

# Discussion Papers in Economics

## Inequality and Environmental Policy

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## Abstract

A positive theory of mitigation of environmental degradation is discussed in order to understand the formation of environmental policy. When an environmental problem is not mitigated, this is because those affected don't know it is happening, cannot locate the cause, don't have the resources to abate the problem if they are its producers, or don't have the political power to influence policy to stop the problem if they are not its producers. The last is related to inequalities in political power and its implications are examined further. These include implications for the spatial spread of unmitigated pollutants produced by the powerful as opposed to the poor, and the implications of political structure for the overall level of pollution. These and related hypotheses are examined with reference to examples, and, where possible, with representative data. It is shown that there is an important sense in which the "Environmental Kuznets Curve" does not exist.

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<sup>1</sup> This is a revised version of a lecture delivered at the University of Siena's International School for Economic Research's XV<sup>th</sup> summer workshop in June 2002.

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Environmental problems occur as a side effect of other activities. Economists have emphasized that they are a case of negative externalities. If they are left unchecked this is because the losers are different from those whose activities create the problems. This is not always the case. Sometimes the problem is created by those who suffer from it. An important example is indoor air pollution, which is very widespread in poor countries and occurs as a result of cooking with low-quality stoves or open fires using traditional fuel like wood, charcoal, or agricultural wastes. The problem is left unchecked because the victims do not have the resources or technology to deal with it, and perhaps also because they do not understand the extent of the harmful effects on their health.

The traditional economic approach to such a problem is that as long as people do not understand the problem, there isn't one, since they choose to do nothing about it. The public-health approach to these issues is very different and reflects the belief that people often do not have the knowledge needed to make informed decisions. In this approach, attention is focused on what kind of education is necessary to deal with various health problems.

We will return to these issues as they occur also in the context of externalities and may, in fact, be magnified in their presence. Consider from now on only those polluting or environmentally degrading activities for which total benefits fall short of total costs in the sense that it would be impossible for the gainers to compensate losers and still be better off.

When the victims of such activities are aware of the cause of degradation, they will act to end it if they have the political power to do so. It follows that pollution will remain unabated when the net losers from the polluting activity have less political power than the net gainers. This implies that resource degradation and pollution will tend to take place in locations where the net losers from polluting activities lack the political power to stop them or abate their effects (Boyce, 1994).

Who the net gainers are will depend a great deal on market structure in the polluting industries. If the industries are competitive, then the net gainers will mostly be consumers of the products of those industries. To the extent that the polluting industries generate rents, however, then producers will get a share of the net gains from pollution. They may not then face a significant problem of collective action in lobbying to protect these rents. This is even more true when government officials themselves are collecting the rents. Deforestation owing to logging of tropical hardwoods in Indonesia, Malaysia, and the Philippines is an example of this. Leases for logging were given to timber companies with extensive government contacts, resulting in huge deforestation. Politically puny traditional residents of the forests had little or no chance of stopping them.

When is this conjunction of weak victims and powerful beneficiaries likely to be seen? When political power is concentrated, and there are rents to be had in the polluting industries. The rents can be used to buy influence over government policy or government policy can be made to create rents. Sometimes it is difficult to tell which came first, the chicken or the egg. The concentration of political power channels rents towards those who wield it, making it less likely that pollution will be abated. Authoritarian states tend to concentrate political power. They also have the convenient feature that protests and attempts to organize by anti-pollution activists can be crushed. Oil production and related pollution in Ogoni land in Nigeria is a much-publicized case in point.

What are the countervailing factors which favor abatement? The losers from pollution should also have some political power. This is more likely to be the case if there exists a reasonably large middle class. When the economy is diversified the economic interests of the upper classes are diffused through several industries. A significant section of them may be adversely affected by pollution without seeing sufficient economic gains from its existence to be net beneficiaries. This class can then put up resistance.

