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# **Jobs and the Environment**

The Myth of a National Trade-Off

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Economic Policy Institute

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## Executive Summary

In a 1990 poll conducted by the *Wall Street Journal*, 33% of respondents thought it was likely or somewhat likely that their own job was threatened by environmental regulation. Such fears, shared by *one-third* of the working population, reflect the common view that a **widespread** trade-off between jobs and the environment is, like death and taxes, a regrettable fact of life.

This report reviews two decades of research on the question of jobs and the environment and finds no factual basis for the conventional wisdom. At the level of the economy, there simply is no trade-off between employment and environmental protection. Moreover, actual layoffs from regulation have been startlingly small. The report presents five main findings:

- The great majority of economy-wide studies show a small positive effect of environmental regulation on overall employment. Environmental protection raises employment levels because it makes intensive use of labor or domestically produced materials or because it provides some recession-proof stimulus to aggregate demand.
- Few manufacturing plants have been shut down because of environmental protection. Government data from the late 1980s reveal that, on average, four plants per year shut down as a result of environmental *or* safety regulation. These accounted for less than one-tenth of 1% of all large-scale layoffs. On an annual basis, in recent years, about 1,300 workers nationwide have lost their jobs partially as a result of environmental or safety regulation.
- Environmental regulation provides jobs disproportionately **weighted** to blue-collar sectors and away from government and private-sector services. While only 22% of all **nonfarm** jobs were in manufacturing, transportation, communication, and utilities in 1991, 57% of jobs generated by environmental spending fell into these categories. Only 22% of environment-dependent jobs were in wholesale and retail trade, finance, insurance, real estate, or services, compared to 55% economy-wide. And, in spite of criticisms that environmental regulation creates only jobs for pencil-pushing regulators, government jobs accounted for only 11% of environmentally related employment, compared to 17% overall.

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***At the /eve/ of the economy, there simply is no trade-off between employment and environmental protection. Moreover, actual layoffs from regulation have been startlingly small.***

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***In the long run, markets for clean manufacturing and energy technologies can provide the kind of high-wage boost to the U.S. economy that autos and defense provided in the 1950s and 1960s.***

- Environmental regulation is not responsible for the long-term decline of manufacturing employment in the United States. The “pollution haven” effect-in which industrial firms relocate to poor countries to take advantage of lax environmental regulation-has seldom been observed. Firms are relocating, but the overwhelming reason is lower labor costs. As for the net effect of environmental regulation on the rate of growth of productivity, its impact has been small and, indeed, may have been positive.
- In the mining and logging industries, where trade-offs between jobs and the environment are most evident, local job loss from regulation can be significant. Even here, however, new jobs are generated elsewhere in the economy to provide substitute products for the timber or minerals preserved; they are also created in fishing and tourism and in industries seeking high “quality of life” for their employees. In the aggregate, these job gains will generally balance job losses in the long run, though national policy will have to address local problems of dislocation.

This report does not seek to minimize the personal and social costs of job loss and unemployment, whether they arise from environmental protection measures or more general causes. The dramatic decline of the U.S. manufacturing base over the last 20 years has had profound, negative consequences for working people. More job loss appears likely as a result of corporate downsizing, import competition, and defense cutbacks. Policy measures to foster reindustrialization and provide high-paying jobs for high school graduates are essential to recapture the American dream.

In the long run, markets for clean manufacturing and energy technologies can provide the kind of high-wage boost to the U.S. economy that autos and defense provided in the 1950s and 1960s. In the short run, however, immediate steps to address job loss in manufacturing can be taken. Expanded job training and adjustment assistance can help American workers adapt and can provide American industry with a competitive edge. Such programs address worker dislocation problems and would also ease the transition for the small number of workers who lose their jobs as a result of environmental regulation. Measures to encourage hiring in manufacturing that are related to environmental policy include shifting the tax burden from labor to energy and adopting smarter forms of incentive-based regulation.

## Introduction

During the 1993 “Timber Summit” in Portland, Ore., 50,000 environmentalists bent on protecting the remaining old growth forest and its now-famous resident, the spotted owl, attended a rally and rock concert in a riverside park. The next day, 20,000 workers from the logging industry rallied in the same park. They called on President Clinton to end logging restrictions in the old growth forest. Buzz Eades, a sixth-generation logger, put his predicament this way: “I represent thousands of... modern Paul Bunyans who are hiding in the car while their wife buys groceries with food stamps.”

In 1992, the United States was the odd-country out at the Rio Earth Summit. President Bush chose not to sign an otherwise universally approved treaty on biodiversity, and his administration successfully weakened an agreement designed to curb carbon-dioxide emissions thought likely to cause global warming. In both cases the president maintained he was, in the *Wall Street Journal's* paraphrase, “protecting American jobs from environmental extremists.”\*

In 1992, a report released by the Economic Policy Institute made the case for expanded job training “because of continued shocks to the labor market such as those developing from foreign trade treaties, defense cut-backs, and environmental regulation.” This message echoed that of a 1990 study sponsored by the Oil, Chemical, and Atomic Workers Union (Batt and Osterman 1993, 9; Wykle et al. 1990).

Across the country, “jobs versus the environment” has become a staple of the political landscape, intoned by conservatives, progressives, and those workers unfortunately caught in the middle. And the message has clearly hit home. In a 1990 poll, an astounding one-third of the respondents thought it somewhat or very likely that their own jobs were threatened by environmental regulation.<sup>3</sup> Although strong support for aggressive environmental protection measures remains, there appears to be a widespread acceptance of at least one of two major trade-offs between jobs and the environment:

**Trade-Off No. 1.** Environmental protection causes more jobs to be lost economy-wide than it creates. It has thus lead to a large *net* drop in U.S. employment.

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***Although strong support for aggressive environmental protection measures remains, there appears to be a widespread acceptance of at least one of two major trade-offs between jobs and the environment.***

**Trade-Off No. 2.** Even if environmental protection measures have not cost the economy jobs overall, they have nevertheless generated widespread plant shutdowns and relocations, leading to massive layoffs. Environmental regulation has thus lead to a large **gross** drop in U.S. employment.

This report will make clear that both of these propositions are simply myth. At the national level, any claim of a trade-off between jobs and the environment is completely without substance. In fact, when the job creation aspects of pollution control policies are factored in, environmental protection has probably increased net employment in the U.S. economy by a small amount.

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***At the national level, any claim of a trade-off between jobs and the environment is completely without substance.***

At the local level, trade-offs do exist. Restrictions on the logging of old growth forest on public lands, along with recession, mechanization, the increasing export of unprocessed logs, and changes in management practices, have indeed led to layoffs in the timber industry. While the spotted owl controversy is much more than a “jobs versus the environment” debate—logging has indirectly cost jobs in the fishing and tourism industries—the conflict in the Pacific Northwest starkly illustrates the potential for such a trade-off.

Yet, when viewed in the context of job loss from other factors, environmental regulation has generated extraordinarily small trade-offs. From 1987 to 1990, Department of Labor figures reveal that environmental protection measures accounted for less **than one-tenth of 1% of all mass layoffs** each year. Among the 57% of the manufacturing workforce surveyed, **four plants nationwide** listed environmental or safety regulation as a primary reason for closure each year. Poll results indicating a fear of environmentally induced job loss among one-third of the population thus reflect a powerful myth. While timber workers in the Northwest are undoubtedly bearing the brunt of a trade-off (as well as a more general decline in the industry), widespread fears of job loss from environmental protection are simply unfounded.

How then has such serious concern over the employment impact of environmental protection arisen? The jobs versus the environment debate has been fueled by “**deindustrialization**”—a process that became increasingly apparent to U.S. citizens during the 1980s. Over the past 15 years, the United



States lost over 3 million manufacturing jobs, due in part to increased import competition both from first world nations and from the newly industrializing countries of Korea, Taiwan, and Brazil. At the same time, U.S. manufacturers increasingly began to move production “offshore,” investing in manufacturing facilities in low-wage countries like Mexico rather than at home. High-paying manufacturing jobs have traditionally been the backbone of the blue-collar middle class in the United States. The disappearance of these jobs has contributed to a decline in average real wages since 1973 and to a shrinking middle class (Mishel 1989).

Environmental regulation has often been blamed for contributing to this shift out of manufacturing and into service employment. Critics have argued that expensive environmental protection measures have (1) led to the shutdown of manufacturing plants, (2) encouraged the flight of U.S. manufacturing capital overseas, and (3) reduced domestic investment in new jobs by hampering productivity growth. While there is a grain of truth to all of these arguments, this report will show that the employment effects of shutdowns, capital flight, and productivity losses from environmental protection have been small.

At the same time, money spent to protect the environment has not been thrown away. In 1993, some 4 million people were employed directly or indirectly in the “environmental protection industry.” Indeed, because much environmental spending is either labor intensive (recycling and sewage construction) or uses domestically produced capital goods (air-pollution-control equipment), a majority of the available studies indicate that environmental spending has *actually boosted* aggregate employment somewhat. In addition, jobs related to environmental protection are weighted disproportionately to traditional blue-collar sectors—manufacturing, transport, communication, and utilities.

Some workers, around 1,300 per year in recent years, have lost their jobs because of environmental concerns. Short-run unemployment from environmental regulation (or any other cause) should not be minimized. Plant shutdowns cause very real suffering for workers and communities, particularly for older and unskilled workers who find it difficult to retool. But these trade-offs are local, and, in contrast to the amount of press they have received, extraordinarily small.

However, at the economy-wide level an *employment-environment trade-*

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***Because much environmental spending is either labor intensive or uses domestically produced capital goods, a majority of the available studies indicate that environmental spending has actually boosted aggregate employment somewhat.***

*off simply does not exist.* If anything, environmental protection has probably led to a small net increase in jobs for U.S. workers. And in the future, investments in environmental technology and energy efficiency can boost U.S. competitiveness and serve as an important source of high-wage employment.

Ultimately reversing the deindustrialization trend and creating a high-wage economy require strengthening the competitive position of the country. The United States is currently among the world's leaders in the environmental technology field. As we move into the 21st century, demand for clean technologies such as photovoltaic, solar thermal and wind electricity, energy- and water-efficient technologies, efficient electric vehicles and clean battery storage, and high-speed trains for intercity transport will be the driving force behind industrial job creation. Insuring that U.S. firms develop and maintain the lead in these fields will allow the country to capitalize on high-wage employment opportunities in environmental protection.

With an eye to the future, this report reviews two decades of evidence on the relationship between employment and environmental protection. Section I considers the overall impact of environmental protection on net job growth in the U.S. economy and demonstrates the complete lack of support for Trade-Off No. 1. On balance, regulation appears to have generated more jobs than have been lost. Section II examines the case for Trade-Off No. 2-widespread layoffs-in the manufacturing sector. The data show that environmental spending has in fact led to quite small job losses from plant shutdowns, capital flight, and reduced productivity growth in the manufacturing sector. Indeed, due to the fact that environmental jobs are found disproportionately in the manufacturing sector, regulation has on balance probably slowed the employment shift from manufacturing to service industries.

Section III evaluates the most serious arena of conflict between jobs and the environment-extractive industry-by looking closely at two controversial cases, logging in the old growth forest of the Pacific Northwest and oil development in the Arctic National Wildlife Refuge. The numbers of jobs at stake in these decisions are clearly significant from a local perspective, yet only in rare cases do they imply net job loss at the economy-wide level. And, in spite of the press they receive, such "set-aside" decisions are not typical of environmental regulation.

