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WAGE AND POLLUTION STANDARDS

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Duane Chapman

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Department of Agricultural Economics
Cornell University Agricultural Experiment Station
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, New York, 14853

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*Professor of Resource Economics, Department of Agricultural Economics, Cornell University, Ithaca, NY 14853

1. Introduction: the Newt and the Canary

Newts and salamanders are inelegant creatures with few fans. There is no Newt Society, nor Christmas Newt Counts. Subjectively, asked about willingness to pay for newt preservation, I would offer little. If newts and salamanders and other aquatic-linked wildlife are the major fauna affected by global air pollution, then I and many others would not be much bothered.

But we have the nagging feeling that there is something not yet known. Popular stories have yesterday's coalminers taking canaries underground with them, and hanging cages from the roof. If a canary stopped singing and fell unconscious, the crew would head for the surface. This was not because of sympathy for the bird, but concern about the symbol. An unconscious canary indicated methane and the possibility of asphyxiation and explosion. A dead canary gave evidence of the prospect of dead homosapiens. Hence the concern.

Given our present primitive knowledge about air pollution effects, we do not know whether we have a newt problem or a canary problem.

This uncertainty is restricted to long run impact, of course, arising from the deposition and carbon dioxide phenomena. In urban areas, we know fairly well what concentrations are toxic, and have moved successfully to control them in much of Japan, North America, and Europe.

In this paper, I am concerned about those air pollutants which are continental and global in effect, and have control costs of sufficient magnitude to affect the competitive positions of products, producers, and regions. This is necessarily an introductory paper. The theoretical work on transboundary pollution in the 1970's has not been followed by empirical analyses.[1]

2. Global Pollution: Copper and Steel

Carbon dioxide is the quintessential global pollutant. As a gas, it rises, is accumulating, and its expected effects are both positive and negative depending upon future planetary alterations in temperature, precipitation, and sea level. In rough figures, about 7 gigatons (GT) of carbon enter the atmosphere annually. Fossil fuel contributes 5 GT, and the U.S. about a fourth of this.[2] There are no control technologies or standards, and the presumed negative effect is distant in time and space from the producer.

Sulfur oxides (SO_x) have more immediate economic implications. About 200 megatons (MT) of SO_x enter the atmosphere annually, and one-third is biogenic.

Of the 100-125 MT of anthropogenic emissions, about one-sixth originates in the United States.[3] Unlike carbon dioxide, SO_x is regulated in industrial countries, is costly to remove, and its effects are generally received by Eastward continental neighbors.

The major sources of anthropogenic emissions are coal and oil burning, copper and metal ore refining, oil refining, and sulfuric acid production.

Copper provides illuminating anecdotal illustration of the world nature of air pollution economics. First, an arsenic case. The Tacoma smelter currently controls about 90% of the potential arsenic from its facility. Nevertheless, downwind concentrations are about 25 times above average levels, and seem to indicate a real health hazard. However, 100% arsenic control may add 50¢/lb to the cost of copper. With current prices about 70¢/lb, imposition of this higher level of control would lead to closing the facility. The ore would presumably be smelted in the Phillipines.[4]

Copper is better known for its sulfur emissions. A typical uncontrolled facility is expected to have 2.5 times the mass of sulfur oxide emissions as copper production.[5] A particularly interesting development is taking place in Sonora, Mexico, just south of American copper production in Arizona. Mexico is building a facility there which is expected to produce 200 kT (kilotons) of pure copper annually, and 400 kT of sulfur oxide. Sulfur removal facilities are not being built. A 932 foot stack will put much of the uncontrolled emissions into a plume over the Southwestern United States. The ore had previously gone to Korea, Japan, and West Germany for smelting. Presumably some fraction of the copper arrived in the United States in electronics and automobile imports. With the new uncontrolled smelter, the United States as consumer will benefit from less costly imported goods manufactured with lower wages and pollution control in Mexico and Asia, but also receive the pollutant byproducts.[6]

In The United States, sulfur oxide emissions from copper smelting and refining have declined from 3 MT in the 1950's and 1960's to less than 2 MT in the 1980's.[7] Production is slightly higher, and SO_x emissions have apparently fallen from 2.5 tons per ton copper to 1.5 tons emissions per ton copper. The cost of control is sufficiently large to add economic incentive to the displacement of American production by foreign production, not simply world-wide but also in the foreign manufacture of goods consumed in the United States.