The poor, on the other hand, are least likely to be able to influence policy in their favor. They face the difficulties of having the least access to the relevant information, the

least contacts with government officials, the least access to the news media, and the least resources to devote time to collective action. Of all these factors, the role of the media deserves further comment. The media is mostly driven by the concerns of its readers and viewers, and sometimes, by advertisers. Since, in poor countries, a significant section of the public is illiterate and cannot afford television, their concerns and problems affecting them attract the least attention in the media. Two consequences follow: they are then all the less likely to be informed about environmental problems concerning them, and, in addition, the state is under less pressure to address such problems. This feature of economic inequality producing political inequality is less pronounced in developed countries but still present simply because affluent people are a more important target for advertisers and, therefore, for the news media.

These considerations suggest that when the poor are the net losers from pollution, it is least likely to be abated. This implies that unabated pollution will be more severe in poor countries. Further arguments which strengthen this conclusion come from the observation that environmental problems are often not recognized as such without considerable research. The toxic effects of various pollutants are often not apparent. Identifying these problems, their health effects, and their causes may be a major research undertaking for which poor countries simply lack the infrastructure.

A related but distinct issue is the availability of impartial expert opinion. Consider the controversy over the building of various river development projects involving dams, the Narmada and Tehri projects in India, and the Three Gorges dam in China. Considerable research was needed to establish the likely environmental consequences of dam-building, with estimates of earthquake risks, siltation rates, and so forth being required. Neither country has much by way of a university system with impartial scientists with the necessary expertise. Instead, the news media in India were full of reports quoting either advocates or opponents of the projects. While some of these “experts” did have expertise in the relevant disciplines, most were not impartial, since they were either partisans getting government funding to defend the projects or linked to non-government organizations opposed to the projects. The university system is simply

not large enough and sufficiently resource rich to generate the academic discourse necessary for the scientific process of peer review to weed out motivated claims. In these circumstances, it becomes difficult for the public to judge the truth of the matter and make an informed decision to support one side or the other. The result is the occasional panic, as happened during the plague that struck Surat in 1994. In fact, plague is treatable and far less dangerous than many other diseases to which Indians are exposed but which evoke little reaction. More frequently, however, the lack of reliable information on which to base a judgement works in favor of the polluters, since making changes to the status quo of pollution requires some costly collective action, which is not forthcoming on the basis of unreliable information.

One implication of the theory of the supply of pollution abatement outlined above is that unabated pollution by the poor is likely to be of short range, affecting mainly the poor, while that by the rich is likely to be of long range and thereby affecting not themselves so much as less powerful people living further away. The principal examples of the former are air pollution from the cooking fires of the poor and degradation of local common property resources such as forests and pastures. Air pollution from cooking fires affects principally those cooking, and to a lesser extent others in the household as well as immediate neighbors. To some extent this reflects externalities within and between households. The gender division of labor and the lower status of women in patriarchal societies means that while all members of the household benefit from the cooking, women and young children suffer disproportionately from its ill effects (Parikh *et. al.*, 1999).

An example of the rich polluting unabated at long range is carbon emissions and global warming. Most of the buildup of carbon dioxide in the atmosphere has originated in the rich countries. Until very recently, most studies of the threats of climate change have indicated that the mainly poor tropical countries are likely to be the worst sufferers while the rich temperate countries are likely to see fewer adverse effects and may even realize net gains from the climate change brought about by fossil fuel combustion.

Where pollution by the rich affects other rich and, therefore, powerful people, abatement is faster in coming. The abatement of halocarbons that threatened the ozone layer, and that would affect the rich temperate countries most, is an example. The Montreal Protocol and its successors have been very effective in reducing and even ending emissions of various halocarbons. It is true that the difference between these two cases can also be explained by appealing to costs. Abatement of halocarbons is a low-cost affair compared to abatement of pollution from as fundamental a part of the economy as its principal energy source. Nevertheless, the small sums spent on research on non-polluting energy sources suggests that the difference between these two cases is not one of abatement costs alone. For example, in 1997-98, the total public sector research and development spending on renewable energy and energy conservation in the US, the European Union and Japan, which together account for over 95% of all energy research spending worldwide, was about US\$ 1 billion (Dooley and Runci, 1999). By way of comparison, the total R&D budget for 2002 for the US alone exceeded \$100 billion, with \$50 billion going to the Department of Defense, and \$1.5 billion to counter-terrorism R&D (Koizumi and Turner, 2002).