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***As we move into the 21st century, demand for clean technologies will be the driving force behind industrial job creation.***

This report does not seek to minimize the personal and social costs of job loss and unemployment, whether they arise from environmental protection measures or more general causes. The dramatic decline of the U.S. manufacturing base over the last 20 years has had profound, negative consequences for working people. More job loss appears likely as a result of corporate downsizing, import competition, and defense cutbacks. Policy measures to foster reindustrialization and provide high-paying jobs for high school graduates are essential for recapturing the American dream. The final section discusses three steps that should be taken to reduce the extent and cost of job loss regardless of the proximate cause: retraining, shifting the tax burden from labor to energy, and moving to smarter forms of environmental regulation.

## **I. Environmental Protection and Overall Employment**

Over the last 25 years, spending on environmental protection (EP) in the United States has grown even faster than spending on health care. Pollution control spending as a percentage of GNP rose from less than 1% in 1972 to 2.1% in 1990, and is predicted to rise to over 2.5% by 1995, more than doubling its claim on the nation's resources. In dollar terms, government and industry were spending about \$117 billion on pollution control in 1990 and will be spending \$160 billion in 1995 (Carlin 1990).<sup>4</sup> These costs include, for example, investments in pollution control equipment and personnel, scientific studies to test pesticides and chemicals, the cleanup of hazardous wastes at Superfund sites, and the bill we pay to our local garbage collectors.

While this tremendous increase in environmental spending represents a real cost in terms of other goods and services we have had to forgo, it has, of course, also generated jobs. The one comprehensive estimate available suggests that in 1992 just under 4 million jobs were directly or indirectly related to pollution abatement and environmental protection in the United States.<sup>5</sup>

What kind of jobs are generated by EP spending? Somewhat surprisingly, environmental protection provides employment heavily weighted to the traditional blue-collar manufacturing, transport, communication, and

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**The one comprehensive estimate available suggests that in 1992 just under 4 million jobs were directly or indirectly related to pollution abatement and environmental protection in the United States.**

utility sectors and away from services, both private and governmental. **Table 1** provides an estimated breakdown of the composition of nonagricultural jobs directly and indirectly dependent on **EP** spending in 1991, with comparative figures for the economy as a whole.

**TABLE 1**  
**Jobs Dependent on Environmental Protection Spending**  
**by Sector, 1991**

**While only 22% of all nonfarm jobs were in the manufacturing, transportation, communication, and utility sectors in 1991, 57% of employment generated by EP spending fell in one of these categories.**

Sector	Total (000's)	Percent of Nonfarm Jobs	
		EP Dependent	U.S. Economy
Mining	226	7	1
Construction	130	4	4
Manufacturing	1,337	40	17
Transportation, Communication, and Utilities	563	17	5
Wholesale and Retail Trade	261	8	23
Finance, Insurance, and Real Estate	04	2	6
Services	396	12	26
Government Enterprise (Federal, State, Local)	385	11	17
<b>Total</b>	<b>3,469</b>	<b>100</b>	<b>100</b>

Source: Environmental-protection-dependent employment data for 1991 were obtained from Management Information Services. MIS's 1992 data are published in Bezdek (1993). Economy-wide data are from *Employment* and *Earnings* (U.S. Department of Labor, Washington, D.C.).

While only 22% of all **nonfarm** jobs were in the manufacturing, transportation, communication, and utility sectors in 1991, 57% of employment generated by EP spending fell in one of these categories. By contrast, only 22% of EP dependent jobs were in wholesale and retail trade, finance, insurance, real estate or services, compared to 55% for the economy as a whole. And, in spite of criticisms that environmental regulation only creates jobs for pencil-pushing regulators, only 11% of EP employment was **governmental**, as compared to 17% economy-wide.

How can we account for these results? Environmental protection is an industrial business. In 1990, the private sector spent \$18.4 billion on pollu-

tion control plant and equipment and \$36.3 billion on pollution control operations, ranging from sewage and solid-waste disposal to the purchase and maintenance of air-pollution-control devices on smokestacks and in vehicles. Federal, state, and local governments spent around \$10.6 billion on the construction of municipal sewage facilities. Only 2% of all EP spending went to support the government's direct regulation and monitoring establishment.<sup>6</sup> The EPA's total budget, including subcontracts, was less than 4% of all EP spending. The bulk of EP spending thus remains in the private sector, generating a demand for workers disproportionately weighted to manufacturing, utilities, transport, and communications and away from services. This is not to say that EP spending creates only high-quality, high-paying jobs. But it is clear that EP spending does support jobs in traditional blue-collar industries.

Of course, the 4 million jobs in the EP industry in 1992 were not net jobs created. If the money had not been spent on EP, it would have been spent elsewhere—perhaps on health care, travel, imported goods, or investment in new plant and equipment. This spending too would have created jobs. But, if instead of spending \$117 billion on EP in 1990 we had spent only \$100 billion, would there have been more or fewer jobs in the U.S. economy that year? Clearly fewer had we spent the \$17 billion on imports, and perhaps more had we spent the money on labor-intensive products made at home. As a rule, money spent on sectors that are both more labor-intensive (directly and indirectly) and have a higher domestic content (directly and indirectly) will generate more American jobs. Environmental spending is often either labor intensive or has a high domestic content.<sup>7</sup>

To illustrate, a recent study done for the Department of Sanitation in New York City found that boosting the percentage of waste that was recycled from 6% to 25% and reducing the percentage incinerated from 76% to 57% would result in a permanent net increase in local employment of around 400 jobs per year. This was true even accounting for the higher taxes necessary to pay the higher per-ton cost of recycling. The increase in jobs arose because recycling is labor rather than capital intensive (leading to a higher local payroll, thereby generating bigger indirect employment effects in the city) and because the incineration option had a low “domestic” content (New York City produces little of the equipment necessary to manufacture incinerators).<sup>8</sup> At the national level, analyses of the employment

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***A recent study in New York City found that boosting the percentage of waste that was recycled from 6% to 25% and reducing the percentage incinerated from 76% to 57% would result in a permanent net increase in local employment of around 400 jobs per year.***

impact of pollution-control efforts have revealed a similar story. For example, Wendling and Bezdek (1989) found that some 95% of the direct expenditure on acid-rain pollution-control equipment, products, and processes would accrue to U.S. firms. As a result, a net increase in jobs was foreseen from the acid-rain control policies they analyzed. Job losses in high-sulfur-coal mining, electric utility, and electricity-intensive sectors would be more than balanced by pollution-control jobs created from the expenditure of several billion dollars per year. Overall, Wendling and Bezdek predicted a net employment gain from acid rain control.<sup>9</sup>

A number of other economy-wide studies have also examined the aggregate employment effect of environmental regulation. The results are summarized in **Table 2**.

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***Results from macro and general-equilibrium models of the economy, all done in the late 1970s and early 1980s, mostly reveal a positive effect of environmental spending on employment.***

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**TABLE, 2**  
**Economy-wide Studies of Jobs and the Environment\***

Study	Type of Study	Employment Impact
<b>Haveman</b> (1978)	Summary of macro-model studies	Positive
Hollenbeck (1978)	General-equilibrium	Negative
Data Resources Inc. (1979)	Macro-model	Positive
Data Resources Inc. (1981)	Macro-model	Positive
<b>Muller</b> (1981)	Summary of three macro-model studies	Two positive One mixed**
Wendling and Bezdek (1989)	Input-output	Positive
Meyer (1992, 1993)	Cross-sectional regression	Positive

• The author believes this to be a complete listing of economy-wide studies either published in peer-reviewed journals, published by the EPA or OECD, or resulting from academic work.  
\*\*Positive short-run effects, negative long-run effects.

Results from macro and general-equilibrium models of the economy, all done in the late 1970s and early 1980s, mostly reveal a positive effect of environmental spending on **employment**.<sup>10</sup> Even given the well-known limitations of economy-wide forecasting models, one lesson can be gathered: whichever direction the employment impact of environmental regulation goes, the effect is small. A 1984 summary by the Organization for Economic Cooperation and Development characterizes the results as follows: “in every case, those [employment] effects, whether positive or negative, appear to be a very small percentage of total employment.”

The most recent exploration of the economy-wide jobs-environment link is by Meyer (1992, 1993). In examining data from the 50 states, he found a persistent, positive, and significant correlation between growth in construction employment and the strength of statewide environmental regulatory efforts, and no correlation between environmental regulation and job growth in general.” (Meyer also found a positive correlation between total employment and environmental regulation, but this relationship was insignificant when the presence of extractive industry was considered in a multivariate framework.)

On balance, the available studies indicate that EP spending--either because of its high domestic content or labor intensity--has probably led to a net increase in the number of jobs in the U.S. economy. However, this effect, if it exists, is certainly not large. At any rate, while national environmental policy should focus primarily on improving environmental quality, government investments in EP measures and new clean technologies, as the New York City case illustrates, may also have a significant impact on net job growth in particular industries. This possibility should be taken into account by state and regional planners facing serious long-term or structural unemployment problems.

In general, one should be wary of any statement preceded by “All economists agree... .” But, in this case, there seems to be universal accord that, on an economy-wide basis, the “jobs versus the environment” **debate** is based purely on myth. A similar point is made, for example, in both a recent paper financed by the American Petroleum Institute and in the leading environmental economics textbook. “\* The tremendous increase in EP spending over the last 20 years has clearly come at a cost when measured in terms of foregone consumption of goods and services, but it has not led to any net

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***On balance, the available studies indicate that EP spending--either because of its high domestic content or labor intensity--has probably led to a net increase in the number of jobs in the U.S. economy.***

job loss in the economy.

Trade-Off No. 1-net job loss from EP measures-has no basis in reality, yet this knowledge provides little solace to those who have lost their jobs as a result of EP spending and find it difficult to obtain new employment at comparable pay. How big is the gross job loss from EP regulation? The next two sections of this report examine the case for Trade-Off No. 2 in the manufacturing and extractive sectors of the economy.

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***On average, according to employers' own estimates, EP spending accounted for less than one-tenth of 1% of all mass layoffs nation wide.***

## **II. Environmental Protection and Deindustrialization**

Perhaps the most serious economic charge leveled against environmental protection has been that it has accelerated the decline of U.S. manufacturing and the disappearance of 3 million-plus blue-collar jobs over the last 15 years. Critics of regulation maintain that it has led to (1) plant shutdowns, (2) the flight of **new** investment capital to countries with lax environmental standards, and (3) reduced productivity, profitability, and thus investment in manufacturing. As we shall see, however, economists who have studied these charges have found that they bear little weight.

### ***Plant shutdowns***

Environmental protection expenses alone are simply not large enough to cripple an otherwise healthy plant. However, stringent pollution regulations might serve as the straw that breaks the camel's back by making production at certain locations unprofitable. Yet, fears of such effects from pollution-control efforts are liable to be greatly overblown, since industry officials can gain politically by blaming plant shutdowns due to normal business causes on environmental regulations.

Keeping this in mind, since 1987 the **Department** of Labor has collected information on layoffs, including shutdowns, that idle more than 50 workers. Seventy-five percent of firms in the civilian economy employing more than 50 people are covered in the survey; around 57% of the manufacturing workforce is **included**.<sup>13</sup> Employers are asked to list the primary cause of the layoff. The data are reported in **Table 3**.

