

Designing a Carbon Tax: The Introduction of the Carbon-Burned Tax (CBT)

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I.

INTRODUCTION

A. *The Greenhouse Effect*

Our environment is under attack, and as the threats become more serious, we must find creative and effective ways to combat them. One possible approach is to structure the tax system to further environmental objectives. One current environmental concern with potentially serious global consequences is the greenhouse effect. This article focuses on the goal of environmental protection through reducing carbon dioxide emissions from fuel combustion and on the goal of raising revenue for the government.¹ Light passes through carbon dioxide and other gases, including methane, chlorofluorocarbons (CFCs), and nitrous oxides, and heats the earth's surface. These gases then "absorb and reradiate the infrared energy emitted from the Earth's surface."² An increase in these gases heats the earth's atmosphere and produces climate changes.³

Carbon dioxide is the dominant greenhouse gas. Based on emission

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1. These two goals, conservation and revenue raising, are in potential conflict. See discussion in section II.B on the relationship between a broad tax base and tax level. With regard to setting the amount of tax, conservation and revenue considerations directly conflict. Promoting conservation requires setting the tax at a relatively high level. To the extent conservation goals are realized, less revenue will accrue to the government. Taxing with a broad base *and* at high relative rates resolves the conflict to some extent by increasing the amount of revenue raised, while maintaining sufficient economic incentives to conserve. Therefore, both goals can be pursued simultaneously if the tax applies broadly and at a sufficiently high level.

2. Daniel B. Botkin, *Global Warming: What It Is, What Is Controversial About It, and What We Might Do In Response to It*, 9 UCLA J. ENVTL L. & POL'Y 119, 121 (1991).

3. *See id.* at 120.

rates in the past decade, carbon dioxide accounts for an estimated 57 percent of the increase in greenhouse gases that create the potential for global warming. Of the remaining worldwide emissions of greenhouse gases, chlorofluorocarbons contribute about 24 percent and, together, methane and nitrous oxide account for approximately 19 percent of the potential change in climate. Ozone, water vapor, and other trace gases may also contribute to the greenhouse effect

Most of the carbon dioxide from man-made sources is emitted during the burning of fossil fuels. Coal and oil, together, contribute approximately 84 percent of worldwide emissions of carbon dioxide from fossil fuels; the remainder is attributable to natural gas Worldwide deforestation from the cutting and burning of trees — most of which is occurring in the tropical forests of South America, Asia, and Africa — is responsible for an estimated one-tenth to one-third of man-made emissions of carbon dioxide.

Not only the amount but also the type of fossil fuel burned affects the emissions of carbon dioxide. Since the carbon content of fossil fuels varies, the carbon energy obtained also varies. Natural gas has the lowest emissions of carbon dioxide per British thermal unit (Btu); oil emits about 40 percent more carbon dioxide than natural gas; and coal emits two to three times as much carbon dioxide as natural gas because of the additional energy required for conversion. . . . [T]he relative contribution of each fuel to emissions of carbon dioxide in the United States differs from its prevalence in energy consumption. Coal accounts for about one-third of U.S. emissions and natural gas for about one-fifth, although each accounts for about one-fourth of energy consumption from fossil fuels. . . .

The United States is responsible for about one-fifth of the potential change in climate resulting from worldwide emissions of greenhouse gases from man-made carbon dioxide from fossil fuel combustion.⁴

Uncertainty surrounds the amount and effects of global warming; however, most in the scientific community agree that burning fossil fuels contributes to global warming to a greater extent than any other single cause. To attack this environmental threat *effectively*, it would behoove policy makers to target those factors that contribute most to the problem. Moreover, Congress should use those policy mechanisms that would accomplish the desired goals at the least cost.

4. FRANK G. SUSSMAN, CONGRESSIONAL BUDGET OFFICE, ENERGY USE AND EMISSIONS OF CARBON DIOXIDE: FEDERAL SPENDING AND CREDIT PROGRAMS AND TAX POLICIES ch. 2 (1990), reprinted in TAX NOTES TODAY, Jan. 15, 1991, available in LEXIS, Fedtax Library, TNT file, Doc. 91-309 [hereinafter CBO: ENERGY USE] (citations omitted) (citing, among others, J. Hansen et al., *Regional Greenhouse Climate Effects*, in CLIMATE INSTITUTE, COPING WITH CLIMATE CHANGE 68-81 (1991)).

B. *Choice of Tools*

Achieving these goals probably requires the use of a variety of policy options.⁵ Price-oriented or market-based mechanisms like energy taxes may not, by themselves, promote conservation or efficiency improvements sufficient to achieve the desired reduction in carbon dioxide emissions. Market failures often exist: lack of information about the availability of alternative energy sources; the absence of non-carbon alternative fuels in the short run; short-run limitations on the availability of more energy-efficient technology; and shortages of capital supporting installation or development of more efficient technology. Another problem is the possibility that demand for fuel is so highly elastic that the entire tax cost could not be passed on to the energy consumer. Market mechanisms may also fail because of policy-makers' unwillingness to set prices high enough to discourage demand sufficiently. A national strategy to combat greenhouse gas emissions should therefore have complementary components: pricing or economic policies through some kind of energy tax, governmental regulations mandating behavioral changes and promoting the development and adoption of new technologies.

There are a number of federal price-oriented, nonregulatory programs in effect that discourage the use of fossil fuels and decrease the emissions of carbon dioxide resulting from combustion.⁶ However, the aggregate effect of these programs remains relatively small and is offset by other programs that encourage fossil fuel use.⁷

C. *Scope of This Article*

This article will assume that instituting an energy tax would be wise policy and will focus on how that tax should be designed. The assumed purpose of such a tax system is to combat the threat of global warming. I will discuss various theories of energy taxation and specifically the carbon-tax approach to reducing carbon dioxide emissions.⁸ I will then discuss some of the problems encountered in

5. DEBORAH GORDON, *STEERING A NEW COURSE: TRANSPORTATION, ENERGY, AND THE ENVIRONMENT 191-92* (1991).

6. See, e.g., David Kaufman, *The Greenhouse Effect: Available and Needed Laws and Treaties*, *UCLA J. ENVTL. L. & POL'Y* 219, 228-30 (1991).

7. See *id.* at 230 (describing current United States' efforts as *ad hoc*).

8. With regard to international negotiations, bringing about consumer response to global environmental dangers such as the greenhouse effect is challenging. In this situation, there is a collective action problem because harm to the environment results from using shared resources like the atmosphere in an uncontrolled manner. No one country has the economic incentive to reduce greenhouse gas emissions, even though doing so

designing such a tax, outline the possibilities for design and where appropriate, recommend a certain strategy or approach.

D. *Propriety of Using the Tax System for Environmental Goals (or Anything Other Than Raising Revenue)*

To what extent is it permissible to use the tax code to engineer social behavior? Should the sole purpose of a tax system be revenue

would yield significant benefits. From the perspective of any one nation, the expenses of reducing emissions may outweigh the expected return since, without agreement by other countries that they will follow suit, reductions in one country may be offset by increases in others. So, even though the world would benefit from reduced emissions, the collective action problem prevents that outcome. Incentives are necessary to help market participants overcome their individual rational apathies and to yield a socially efficient outcome. James Poterba, MIT Economist, Speech at Harvard Law School, International Tax Program (January 30, 1991). See Jack Fitzgerald, *The Intergovernmental Panel on Climate Change: Taking the First Step Towards a Global Response*, 14 S. ILL. U. L.J. 231 (1990) for background regarding the collective action problem.

Developing international policy involves difficult negotiation problems. The process leading to international agreement in the context of reducing CFC emissions took roughly ten years and culminated in the Montreal Protocol. Implementation of an agreement also takes time. There is reason to believe that an international agreement to reduce carbon dioxide emissions could potentially require even more time because industrial economies are currently more directly dependent on carbon-dioxide-producing activities than they ever were on the use of CFCs. See CONGRESSIONAL BUDGET OFFICE, CARBON CHARGES AS A RESPONSE TO GLOBAL WARMING: THE EFFECTS OF TAXING FOSSIL FUELS 62-63 (1990) [hereinafter CBO: CARBON CHARGES] (negotiating international carbon charges should be more difficult than negotiating the Montreal Protocol).

Yet it should be remembered that failing to take domestic action to reduce carbon dioxide emissions will harm the U.S. diplomatically since many countries have already begun unilateral emissions reductions (e.g., Japan, Sweden, Denmark, the Netherlands, Finland, the U.K., etc.). In fact, ministers from Germany, Denmark, and the Netherlands, joined by Italy, Belgium and Luxembourg, have recommended to the European Community that the EC Commission propose formal carbon tax legislation. Bureau of Nat'l Affairs, *International Taxes, Ministers Ask EC Commission to Make Formal Energy Tax Proposal*, DAILY TAX REPORT, DTR No. 241, Dec. 16, 1991, at G-3 [hereinafter *International Taxes*]. Although no consensus or specific design has emerged as of the writing of this article, many European Community environment and energy ministers acknowledge the need to tax carbon dioxide emissions. The EC Commission plan (which has been outlined in an informal "communication" to national governments rather than as a formal legislative proposal) aims for a tax of ten dollars/barrel of oil by the year 2000.

