about 5% of combustion-derived airborne sulfur compounds. Species traveling on cargo ships have invaded ecosystems throughout the globe, destroying hundreds of millions of dollars worth of crops and becoming the number two threat to the survival of indigenous species (after habitat destruction for land use). The severity of these problems has only recently been appreciated, and there is as yet no empirical evidence indicating the extent to which they might be exacerbated or mitigated by changes in trade policy.

Policy Implications

The working assumptions at this stage should be that trade liberalization yields economic growth everywhere and pollution havens in poor countries, but has no predictable impact on global damage levels or on the environmental policy decisions of national governments. Does this tell us anything about what ought to be done?

Many people are uncomfortable with the idea of pollution havens, which can be characterized as poor countries suffering environmental damage to sustain high consumption levels for the rich. That characterization is perfectly accurate, but it does not answer the question which is, for most of us, the ethical essence of the matter—do the poor countries (and especially their poorer citizens) end up better or worse off than they would be under less liberal trade? That answer to that really depends on *why* a country becomes a pollution haven, which can vary from country to country and even government to government within a country. A nation may do relatively little environmental enforcement because the poverty of its citizens makes economic growth more important; in that case, the pollution haven should be permitted to emerge. Or, a nation may be lax despite the desires of its citizens because the government lacks the institutional capacity to enforce laws. In that case, specialization in pollution-intensive goods can be harmful.

A particularly disturbing variant of this second concern arises from the observation that poor countries tend to be characterized by less democracy, less-transparent legal systems, and less secure property rights than rich countries. If the barriers to trade between rich and poor are greatly reduced—which is the main proclaimed objective of the current (Doha) round of trade talks—the poor countries may end up pollution havens for the wrong reasons. Indeed, if the insecurity of property rights over natural resources is sufficiently severe, poor countries could end up suffering both environmental deterioration and loss of GDP. These two problems are essentially two versions of the same story: the damage done by poor policies is often limited by the fact that the people in the neighborhood, being poor themselves, do everything on a small scale. Open up to the rich world, and the scale of everything, including the harm done by poor policies, increases.

Margolis and Shogren (see Further Readings) have shown that the resulting increase in harm can be so great as to outweigh the gains from trade traditionally stressed by economists—but only *can* be, not *must* be. Trade liberalization is harmful only if patterns of world trade are of just the wrong sort. We are not close to having the data needed to indicate whether this is just a theoretical problem or a real threat to the poor countries. The only empirical evidence directly relevant is that referred to above on the relation between openness and growth, which indicates that the natural-resource problem, at least so far, has not been so severe as to render trade a negative influence on GDP. We do not know whether trade may have left poor countries worse off by inducing environmental degradation worth more than the economic growth, nor how much of that growth may have come at the expense of future income by destroying productive natural systems.

In order for trade liberalization to be harmful, there must be something seriously wrong with some group of nontrade policies. If those policies cannot be fixed, it might be best to restrict trade, and it might also make sense to slow down the process of global integration while environmental institutions are under construction in the less developed countries. This is to gamble on a hunch—that what is lost to institutional failure will mean more than what is gained from specialization through functioning markets. My hunch goes the other way. The positive impact of trade on income means that liberalization leaves us with more resources to pursue poverty reduction and environmental management. At present, it probably makes more sense to focus on building the institutions that will use those resources effectively than to slow down global integration.

Further Readings

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