Trade-Off No. 2, which asserts major job losses from EP measures, clearly has no basis in fact. On average, **(according to employers' own esti-**



**TABLE 3**  
**Employer-Reported Reasons for Mass Layoffs, 1987-90**

	1987 Layoff Events	1987 Job Loss	1988 Layoff Events	1988 Job Loss	1989 Layoff Events	1989 Job Loss	1990 Layoff Events	1990 Job Loss	Average Layoff Events	Job Loss	Percent of Layoffs Environment- Related
Total, All Reasons	2,020	406,887	2,322	450,300	2,764	572,570	3,078	586,690	2,546	504,112	
Automation	9	951	7	737	11	1,378	11	1,688	10	1,189	0.2
Bankruptcy	43	7,259	76	16,559	81	18,599	100	26,428	75	17,211	3.4
Business Ownership Change	88	30,955	92	18,973	82	19,147	78	16,989	85	21,516	4.3
Contract Cancellation	25	4,168	32	3,894	26	5,824	48	8,532	33	5,605	1.1
Contract Completion	147	27,696	178	50,822	225	50,971	201	40,167	188	42,414	8.4
Domestic Relocation	49	10,877	68	12,816	68	1,138	114	18,512	75	10,836	2.1
Energy-Related Disruption	6	888	—	—	6	789	—	—	3	419	0.1
Environment Related*	4	511	4	388	5	1,304	4	390	4	648	0.1
Import Competition	40	8,328	34	8,222	43	8,310	69	10,028	47	8,722	1.7
Labor-Management Dispute	43	12,592	26	2,824	47	40,387	—	—	29	13,951	2.8
Material Shortages	11	1,872	20	2,169	24	4,318	20	5,859	19	3,555	0.7
Model Changeover	17	16,441	21	7,186	17	9,089	15	3,039	18	8,939	1.8
Natural Disaster	6	561	4	919	4	678	—	—	4	540	0.1
Overseas Relocation	30	4,963	10	1,225	6	1,189	13	<b>3,122</b>	15	<b>2,625</b>	<b>0.5</b>
Plant or Machine Repairs	19	3,146	21	3,837	19	3,360	27	6,512	22	4,214	0.8
Seasonal Work	516	101,168	710	144,522	889	175,970	884	167,287	750	147,237	29.2
Slack Work	535	<b>9,4071</b>	450	69,764	661	102,607	943	142,038	647	102,120	20.3
Vacation Period	17	4,161	21	3,650	22	5,871	15	2,106	19	3,947	0.8
Weather-Related Curtailment	13	1,246	43	4,285	63	11,009	84	11,815	51	7,089	1.4
Other (Including Reorganization)	240	51,207	229	51,744	255	46,778	284	97,474	252	61,801	12.3
Not Reported	162	23,826	276	45,764	210	53,604	168	24,704	204	36,975	7.3

\* Includes environmental and safety-related shutdowns.

Source: U.S. Department of Labor, "Mass Layoffs in [various years]," *Bulletin* (Bureau of Labor Statistics), 2395, 2375, and 2310.

**mates**, EP spending accounted for less than one-tenth of 1% of all mass layoffs nationwide. In data covering 75% of all major layoffs, and 57% of the manufacturing workforce, *four plants* per **year** were found to have closed primarily as a result of environmental or **safety** problems. If the figures are doubled to account for the remainder of manufacturing jobs, 1,300 lost positions per year on average could be partially attributed to environmental regulation. For comparison, 40 times more layoffs resulted from ownership changes than EP measures; IBM permanently laid off six times more workers in 1990 alone (over 18,000) than the total of EP layoffs identified by the Labor Department survey in four years.

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**Forty times more layoffs resulted from ownership changes than EP measures; IBM permanently laid off six times more workers in 1990 alone (over 78,000) than the total of EP layoffs identified by the Labor Department survey in four years.**

These job-loss figures from the late 1980s are similar to those found in previous years. The U.S. Environmental Protection Agency (1981), in a study looking at firms with more than 25 employees, has estimated that, from 1971 to 1981, about 3,200 workers per year lost their jobs **partly** in response to the costs of environmental regulation. Other prominent factors responsible for these plant closings included obsolescent equipment, declining sales, and the presence of new competitors. A Commerce Department study (Kieschnick 1978) covering the years 1972-78 and including smaller firms yielded similar total estimates. Finally, a survey conducted by the Oil Chemical and Atomic Workers Union of 224 permanent plant closings from 1980 to 1986 found that 12, or two per year, listed environmental considerations as a **partial** motive for closure (Wykle et al. 1991).

Of course, as was suggested above, industry leaders have much to gain and little to lose by stressing the environmental/regulatory pressures when discussing the breakdown of their **manufacturing** operations. To illustrate this point, consider Amoco's shutdown of its oil refinery in Casper, Wyo. in 1991. In closing the plant, operated on the same site since 1913, Amoco issued the following statement: "The \$150 million capital investment needed for environmental projects, added to our small size, limited crude oil flexibility, and marginal performance, tipped the scales" to closure. Local supplies of the crude upon which the refinery depended were also declining.

The magnitude of the environmental expenses provided by Amoco must of course be taken on faith, but a company spokesman conceded that additional costs of \$100 million would also **have** led to closure. In addition, the company announced that \$75 million would have to be spent regardless to clean up the abandoned site. (These funds will help cushion the **employ-**

ment blow of the plant closing to the community.)

The shutdown, idling some 200 workers, came in the midst of the ongoing, nationwide deindustrialization process. The 1980s saw a loss of some 400,000 jobs in the oil industry, as both prices and demand flattened out, crude production and exploration dropped, and automation increased. In the first half of 1992, the industry shed 40,000 jobs. Also in 1992, the year after the Casper shutdown, Amoco alone eliminated 8,500 more jobs, including at least 2,800 resulting from shutdowns of businesses deemed “nonstrategic.” It seems probable that the small, “marginally” performing Casper refinery would have fallen victim to this restructuring regardless of environmental regulations.<sup>14</sup>

The Casper case became fodder in the national jobs-versus-environment debate in a generally balanced *Congressional Quarterly* article:

Air-quality standards and numerous other environmental regulations introduced since the 1970s have also taken their toll on oil-industry employment. O’Keefe [of the American Petroleum Institute] cites the case of a polluting oil refinery in Wyoming that Amoco was forced to shut down several months ago. “That put 200 people out of work because the cost of bringing that refinery into compliance couldn’t be justified,” he says.

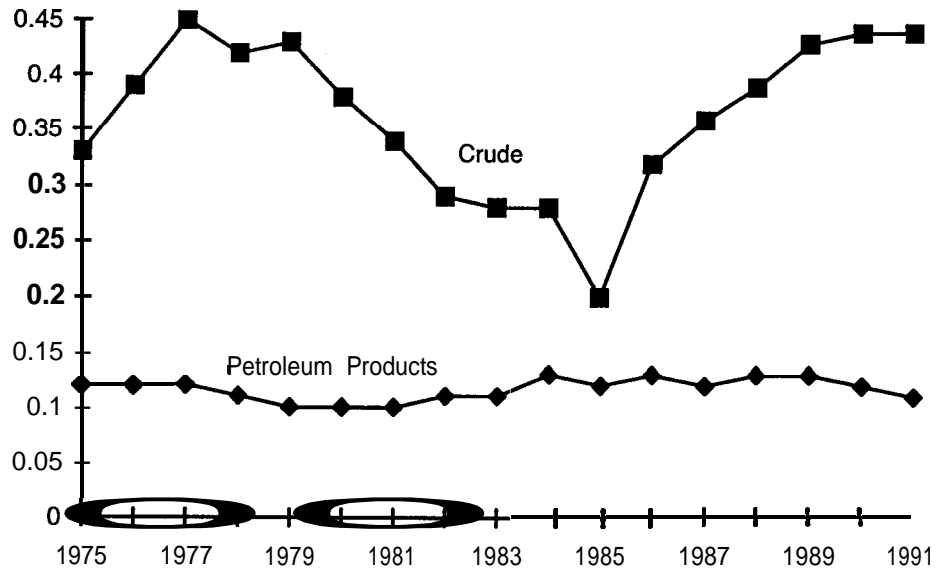
In the same article the author states as fact, and without evidence, that members of the American Petroleum Institute “have often found it less costly to close down polluting refineries and shift operations overseas rather than comply with environmental regulations.”<sup>15</sup> Have air-pollution-control requirements really led to a massive or even measurable shutdown of U.S. petroleum-refining capacity?

A look at import trends of petroleum products suggests not. **Figure 1** reveals that the share of petroleum-product imports has remained remarkably constant at about 12% of total supply since 1975. According to the U.S. Department of Energy, “total U.S. refinery capacity has remained fairly steady” since the post-recession shakeout of 1984-85. The constant import share is somewhat surprising for two reasons. First, the OPEC nations invested heavily in refinery capacity during the 1970s and 1980s. **Second**, as revealed in the graph, since 1985 U.S. refineries have had to rely increasingly on imported crude. A closer look at the pattern of imports suggests that OPEC countries have indeed increased their share of the import total

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***Have air-pollution-control requirements really led to a massive or even measurable shutdown of U.S. petroleum-refining capacity? A look at import trends of petroleum products suggests not.***

Figure 1  
 Import Shares for Crude and Refined Petroleum Products,  
 1975-1991



OPEC countries have indeed increased their share of the import total while non-OPEC refineries lost ground. Yet, U.S. refiners have not lost market share over the last 20 years.

Source: U.S. Department of Energy, *Monthly Energy Review*.

while non-OPEC refineries lost ground.<sup>16</sup> Yet, U.S. refiners have **not** lost market share over the last 20 years. It is thus hard to believe that petroleum companies have “often” or even occasionally shut down U.S. refining plants primarily as a result of EP expenses.

What of the future? A Business Roundtable Study, typical of the inflated rhetoric surrounding this issue, predicted dire employment consequences from the new Clean Air Act signed by President Bush in 1990. But even here, the authors restrict themselves to identifying jobs “affected” (they count 2.5 **million**) or “at risk” because of cost increases imposed by the new legislation. The only firm prediction they provide is a loss of 20,000 to 23,000 jobs over the next decade due to the imposition of controls on air toxic emissions, with shutdowns presumed to result because the technology does not **currently** exist to meet the standards. Slow, selective, and uneven enforcement, as well as induced technological change, however, will undoubtedly blunt this impact (Hahn and Steger 1990).<sup>17</sup>

Much of the debate over the acid rain provisions of the Clean Air Act

focused on the coal industry. The EPA has predicted a possible loss of some 14,000 high-sulfur-coal mining jobs in Northern Appalachia and the Midwest over the decade, to be balanced by a gain of around 17,000 low-sulfur jobs in Central and Southern Appalachia and the Western states. Not all of these job losses would materialize as layoffs, of course; some would be handled through attrition (Mason 1991).

If we take these estimates for the new Clean Air Act seriously, we might expect the Bureau of Labor Statistics data to begin showing a rough doubling in the number of layoffs partially attributable to environmental regulation over the next few years. Such an increase would imply job-loss estimates of around 2,600 per year, consistent with the numbers from the 1970s when the first round of air- and water-pollution controls were imposed.