Because the U.S., which is responsible for substantial carbon dioxide emissions, is reluctant to enact a carbon tax, it is unlikely that the EC will seriously consider doing so for some time. *Id.* This unwillingness for any individual country or group of countries to act first illustrates the collective action problem described above. The earliest serious proposals for any international carbon tax will probably emerge in the United Nations Conference on Environment and Development to be held in June of 1992 in Rio de Janeiro, Brazil. It will be at this time that foreign countries will begin to exert pressure on the U.S. to respond to global environmental concerns such as carbon dioxide emissions.

raising? Any tax system, even if enacted solely for the purpose of raising revenue, will promote some types of social behavior over others. Therefore, it is an empty exhortation to assert that no tax should be enacted if it affects social behavior. Because no tax system is neutral, those systems we choose to adopt should be ones that promote beneficial activities. As long as the social benefits from the tax outweigh losses (both in terms of absolute efficiency and other social goals), the tax may be designed to promote social goals.

Further, the implementation of a legal system that harnesses market incentives does not contradict notions of representative government, since the *elected* legislature carries out its representative function by choosing which social goals will be imported into a tax system.

E. *Economic Efficiency*

Taxing carbon-dioxide-emitting fuels entails various efficiency gains and losses. These should be considered when determining whether or not, and to what extent, a tax on fossil fuels should be imposed. The imposition of a tax on fuel will introduce economic inefficiency since fuel and product markets have developed equilibrium prices and outputs in the absence of a broad energy tax. This is because the open market has developed prices without considering environmental costs. Hence, enacting a tax introduces consumption and production distortions vis-à-vis a scenario without tax. As some energy inputs (and the products they yield) become more expensive relative to others, financial and human capital will have to shift from the declining highly energy-intensive industries to those that are less-energy intensive or to those which benefit directly from a carbon tax (e.g., solar technologies industries). These shifts in capital will not be inexpensive to achieve, but their costs should be viewed as one-time charges.⁹ "In the case of a carbon tax, those industries or energy users most dependent on fossil fuels, least able to switch to alternative energy sources, least able to produce lower energy product lines, or least able to reduce their overall use of energy will be hardest hurt."¹⁰ The government can partially offset these one-time costs by allocating some of the revenue from the tax to help fund the various transitions. Doing so would help combat the negative political ramifications that an energy tax would proba-

9. 136 CONG. REC. E709, 711 (1990) [hereinafter Dower & Repetto] (statements of Roger Dower & Robert Repetto of the World Resources Institute).

10. *Id.* at 711.

bly engender. Also, if a tax were phased-in over a number of years the shock to the economy would be mitigated.¹¹

The argument that an energy tax would be inefficient stems from the fact that most taxes *are*, in fact, inefficient. They impose added costs on socially beneficial activities such as productivity (work) or savings.¹² The losses resulting from reduction of work, of savings or of investment are typically greater than the gains that result from the tax (revenue for the government which is used in turn to run various social programs and regulatory systems).¹³ The excess of loss over gain is a dead-weight loss to society and indicates that taxes are inefficient in the economic, total social welfare sense.¹⁴

Taxes that increase the cost of socially *beneficial* activities *are* allocatively inefficient. However, a carbon tax actually increases allocative efficiency by taxing a *negative* externality. The extra cost imposed on burning fossil fuels internalizes social costs of pollution not otherwise reflected in current market prices.¹⁵ Using taxes to

11. A phase-in allows industry and individual consumers to adjust their behavior to prepare for the additional costs that a tax would impose. It accomplishes this in two ways: first, energy users can spread the cost of adapting to the tax over a number of years rather than having to incur large expenses within a short period of time. For example, companies can buy more energy-efficient equipment over time as their old equipment wears out instead of having to pay to replace equipment immediately. Taxpayers would not have to depend on the immediate availability of capital and of more efficient technology. Second, the phase-in, or deferral of full taxation, gives the energy consumer time to adopt new attitudes about conservation. Thus, a phase-in spreads out costs over time (effectively reducing the initial tax rates) and provides a period for adjustment of attitudes regarding conservation. Improved attitudes will increase conservation and will allow the taxpayer to incur less total tax liability.

12. Dower & Repetto, *supra* note 9, at 710.

13. *Id.*

14. "In its narrowest perspective 'social,' or 'deadweight,' costs are those incurred without an offsetting benefit to someone else. Economists often call systems that avoid such costs Pareto-efficient. . . . [But s]uch a perspective can be criticized for failing to account for fairness and distributional concerns." Mark J. Roe, *Bankruptcy and Debt: A New Model for Corporate Reorganization*, 83 COLUM. L. REV. 527, 529 n.3 (1983).

15. See 137 CONG. REC. H1109, 1110 (daily ed. Feb. 21, 1991)(statement of Rep. Stark); Dower & Repetto, *supra* note 9, at 710; GORDON, *supra* note 5, at 178; Tim Gray, *White House Energy Plan Panned; Some Pain No Gain for Bush's Proposed Capital Gains Study*, 50 TAX NOTES 813, 814 (1991)[hereinafter Gray, *White House*](quoting Lester Brown); J. Andrew Hoerner, *Breath and Taxes: Air Pollution Taxes in the Works*, 46 TAX NOTES 1356, 1357 (1990) [hereinafter Hoerner, *Breath*]; J. Andrew Hoerner, *Climate Said to Be Warm for Passage of Carbon Tax*, 47 TAX NOTES 1417 (1990) [hereinafter Hoerner, *Climate*]; J. Andrew Hoerner, *Energy Taxes for Deficit Reduction: The Shape of Things to Come*, 48 TAX NOTES 1585, 1587 (1990) [hereinafter Hoerner, *Energy Taxes for Deficit*]; Alan S. Miller, *Policy Responses to Global Warming*, 14 S. ILL. U. L. J. 187, 204 (1990); Elizabeth Corcoran & Paul Wallich, *Carbon Levies: Tax on Fuels Containing Carbon—The Analytical Economist*, 263 SCI. AM., Sept. 1990, at 171 ("Some economists argue that imposing a tax on environmentally damaging carbon just makes the price of fossil fuels more closely reflect their 'true'

discourage polluting activities, which generate economic losses through environmental degradation, can improve economic efficiency. Pollution taxes and charges can help correct the well-known failure of markets to reflect pollution damages fully in the costs and profit-loss calculations of the polluting firm or household.

Shifting the tax base so that taxes fall less heavily on savings and work, and more heavily on environmentally damaging activities, pays double dividends in economic efficiency. Every dollar taken off the personal or business income tax pays a 15 to 45 percent dividend in increased economic welfare. If the tax loss is made good by a dollar levied on polluting activities, there is a further dividend in the form of reduced environmental damages and regulatory costs. [The economic value of reduced environmental damage must, of course, be estimated, but it encompasses the benefits of the reduced chance of global warming and all of its detrimental climatic effects,¹⁶ reduced health costs,¹⁷ a decrease in lost work time, and the mitigation of the decrease in property values that may result from pollution.] . . . [The benefits of] resource efficiency and environmental protection [should be] fully integrated into the decisions of producers and consumers throughout the economy.¹⁸

A carbon tax is a market mechanism that would force private actors to take into account the social costs of polluting. A distinction exists between *increasing* deadweight loss through a tax, and *correcting* a market failure to address non-market costs. The theory behind a carbon tax is that it would accomplish the latter task rather than be classified in the former category.

The argument that the tax is imprudent because taxes are inherently inefficient must also be evaluated by comparing the efficiency of alternative strategies. Once a government determines that it

cost to society."); *Red Ink, Green Taxes*, *ECONOMIST*, July 21, 1990, at 11; Poterba, *supra* note 8.

16. Broadly speaking, the detrimental environmental effects of global warming include: "Rapidly changing climate patterns rather than the relatively stable climates of the past millennia; [n]ew and changing water resource regimes; [m]ore vulnerable and uncertain agricultural production systems; [s]maller and less numerous ecosystems; [r]ising sea levels; and [i]ncreased risk of large scale environmental losses from positive feedback effects." Dower & Repetto, *supra* note 9, at 711.

17. "A study by the American Lung Association has determined that nearly one-half of all Texans - close to eight million people - are at risk from the air they breathe. A clean-burning fuel such as natural gas . . . would emit less [sic] pollutants [as compared to oil] and help clean the air [eliminating many of the long-term costs associated with providing health care for individuals affected by air pollution]." Lori M. Rodgers, *Energy Efficiency, Conservation, and Clean Air: An Ongoing Debate*, *PUB. UTIL. FORT.*, Jan. 18, 1990, at 32.