The theory discussed so far suggests that pollution by the poor will be abated if the rich are adversely affected by it. Two questions arise immediately. If this is true, then why is water pollution from untreated sewage so prevalent in poor countries in which the rich and powerful also live? Second, air pollution in Third World megalopolises is often largely from vehicles driven by the poor or lower middle class while the rich in these countries are concentrated in these cities. Why does this persist?

The answer to the first question is that the rich can to a large degree, though not perfectly, insulate themselves from water pollution by treating their domestic water themselves. This is what they do. A partial answer to the second question is that there are producer lobbies in poor countries which account for the persistence of polluting vehicles driven by the lower middle classes and poor. For example, in India, manufacturers who have invested heavily in two-stroke engine two and three-wheeled vehicles have prevented a ban on them. A similar observation applies to manufacturers of obsolete

diesel engines for trucks and buses. The obsolete domestic industry grew up under trade barriers and is an obstacle to further progress. This is also true of the domestic oil refining industry which continues to produce low-quality diesel.

We have so far discussed two factors that affect pollution abatement. One, the informational issue, affects the demand for environmental quality, while the second, political structure, affects its supply. In addition, of course, income affects the demand for environmental quality positively. Income also affects incipient pollution, meaning the pollution that would occur if environmental costs were not taken into account at all. One may expect that this will be increasing in income in accordance with the well-known IPAT equation (Ehrlich and Holdren, 1971) which says that environmental Impact = Population x Affluence x Technology. The logic of this is that increased economic output and technological capacity results in a greater use of natural resources and creation of waste in the course of production and consumption. Actual pollution or resource degradation is the result of incipient pollution being reduced as a consequence of environmental abatement expenditures, which depend on the demand for environmental quality and its supply, which in turn, depend on the factors indicated above.

The Environmental Kuznets Curve hypothesis is that actual pollution rises with per capita income and then falls as abatement increases in response to the demand for environmental quality. The theory discussed adds to this the notion that the supply of environmental quality will depend on the distribution of power. More democratic countries will abate more. This should strengthen the effect of income on abatement as per capita income and democracy are correlated. However, we can also test whether democracy matters, controlling for income and its distribution. The latter control is necessary since, as pointed out by Scruggs (1998), inequality in incomes may lead to less pollution. The reason is that at higher income levels, there is a greater demand for environmental quality. Moreover, consumption may be less intensive in materials and more intensive in services which may result in less pollution per dollar of consumption.

The data on environmental indicators that are used in most cross-country studies are from the Global Environmental Monitoring System of the UN, started in 1977. These monitor selected air pollutants: sulfur dioxide concentrations, smoke, and heavy particles in 19-42 countries, and water pollution using measures of dissolved oxygen and fecal coliform bacteria in 58 countries. Monitoring is not nationally representative: air pollution data are from major cities which may not represent urban pollution in the various countries.