Trade-Off No. 2, large gross job losses, is clearly a myth. Extrapolating from employer-reported data, in recent years about 1,300 workers per year have been laid off as a result of plant closures partially due to the need for environmental or safety spending. And as the Casper case illustrates, these figures probably overstate the true layoff impact of environmental regulation. For the workers who lose their jobs, the trade-off is, of course, very real. But it is indeed astounding, and a tribute to political scare tactics, that one-third of the *Wall Street Journal* poll respondents considered their jobs to be threatened by environmental-protection measures.

Workers are primarily concerned about the threat of layoffs and shutdowns, since these impose high personal and community costs. But critics have charged that EP spending has had a more insidious and long-term negative effect on growth in U.S. manufacturing jobs, both through encouraging new investment abroad rather than at home and reducing productivity, profitability, and investment domestically. We now turn to these issues.

### ***Pollution Havens?***

Rather than shutdowns, one might expect new investment to occur in poorer countries with less-strict pollution regulations. How serious is this problem of capital flight to so-called pollution havens? A study by Leonard (1984) of the impact of the federal water- and air-pollution regulations of the 1970s suggests that such effects were localized to a very few industries. These included manufacturers of highly toxic substances such as asbestos and select pesticides; copper, zinc and lead processing; and possibly a handful

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**Trade-Off No. 2, large gross job losses, is clearly a myth.**

of producers of organic chemicals. These industries also tended to be facing declining demand and operating **obsolescent** facilities. In addition, occupational health standards seemed to be more important than environmental standards in the decision to shift investment overseas.

Why have the effects not been greater? First, pollution-control costs appear to be a small portion of total business costs (typically 1% to 2%), and, second, costs are only one factor influencing business-location decisions.<sup>18</sup> Factors as diverse as access to markets and the quality of life are also important components. A recent study by Koechlin (1992) identified in order of importance market size, wages, tax rates, political stability, access to the European market, and distance to the United States as the primary determinants of U.S. investment **abroad**. Given these factors, most U.S. direct foreign investment continues to be in developed countries, with environmental regulations comparable to those at home.

At the end of 1991, 79% of all U.S. manufacturing investment abroad was in other developed countries. The country with the second-highest share of U.S. investment, Germany, is also the country with the most stringent pollution-control requirements outside of the United States, as measured by the percent of GNP devoted to environmental protection. In fact, some Japanese and German air-quality regulations are more stringent than those here.

All told, less developed countries have only a 21% share of U.S. foreign manufacturing investment; over half of this is in Mexico and Brazil. Mexico, of course, is close to the U.S. market, while Brazil has a large internal market of its own.<sup>19</sup>

While manufacturing investment in poor countries remains relatively small, capital flight to low-wage countries has clearly been important in several U.S. industries. Critics of the North American Free Trade Agreement, in particular, have expressed concern that lax environmental enforcement, along with close proximity and low wages, may attract investment to Mexico that would otherwise occur in the United States. This hypothesis has recently been tested in the Maquiladora region of the country, an area within 100 kilometers of the U.S. border from which plants can import and export products freely. While these plants are required in theory to meet U.S. federal environmental standards, in practice the Mexican government has not vigorously enforced the law. As a result, air and water pollution have become serious problems in the **region**.<sup>20</sup>

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***Pollution-control costs appear to be a small portion of total business costs (typically 1% to 2%), and costs are on/one factor influencing business-location decisions.***

The most dramatic instance of plants moving to this region occurred in the Los Angeles-area wood furniture industry. Based on sketchy evidence, it is estimated that four to five plants per year moved to the Maquiladora region from 1988 to 1990 *partially* as a result of environmental regulations. This movement accounted for a loss of about 350 jobs per year.<sup>21</sup> The L.A. basin has the worst air pollution in the United States and some of the toughest emission-control standards. Solvent-based coatings for wood furniture evaporate easily, contributing to smog; 1988 regulations in the Los Angeles area mandated the phase-in of expensive collection chambers to contain the solvent emissions. As of 1990, there were no regulations in the Maquiladora region pertaining to emissions from solvents.

Yet an added, if not primary, inducement for these firms to relocate was lower wages and benefits. The average hourly wage in Los Angeles was \$8.92; across the border it was \$0.77. In addition, as U.S. employers the firms were required to pay \$1.75 per hour in workman's compensation; the equivalent Mexican tax was \$0.13. For furniture makers, labor and environmental costs were clearly significant factors in the decision to locate in Mexico. More generally, in a 1988 survey of 76 Maquiladora plants, 10% listed environmental factors as *among* the main reasons for locating in Mexico.<sup>22</sup>

However, a more comprehensive look at investment in the Maquiladora region by Grossman and Krueger (1991) confirms the earlier Leonard insight: even in the Maquiladora region, environmental factors are in general relatively unimportant. Industries with higher pollution-abatement costs are not overrepresented among the Maquiladoras, while those with higher labor costs are. At this point, it appears that the direct costs associated with pollution control have not been a major factor in influencing plant-location decisions. Highly polluting industries are relocating to poor countries; the reason, however, is primarily low wages.

Yet, as the furniture industry illustrates, in certain cases environmental-control costs can rise sufficiently to become a dominant concern. This is particularly true for investment in Mexico, given both its wage advantage and proximity.<sup>23</sup> Such well-publicized, if infrequent, cases help explain the widespread fear of job loss through environmental protection that has shown up in public opinion polls. Moreover, as the Mexican case demonstrates, once having relocated, firms take advantage of looser pollution standards.

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***Highly polluting industries are relocating to poor countries; the reason, however, is primarily low wages.***

Thus, while free trade may not encourage the flight of dirty industry, greater levels of pollution are to be expected when industry moves south.”

### *Productivity Effects*

The final link alleged between **deindustrialization** and environmental protection lies in productivity growth. Productivity, or output per worker, is an important economic measure. Rising productivity increases the size of the economic pie, making it at least possible for general living standards to rise without a redistribution of wealth. However, from a jobs perspective, productivity is a two-edged sword. On the one side, rising productivity means that fewer workers are needed to perform current tasks. Subsequent layoffs generate “technological unemployment.” On the other side, rising productivity increases profitability, and thus investment and employment growth.

In a competitive world economy, productivity growth is the only route to maintaining a high-wage employment base. Major attempts to fight off profitable, labor-saving technological change to preserve jobs are indeed likely to accelerate capital flight to low-wage countries. At the same time, however, job growth from new manufacturing investment can be encouraged by measures that reduce labor costs *vis a vis* those of capital and energy. In addition, political steps can be taken to insure that the larger economic pie is equitably shared.<sup>25</sup>

Since 1974, productivity growth in the United States has averaged only 1%, well below the 3% rate the American economy experienced in the 1950s and 1960s. Because growth is a cumulative process, such small changes in productivity can have dramatic long-run effects. If, rather than declining after 1974, productivity growth had continued at its 1950-70 rate of 3%, GNP in 1990 would have been more than \$2 trillion higher than it actually was.

The productivity slowdown has been attributed to a variety of causes. Oil price shocks in the 1970s, the transition to a low-productivity service economy, increasingly shortsighted American managers, poorly educated or motivated American workers, inadequate infrastructure investment, a resource drain into defense spending, a legal system that encourages excessive litigation, and government regulation have all been labeled as **suspects**.<sup>26</sup> Some consider environmental regulations to be a major contributor.

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***While free trade may not encourage the flight of dirty industry, greater levels of pollution are to be expected when industry moves south.***



We know, however, that pollution-control efforts can *spur* productivity growth by forcing firms to adopt new and cheaper production techniques. For example, rather than installing “end-of-the pipe” equipment to treat their emissions, some firms have developed new production methods to aggressively reduce waste, cutting both costs and pollution **simultaneously**.<sup>27</sup> In this case, regulation has played a technology-forcing role, encouraging firms to develop more productive manufacturing methods by setting standards they must achieve.

However, productivity can also be dampened by environmental regulation in a variety of ways. First, regulation imposes direct costs on regulated firms—these costs can drain capital from investment in new plant and equipment. Second, regulation may slow down investment in conventional capital when the requirements are more stringent for new sources of pollution, **as** they often are. Third, regulation will cause higher prices for important economy-wide inputs, such as energy and waste disposal. **These** cost increases in turn may lead to reductions in output and investment in secondary industries not affected directly by regulation, such as the health and financial sectors.

Finally, regulation may frustrate entrepreneurial activity. Business people complain frequently of the “regulatory burden” and “red tape” associated with regulation, including environmental regulation. Filling out forms, obtaining permits, and holding public hearings all add an additional hassle to business that may discourage some investment, particularly by small **business**.<sup>28</sup> In recent years, Presidents Bush and Reagan acknowledged **frustration** among employers by imposing temporary moratoriums on **new** regulations issued by the federal government.

However, in spite of the chorus attacking regulation as one of the main culprits hampering American productivity growth, evidence for this position is not strong. A recent examination of five heavily regulated industries by **Barbera** and **McConnell** (1990) concluded that only 10% to 30% of the productivity decline in these industries could be accounted for by environmental regulation. Since most industries experienced substantially less regulation than the five examined in the study, the economy-wide effect would presumably be smaller. The **Barbera** and **McConnell** results are generally consistent with small economy-wide effects found in other **studies**.<sup>29</sup>

Nevertheless, because of the cumulative nature of economic growth, even

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***Pollution-control efforts can spur productivity growth by forcing firms to adopt new and cheaper production techniques.***

productivity declines well under 1% have major effects over the long run. For example, Barbera and McConnell maintain that, on an economy-wide basis, less than 10% of the 2% productivity slowdown in manufacturing after 1970 can likely be attributed to environmental regulation. Assuming, quite generously, that federal environmental regulations depressed economy-wide labor productivity growth from 1.1% to 1% beginning in 1974 (thus accounting for 5% of the total slowdown), then (1) in the complete absence of any federal water- or air-pollution regulation, and (2) assuming job growth through new investment kept up with productivity-induced layoffs, GNP would have been \$90 billion larger in 1990.<sup>30</sup>

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***In the absence of pollution-control measures, the United States would have experienced considerably higher rates of sickness and premature mortality, damage to crops and buildings, and impaired visibility.***

This kind of counterfactual exercise forms the crux of the productivity attack on environmental protection. Even with a small depression in productivity growth, the cumulative effects mount, to perhaps \$90 billion per year by 1990. And from the perspective of this study, in which long-run structural unemployment is important, the addition to national income might make a difference. Assuming again (and this is not a foregone conclusion) that increased employment from new investment at least matched productivity-induced job loss, the long-run boost to aggregate demand would be shared between higher real wages and a reduction in unemployment.

Yet, as it turns out, the very existence of a negative productivity effect arising from EP measures is questionable. As is generally acknowledged in recent productivity studies, the important positive influence of regulation on productivity growth has been ignored. In the absence of pollution-control measures, the United States would have experienced considerably higher rates of sickness and premature mortality, damage to crops and buildings, and impaired visibility. These would have reduced productivity directly as well as indirectly, since expenditures on health care and other private defensive measures would have risen dramatically. This spending in turn would have represented a drain on productive investment resources potentially comparable to expenditures on pollution control.

Repetto (1990) examined the positive effects (avoided costs) resulting from EP expenditures on productivity in the electric utility industry, the sector most heavily affected by regulation. He found that rough adjustments for reductions in emissions due to environmental regulation were large enough to offset the productivity declines found in earlier studies.