18. Dower & Repetto, *supra* note 9, at 710.

wants to reduce or stabilize carbon dioxide emissions (given expected benefits and costs), the choice of which strategy to pursue depends on their relative efficiencies. If a tax approach to global warming proves more efficient than alternative approaches, it should be implemented first. If additional measures need to be taken in order to reduce carbon dioxide emissions further, they should be implemented in order of decreasing efficiency until the ultimate goal is achieved.¹⁹ Bruce Ackerman provides a useful analogy illustrating why market approaches are generally preferable to command and control regulation.

An analogy from a very different policy area may be instructive. Imagine that the Labor Department refused to report an Unemployment Rate each month. Instead, when it was asked about the employment situation, it inundated its audience with stories about how workers in one or another industry might be displaced by one or another technology. While such stories are informative, wouldn't there be a great danger that the general public, and Congress, would miss the forest for the trees? The preeminent question, after all, that generalist decisionmakers can and should answer is how much overall unemployment [or in this case, how much overall carbon dioxide emission or global warming] is tolerable. And for this purpose, the unemployment rate functions as a key control variable. The same holds true in environmental policy; a vote on a proposal to change the overall [baseline cost to impose on the overall amount of pollution] . . . would be a vehicle for the democratic formulation of policy superior to any generated by the existing BAT [Best Available control Technology] regulatory system.²⁰

The Congressional Budget Office, echoing this sentiment, stated that "carbon charges would be more efficient than regulatory measures that would require the government to dictate to consumers or producers what amounts of fossil fuels they should use or what levels of carbon dioxide they should emit."²¹

F. *Alternative Goals*

The use of an energy tax to mitigate the greenhouse effect also promotes alternative national goals: national security, by reducing dependence on fossil fuel, much of which is imported from the Mid-

19. See Bruce Ackerman, *Reforming Environmental Law: The Democratic Case for Market Incentives*, 13 COLUM. J. ENVTL. L. 171, 172-178 (1988) for a description of how current environmental command and control regulatory policies are highly inefficient in achieving their goals.

20. *Id.* at 190.

21. CBO: CARBON CHARGES, *supra* note 8, at 15.

dle East;²² the additional environmental benefit of reducing atmospheric concentrations of carbon particulates, thereby improving air quality; and raising revenue.²³ Revenue from an energy tax could be used for any number of purposes, including the reduction of the deficit, environmental protection or the provision of funds to deal with the transitional economic dislocations that would occur as a result of the tax.²⁴ This fact increases the overall attractiveness of an energy-tax approach to fighting global warming.

II.

DESIGN

A. *Theories of Energy Taxation: Considerations in Determining How an Energy Tax Should Be Calculated*

There are three main theoretical bases for calculating an energy tax: the ad valorem method, the Btu tax and the carbon tax.²⁵ The different varieties of tax accomplish different goals, so the choice of goals to be promoted should determine what type of tax should be adopted and how that tax should be designed and implemented.

1. The Ad Valorem Method

The first basis for calculating an energy tax is the ad valorem method. This method would impose a tax based on a percentage of a fuel's sales price. Such a tax would serve the goal of minimizing the percentage of GNP spent on energy, thereby promoting the use of capital for alternative purposes. This tax would promote national-security and trade-deficit goals by making coal (derived primarily from domestic sources) more attractive than oil (most of which is imported) because coal costs much less per unit of energy output than does oil. Although total consumption of fuel would diminish, demand for fuels relative to each other would shift toward the cheapest and coincidentally the dirtiest fuels, primarily coal.²⁶

22. 137 CONG. REC. H1109 (daily ed. Feb. 21, 1991); Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1586; 136 CONG. REC. D854 (daily ed. July 11, 1990) (statement of Felix G. Rohatyn, Senior Partner, Lazard Freres and Co., before the U.S. House of Representatives Committee on Ways and Means).

23. 136 CONG. REC. H2248, H2249 (daily ed. May 10, 1990) (statement of Rep. Stark).

24. *See generally*, 136 CONG. REC. D854 (daily ed. July 11, 1990); Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1586; *Red Ink, Green Taxes*, *supra* note 15, at 11; J. Andrew Hoerner, *Future Bright but Hazy for Pollution Taxes*, 47 TAX NOTES 12, 13 (1990).

25. *See* Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1586.

26. Jessica T. Mathews, *Energy Tax Options*, WASH. POST, July 30, 1990, at A11.

An ad valorem tax would also impose additional costs on clean forms of energy, such as solar and wind power,²⁷ so it would not necessarily serve the environmental goal of reducing carbon dioxide emissions.²⁸ According to Hoerner, this way of calculating an energy tax would be relatively easy to administer both because current accounting methods track values rather than volumes and because the taxing authorities are accustomed to tracking values reported as opposed to physical quantities of goods.²⁹ Nevertheless, a tax system could be designed that would track volumes rather than values of fuel.³⁰

In addition to the problems of promoting coal over oil and natural gas and in discouraging non-fossil energy sources, an ad valorem tax would double-tax energy that is produced from the combustion of other energy.³¹ For example, a fossil fuel used to produce electricity would be taxed at a percentage of its value. The electricity produced would also be taxable separately to consumers even though carbon dioxide has been emitted only once during the production of the electricity. If the taxing authorities decide to impose an ad valorem tax at only one point in the energy production cycle to combat double-taxation, then they must determine the most equitable point at which to impose it for all the different fuels. The purpose is to avoid inequities when the tax is imposed at different points of the production cycle or marketing channel for different fuels (e.g., coal taxed at the mine mouth and natural gas taxed at the point of sale to the final customer).³² Because an ad valorem tax is based on cost, rather than on actual carbon content, "transportation and distribution costs of [natural] gas, but not of coal, would be subject to the ad valorem rate"³³ in the example provided. Although coal would be taxed correctly, natural gas would be excessively taxed.

The ad valorem method would exacerbate any existing regional

Throughout this paper the term "clean fuels" will refer to those fuels with a carbon content that is low relative to that of other fuels (e.g., natural gas) or to energy sources with no carbon content (e.g., solar, wind, or geothermal power). The term "dirty fuels" will be used to refer to those fuels with a carbon content that is high relative to that of other fuels (e.g., coal or oil).

27. *Id.*

28. Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1586-87.

29. *Id.* at 1587.

30. See generally section on Carbon Burned Tax, Sections II.C.1.b (1) and (2) *infra*, for how such tracking could be accomplished.

31. Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1589.

32. *Id.*

33. *Id.*

or industrial inequities in fuel bills. For example, consumers of electricity pay very different prices depending on where they live.³⁴ Those who pay more for one unit of electricity before the tax will also pay a larger tax since the tax would be calculated as a percentage of sales price rather than of pollution emitted.

2. The Btu Tax

The Btu (British thermal unit) tax provides another option for calculating an energy tax. Taxes imposed would be "based on the physical amount of heat [that] the energy source supplies."³⁵ Taxing energy in this way does not directly serve any energy tax goal. Btus simply function as one measure of energy use. Since one must burn much more coal than natural gas to obtain a given useful Btu output, coal (emitting more carbon dioxide per Btu produced than does natural gas) would be undertaxed relative to natural gas under this method. Since energy dissipates at every stage of energy transmission, determining the proper point in the production process to impose a Btu tax creates problems.³⁶ As the energy gets closer and closer to the end-user, the number of Btus available for use decreases. Thus, given a constant tax rate on Btus, the amount of tax actually payable decreases the further along in the production process the tax is imposed. Of course, rates could be adjusted upward as the imposition of the tax moves closer to the final user. Determining the correct rate adjustments, however, would create administrative difficulties because the size of the adjustment would depend on energy conversion efficiency. The more efficiently energy is converted, the smaller the upward adjustment in the tax rate should be. In the ad valorem situation, the tax rate would be adjusted downward as the imposition of the tax moves closer to the final user. The amount of the adjustment would depend on the expenses incurred by (and the profit margin of) fuel producers.³⁷

In addition to this problem, taxing energy on the basis of total Btus produced provides no incentive to develop technology that would allow for more efficient fossil fuel combustion. Under the Btu tax, the more heat one could extract per unit of fuel, the greater

34. See generally Mathews, *supra* note 26.

35. Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1586.

36. *Id.* at 1589.

37. Under an ad valorem tax, the rate should be adjusted downward as the energy source moves closer and closer to the end-user because the underlying price on which the tax is payable increases. Under a Btu tax, one should increase the rate as the energy moves closer to the final-user because the number of Btus on which the tax is payable decreases.

the amount of tax that would be incurred. Essentially, the energy user would be penalized for improving energy efficiency.

Enforcement of a Btu tax would also entail the difficulty of verifying a fuel's Btu content, especially once the fuel has been consumed.³⁸ Hence, there would be a great incentive for taxpayers to commit fraud by misreporting their fuel's quality.