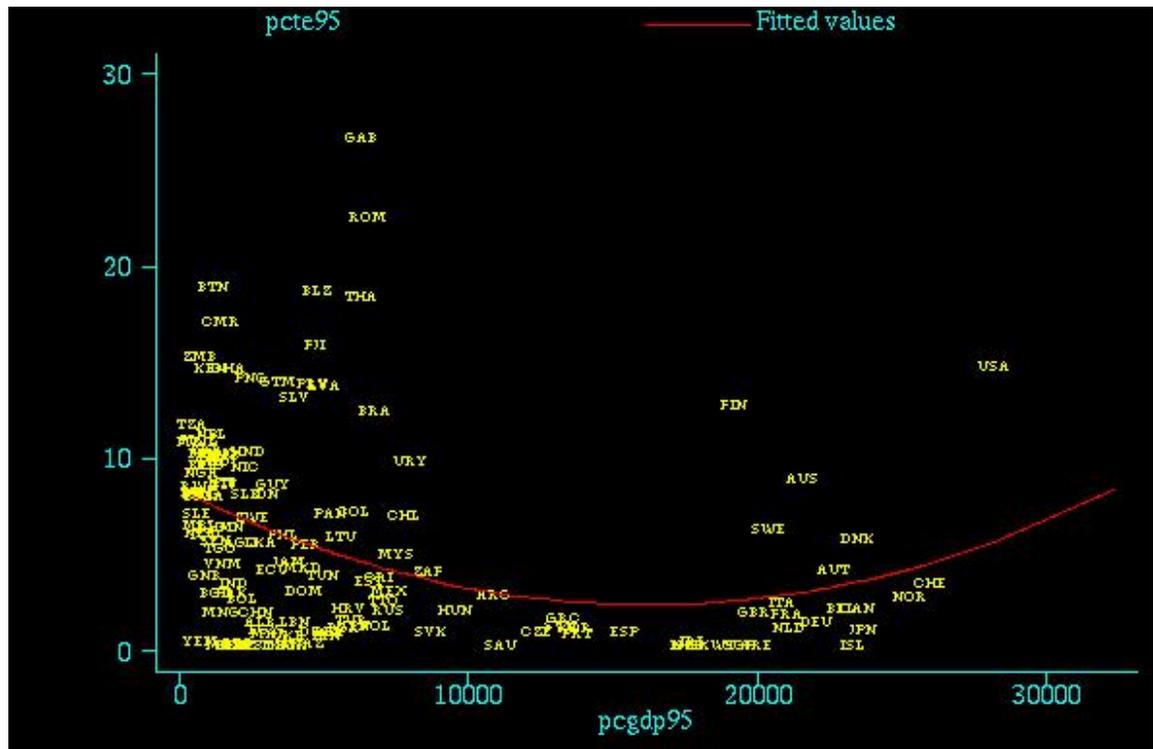
Torras and Boyce (1998) find that for low-income countries (among which there is considerable variation in inequality and democratic rights), inequality is associated with more of some pollutants and less of others. The reason may be that the effect of inequality on the composition of output is to reduce pollution while the political effect of inequality is to increase pollution. There is also the problem of the non-representative nature of the data mentioned earlier, as well as the fact that the data on income distribution are known to be very inaccurate.

Torras and Boyce find that the effect of democracy, as measured by their “rights” variable, on pollution is more consistently negative at least for low-income countries. The probable reason for this is that it picks up only the political effect. Despite the various problems with the data, there is some support for the idea that a wider spread of political power reduces pollution.

It is important to note, however, that an uncritical use of the UN Global Environmental Monitoring System data can present a highly misleading picture. For example, most studies find an upward-sloping part of the Kuznets curve at low incomes, although the evidence for whether there is a downward-sloping part at higher incomes is mixed. But there is a selection bias in the nature of pollutants monitored. The two biggest health problems afflicting the poor in developing countries are water-borne diseases and respiratory infections, with the possible exception of AIDS in Africa. It is well established (Smith, 2000), but unfortunately not yet well known, that indoor air pollution is a major cause of death in poor rural, and to a lesser extent, urban households in poor

countries. But indoor air pollution monitoring has hardly begun anywhere in the world. To proxy for its effects, we examine a graph of the quantity of traditional fuel used per capita against per capita income in Figure 1 below.<sup>3</sup>

**Figure 1: Per capita traditional energy consumption against income**



**Source:** Graphed using 1995 energy data (billions of Joules per capita) from *World Resources 1999*. GDP data for 1995 are in US dollars adjusted for purchasing power parity from the *World Development Indicators* published by the World Bank.

It is clear that traditional fuel use declines with income at low levels of per capita income, and therefore, so must exposure to indoor air pollution. The reason must be that households switch to cleaner fossil fuels as soon as they can afford to do so. This is probably not because they are aware of the lethal effects of smoke, but rather because it is a nuisance. The upturn in the graph for high income countries may be due to non-domestic uses of certain fuels and almost certainly does not reflect an increase in exposure to toxic indoor smoke.