Less formally, we might consider in detail a specific regulation: the

EPA’s recent decision limiting the amount of lead that can leach from the solder in water pipes. **Table 4**, a summary of a benefit-cost study done by the agency, illustrates the suspected health effects from lead leachate. From this long list, the agency was able to quantify only benefits for hypertension, chronic heart disease, stroke, and death in adult males and reduced intelligence in children. Most of the other health effects of lead exposure fall into the category of suspected, but not confirmed. As the EPA states: “Many categories of health effects from lead exposure cannot be quantified-credible dose-response functions are not yet available” (U.S. EPA 1991, 5-1). Finally, other **nonwater** benefits the agency notes are reduced lead content in sewage sludge and, thanks to corrosion control, longer pipe life and reduced water leakage.

The option the agency ultimately chose was predicted to cost \$4 billion over the 20-year lifetime of the program but to generate *quantifiable* health benefits of \$64 billion. Among these were a reduction among adult males of 635,000 cases of hypertension per year and, among males age 40-59, 8 18

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**A 1990 study of the electric utility industry found that rough adjustments for reductions in emissions due to environmental regulation were large enough to offset the productivity declines found in earlier studies.**

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**TABLE 4**  
**Health Benefits of Reduced Lead Exposure**

*Men*

- Hypertension (adult)\*
- Heart disease, stroke, and death (ages 40-59)\*
- Possible heart disease, stroke, and death (ages 20-40; 60 and above)
- Cancer

*Women*

- Possible hypertension, heart disease, stroke, and death
- Fetal effects from maternal exposure, including diminished **childhood IQ**, decreased gestational age, and reduced birthweight
- Possible increases in infant mortality
- Cancer

*Children*

- Interference with growth
- Reduced intelligence\*
- Impaired hearing, behavioral changes
- Interference with PNS development
- Metabolic effects, impaired **heme** synthesis, anemia
- Cancer

\*Benefits EPA was able to quantify.

Source: EPA 1991.

heart attack cases and 609 strokes. Some 188,000 children per year would be spared a reduction in IQ levels. In the absence of this regulatory action, productivity would clearly be reduced by the absence of these workers from their jobs as well as by the reduced mental capabilities of future workers. In addition, the increased medical costs borne by these people, and their insurers, would represent a diversion of capital from investment in new capital and equipment as surely as do expenses on pollution control.

Thus, while federal environmental regulations put in place in the 1970s reduced measured productivity somewhat, such effects account for only a small portion of the total productivity slowdown. However, in the absence of regulation, productivity would have fallen anyway due to increased illness and the subsequent diversion of investment resources into the health care field. Rolling back environmental laws to their 1970 status, even if this were possible, would at best make a small dent in the problem of reduced U.S. productivity and might easily make things worse. The environmental consequences of such a policy would be disastrous.

In conclusion, what has been the impact of environmental protection spending on the manufacturing sector? Recent studies have shown: (1) EP spending, as one of many contributing factors, has led to job loss through the shutdown of a small number-one-tenth of 1%, by employers' own estimates-of manufacturing plants; (2) jobs have been lost in a few pollution-intensive manufacturing industries as firms have invested in countries with lax regulatory climates; and (3) EP spending appears to have had little if any net effect on employment via a reduction in productivity growth. Environmental protection thus bears very little blame for the loss of 3 million-plus manufacturing jobs over the last 15 years. Moreover, as was shown above, EP spending is in fact disproportionately concentrated in the manufacturing sector of the economy. Thus, on balance, environmental regulation has probably *slowed* the transition to a service economy.

While EP spending may have been partly responsible for the disappearance of 1,300 jobs per year due to shutdowns in the late 1980s, General Motors during the same period permanently laid off over 18,000 U.S. employees annually for unrelated reasons. The North American Free Trade Agreement may well reduce the U.S. manufacturing base by 200,000 jobs over the next decade as firms head south in search of low wages (Koechlin and Larudee 1992). Defense cuts are even more threatening: as many as 1.1

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***Rolling back environmental laws to their 1970 status, even if this were possible, would at best make a small dent in the problem of reduced U.S. productivity and might easily make things worse.***

million government jobs and another 1.4 million in the defense industry could be lost over the next decade.<sup>31</sup> Trade-Off No. 2 thus represents a powerful myth that, unfortunately, has focused national concern about employment and unemployment on the wrong issue.

### **III. Environmental Protection and Extractive Employment**

The previous section showed that shutdowns induced by environmental protections have been small, and that job growth in manufacturing has been only minimally affected by the flight of new investment to pollution havens and alleged productivity declines. A more substantial case for curtailed job growth can sometimes be made when natural resources are “locked up” in parks or in endangered ecosystems.

A reduction in net job growth, however, will only occur if the country shifts away from reliance on a domestic resource or one whose extraction has a high domestic content. If not, job losses in one region or community will be matched by job gains in another. Even here, though, a medium-term increase in net job growth will be matched by a long-term decrease, as those familiar with the boom-and-bust cycle of resource-based industry understand. In the long run, extractive-industry jobs disappear with the resource.

This section reviews the likely employment impact of two ongoing, controversial “set-asides”: protection of the old-growth forest in the Pacific Northwest, home to the spotted owl and other threatened species, and prohibition of oil development in the Arctic National Wildlife Refuge (ANWR) in Alaska. The benefits of preserving these areas are not discussed here. The intent is rather to present some reasonable estimates of the gross and net employment effects.

#### ***Old Growth Forests***

Protection of the old-growth forest in the Pacific Northwest has raised more controversy than the ANWR case because the jobs at stake are real, not hypothetical. Moreover, regardless of action to protect the owl’s ecosystem, for at least two additional reasons the future is not bright for timber workers in the region. First, harvest levels in the 1980s were widely recog-

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***While EP spending may have been partly responsible for the disappearance of 1,300 jobs per year due to shutdowns in the late 1980s, General Motors during the same period permanently laid off over 18,000 U.S. employees annually for unrelated reasons.***

nized to be unsustainable from an industrial perspective. Unless one is willing to trade jobs today for jobs in the future, timber harvests must be managed on a sustained yield basis. As a result, the U.S. Forest Service drafted new lumber-management rules that will dramatically reduce cutting on federal lands. Sample and Le Master (1992), based on a review of six employment studies, report that these new management plans will have an employment impact ranging from roughly half as large to as large as spotted owl protection itself.

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***Unless one is willing to trade jobs today for jobs in the future, timber harvests must be managed on a sustained yield basis.***

Second, rapid productivity growth in the highly competitive wood-products industry has already yielded thousands of layoffs. From 1980 to 1988, while output of finished lumber grew 19.2%, automation and productivity gains eliminated some 13,875 jobs in the industry. One study has estimated that, if current productivity trends continue, productivity-induced direct employment losses will total 33,600 by 2010, roughly three times the number of direct jobs likely to be lost due to old-growth protection (Anderson and Olson 1991).<sup>32</sup>

Finally, the area has been hard hit by the recent economic slowdown. From 1990 to 1992, 20,000 workers were laid off in the industry. These factors—reductions in timber harvests for timber-management reasons, productivity growth, and the vulnerability of workers to cyclical unemployment—all underscore a point to be made below. The region needs expanded adjustment assistance and retraining programs regardless of the impact of environmental protection on jobs.

What are the likely impacts of protecting the old-growth forest? Gross job losses are certain to be regionally significant. Estimates based on late 1980s data of direct and indirect job loss from old-growth protection range from around 15,000 to 30,000, depending upon the severity of the timber restriction and other underlying assumptions.<sup>33</sup> Anderson and Olson (1991), however, predicted that by 2040 about half of these extra jobs in the industry would disappear along with the old-growth forest.

Since these studies were written, however, job losses due to recession have been severe. The question now has become, how many of these jobs will reappear when the recession is over? Clinton's recently announced management plan falls on the more restrictive end of the scale used in the employment analyses in terms of land set-asides for old-growth protection. (Given recent biological studies, however, some have questioned whether

the plan is indeed adequate to protect the forest ecosystem.) Yet, if the Clinton proposal satisfies federal courts on the issue of endangered species, it may arrest further job loss.<sup>34</sup>

On an economy-wide basis, *net* job loss will occur only if the ban on old-growth harvesting generates an increase in timber imports. Instead, timber production has been shifting to the Southern United States. For example, from 1978 to 1990, the nation's seven biggest lumber and plywood manufacturers reduced capacity in the Northwest by 34% while increasing capacity in the South by 121% (Anderson and Olson 1991). Timber substitutes such as structural particle board are also being developed. In addition, the reduction in clear-cutting should have a positive impact on job growth in the fishery, recreation, and tourism industries within the region itself. Indirectly, it will boost the Pacific Northwest's ability to attract industry interested in "quality-of-life" issues. Thus, while the impact on timber towns will be significant, on an economy-wide basis net job losses from spotted owl protection will likely be minimal.

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***While the impact on timber towns will be significant, on an economy-wide basis net job losses from spotted owl protection will likely be minimal.***

### ***Arctic National Wildlife Refuge***

The clearest case in which net job growth is likely to be traded off for environmental quality probably lies in the preservation of the Arctic National Wildlife Refuge in Alaska. To the extent that domestically produced oil would indeed substitute for imported crude, net job growth would occur both directly in extraction and indirectly in the provision of capital goods for ANWR development.

Of course, ANWR oil might very well displace high-cost domestic production (and jobs) in the lower 48 rather than low-cost OPEC imports. Also, in terms of direct employment, not all of the workers attracted to Alaska would come from the ranks of the unemployed. ANWR development would tighten construction and engineering markets in the West particularly, and, because of supply restrictions for skilled labor, some jobs abandoned for the lure of high North Slope wages would go unfilled.

Yet, while some of ANWR spending will simply divert workers from other industries, net direct job creation remains likely. Moreover, ANWR would also give an indirect boost to U.S. manufacturing and transport industries. According to industry sources, oil companies would spend \$3.3 billion for five years developing and exploiting ANWR if the expected

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***An increase in AN WR-supplied oil might forestall domestic investment in weatherization and energy-efficiency measures with both high employment potential and attractive economic rates of return.***

amount of oil is indeed discovered (WEFA 1990). This money would be spent on labor as well as drilling equipment, facilities, and other capital equipment. Some of this capital spending would otherwise have occurred overseas, though some of it will be diverted from domestic exploration and development activities.

Of course, this additional demand would cause prices for capital goods to rise, thereby offsetting some of the increase. Moreover, some of the demand for capital goods will be satisfied by foreign firms, just as U.S. firms probably will supply equipment for new oil development in Canada, Mexico, or Venezuela if ANWR is not developed. Finally, an increase in ANWR-supplied oil might forestall domestic investment in weatherization and energy-efficiency measures with both high employment potential and attractive economic rates of return. Nevertheless, one should expect both a higher American content in Alaskan oil projects and a small decrease in oil imports with ANWR. Thus, some net increase in upstream manufacturing and transport hires would likely result from ANWR development.

Currently, each billion dollars of spending in the economy supports about 22,000 jobs. Assume for the purposes of illustration that (1) half of ANWR spending would represent a *net* addition to demand for domestic products; (2) there is a multiplier effect of 1.5; and (3) enough oil to justify continued capital expenditure is indeed found. (The U.S. Geological Survey has put the probability of actually finding the mean deposit at 46%.)<sup>35</sup> Then, the \$3.3 billion in ANWR spending might be expected to generate an additional 55,000 jobs nationwide for a period of five years.