3. The Carbon Tax

The carbon tax provides a third method for taxing energy. Under a carbon tax, government would impose taxes "based on the carbon content of fuels and their contribution to the problem of global warming."³⁹ By placing a disincentive on dirty fuel consumption, a carbon tax should generate "energy conservation [and prompt] the substitution of fuels that produce less carbon dioxide for [those] that produce more."⁴⁰ Since a carbon tax would be applied to fuels based on their carbon content, it would affect primarily the three main fossil fuels: coal, oil, and natural gas. The tax would not impose additional costs on non-polluting energy sources such as solar or wind power. Since a carbon tax grows in proportion to the carbon content of various fuels, this form of tax should prove the most effective in reducing carbon dioxide emissions and in improving allocational efficiency. Per unit of energy produced, burning coal emits seventy-five percent more carbon dioxide than burning natural gas and twenty-two percent more than burning oil.⁴¹ Under a carbon tax, coal would be taxed most heavily, followed by oil and natural gas. By discouraging coal consumption the carbon tax would also reduce emissions of sulfur and nitrogen oxides—other pollutants released by the combustion of coal.⁴² As a result, a carbon tax would promote several environmental goals.

The carbon tax would not be vulnerable to the problem that arises under the ad valorem system of double taxing energy. While the carbon fuel used to produce electricity would be taxed, no second tax would be imposed on the sale of electricity because the electricity itself contains no carbon. Additionally, the carbon tax avoids the problem, inherent in both the Btu and the ad valorem methods, that the amount or rate of tax should depend on when in the production cycle it is imposed. Under the Btu method, the

38. Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1587, 1589.

39. *Id.* at 1586.

40. *Id.* at 1587.

41. *Id.* at 1586.

42. See Mathews, *supra* note 26.

longer one waits to tax the energy, the fewer Btus remain to be taxed. Under the ad valorem tax, the longer one waits to tax the energy before it gets to the end-user, the greater the sale price of the fuel (since other costly inputs and mark-ups have driven up the price) and the greater the tax imposed. The amount of carbon subject to tax does not change as a fuel moves through the production cycle. Therefore, by basing the tax calculation on the carbon content of the fuel burned, no shifts in the taxable base will result as the fuel moves through the production cycle, from the point of extraction through the point of combustion.⁴³

The fact that a carbon tax calibrates the cost of energy sources with their carbon dioxide emissions does not mean that the carbon tax addresses all energy-related goals or that no design issues are raised. A carbon tax would make large domestic sources of fuel (e.g., coal) prohibitively expensive. It would also encourage further development and exploitation of nuclear power. To the extent that domestic fuel sources are not economically exploitable, we would increase our relative dependence on imported energy in the short run.⁴⁴ The carbon tax presents another complication because under its rationale a credit for reforestation would be justified, since trees act as sinks absorbing carbon dioxide from the atmosphere and preventing those absorbed emissions from contributing to the greenhouse effect.⁴⁵ Potential for taxpayer abuse of such a credit exists and raises its own enforcement issues.⁴⁶ A carbon tax, rather than an ad valorem or Btu tax, would best serve the environment since it most accurately calibrates the price of each fossil fuel to that fuel's contribution to carbon dioxide emissions, and thus to global warming.

B. *Broad Versus Narrow Tax Base*

Economists agree that broad-based taxes are more economically efficient than those imposed on a narrowly targeted group or activity.⁴⁷ Broad-based taxes create smaller deadweight losses than nar-

43. Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1588-89.

44. *Id.* at 1587.

45. *Id.* at 1589.

46. For instance, if tax breaks are given for tree planting, and the calculation of the credit or deduction assumes normal tree lives (and, hence, assumes that each tree will absorb carbon dioxide for many years), it would be relatively easy to get a greater subsidy than is deserved by planting and destroying trees over and over again on one small parcel of land. Poterba, *supra* note 8. Other specific design issues that arise under the carbon tax will be addressed in Part II of this article.

47. See J. Andrew Hoerner, *Energy Taxes Would Hurt Chemical Industry*, *Dow Offi-*

row-based taxes.⁴⁸ Furthermore, when the government taxes a large pool of entities, each taxpayer's individual burden can be reduced while the government maintains a given level of revenue. Thus, the broader the tax base, the more money the government can raise at any given rate of tax.⁴⁹ Therefore, if the government establishes a carbon tax, the tax should have as broad a base as possible.

Narrowly based energy taxes may be ineffective. The gas-guzzler tax provides an example. According to the American International Automobile Dealer's Association, cars "account for ('only') 16% of all domestic carbon dioxide production."⁵⁰ Hence, legislation that taxes only inefficient cars will not reduce total carbon dioxide emissions by any significant amount. Designing the tax to be broad-based would serve both environmental and revenue goals since both travel and transportation (as in a narrow gas tax), as well as all other combustion of carbon energy would be taxed.

An oil excise tax, another narrow energy tax, also illustrates the ineffectiveness of narrowly based taxes in reducing carbon dioxide emissions. By making oil more expensive compared to dirtier fuels such as coal, an oil tax promotes the use of the dirtier fuels and would encourage higher carbon dioxide emissions.⁵¹

The broader the energy tax base, the less likely the energy tax is to single out any one industry, region, or economic class disproportionately. For example, a tax applied narrowly only to oil would hurt oil-producing regions of the country while coal-producing regions would not bear any of the burden. Also, a narrow gas tax hits the poorest individuals hardest,⁵² since the fixed amount of tax would constitute a larger portion of a poor individual's income. A broad-based energy tax would mitigate this inequitable regressivity somewhat: the wealthy consume more "intermediate energy" from manufactured goods (coal, oil and natural gas), a greater share of electricity (primarily coal) and a greater portion of travel-related aviation energy (oil) than do the poor.⁵³ Hence, choosing a broad

cial Charges, 50 TAX NOTES 1215 (1991), [hereinafter Hoerner, *Energy Taxes Would Hurt*]; CONG. BUDGET OFFICE, REDUCING THE DEFICIT: SPENDING AND REVENUE OPTIONS: A REPORT TO THE SENATE AND HOUSE COMMITTEES ON THE BUDGET—PART II 427 (1990) [hereinafter CBO: REDUCING THE DEFICIT]; *Red Ink, Green Taxes*, *supra* note 15, at 11.

48. Hoerner, *Energy Taxes Would Hurt*, *supra* note 47.

49. *Red Ink, Green Taxes*, *supra* note 15, at 11.

50. Hoerner, *Breath*, *supra* note 15, at 1359.

51. *Red Ink, Green Taxes*, *supra* note 15, at 11.

52. Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1589.

53. *Red Ink, Green Taxes*, *supra* note 15, at 11.

base that taxes coal, oil (including gasoline) and natural gas rather than only gasoline would mitigate regressivity.⁵⁴ A carbon tax presents the most theoretically sound form of energy tax. It is broader-based than a variety of specific energy taxes. Because it is broader-based, it can raise more revenue at lower per-unit rates, and is more efficient.⁵⁵

The carbon tax is not the broadest energy tax. It would not tax those energy sources which contain no carbon, such as nuclear, solar, and wind power. The Btu tax, for example, which applies a tax based on the heat output of a given energy source, would include these other energy sources in the tax base.⁵⁶ However, given the goal of preventing the greenhouse effect, taxation of non-polluting energy sources such as solar power does not make sense: a carbon tax would be superior.⁵⁷ Of course, promoting nuclear power by not taxing it presents other significant dangers to the environment, but inhibiting carbon production alone is the most direct way to respond to the threat of global warming.

An ad valorem tax may be broader than a carbon tax depending on which energy sources it would cover. If the ad valorem tax were applied only to gasoline (as is the usual case), then it would be much narrower than a carbon tax, which theoretically applies to all sources of fuel that emit carbon dioxide upon combustion. If the ad valorem tax were applied to all carbon fuels, however, and to solar and hydro-power as well, then it would be broader than the carbon tax. As mentioned above, however, taxing non-polluting energy sources like solar power would not further environmental policy.

C. *Problems Encountered in and Approaches for Designing and Implementing a Carbon Tax*

Implementing a carbon tax to achieve its goals of reducing carbon dioxide emissions and raising revenue requires consideration of certain practical problems. For instance, measuring carbon dioxide emissions directly is virtually impossible.⁵⁸ This problem causes

54. See *id.*; Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1589.

55. See discussion of testimony by Helen O. Petruskas of Ford Motor Company and of Marina Whitman of General Motors in 136 CONG. REC. H2248, 2249 (1990)(statement of Rep. Stark); Hoerner, *Breath*, *supra* note 15, at 1359 (position of American International Automobile Dealers Association).

56. Hoerner, *Energy Taxes Would Hurt*, *supra* note 47, at 1215.

57. Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1586-87.