Particulate emissions have been the major air pollution problem for iron and steel manufacture in the United States. An uncontrolled pig iron blast furnace might produce 100 kg for each metric ton of iron, and the uncontrolled basic oxygen steel furnace adds another 30 kg. These are typical figures: uncontrolled emissions at any facility depend upon the process, the ore, the fuel, and scrap loading. Precipitators and scrubbers can remove 94% to 99% of the potential emissions at the different stages of the steel making process.[8]

In aggregate, U.S. particulate emissions have declined from 50 kg per metric ton of steel production in 1950 to 5 kg per ton in the 1980's.[9]

Overall data for basic industry in the United States show a clear pattern of reduced emissions. Consider basic industry to be agriculture and forestry production and processing, mining, construction, manufacturing, transportation, and utilities. In 1983 dollars, Gross Domestic Product in this basic industry sector rose from $520 billion in 1950 to $1.3 trillion in 1980. SO_x emissions declined from 31 grams per constant dollar of production in 1950 to 17 grams in 1980. For particulates, the decline went from 42 grams to 5 grams per dollar. At 1950 emission rates and standards, American industrial sulfur oxide emissions would have been twice as high in 1980, and particulate emissions would have been 8 times higher.[10]

3. Wages, Pollution, and the Automobile

Low wages may be an economic complement to low pollution standards. Wage data which is comparable on an international basis is seemingly as scarce as international pollution data. However, the Survey of Current Business published comparable compensation data for production workers of U.S. affiliates in foreign countries and for U.S. operations.[11] For total manufacturing, U.S. operations were the highest at $8.76 per hour in 1977. West Germany and Japan were only slightly lower at $8.42 and $7.37 per hour.

However, manufacturing in Indonesia, Taiwan, South Korea, and the Philippines averaged 86¢ per hour. To some degree, these low wages are probably matched or perhaps lessened for Japanese or indigenous business processing materials for fabrication into intermediate and final goods.

Wage and pollution standards interact to affect the competitive price of U.S. and rest-of-the-world goods. In automobiles, this cost advantage may constitute a $1000 savings for a Japanese car imported into the United States. Certainly other factors are equally relevant, particularly labor productivity. Offsetting higher costs probably exist in U.S. taxes, transportation, and return to capital.

Table. Speculative Sources of Japanese Cost Differences in Automobiles

	Pollution Standards	Wage Level & Labor Productivity	Other
Iron and steel	$-125	$-150	
Copper and nonferrous metals	-50	-25	
Other suppliers: textiles, rubber, glass, etc.	-75	-75	
Auto manufacture		-500	
U.S. taxes			$+125
Transport			+225
Return to capital			+150
	$-250	$-750	$+500

Note: Speculation derived in part from input-output data.

The Table summarizes a first-try speculative illustration for cost differences associated with comparable U.S. and Japanese cars. The illustration is based upon an assumed cost of $9,000 for the U.S. car, and $8,500 for the Japanese vehicle sold in the United States.

4. A Social Tariff and International Standards[12]

I expect that, in the absence of national or global policy, industrial migration will continue and be associated with increasing basic industry in Asia and increasing global releases of carbon dioxide, sulfur oxides, and other transcontinental pollutants. The international situation now parallels U.S. circumstances in the 1950's. At that time, each State could compete for industry through differential pollution and wage standards. In the 1980's, harmful pollutants are regulated on a national basis and regional wage differentials are apparently reduced.

Similarly, worldwide wage and pollution standards will ultimately develop. Average global GNP is above $2600 per capita, and, in the aggregate, such worldwide standards are likely to have a positive effect on world living standards.

In the interim, however, I suggest we in the United States consider a social tariff based upon existing pollution and wage differentials. There are several distinct advantages to this approach.

First, and most parochial, the tariff would reduce the competitive advantage of pollution-intensive and labor-intensive goods manufactured in countries with lesser standards.

Second, a U.S. tariff system based on pollution standards would motivate the governments and citizens of newly industrializing countries to look more favorably on pollution control in their countries.