Indicative of the inflated rhetoric around the jobs-versus-environment issue is a study done by WEFA (1990) for the American Petroleum Institute. In an extraordinary feat of macroeconomic modeling, the consulting firm predicts a net employment gain of 750,000 jobs via ANWR development in a “high resource” case (deemed only a 5% probability by the U.S. Geological Survey). This translates into roughly 130,000 ***jobs for each billion in expenditures***, compared to the economy-wide average of 22,000.

In a critique of the report, commissioned by the Wilderness Society, Breslow et al. (1992) find that the alleged employment affect is not being driven by an increase in aggregate demand, discussed above, but rather from ANWR’s “expected” impact on world oil prices. The idea behind the WEFA



study can be summarized as follows: (1) ANWR-supplied oil will drive down world oil prices significantly; (2) as a result, U.S. GNP will be larger in the long run; and (3) higher long-run GNP levels will generate lower unemployment levels.

Step 1 is the weakest point in the argument. First, the WEFA number of 750,000 net jobs is based on a hypothetical oil strike deemed highly unlikely by government scientists. The more likely mean ANWR oil field is an even tinier portion of world, and indeed national, reserves. Second, in the WEFA study, a 0.9% increase in world oil supply from ANWR (the field's theoretical maximum) translates into a 4.5% decrease in world oil prices. This is an implied demand elasticity of 0.2, less than one-third the value of generally accepted estimates. Third, WEFA assumes that OPEC will not react to an increase in U.S. production by curtailing its own. Finally, the report adopts unreasonably high price forecasts for oil.<sup>36</sup>

The second step in the argument is also problematic. If ANWR oil is so important for the health of the U.S. macroeconomy, one must also wonder what happens beyond the forecast period, when ANWR supplies are exhausted. If the United States is then forced to quickly and dramatically boost reliance on expensive imports, the negative macroeconomic consequences and job losses would presumably be dramatic.

The WEFA study should be viewed as a highly speculative scenario, but it has unfortunately become injected into the public debate. The real job-creation benefits from ANWR are likely to come from an increase in net demand for labor and domestic capital goods and, provided the mean deposit is found, be on the order of 55,000 nationwide for the five years of intense development.

In conclusion, this examination of two major, ongoing conflicts between environmental protection and jobs in extractive industry illustrates that, in contrast to manufacturing, job losses from a major restriction of access to natural resources can indeed be regionally significant. However, in the case of the spotted owl, productivity growth and timber management issues loom equally large as a source of job loss. The ANWR case shows that, if restricted access to natural resources results in an increase in imports, reduction in net job growth is likely. This example, however, is somewhat unique. No other "foregone" development project rivals it in scale.

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***If ANWR oil is so important for the health of the U.S. macroeconomy, one must also wonder what happens beyond the forecast period, when ANWR supplies are exhausted.***

## IV. Reducing the Extent and Cost of Job Loss

This report has documented that, at the economy-wide level, environmental protection spending, if anything, has boosted the total net number of jobs in the economy. We have also illustrated that, relative to the widespread and painful deindustrialization process the nation has been undergoing, gross job losses from EP measures that have occurred have been small, on the order of one to two thousand per year.

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***In the long run, government policy should work to promote reindustrialization based on new energy and clean manufacturing technologies.***

In the long run, government policy should work to promote reindustrialization based on new energy and clean manufacturing technologies.<sup>37</sup> In the short run, policy can focus on three concrete measures that could help reduce both the extent and personal cost of job loss in manufacturing and extractive industry, whether these layoffs result from EP regulation or some more common cause. These policies are (1) adjustment and retraining assistance; (2) shifting of the tax burden from labor to energy; and (3) where feasible, a move to cost-reducing, incentive-based regulation.

The most immediate measure to address job loss from EP regulations is adequate adjustment and retraining assistance. The need for such programs to build up the stock of the nation's human capital and improve its international competitive position has been widely discussed, most visibly during the 1992 presidential election. Retraining needs thus extend well beyond the small job losses resulting from EP spending.<sup>38</sup>

In a historic first for environmental legislation, the 1990 Clean Air Act authorized limited assistance to workers adversely affected. Laid-off workers enrolled in a retraining program can obtain income support for up to a single year. Out of a total Clean Air program expected to cost U.S. industry and consumers \$30 billion per year, up to \$50 million per year was authorized for the adjustment-assistance program. However, benefits are not available to support on-the-job training or general educational activities. Critics have argued that this type of short-term, limited program is "geared to low-skill, dead-end jobs at much lower pay" (Wykle et al. 1991, 53).

As a more comprehensive and effective model, the Oil Chemical and Atomic Workers Union have proposed a so-called "Superfund for Workers," targeting adjustment to those laid off as a result of EP measures and defense-related shutdowns. Modeled on the GI bill, it would provide tu-

ition, child care, and income support for laid-off workers enrolled in educational or retraining programs for up to four years (Wykle et al. 1991).

The Clinton administration has proposed a fairly comprehensive adjustment package for timber workers in the Northwest. The plan calls for expenditure on the order of \$250 million per year for five years, to be used to fund local development projects, retraining, and stream restoration. The plan also would fund research into low-impact harvesting methods, with the intent of ultimately allowing selective logging in threatened ecosystems.<sup>39</sup>

Beyond adjustment assistance, another measure to improve hiring and rehiring in manufacturing, while simultaneously improving environmental quality, is to lower the effective cost of employment by shifting some of the tax burden from labor to energy. In particular, if the national health program now being discussed in Congress were financed out of energy taxes, rather than, as Clinton has proposed, payroll taxes, firms would have less of an incentive to substitute energy (and capital) for labor.

In the long run, higher fossil fuel prices also form an important part of a strategy to improve competitiveness in environmental technology. However, energy taxes can be a significant burden for poor citizens, since they raise the price of necessities, and can be inflationary. Their disproportionate impact on the poor could be offset, however, if such taxes were coupled with comprehensive and economically progressive programs. A universal health care package funded with energy taxes is an example of such a program.

The inflationary impact of energy taxes would also be reduced as business costs (employer-provided health insurance) fell on a one-to-one basis with rising energy costs. In a forecast done for the EPA, Brinner et al. (1992) examined a package that coupled a gasoline tax large enough to stabilize carbon-dioxide emissions from vehicles (thought likely to cause global warming) with a commensurate cut in direct business expenses. They found this policy would actually improve the long-run prospects for economic growth by reducing expenditures on imported oil.<sup>40</sup>

A final way to reduce negative productivity impacts on the manufacturing sector is to adopt smarter, less-expensive forms of regulation.<sup>41</sup> For example, a recent EPA-Amoco study of an Amoco refinery in Virginia revealed that regulations to control air pollution were targeting the wrong source. Amoco offered to trade stricter control at the higher-polluting (un-

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***The disproportionate impact of energy taxes on the poor could be offset, if such taxes were coupled with comprehensive and economically progressive programs.***

regulated) site for a relaxation of control at the less-polluting (regulated) site, for a savings of \$35 million-money that would certainly increase profits but might also be used for domestic investment. However, the EPA declined, saying it could not make exceptions to regulations on the basis of a single study.<sup>42</sup>

Such bureaucratic intransigence is perhaps understandable in a world of sketchy information about pollution sources and emissions. But as monitoring and enforcement technologies improve, the EPA should move to allow industries more flexibility in meeting overall pollution targets. Economists have made a generally convincing case that **when monitoring and enforcement are adequate**, incentive-based approaches such as emission trading or pollution taxes can reduce industry costs in the short run without sacrificing environmental quality. Perhaps more importantly, in the long run incentive-based systems also encourage innovation in pollution-control technology. Such a dynamic is vital for the growth of a competitive U.S. pollution-control industry.<sup>43</sup>

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***At the aggregate level, the bulk of economic research indicates that, if anything, EP spending has created more jobs than it has eliminated.***

## Conclusion

This study makes three main points:

- Trade-Off No. 1, that environmental protection is responsible for an increase in economy-wide unemployment, is simply a myth. At the aggregate level, the bulk of economic research indicates that, if anything, EP spending has created more jobs than it has eliminated.
- Trade-Off No. 2, that environmental protection is nevertheless responsible for large numbers of layoffs due to shutdowns, is also a myth. Based on a simple extrapolation of Labor Department data, about 1,300 people per year lost their jobs **partially as** a result of environmental regulation in the late 1980s. In addition, plant relocations to pollution havens have been small by any measure, and net job loss from an alleged environmentally induced productivity decline are unlikely to have occurred. Indeed, because of the disproportionate number of EP workers in manufacturing, regulation may well have slowed the transition to a service economy.

- Local trade-offs can be significant in extractive industry. Even here, however, more conventional sources of job loss typically dominate. Moreover, job loss will typically be balanced by job growth in industries providing substitute products for the “locked up” resource as well as those industries dependent on an undamaged environment. A reduction in net job growth at the economy-wide level will only occur in a rather unique case like ANWR, where a major net increase in domestic investment is foregone.

In the long run, markets for clean manufacturing and energy technologies can provide the kind of high-wage boost to the U.S. economy that autos and defense provided in the 1950s and 1960s. In the short run, expanded job training and adjustment assistance are vital to help American workers adapt and to provide American industry with a competitive edge.. While EP measures are by no means a major source of job loss in the economy, such programs would also ease the transition for those workers who lose their jobs as a result of environmental regulation. Two additional environmental policy steps-shifting the tax burden from labor to energy and adopting smarter forms of incentive-based regulation-could be implemented to encourage hiring in manufacturing.

Over the last 15 years, the loss of over 3 million U.S. manufacturing jobs has had a devastating impact on workers, communities, and the nation as a whole. Additional major job losses are likely to result from corporate restructurings, import competition, and defense cutbacks. Given these serious problems, it is unfortunate that national attention has focused on a mythical trade-off between jobs and the environment. Fostered by media attention on high-profile cases like the spotted owl, as well as political hyperbole across the country, widespread fears of job loss from environmental regulation appear to have taken root. In fact, for the overwhelming majority of American workers, these fears are simply unfounded.

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***In the long run, markets for clean manufacturing and energy technologies can provide the kind of high-wage boost to the U.S. economy that autos and defense provided in the 1950s and 1960s.***



## Endnotes

1. “Quotable,” *Spokane Spokesman-Review*, April 3, 1993.
2. “President’s Clumsy Handling of Earth Summit Results in a Public-Relations Disaster for Him,” *Wall Street Journal*, June 15, 1992.
3. “Americans Are Willing to Sacrifice to Reduce Pollution, They Say,” *Wall Street Journal*, April 20, 1990.
4. All monetary sums in this report are in 1990 dollars.
5. “Directly and indirectly” incorporates multiplier effects. For example, a complete accounting of jobs in the aluminum-recycling industry needs to include workers in the steel industry who make the machines to recycle aluminum as well as workers who make the equipment to make the steel to make the aluminum recycling machines, and so on. Economists use input-output models to capture all these indirect effects.