58. Hoerner, *Breath*, *supra* note 15 at 1357-58 (discussing analogous area of taxing emissions of sulphur oxides and nitrogen oxides). Under current environmental regulations, devices that measure emissions of these chemicals are already attached to some

many difficulties in designing and implementing the tax. As a consequence, the administrative burden increases. As a substitute for measuring emissions directly, tax administrators should focus on measuring the volume and carbon content of fossil fuels burned. Fuel volume and grade can be verified much more easily than can carbon dioxide emissions directly. Yet verification of fuel volume, type, and grade poses its own administrative problems.⁵⁹

Virtually all sectors of our post-industrial economy contribute to carbon dioxide emissions through their prolific use of fossil fuels. Some industries, nevertheless, account for a substantial percentage of carbon dioxide emissions because they burn disproportionately large amounts of fossil fuels. The utility industry and the transportation sector of the economy fall into this category. The electric utility sector accounts for eighty percent of total U.S. coal consumption.⁶⁰ Therefore, "[t]he response of electric utilities is critical to the effects of carbon charge policies since coal emits more carbon than other fossil fuels."⁶¹ "Over 60% of petroleum products are consumed in transportation, including gasoline and diesel fuels for [cars], trucks and railroad locomotives, and jet fuel for aviation."⁶² Therefore, the tax must be designed in such a way as to dampen consumption of electricity and transportation sufficiently and to promote the use of cleaner fuels in these sectors.⁶³ Because of their large relative contributions to carbon dioxide emissions, examples from these two sectors will be used illustratively throughout this article. Where examples from other industries are more appropriate to illustrate a point, they will be used instead.

1. On Whom Should the Tax Be Imposed?

In designing a carbon tax it is necessary to determine on whom the tax should be imposed. There are a number of possible entities on which the tax could be levied.

emissions sources, i.e., smokestacks. No such devices for measuring carbon dioxide emissions are set up in all locations where fossil fuels are burned, however. (E.g., automobiles.)

59. Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1587.

60. CBO: CARBON CHARGES, *supra* note 8, at 28.

61. *Id.* at 29.

62. *Id.* at 30.

63. The Congressional Budget Office obtained or derived all of its figures from U.S. ENERGY INFO. ADMIN., DEP'T OF ENERGY, ANNUAL ENERGY OUTLOOK (1989).

a. *Impose the Tax on One Entity*

(1) **Impose the Tax at the Dock, the Mine-Mouth or the Well-Head**

One could tax the company that first introduces the fuel into the economy: the firm that extracts the natural resource and turns it into usable fuel or the company that imports the fuel into the domestic economy.⁶⁴ Imposing the tax at its initial entry point into the economy ensures a broad tax base. Imposing the tax at the beginning of the production process also helps prevent the situation where some fuel escapes taxation.⁶⁵ And it prevents double-taxation of some uses of fuel.⁶⁶

When the government imposes a tax on the entity that introduces the carbon fuel into the economy, that entity will raise its prices. "Since the use of fossil fuels is pervasive in the U.S. economy, the changes in fuel prices caused by carbon charges would affect the prices of virtually all intermediate and final goods."⁶⁷ The price increase will filter through the economy,⁶⁸ making carbon-intensive

64. Taxing the fuel at this point is commonly referred to as imposing the tax at the dock, the mine-mouth, or the well-head.

65. For example, where a gasoline retailer is the entity on whom the tax is imposed, fuel would escape taxation to the extent of any sales directly from wholesaler to consumer.

66. Suppose burners of coal are the entities on whom the tax would be imposed. Any coal that utilities bought from sources other than original extractors, which are also presumed burners, would have already been taxed when that seller bought it (because of the seller's status as a presumed burner). The coal would be taxed again when the utility company purchased it, since the utility is also presumed to be a burner. To avoid this double taxation, one must either impose the tax only at the fuel's entry point into the stream of commerce or establish a system whereby resale of the coal will trigger a credit for the seller. (See CBT discussed *infra* section II.C.1.b.)

67. CBO: CARBON CHARGES, *supra* note 8, at 11.

68. Prices will increase to some extent but probably not enough to account for the entire amount of tax incurred. This results because producers may not be able to pass on their entire cost increase to consumers. Their ability to pass on increased costs to consumers depends on the elasticity of demand of the good being sold. When demand is highly elastic (because of the availability of substitute goods, for example), many consumers will stop purchasing the good following a price increase. They will instead purchase substitute goods or reduce consumption altogether in favor of saving.

To maintain a sufficient sales volume, the seller must keep the price of the good low. Therefore, any additional costs which the seller incurs, he will have to bear. When demand is inelastic, on the other hand, the producer can raise prices, and consumers (who still need that good) will willingly pay the increased price in order to obtain the product. In this case the consumer bears the tax burden because prices will increase to reflect the additional tax costs. To the extent that demand for goods produced with fossil fuels is inelastic, the tax imposed on fuel at the beginning of the production process will filter through to ultimate consumers in the form of increased prices. As long as demand is not completely inelastic, consumption patterns will shift to some extent, and

energy more expensive and thus discouraging its use. The increase in the price of carbon fuels will also make goods produced with carbon-intensive energy more expensive than other goods. The higher prices of the "polluting" goods will discourage their consumption.⁶⁹ One problem with imposing a carbon tax at the mine-mouth, the well-head or the dock is that in some industries, such as independent oil and gas production, the market structure of the chain of production is such that the tax would be imposed on a party that could not pass the additional cost on to its buyer. This would happen where the taxed party is a price taker.⁷⁰ A price taker either lacks the negotiation power to demand a higher price for its goods or sells goods with highly elastic demand. In either case, by raising its prices, the price taker loses all its business. In such a case, the price increase would not be passed on to the consumer. The inability to pass the additional cost on through the various production levels to the ultimate consumer would prevent the desired shift in consumer demand away from energy-intensive goods.⁷¹ Each energy industry must be examined now and over

producers will use cleaner fuels and attempt to be more fuel efficient in order to recapture a market for their goods.

Even if demand for a good were elastic, some energy efficiency may be encouraged by imposing a carbon tax at the beginning of the production process. Forcing producers to bear a portion or all of the tax encourages them to improve energy efficiency and to use cleaner fuels through their desire to improve profitability. Elasticities of demand for raw materials vary at different points of the production process and over time as technological advances make clean substitute energy sources available. See Martin Lobel, *Refunding Unconstitutional State Taxes*, 52 TAX NOTES 584 (1991). See generally DOUGLAS R. BOHI, *ANALYZING DEMAND BEHAVIOR: A STUDY OF ENERGY ELASTICITIES* (1981); Robert S. Pindyck, *The Characteristics of the Demand for Energy in ENERGY CONSERVATION AND PUBLIC POLICY* 22 (J.C. Sawhill ed., 1979). For an example from William Roberts of the Environmental Defense Fund, see Hoerner, *Breath*, *supra* note 15, at 1359. Because of these complications, determining the ultimate incidence of a carbon tax with certainty is very difficult.

69. The difficulty in determining precisely how much of the tax each participant in the economy would bear should be noted. For example, a tax of \$100 per ton of carbon dioxide emissions would increase the price of oil or natural gas at the well-head by about fifty percent, but it is estimated that only half of this price increase would ultimately reach the retail consumer. CBO: CARBON CHARGES, *supra* note 8, at 21. Thus, the fact that the carbon tax is imposed on only one entity in the production line does not mean that entity will be discouraged more than others in the line from using fossil fuels. The ultimate incidence of a carbon tax may be affected only a little bit by choice of what entity should remit payment of the tax.

If the incidence of a carbon tax results in a tax-exempt entity bearing some portion of the tax, that entity should not receive a refund for the amount of tax borne. Tax-exempt entities should, like others, have a responsibility to make consumption decisions that further environmental goals.

70. See Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1587.

71. See generally *supra* note 68.

time to ensure that the government imposes the tax against the earliest owner that can successfully pass on the additional cost.

(2) Impose the Tax Later in the Production Process

As an alternative to taxing the entity that first brings the carbon fuel into the stream of commerce, the tax could be imposed at a later stage of production. The tax could be imposed on an entity that owns either the fuel or the goods produced by burning the fuel. The tax would be imposed on the middle- or end-user of the fossil fuel (i.e., either the producers of products that require fossil-fuel combustion for their manufacture or the ultimate consumers of those products). The rationale behind making a carbon tax payable by a middle- or end-user is that not all of the tax can be absorbed in the form of price increases when imposed at the mine-mouth, well-head or dock. When demand for a fuel is inelastic, the entity that first introduces it into the stream of commerce can pass increases in price on to purchasers. This allows the price increase caused by the tax to filter through all stages of production and to affect ultimate consumers' purchasing decisions, making energy-intensive products more expensive than those not requiring much energy input. When demand for an energy source is elastic, however, the entity which first introduces the fuel into the production process must absorb some portion of the tax to avoid reduced demand for the fuel. It cannot shift to purchasers the entire amount of the tax in the form of a price increase. This means that the fuel producer or importer may pay for environmental damage even though it does not actually burn the fuel. The ultimate burner or consumer of the fuel may bear only a portion of the tax and, hence, remain underdeterred from burning or consuming fuel (or from consuming goods whose manufacture requires the combustion of dirty fuels).