<sup>3</sup> This variable includes industrial as well as domestic consumption of traditional fuels. So it is a very imperfect measure of what we are trying to capture: exposure to indoor air pollution from the use of polluting solid fuels in cooking. For example, Brazil's consumption of alcohol for transport is included as a traditional fuel. Moreover, the quality of the data are poor for some countries, since they are from estimates by the Food and Agriculture Organization rather than from measurements.

However, as the environmental Kuznets curve literature generally shows, it is also true that exposure to urban outdoor air pollution increases with income at low levels of per capita income. The question then is: what is the net effect of increasing incomes on exposure to air pollution? One can get an idea of this by looking at data for India as Smith (2000) has done. Indian cities are among the most polluted in the world. Outdoor concentrations of PM<sub>10</sub>, particulate matter smaller than 10 microns in diameter, range from 90-600  $\mu\text{g}/\text{m}^3$  with a mean of 200  $\mu\text{g}/\text{m}^3$ . By contrast, the population-weighted mean for *indoor* concentrations is 700-800  $\mu\text{g}/\text{m}^3$ , more than three times as high. To put these figures in perspective, note that the (outdoor) mean for the USA is less than 30  $\mu\text{g}/\text{m}^3$ . Moreover, *exposures* to these high concentrations are greater for indoor air pollution since those in the kitchen are nearer to the source for long periods of time every day.

Since a switch from bio-fuels to gas results in indoor concentrations of fine particulate matter and other pollutants (carbon monoxide, polyaromatic hydrocarbons, volatile organic compounds) falling to negligible levels, it is clear that raising incomes enough to enable poor households to make this switch would result in a considerable decline in overall exposure, despite the expected rise in urban outdoor air pollution. Thus, we may conclude that as far as air pollution is concerned, the idea that pollution increases with income at low levels of income is false. The idea seems to have gained so much ground because most of those conducting measurements were simply not aware of, or ignored, the principal air pollution problem facing the poor in poor countries.

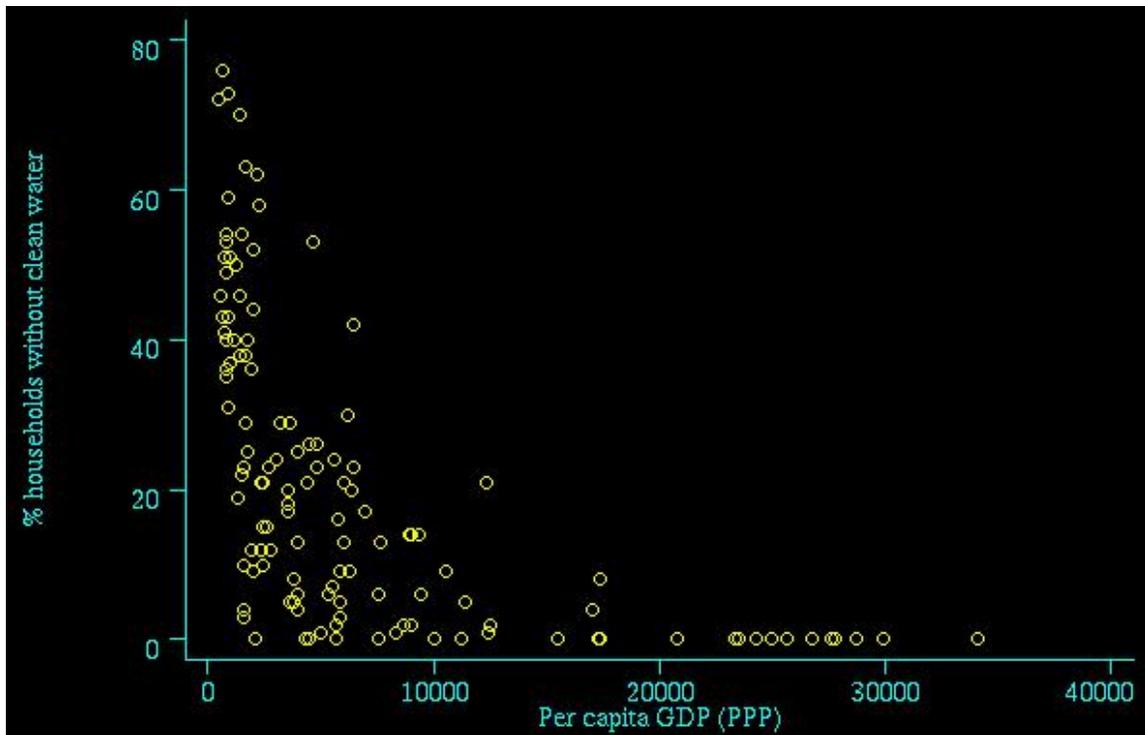
So much for air pollution. What about water pollution? As Figure 2 below shows, the proportion of those using water polluted by pathogens unambiguously increases with income.<sup>4</sup> Measures of chemical pollution as opposed to pollution by pathogens are not available as widely. Nevertheless, it is generally believed that their