The 4 million figure is from Bezdek (1993) and is based on Management Information Services’s input-output model, described in Bezdek et al. (1986). To the author’s knowledge, MIS is the only source to have generated I-O-based employment estimates for the EP sector. Nestor and Pasurka (1993) have developed an I-O model for the Environmental Protection Agency that includes an EP sector, but they have not yet generated any employment figures.
6. These data are from Rutledge and Leonard (1992), with monetary values in 1990 dollars.
7. Haveman (1978), summarizing data from the 1970s, finds that “about 60,000 to 70,000 jobs are created for each \$1 billion of [government] spending [on pollution control]. For purposes of comparison, each billion of GNP generates approximately 50,000 jobs on average.” Translated into early 1990s dollars and productivity relationships (22,000 jobs per billion dollars), we might expect gains on the order of 5,000 to 10,000 net jobs per billion dollars of expenditure on environmental-protection measures.
8. Breslow et al. (1992). Because recycling also requires capital spending on “imported” equipment, the two options did not differ greatly in either their labor intensity or “domestic” content. However, the differences were large enough to translate into an employment advantage for recycling.
9. The authors’ findings are based on the input-output model described in Bezdek et al. (1986). They analyze two acid-rain control bills introduced in the 99th Congress, which differed somewhat from the final legislation passed in 1990. The authors predict net job gains of between 100,000 and 200,000 jobs, around 25,000 net jobs for each billion spent on pollution control. These figures are almost certainly on the high side, since they assume a costless reassignment of resources and a ready supply of workers with the available skills. In addition, U.S. EPA (1993) found that 79%, rather than 95%, of the air-pollution-control equipment used in the United States is produced domestically.
10. As is well known, economy-wide forecasting is an imprecise exercise at best. Indeed, in an honest fashion, Hollenbeck (1978) devotes the last three paragraphs of his article to explaining the limitations of his model. In fact, the author does not actually find an increase in unemployment, because, as in most general equilibrium simulations, the model *assumes full employment*. Rather, because relative to no pollution control wages decline along with physical output, workers withdraw from the labor market. Thus the estimated rate of labor-force participation decreases. Hollenbeck assumes a labor supply elasticity of 1.5 for low-wage occupations, which seems high.

This means, for example, that for a 10% increase in wages driven by increased demand, the number of low-wage job-seekers (and jobs in his model) increases by 15%.

11. Meyer also found a positive correlation between total employment and environmental regulation, but this relationship was insignificant when the presence of extractive industry was considered in a multivariate framework.

12. Hopkins (1992, 7) makes this point to attack those who argue that environmental regulation leads to job creation. Regulations, he says, are a “reshuffling of society’s workforce, one that may proceed smoothly and conceivably yield higher average salaries, but not likely one that can be given credit for reducing the nation’s unemployment rate.” See also Tietenberg (1992, 574-76).

13. The survey would not pick up shutdowns at small manufacturing plants. These accounted for 24% of total manufacturing employment in 1987. But see the discussion of earlier surveys below.

14. See “Amoco to Close Casper Refinery,” “Impact of Refinery Closing Not Yet Known,” *Casper Star-Tribune*, October 4, 1991 and November 10, 1991; and “Oil Company Plans to Cut 8,500 Jobs,” *Belleville (Ill.) News-Democrat*, July 9, 1992.

15. “Jobs Versus Environment,” *Congressional Quarterly Researcher* (2-18, 4 I-60, May 15, 1992). Bezdek (1993) also cites the Casper case as evidence of a jobs-environment trade-off.

16. Quote is from the Energy Information Administration’s *International Energy Outlook 1992*, p. 7. Among non-OPEC countries, the losers were all islands: the Bahamas, Trinidad and Tobago, the Antilles, the Virgin Islands, and Puerto Rico. Non-OPEC countries with significant (greater than 40,000 barrels per day) increases in exports to the United States included Brazil, Mexico, Spain, and the former U.S.S.R.

17. For a discussion of enforcement, see Goodstein (forthcoming) and Gray and Deily (1990).

18. Dean (1992) surveys the cost literature; see Chapman (1991) for an interesting dissenting view on the importance of environmental costs.

19. Pollution-control expenditures are found in OECD (1991, Table 23). Direct foreign investment figures are from Scholl et al. (1992).

20. “Border Boom’s Dirty Residue Imperils U.S.-Mexico Trade,” *New York Times*, March 31, 1991.

21. These are the mid-range estimates from U.S. GAO (1991), based on 78% of employers reporting stringent air-pollution controls as one reason for moving.

22. See U.S. GAO (1991) and “A Warmer Climate for Furniture Makers,” *Los Angeles Times*, May 14, 1990. The survey results are discussed in Sanchez (1990).

23. There is some speculation that liability under the hazardous-waste regulations passed during the 1980s may become significant enough to effect location decisions. See Hettige, Lucas, and Wheeler (1992).

24. Hettige, Lucas, and Wheeler (1992) report results that appear to contradict those of Leonard as well as Grossman and Krueger. They find that in the 1960s “toxic intensity [in manufacturing] grew most quickly in the high-income economies. During the 1970s and 1980s, after the advent of strict OECD environmental regulation, this pattern was sharply reversed.” (Toxic intensity is a measure of the share of manufacturing output claimed by high-pollution industries.) This finding might be interpreted as suggesting that multinationals substantially reduced “dirty” investment in rich countries and increased it in poor countries.



However, the authors find that “paradoxically...outward-oriented, high-growth LDCs have slow-growing or even declining toxic intensity, while toxic intensity increases more rapidly in inward-oriented economies.” It is presumably these outward-oriented, high-growth LDCs that should be attracting manufacturing capital from the developed world under the pollution-haven hypothesis.

In a more detailed paper, Lucas, Wheeler, and Hettige (1992) suggest that the results may be explained by “a shift towards a different global distribution [of production]” without direct investment. In other words, closed, high-growth economies may have deliberately fostered the domestic growth of polluting industries such as chemicals as well as oil and mineral refining. The authors thus suggest that their findings do not support a capital-flight argument.

In addition, their initial results may also arise from the relatively slow growth experienced by most of the closed economies in the periods 1974-79 and 1980-88. Zambian industry, for example, might be expected to have a very high toxic intensity in the 1980s following the collapse of virtually all manufacturing save state-supported mineral smelting and refining.

25. If rising productivity ultimately leads to a “shortage” of good jobs, then political efforts to shorten the work week and increase vacation time can help insure that the available jobs and income opportunities are equitably shared. See Schor (1991).

26. See Baily and Chakrabarti (1988), Melman (1987), Bowles, Gordon, and Weisskopf (1991), and Aschauer (1990) for differing perspectives on this issue.

27. See Barbera and McConnell (1990) as well as “Some Companies Cut Pollution by Altering Production Methods,” *Wall Street Journal*, December 24, 1990.

28. In a recent Dun and Bradstreet survey of small businesses, 13% of respondents claimed that environmental regulations substantially affected their businesses, 32% claimed a moderate effect, and 50% experienced very little effect. The survey had only an 8% response rate. The number of those affected may be inflated due to a sample selection bias: it would seem likely that people who were truly bothered by regulation would be motivated to respond (Howard 1991).

29. Barbera and McConnell (1990) address some possible sources of bias in Gollop and Roberts (1981), who find somewhat larger effects in the electric utility industry. Gray (1987) finds that environmental regulation was responsible for 12% of the measured productivity decline in manufacturing, with “no real effect on the productivity of inputs actually used in production.” More evidence of small productivity effects is found in Meyer (1992; 1993), who found no significant correlation between manufacturing productivity growth and the strength of environmental regulation in a cross-sectional study of the 50 states.

30. GNP per civilian worker was \$41,353 in 1974. Productivity growth of 1% would have raised that figure to \$48,489 by 1990; growth of 1.1% would have increased productivity to \$49,263. Given the civilian labor force in 1990, this translates into a GNP differential of \$91 billion. The 5% assumption is generous, based on Barbera and McConnell’s finding that the environmental regulation probably accounts for less than 10% of the productivity slowdown in the manufacturing sector, where the impact would be largest. Manufacturing output in turn makes up less than 20% of total output.

Hazilla and Kopp (1991) and Jorgenson and Wilcoxon (1990) undertake much more sophisticated counter-factual exercises using general equilibrium models and arrive at what appear to be aggregate annual “productivity” costs of \$125 billion and \$143 billion, respectively, for federal air- and water-pollution-control efforts undertaken since 1970. These rather large effects are in contrast to the modest productivity impacts found in industry studies. The validity of the GE results are difficult to assess, given the complexity of the modeling process. Joskow (1992) provides a rather critical view of the Jorgenson-Wilcoxon model in a different context.

In addition, general equilibrium studies assume full employment to generate their estimates. As a result, one cannot, as Bezdek (1993) does, “extrapolate” from the Jorgenson and Wilcoxon GNP reduction figure to net economy-wide job losses of 3 million from environmental regulation.

31. **These are** Office of Technology Assessment estimates, cited and further discussed in Markusen and Hill (1992).

32. Some have argued that the pace of technological change in the industry is likely to slow dramatically over the next decade. Sample and Le Master (1992, 50).

33. See the reviews in Gorte (1992, Tables 12 and 13) and Sample and Le Master (1992, Table 11).

34. The New York **Times** (“Upheaval in the Forest,” July 2, 1993) reported a job-loss figure of 6,000 from the Clinton plan, which was apparently based on a reduction from 1991 cut levels to the 1.2 billion board feet per year allowed under the plan. In recent years, however, as a result of court injunctions motivated by the spotted owl issue, sales of timber from federal lands have been only around 400 million board feet per year. See Wilderness Society (1993a; 1993b).

35. Breslow et al. (1992) note that the estimate was raised from 19%, under unclear circumstances.

36. For further discussion of these points, and other weaknesses of the WEFA study, see Breslow et al. (1993).

37. Geller et al. (1992), for example, use input-output modeling to suggest that around 1 million jobs on net could be gained through investment in energy efficiency. The job gains arise as oil imports are reduced and employment shifts into more labor-intensive industry.

38. See, for example, Markusen and Hill (1992) and Batt and Osterman (1993).

39. “Upheaval in the Forests,” *New York Times*, July 2, 1993. The article suggests that the funds would come from the existing Interior Department budget. For a discussion of possible adjustment strategies, see Anderson and Olson (1991).

40. Brinner et al. (1992) model the impact of increased gas taxes coupled with cuts in the employer-paid portion of payroll taxes. Increasing energy prices while reducing direct business costs improves long-run economic performance, according to the authors, because it encourages the substitution of domestic labor and capital for imported oil, thereby increasing domestic income. At the same time, the short-run inflationary impact of higher gas prices is reduced, so higher interest rates and reduced business investment are not forthcoming. While such a policy would reduce incentives for energy-labor substitution, might improve long-run growth prospects, and stabilizes carbon dioxide emissions, it remains regressive. To address regressivity, any energy tax increase should be coupled with a progressive tax cut or spending policy..

41. Even if, as is argued above, the net productivity impact is close to zero, this simply means that the positive impact (better health) balances the negative. Reducing the negative impact would cause the net productivity effect of regulation to be positive.

42. “What Really Pollutes? Study of a Refinery Proves an Eye-Opener,” *Wall Street Journal*, March 29, 1993.

43. For a detailed discussion of the pros and cons of incentive-based approaches to pollution control, see Goodstein (forthcoming).