For revenue purposes, it does not matter whether energy consumers or those entities which extract or import the fuel bear the taxes. From an environmental perspective, however, conservation goals could be best promoted if the tax were borne by that entity which could decide whether or not to consume the energy or the energy-intensive good: the middle- or end-user. For this reason, it may make sense to design the tax to be imposed directly on the energy user (the producer or ultimate consumer of goods).

Imposing the tax late in the production cycle entails costs. It would be necessary to identify all the fuel users in order to maintain

a broad tax base.⁷² If many were missed, the resulting tax would necessarily have a narrower base than if it had been imposed at the beginning of the production cycle. It is also likely that there would be more taxable entities if the tax were imposed on middle- or end-users than if it were imposed on extractors and importers of fuel.⁷³ The greater number of potential taxpayers significantly complicates the administration and enforcement of the tax.⁷⁴ This complication provides another reason for imposing the tax when the fuel enters the economy rather than on middle- or end-users. A third problem with imposing the tax late in the production process occurs when the tax is imposed after non-fuel goods are produced by burning fossil fuel. The difficulty inherent in verifying what the fuel's carbon content had been prior to combustion would hamper enforcement of the tax.

b. Impose the Tax on More Than One Entity: The Carbon-Burned Tax (CBT)

The two choices described above concerning whom to tax both provide for the taxation of only one entity along the production process. The value-added tax (VAT) provides some useful concepts for determining an alternative scheme for how to design a carbon tax. Instead of imposing a carbon tax on only one entity along the chain of production, it is possible to employ a method analogous to the VAT subtraction method. Both sales and use of fuel would be tracked throughout the production process. Under this method the government could impose the tax on more than one entity per use of fuel. Each and every entity that burned any carbon fuel would be responsible for paying the carbon tax no matter where along the production process they are located. An appropriate name for such

72. See Charles Komanoff, *Instead of a Gas Tax, How About a Carbon Tax?*, WASH. POST, Mar. 6, 1989, at A15. Komanoff suggests that if all of the following end-users were taxed, a relatively broad tax base could be maintained: gasoline consumers; electricity users; industry, office and home users of natural gas; truck and jet fuel users; petrochemical companies; home users of heating oil; and steel producers which consume coal.

73. *But see* Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1588. Taxing natural gas at the well-head is difficult because currently that industry includes a large number of small producers at the well-head stage of production. Still, the number of producers compared to the number of middle or final users of fuel may be small.

74. See CBO: REDUCING THE DEFICIT, *supra* note 47, at 428. To avoid evasion problems, the best administrative alternative is to impose the tax at the stage in which the fewest entities would be taxed. The report suggests that in the fossil fuel industries, fewer entities would be taxable at the stage where fuel enters the stream of commerce than at the ultimate retail level.

a tax is the "Carbon-Burned Tax" (CBT). Each taxpayer is taxed on the fuel its burns.

A CBT would work similarly to a VAT by taxing entities at each level of production. It would differ from a VAT in that it would be based on *volume* of fuel burned rather than on *value* added from fuel use. It would also differ from a VAT in that each entity would be taxed on volume of fuel purchases less volume of fuel sales, rather than value of sales less value of purchases of goods.

The rationale for taxing carbon fuels in this fashion would be that, under a CBT, the charge for emitting carbon dioxide into the atmosphere would be imposed directly on the entity that actually burns the carbon fuel and in proportion to the amount of carbon dioxide that party releases. The tax is paid by the burner of the fuel, the party who, over the short-run and to a greater extent over the long-run, has the power to decide: (1) what kind of fuel to use (a dirty fuel that contributes greatly to carbon dioxide emissions or a clean fuel); and (2) whether or not to implement energy-efficient equipment or equipment which can substitute clean for dirty fuels. By taxing all fossil-fuel consumption, a CBT remains broad-based, yet by taxing many entities along the production process, the ultimate consumer may bear a greater share of the tax than in the case of a tax imposed only at the mine-mouth, the well-head or the dock.⁷⁵ Therefore, demand for energy-intensive goods would drop and demand for energy-thrifty goods would increase. Thus, a CBT offers the advantages of being relatively broad-based *and* of being able to change the relative consumer prices of goods and fuel, which would in turn lead to environmentally sound shifts in consumption decisions.

(1) Functioning of the CBT

For a clarification of how a CBT would work, consider the following examples. In the utility context, the utility company could buy carbon fuel from any source. Since the fuel has not yet been burned, it will not yet have been taxed.⁷⁶ Upon purchase of the fuel, the utility company would incur a carbon tax based on the carbon content and volume of fuel purchased. The utility company would then burn the fuel to generate electricity for resale. When the utility sells electricity to consumers, it would not receive any

75. The ultimate incidence of the tax may or may not be shifted. See *supra* notes 68 and 69.

76. Actually, the seller of this fuel would be taxed when it got possession of the fuel, but it would receive an offsetting credit when it resells the fuel.

credit offsetting its tax liability because the energy it resells does not contain any carbon. The consumption of electricity would not, in itself, trigger any carbon dioxide emissions.

Since utilities are regulated, it should be easy to impose the tax on them and to collect it. They should be permitted to increase their rates to some extent to shift the tax burden to consumers so that electricity consumption would drop accordingly. This reduced electrical output would permit utilities to decrease the quantities of fossil fuels they burn. Hence, carbon dioxide emissions would decrease accordingly.

Utilities would also be encouraged to substitute cleaner fuels for coal. Since a carbon tax would tax coal more heavily than any other energy source, the price increase of electricity to consumers would be greatest for coal-burning utilities. Consumers of electricity produced with coal will cut electricity consumption by a relatively greater amount than would consumers who use electricity generated with cleaner fuels. Thus, coal consumption would drop more than would consumption of those cleaner fuels: a desirable result from an environmental perspective.

To the extent the utility is not allowed to shift the entire tax to consumers, the utility company, too, will have an incentive to modify its behavior. Over time it will install new equipment permitting it to use cleaner fuels and to improve efficiency in generating electricity.⁷⁷

In the transportation context, a CBT would have similar pro-environment effects. The transporter of goods or people would incur tax liability upon purchasing carbon fuel.⁷⁸ The transporter then burns the fuel in transporting the goods or people. Since the transporter cannot resell the fuel once burned, no offsetting credit for that fuel would ever be received. The transportation company would be liable to the government for the tax on the volume and carbon content of the fuel used.

The transporter should then increase prices to pass on to customers the added cost of the tax. For example, orange sellers' shipping costs would increase, and oranges should become more expensive as a result. Once the prices of transported goods and of train or airplane tickets increase, the ultimate consumers of these goods and services will shift consumption away from those whose prices have

77. See generally Matthew L. Wald, *Utilities Given a Warning*, N.Y. TIMES, Mar. 4, 1991, at D3.

78. See *supra* note 76 and accompanying text.

increased the most to those whose prices have not increased or have risen less. Decreased consumption means a decrease in carbon dioxide emissions. Also, decreased demand for their products will encourage transporters who use dirty fuels to substitute cleaner fuels to improve fuel efficiency. The result should be reduced carbon dioxide emissions and increased achievement of environmental goals.

(2) Enforcement of the CBT

Under the CBT, enforcement could be accomplished through the implementation of additional reporting requirements. Companies would have to report to the government the volume of any fuel purchases and sales. The excess of volume purchased over volume sold would represent each entity's fuel consumption. Some of that fuel was burned and thus emitted carbon dioxide into the atmosphere. Some of that fuel may have been used as a feedstock.⁷⁹

In implementing a CBT, it would be necessary to verify quantities of fuel purchased and sold⁸⁰ to counter taxpayer incentives to underreport fuel purchased and to overreport fuel resales. As an aid to verification, all taxpayers should be required to report their purchases *and* sales of carbon fuels. Sellers would have to report to the government the identity of the entity that purchased fuel from them (providing the taxpayer identification number of the purchaser), the type of fuel sold and the quantity. Purchasers would have to report what types and what quantities of fuel they have

79. Using fuel as a feedstock does not require its combustion. The fuel is simply used as an ingredient in a product. Since fuel is not burned, carbon dioxide is not released into the atmosphere. Therefore, under the theoretical rationale for the carbon tax, it does not make sense to tax the feedstock use of carbon fuels. See Hoerner, *Energy Taxes Would Hurt*, *supra* note 47, at 1215. If, however, policy makers were more concerned with resource conservation than carbon dioxide emissions, taxation of fuels used as feedstocks would be proper. The use of carbon fuels as feedstocks is common in a number of industries including chemicals, steel, and plastics. For discussion of carbon use in the chemical industry, see *id.*; *Treasury Tax Correspondence, Dow Chemical Opposes Proposed Fossil Fuel Tax as Anti-Competitive*, TAX NOTES TODAY, July 10, 1990, available in LEXIS, Fedtax Library, TNT file; CBO: CARBON CHARGES, *supra* note 8, at 18. For discussion of carbon use in the steel industry, see Daniel F. Cuff, *Union Carbide Recasts Itself*, N.Y. TIMES, Oct. 10, 1984, at D1; *LTV Corporation Opposes Carbon Tax, Btu Tax, and Virgin Materials Tax*, TAX NOTES TODAY, July 12, 1990, available in LEXIS, Fedtax Library, TNT file. For a discussion of carbon use in the plastics industry, see telephone interview with Pat Toner, Society of Plastics Industry, Jan. 10, 1992 (asserting that as much as half of the Btu input of energy used in the plastics industry is used as feedstock rather than combusted); CBO: CARBON CHARGES, *supra* note 8, at 18. The design implications of using fuel as feedstocks are discussed *infra* section II.C.2.