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<sup>4</sup> The definition of clean water in the Human Development Report is: piped water, a public tap, a borehole with a pump, a protected well, a protected spring or rainwater. It is a reasonable measure of water that is not likely to transmit infections.

health effects are likely to be outweighed by the health effects of infection due to faecal pathogens, since the latter are far more frequent and have more immediate adverse effects (Gadgil, 1998). Just as in the case of air pollution discussed above, it appears that the adverse health effects of water pollution decline with increases in income.

**Figure 2: Exposure to unclean water against income**



**Source:** Data on water are from the UNDP's Human Development Report 1999, while GDP data are from the World Bank's World Development Indicators. Data are for 1997.

Thus, if one weights problems by some measure of their seriousness in terms of lost life-years and numbers of people affected, the biggest environmental problems globally appear to be those associated with poverty. This means that the environment actually improves with higher incomes, at least when one considers the move from low to middle incomes. This is the reverse of the Environmental Kuznets Curve. Low income is the central problem. All the same, better information about health effects might induce some poor households to switch to more expensive cleaner stoves even without subsidies and similarly, increase willingness to pay for sanitation and drinking water infrastructure.

But a public information program in the interest of the poor is not a high priority for governments for reasons discussed above.

So far, we have worked with the standard assumption that environmental improvements or pollution abatement are necessarily costly. Someone has to give up consumption when they are made. This flows from the assumption that consumption is always a good thing. But there is a strand of literature in economics going back to Adam Smith (quoted in Ball et. al. (2001), through Veblen (1899), Duesenberry (1949), and Galbraith (1958), to modern treatments like Frank (1985), and Ng and Wang (1993), which points out that this need not be so. People care about their status relative to other people, and this may lead them to consume more of goods that signal this status, than they would otherwise. One implication is that this will lead to underconsumption of public goods like environmental quality since such goods do not signal status. This is inefficient because, as long as everyone behaves this way, each person's ranking in the consumption of the "status goods" is the same as it would have been if they had not taken their relative standing into account in making their consumption decision. Thus, the attempt to pursue status through consumption can be collectively futile.

It follows that social movements that attempt to discourage overconsumption, if they are successful in changing social norms, can lead to improvements in environmental quality at little or no real cost.<sup>5</sup> The campaign against wearing furs of endangered species, and against the use of ivory are examples of successful movements. More generally, there has been a movement to discourage waste and improve conservation of energy. This is a much bigger effort and I am not aware of any studies that attempt to measure its impact. If successful, it would have implications not only for environmental quality, but also for the distribution of income, since it could lower world prices of fossil fuels to the benefit of those who consume too little of them. The dynamics of such social movements and changes in social norms is little understood, although there is a now growing literature in

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<sup>5</sup> A conventional economic instrument for dealing with the negative consumption externality, progressive taxation of consumption, is proposed by Frank (1999).

economics on social norms, conventions, and fashions, which utilizes evolutionary game theory as well as Bayesian decision theory.

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