## Bibliography

- Anderson, H. Michael and Jeffrey T. Olson. 1991. ***Federal Forests and the Economic Base of the Pacific Northwest***. Washington, D.C.: Wilderness Society.
- Aschauer, David Alan. 1990. ***Public Investment and Private Sector Growth***. Washington, D.C.: Economic Policy Institute.
- Baily, Martin N. and Alok K. Chakrabarti. 1988. ***Innovation and the Productivity Crisis***. Washington, D.C.: Brookings Institution.
- Barbera, Anthony J. and Virginia D. McConnell. 1990. "The Impact of Environmental Regulations on Industry Productivity: Direct and Indirect Effects." ***Journal of Environmental Economics and Management***, Vol. 18, No. 1, pp. 50-65.
- Batt, Rosemary and Paul Osterman. 1993. ***A National Policy For Workplace Training***. Washington, D.C.: Economic Policy Institute.
- Bezdek, Roger H. 1993. "Environment and Economy: What's the Bottom Line?" ***Environment***, Vol. 35, No. 7, pp. 7-32.
- Bezdek, Roger H., Robert M. Wendling, and Jonathan D. Jones. 1989. "The Economic and Employment Effects of Investments in Pollution Abatement and Control Technologies." ***Ambio***, Vol. 18, No. 5, pp. 274-79.
- Bowles, Samuel, David Gordon, and Thomas Weisskopf. 1991. ***After the Wasteland***. Armonk, N.Y.: M.E. Sharpe.
- Breslow, Marc, John Stutz, and Frank Ackerman. 1993. ***Creating Jobs for the 90's: A Report to the Wilderness Society***. Boston, Mass.: Tellus Institute.
- Breslow, Marc, et al. 1992. ***Socioeconomic Impacts of Solid Waste Scenarios for New York City: A Report to the New York City Department of Sanitation***. Boston, Mass.: Tellus Institute.
- Brinner, Roger E., et al. 1992. "Optimizing Tax Strategies to Reduce Greenhouse Gases Without Curtailing Growth." ***The Energy Journal***, Vol. 12, No. 4, pp. 1-14.
- Carlin, Alan. 1990. ***Environmental Investments: The Cost of a Clean Environment, Summary***. Washington, D.C.: U.S. Environmental Protection Agency.
- Chapman, Duane. 1991 "Environmental Standards and International Trade in Automobiles and Copper: The Case for a Social Tariff." ***Natural Resources Journal***, Vol. 31, No. 3, pp. 449-62.
- Cropper, Maureen L. and Oates, Wallace. 1990. "Environmental Economics: A Survey." ***Resources for the Future Working Paper QE90-12***. Washington, DC: Resources for the Future.

- Data Resources Inc. 1979. **The Macroeconomic Impacts of Federal Pollution Control Programs: 1978 Assessment.** Washington, D.C.: U.S. Environmental Protection Agency.
- Data Resources Inc. 1981. **The Macroeconomic Impacts of Federal Pollution Control Programs: 1981 Assessment.** Washington, D.C.: U.S. Environmental Protection Agency.
- Dean, Judith. 1992. "Trade and the Environment: A Survey of the Literature." **Policy Research Working Paper WPS966.** Washington, D.C.: World Bank.
- Geller, Howard, John DeCicco, and Skip Laitner. 1992. **Energy Efficiency and Job Creation: The Employment and Income Benefits From Investing in Energy Conserving Technologies.** Washington, D.C.: American Council for an Energy Efficient Economy.
- Gollop, F.M. and M.J. Roberts. 1981. "The Sources of Economic Growth in the U.S. Electric Power Industry." **The Journal of Political Economy**, Vol. 91, No. 1, pp. 654-74.
- Goodstein, Eban B. Forthcoming. **Economics and the Environment.** Englewood Cliffs, N.J.: Prentice-Hall.
- Gorte, Ross W.** 1992. **Economic Impacts of Protecting Spotted Owls: A Comparison and Analysis of Existing Studies, CRS Report for Congress 92-922 ENR.** Washington, D.C.: Congressional Research Service.
- Gray, Wayne and Mary E. Deily. 1990. "Enforcement of Pollution Regulations in a Declining Industry." **Working Paper 89-8.** Worcester, Mass.: Clark University.
- Gray, Wayne. 1987. "The Cost of Regulation: OSHA, EPA, and the Productivity Slowdown." **The American Economic Review**, Vol. 77, No. 5, pp. 998-1006.
- Grossman, Gene M. and Alan B. Krueger. 1991. "Environmental Impacts of a North American Free Trade Agreement." **Woodrow Wilson School Discussion Paper, No. 1.58.** Princeton, N.J.: Woodrow Wilson School.
- Hahn, Robert and Wilbur Steger. 1990. **An Analysis of Jobs at Risk and Job Losses From the Proposed Clean Air Act Amendments.** Pittsburgh, Pa.: CONSAD Research Corporation.
- Haveman, Robert. 1978. "The Results and Significance of Employment Studies." In **Employment and Environment.** Paris: Organization for Economic Cooperation and Development.
- Hazilla, Michael and Raymond J. Kopp. 1990. "Social Cost of Environmental Regulations: A General Equilibrium Analysis." **Journal of Political Economy**, Vol. 8, No. 4, pp. 853-74.
- Hettige, Hamamala, Robert E.B. Lucas, and David Wheeler. 1992. "The Toxic Intensity of Industrial Production: Global Patterns, Trends, and Trade Policies." **American Economic Review**, Vol. 82, No. 2, pp. 478-81.

- Hollenbeck, Kevin. 1978. "The Employment and Earnings Impacts of the Regulation of Stationary Source Air Pollution." *Journal of Environmental Economics and Management*, Vol. 6, No. 2, pp. 208-211.
- Hopkins, Thomas D. 1992. *Regulation and Jobs-Sorting Out the Consequences*. Washington, D.C.: American Petroleum Institute.
- Howard, James S. 1991. "Small Business Is Hurting From Recession." *D&B Reports*, November/December, pp. 16-19.
- Joskow, Paul. 1992. "Carbon Taxes and Economic Welfare: Comment." *Bookings Papers on Economic Activity: Microeconomics 1992*. Washington, D.C.: Brookings Institution.
- Jorgenson, Dale W. and Peter J. Wilcoxon. 1990. "Environmental Regulation and U.S. Economic Growth." *Rand Journal of Economics*, Vol. 21, No. 2, pp. 31-40.
- Kieschnick, Michael. 1978. *Environmental Protection and Economic Development*. Washington, D.C.: U.S. Department of Commerce, Economic Development Administration.
- Koehler, Timothy and Mehrene Larudee. 1992. "The High Cost of NAFTA." *Challenge*, Vol. 35, No. 5, pp. 19-26.
- Koehler, Timothy. 1992. "Determinants of the Location of U.S.A. Foreign Investment." *International Review of Applied Economics*, Vol. 6, No. 2, pp. 203-16.
- Leonard, H. Jeffrey. 1984. *Are Environmental Regulations Driving U.S. Industry Overseas?* Washington, D.C.: Conservation Foundation.
- Lucas, Robert E. B., David Wheeler, and Hemamala Hettige. 1992. "Economic Development, Environmental Regulation, and the International Migration of Toxic Industrial Pollution 1960-1988." Washington, D.C.: World Bank.
- Markusen, Ann and Catherine Hill. 1992. *Converting the Cold War Economy*. Washington, D.C.: Economic Policy Institute.
- Mason, Keith. 1991. "The Economic Impact." *EPA Journal*, January/February, pp. 45-48.
- Melman, Seymour. 1987. *Profits Without Production*. Philadelphia, Pa.: University of Pennsylvania Press.
- Meyer, Stephen. 1992. "Environmentalism and Prosperity: Testing the Environmental Impact Hypothesis." Cambridge, Mass.: MIT Project on Environmental Politics and Policy.
- Meyer, Stephen. 1993. "Environmentalism and Prosperity: An Update." Cambridge, Mass.: MIT Project on Environmental Politics and Policy.

- Mishel, Lawrence. 1989. "The Late Great Debate on Deindustrialization." *Challenge*, Vol. 32, No. 1, pp. 36-44.
- Muller, Frank. 1981. "The Employment Effects of Environmental Policy: An International Comparison, Germany and the USA." *Journal of Environmental Systems*, Vol. 1, No. 2, pp. 119-37.
- Nestor, Deborah Vaughn and Carl Pasurka Jr. 1993. "The Environmental Protection Industry in an Input-Output Framework." Paper presented at the Eastern Economic Association conference, Washington, D.C.
- Organization for Economic Cooperation and Development. 1978. *Employment and Environment*. Paris: OECD.
- Organization for Economic Cooperation and Development. 1984. *Environment and Economics*. Paris: OECD.
- Organization for Economic Cooperation and Development. 1991. *OECD Economic Surveys: United States*. Paris: OECD.
- Repetto, Robert. 1990. "Environmental Productivity and Why It Is So Important." *Challenge*, Vol. 33, No. 5, pp. 33-38.
- Rutledge, Gary L. and Mary L. Leonard. 1992. "Pollution Abatement and Control Expenditures, 1972-1990." *Survey of Current Business*, Vol. 72, No. 6, pp. 25-41.
- Sample, V. Alaric and Dennis C. Le Master. 1992. *Assessing the Employment Impacts of Proposed Measures to Protect the Northern Spotted Owl*. Washington, D.C.: Forest Policy Center.
- Sanchez, Roberto A. 1990. "Health and Environmental Risks of the Maquiladora in Mexicali." *Natural Resources Journal*, Vol. 30, No. 1, pp. 163-86.
- Scherer, F. M. 1988. "Corporate Takeovers: The Efficiency Arguments." *The Journal of Economic Perspectives*, Vol. 2, No. 1, pp. 69-82.
- Scholl, Russell B., Raymond J. Mataloni Jr., and Steve D. Bezerganian. 1992. "The International Investment Position of the United States in 1991." *Survey of Current Business*, Vol. 72, No. 6, pp. 46-59.
- Schor, Juliet B. 1991. *The Overworked American*. New York, N.Y.: Basic Books.
- Tietenberg, Thomas. 1992. *Environmental and Natural Resource Economics*. New York, N.Y.: Harper Collins.
- U. S. Environmental Protection Agency. 1981. *Economic Dislocation Early Warning System: 2nd Quarterly Report*. Washington, D.C.: U.S. EPA.

- U. S. Environmental Protection Agency. 1991. ***Final Regulatory Impact Analysis of National Primary Drinking Water Regulations for Lead and Copper***. Washington, D.C.: U.S. EPA, Office of Drinking Water.
- U. S. Environmental Protection Agency. 1993. ***International Trade in Environmental Protection Equipment***. Washington, D.C.: U.S. EPA, Office of Policy Planning and Evaluation.
- U.S. General Accounting Office. 1991. "Some U.S. Wood Furniture Firms Relocated From Los Angeles Area to Mexico." ***GAO/NSIAD-91-191, Report to Chairman, House Committee on Energy and Commerce***. Washington, D.C.: U.S. GAO.
- WEFA. 1990. ***The Economic Impact of ANWR Development***. Washington, D.C.: American Petroleum Institute.
- Wendling, Robert M. and Roger H. Bezdek. 1989. "Acid Rain Abatement Legislation: Costs and Benefits." ***OMEGA International Journal of Management Science***, Vol. 17, No. 3, pp. 251-61.
- Wilderness Society. 1993a. ***Forest Policy Baselines for the Pacific Northwest***. Washington, D.C.: Wilderness Society.
- Wilderness Society. 1993b. ***A Critique of the Clinton Forest Plan***. Washington, D.C.: Wilderness Society.
- Wykle, Lucinda, Ward Morehouse, and David Dembo. 1991. ***Worker Empowerment in a Changing Economy: Jobs, Military Production, and the Environment***. New York, N.Y.: Apex Press.

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