80. Verification of the amount of fuel that producers use as a feedstock will be addressed *infra* section II.C.2.

bought and the taxpayer identification numbers of their fuel suppliers. For imported fuel, obtaining an import license could be made conditional on the foreign entity disclosing similar information. Verification of any fuel exports might be required by export authorities to ensure that the quantity and fuel type have not been misrepresented.

Through this dual reporting requirement, the government would be able to cross-check buyers' purchases against sellers' sales. In this way the reporting system could ensure that no individual fuel user underreports the volume of fuel purchased or overreports the volume of fuel sold. For transactions that do not match, the government could audit the two entities involved.

The system of cross-checking eliminates taxpayer incentive to misreport volumes of fuel purchased or resold. Purchasers will not be able to underreport the volume of carbon fuel that they have purchased because to do so would require the seller to underreport the amount of fuel sold. The seller, however, will not do this, because to do so would increase its tax burden.⁸¹ The seller's incentive to overestimate the quantity of fuel it resells is counterbalanced by the buyer's interest in monitoring the seller to make sure the buyer's purchases are not overestimated. Seller overestimation of sales remains a problem only in those instances in which the buyer cannot effectively monitor the seller to ensure that the buyer receives the correct amount of fuel.⁸²

81. Only when the seller and purchaser are subject to different rates of tax on the fuel in question would they both have an incentive to misreport a transaction. Suppose that a seller had to pay a low tax rate on fuel consumption while its buyer had to pay a high tax on fuel it burned. Both parties would have an incentive to underreport the volume of fuel transferred from the seller to the buyer. The seller would be assumed to have consumed more fuel than it actually did (and its tax burden would increase) but jointly the parties would minimize their tax burden because the increase in the tax payable by the seller would be more than offset by the decrease in tax owed by the buyer. Presumably the buyer would make a side-payment to the seller that would enable the two parties to split the tax savings. The incentive for this type of misreporting of transactions impedes designing a carbon tax in which different rates would apply to different entities. Hence, it is difficult to design a carbon tax that is *directly* progressive. See *infra* sections II.C.3.b.(3) and (4) on the regressivity of a carbon tax.

82. One example of such an instance is at the retail level: gas stations. In this context legislation can be easily enacted and implemented to protect the consumer. Many states already have extensive motor-fuel monitoring programs. Enforcement agents already spotcheck gas pumps to make sure that fuel quality matches the octane rating advertised. In some states these same enforcement agents also check to make sure the pump correctly measures the volume of gasoline expelled. See, e.g., 1991 Conn. Act 91-322 (Reg. Sess.); CONN. GEN. STAT. §§ 16a-14b, 16a-15 (1990); MINN. STAT. § 325E.09 (3) (Supp. 1991); MISS. CODE ANN. § 75-55-6 (1990); TENN. CODE ANN. § 47-18-1305 (1991). The Environmental Protection Agency has also spotchecked fuel

The double-reporting method of promoting CBT compliance cannot work if there is no entity against which to cross-check a firm's purchase or sale of fuel. For example, the taxpayer that extracts coal from a mine does not obtain that coal from a seller; therefore, no seller would report the amount of coal to which the taxpayer has access. To eliminate or reduce its tax burden, this taxpayer will have every incentive to underreport the amount of coal extracted up to the amount it actually burns. Thus, to capture the tax that importers and extractors should have to pay on the fuel they burn, it would be necessary to police directly the amount of fuel extracted and/or imported. This policing function would also have to be carried out in a mine-mouth, well-head or dock tax, as well as under a CBT.

Inter-agency cooperation between the Internal Revenue Service and Customs officials would be the appropriate mechanism for policing the volume and type of fossil fuels imported into the United States.⁸³ Similar cooperation between the Internal Revenue Service and the Environmental Protection Agency could facilitate policing the quantity of natural resources that are extracted from the ground domestically. Foregoing the tax due by extractors who consume some of the fuel they produce may mean only modest revenue reductions. However, such foregone revenue would directly subsidize the very firms that should not (for environmental reasons) receive governmental subsidies, the fossil-fuel industries.

The end of the chain of production also presents an enforcement problem under the CBT scenario. This problem occurs only when fossil fuels are sold on a retail level to mass market consumers and exists because imposing a reporting requirement on purchasers who are ordinary consumers is unrealistic. Even if receipts correctly identify the type and amount of fossil fuel purchased and the taxpayer identification number of the seller, taxing ordinary consumers is highly impractical. For example, when consumers line up at the pump to purchase gasoline, they are unlikely to save their receipts.

quality at the gas pumps. See William R. Greer, *Of Pings, Pumps and Mislabeled Gasoline*, N.Y. TIMES, Apr. 6, 1986, § 4, at 5.

83. For instance, currently under I.R.C. §§ 4611(c)(2)(B), 4611(f), 9509 (1990) (providing for the Petroleum Excise Tax for Oil Spill Liability Trust Fund), a tax is imposed on both domestic and imported crude oil. The tax on the imported oil "is imposed on the person importing the product into the United States for consumption, use, or warehousing." JOINT COMMITTEE ON TAXATION, PRESENT LAW AND BACKGROUND RELATING TO FEDERAL ENVIRONMENTAL TAX POLICY (JCS-6-90), Mar. 1, 1990, at 10 [hereinafter JCT: FEDERAL ENVTL. TAX POL'Y]. The same enforcement mechanism used to ensure the collection of this tax could be used to ensure the collection of the carbon tax on imported fossil fuels.

The large number of such fuel transactions per year makes reporting them on tax returns administratively burdensome and for all practical purposes makes the reporting requirement impossible to enforce. As a matter of administrative convenience, the best solution to this problem may be to presume that all fuel sold on the retail mass market will be burned and will emit carbon dioxide into the atmosphere. Instead of imposing the tax on the taxpayers who actually burn the fuel, it may be easier in this instance to impose the tax on the retail sellers. Thus, retail sellers of fuel would not be permitted to reduce volume of fuel purchased by volume of fuel sold to determine the amount of fuel on which they should be taxed. They would be taxed on the entire volume of fuel purchased. Retailers would then increase fuel prices so that at least part of the tax would be borne by the ultimate consumers, those who burn the fuel.

No similar problem occurs in the electric utility sector because utilities burn all their carbon fuel before the electricity produced reaches ordinary consumers. The problems at the gas pump, described above, are associated only with sales of unburned fuel made directly to mass retail consumers. Therefore, such problems should not occur in the production of electricity. The distributors of electricity buy finished non-fossil-fuel goods and thus have no purchases of unburned carbon fuels to report. Likewise, the sellers of these goods cannot report having sold any unburned carbon fuel, and hence, cannot claim any credit. At this stage of production, all fuel has been burned, and thus, all CBT has already accrued.

This end-of-production problem with the CBT would not arise for retail sales of non-fuel goods that are produced with electricity or from the combustion of fossil fuels. In both of these situations, all fossil fuels have already been burned and, thus, all carbon taxes have already accrued before any mass retail market becomes involved. The sale of a non-fuel product will not trigger an increase in volume of carbon fuel resold because no fuel with the potential to release carbon dioxide into the atmosphere will have changed hands. Likewise, the purchase of the good will not trigger the buyer to report any extra volume of carbon fuel purchased. Similarly, a manufacturer's use of electricity would not be a taxable event to that entity under a CBT because the electricity purchased does not emit carbon dioxide when consumed. The manufacturer would not recognize any volume purchased, and so the utility company could not claim a credit for any volume sold.

c. Conclusions Regarding Where in the Production Cycle a Carbon Tax Should Be Imposed

Determining on whom a carbon tax should be imposed is a complicated task. The determination depends on a number of factors. Among them are: how much of the tax (when imposed at various stages of production) is likely to be passed all the way to ultimate purchasers of goods and thus how much the tax can be expected to shift consumption decisions toward more environmentally sound items; how many entities will be subject to tax (administrability); whether or not some independent means for verifying the volume of fossil-fuel combustion exists at the stage proposed to be taxed (enforcement); how broad-based the tax will be if imposed at one point of production but not at others; and whether or not imposing the tax at a certain point will influence fossil fuel burners to switch to cleaner fuel sources and more efficient equipment. To answer these questions fully would require economic models estimating the incidence of a carbon tax. Such models are beyond the scope of this article.