Third, global accumulation of acidic deposition and other transcontinental pollutants will decelerate. A pollution based tariff will slightly reduce consumption of pollution-intensive goods, and reduce the ratio of emissions per unit output.

Fourth, a U.S. tariff will be a strong incentive for the development of international standards on pollutants. Climate change, acid deposition, nuclear waste, water pollution, and toxic chemicals will all come to be viewed as worldwide problems. A U.S. tariff will promote this international decision-making.

Fifth, a social tariff would create interest in the collection of basic statistics on emissions. We can use published data to estimate monthly sulfur emissions at any power plant in the U.S., but nothing comparable exists for most of the world. Eventually pollution data must be collected and published internationally. Temporarily, a U.S. tariff would provide the basis for establishing wage and pollution data for imported goods.

Finally, a U.S. social tariff would reduce the downward pressure on U.S. wages. It seems illogical to establish national wages in the United States, and then encourage the importation of labor-intensive consumer goods manufactured at wages which are small fractions of U.S. levels. As with pollution standards, a U.S. tariff based upon wage differentials would encourage wage growth in newly industrial countries.

The United States imports $100-$125 billion of manufactured goods each year. This is largely in consumer goods, automobiles and other vehicles, and industrial machinery and supplies. Assume that, if manufactured with U.S. wage and air pollution standards, these goods would have cost 40% more. If the social tariff were 50% of the differential, the revenue would be $20-$25 billion and add, on the average, 20% to the price of imported goods.

This proposal is not directed at Japan. Japan has air pollution control standards comparable to those in the United States.[13] However, it should be noted that an automobile assembled in Japan may be made with iron and copper sintered and smelted in the Philippines, Mexico or Brazil, and with coal from Australia or South Africa. The Japanese automobile attains part of its competitive advantage because of the pollution control and wage differentials in these countries.

The concept has been framed as a two stage development with a U.S. tariff leading to international data collection and worldwide standards. It may be the case that several nations would impose similar tariffs with the final result becoming an international system of emission taxes and standards.

As noted, world GNP per capita exceeds $2,600. Thirty seven countries with 1.2 billion people have GNP per capita above $4,000. These countries are distributed over every continent and economic system. Ultimately, global air pollution standards will lead to less world air pollution, less uneven income distribution, and a reduction in the rate of depletion of exhaustible world resources.

Notes and References

1. Kathleen Segerson summarizes the theoretical work very nicely in her Ph.D. dissertation, Unilateral Transfrontier Pollution and Economic Interdependence, draft, December 1983.

2. The 7 gigaton world carbon estimate is from the National Academy of Science report, Changing Climate, 1983, pp. 132, 234. The U.S. estimate is from Jae Edmonds and Jon Reilly, "Global Energy and CO_2 to the Year 2050," Energy Journal, July 1983, 4:3:21-48. A gigaton is the metric equivalent of 1.1 billion U.S. tons. Similarly, a megaton equals 1.1 million U.S. tons and a kiloton equals 1.1 thousand U.S. tons.

3. The global sulfur oxide figure is twice the sulfur estimate reported in Aubrey Altshuller, Rick Linthurst, et al., The Acidic Deposition Phenomenon and Its Effects: Critical Assessment Review Papers, draft, 1983, volume 1, p. 2-3. U.S. data are reported annually in U.S. E.P.A., National Air Pollutant Emission Estimates.

4. Anonymous source, personal communication.

5. U.S. E.P.A., Compilation of Air Pollutant Emission Factors, AP-42, August 1977 and October 1980.

6. Arizona Daily Star, August 28, 1983.

7. Emission Estimates, op. cit. Production data from Survey of Current Business and Business Statistics.

8. See note 5.

9. See note 7.

10. The economic data on basic industries are from the Economic Report of the President, 1983, and the pollution data are from Emission Estimates.

11. Obie G. Whichard, "Employment and Employee Compensation of U.S. Multinational Companies in 1977," Survey of Current Business, February, 1982, 62:2:37-49.

12. The discussion of the social tariff is taken from Energy Resources and Energy Corporations, pp. 342-344.

13. In addition to the references cited in Energy Resources, Ed Rubin compares sulfur and particulate removal costs in Europe, Japan, and the U.S. in "International Pollution Control Costs of Coal-fired Power Plants", Environmental Science & Technology, 1983, 17:8:366A-377A.