Even without knowledge of the precise incidence of the tax, it seems qualitatively correct that a CBT would serve conflicting goals: maintaining a broad tax base and potentially influencing both burners' production and ultimate consumers' consumption decisions. Additionally, through the use of a cross-reporting system, taxpayers would know that revenue officials have the means to check their self-reported figures of volume purchased and volume sold. This knowledge would serve as a check against the tendency to underreport tax liability, thus improving both administrability and enforcement of the tax.

2. Feedstocks

If the government implements a system taxing fossil fuels prior to their use, the potential for overtaxation exists since many fossil fuels are not burned but are used as ingredients in the production of goods. Whenever a fuel is taxed, and that tax is passed on to a purchaser in the form of a higher price, that buyer bears the burden of the tax. Under a carbon tax, many manufacturers would purchase fuel at a price that takes into account the tax and that presumes use of the fuel in a way that pollutes. However, many manufacturers would then use the fuel as a feedstock. Those manufacturers will have paid for the environmental damage of burning

the fuel without having burned it.⁸⁴ Given the rationale underlying the carbon tax, it becomes necessary to refund the tax collected on that amount of fuel. If administratively feasible, the government should allow the feedstock user to claim a refundable credit by subtracting from its tax bill the amount of fuel used as feedstock multiplied by the appropriate tax rate.⁸⁵

Administration of a feedstock credit would be quite difficult. Under the current self-reporting system, manufacturing companies could and would have every incentive to overestimate the quantity of fuel used as a feedstock per item produced. Additionally, the business could attempt to evade taxes by claiming to have used a high-carbon (and, therefore, highly taxed) fossil fuel as a feedstock when it, in fact, used only a low-carbon fossil fuel. As a result, it would receive an excessively large credit. This example of evasion could appear whenever a product could have been manufactured using substitute types of fuel as feedstocks.

These taxpayer abuses would be difficult to detect. Accurately determining, by mere inspection, which fossil fuels are in a piece of steel is an ambitious task.⁸⁶ Trying to determine the relative quantities of each fuel further complicates the determination. For example, many different grades of steel contain different relative amounts of fuels as ingredients. Enforcement of the feedstock credit would require extensive laboratory testing of manufactured products. In many cases even laboratory testing would not sufficiently reveal how much fuel has been used as a feedstock. Taxpayer overestimation of this amount results in an equal underestimation of the amount of fuel actually burned. This type of tax evasion would lead to the undertaxation of carbon dioxide emissions.

The government could combat this undertaxation in two ways. First the government could prohibit any feedstock credit. This would simplify administrability and ease enforcement, but would compromise theoretical soundness and would adversely and inequi-

84. See Hoerner, *Energy Taxes Would Hurt*, *supra* note 47, at 1215.

85. The Internal Revenue code currently taxes similarly those chemicals that are used as feedstocks in the context of the excise tax on ozone-depleting chemicals (I.R.C. § 4681 (Supp. 1991)). The tax on ozone-depleting chemicals does not apply to those used as feedstocks in the production or manufacture of other chemicals if the "ozone-depleting chemical is entirely consumed in the production of [the other] chemical [and if the production of that other] chemical does not involve releasing an ozone-depleting chemical into the atmosphere." See JCT: FEDERAL ENVTL. TAX POL'Y, *supra* note 83, at 13.

86. Letter from Maxine C. Champion and Nicholas C. Tolerico, LTV Corp., to Kenneth W. Gideon, Assistant Secretary for Tax Policy, U.S. Dep't of the Treasury (July 12, 1990), summary available in LEXIS, Fedtax Library, TNT File, 90 TNT 167-44.

tably affect those industries that use substantial amounts of fossil fuels as feedstocks (e.g., the plastics, steel, and chemical industries).

An alternative solution would be to establish a system to prevent the potential misreporting abuse. An example of such a system would be a set of presumptions (probably set out by regulation) regarding how much of each type of fossil fuel is normally used as a feedstock in various manufactured intermediate goods. Estimates for presumptions of the quantity of fossil fuel used as a feedstock should be on the low side. To rebut such a presumption, manufacturers would have to prove use as a feedstock to the satisfaction of the Secretary of the Treasury for any fuel in excess of the presumed level. By setting the presumption levels low, companies which use less than the average amount of fuel as a feedstock would not get the benefit of an excessive credit.

If the government designs a tax that allows a credit for the feedstock use of carbon fuels, and if the government does not choose a CBT tax, the following problem arises: the fuel producer would likely bear some of the tax if it were unable to pass all of it on to the fuel purchaser due to elastic demand, for example. If the purchaser later used that fuel as a feedstock, the purchaser should not get the benefit of the entire feedstock credit. The ensuing credit should be split between the producer and the burner in proportion to their relative burdens under the tax.

It would be very difficult, however, to determine the correct proportion for splitting the tax credit. From a revenue perspective, if no multiple-rate structure has been instituted in an attempt to make the tax progressive, it does not matter that the "wrong" person bears the tax. Total tax revenue will not change. From the perspective of serving environmental goals, declining to split the credit between fuel producer and feedstock user may not be harmful: the entity that gets the benefit of the full credit (the one that uses the fuel as a feedstock) is taxed proportionately less than firms which burn all their fuel. This creates an incentive to use fuel as a feedstock rather than to burn it, especially where there is a choice. Since use as a feedstock does not contribute to carbon dioxide emissions, this incentive enhances environmental goals.

The party harmed by not allowing a split of the tax credit is the fuel producer (or the party on whom the original tax was imposed). The economic harm to producers should be weighed against the massive administrative costs associated with trying to split the credit fairly. Since administrative costs are likely to outweigh any benefit to producers, the credit probably should not be split.

Even under a CBT, it would make sense to split the feedstock credit among the feedstock user (F) and the previous owner (P) of the fuel. Even though P received a credit when it sold its unburned fuel to F (and, therefore, P paid tax only on the fuel *it* burned), the sale price of the fuel P sold to F could have been suppressed because of the existence of the carbon tax, which diminishes the value of dirty fuels. To the extent that the price was lower than it would have been absent a tax, P bore the carbon tax imposed on F. Since F used the fuel as a feedstock and did not pollute, that fuel should not have been taxed. Theoretically, P and F should split the ensuing feedstock credit in proportion to their respective burdens under the tax. Determining the actual incidence of the tax, however, is administratively impossible. As in the non-CBT scenario, prohibitively expensive administrative costs indicate that the feedstock credit should not be split.

3. Addressing the Regressivity of a Carbon Tax

a. Is the Carbon Tax Regressive?

Much of the political opposition to a carbon tax centers around the claim that, as a flat tax, it acts in a highly regressive manner. Energy expenditures appear to account for a greater proportion of income for low-income households than for those with high incomes.⁸⁷ If the rich and the poor both use one gallon of gasoline to drive to work or one hour of electricity to run a heater, the tax applies regressively since both individuals shoulder the same tax burden. The degree of regressivity of a flat carbon tax is, however, subject to debate. Measuring consumption by using the “life-cycle” or “permanent-income” method rather than the traditional “annual-income” method may be a more reliable means of determining how different households are affected relative to each other and how regressive a tax actually results.⁸⁸ Although the “life-cycle” and

87. Corcoran & Wallich, *supra* note 15, at 171.

88. See James Davies et al., *Some Calculations of Lifetime Tax Incidence*, 74 AM. ECON. REV. 633 (1984); James M. Poterba, *Lifetime Incidence and the Distributional Burden of Excise Taxes*, 79 AM. ECON. REV. 325 (1989). These measures may be more reliable than the traditional annual income measure because the year-to-year variation in a household's *consumption* is not necessarily directly related to the household's annual variations in *income*. The economic assumption is that individuals set their levels of consumption on the basis of their expected long-run incomes (not on what their current incomes happen to be). They can do this because of the ability to borrow money to finance current consumption when cash is short in the near term and they expect larger future income and because of the ability to save when current income exceeds expected long-term income. Essentially, it is presumed that individuals make consumption decisions based on their expected average income over their life-cycle.

“permanent-income” measures indicate that a carbon tax will apply somewhat regressively, the *degree* of regressivity will be much less than the traditional measure suggests.⁸⁹

Additional factors make the carbon tax less regressive than claimed by some on Capitol Hill. First of all, opponents of the tax ignore the fact that a tax becomes less regressive if it successfully shifts behavior.⁹⁰ If low-income households improve their energy efficiency in response to higher fuel costs, they will reduce their tax by cutting consumption. Currently feasible ways to shift behavior include insulating one’s home (so that electric heat could be set lower and used less), car-pooling, and using mass transit more often. A carbon tax would be less likely to encourage the wealthy to conserve energy because the wealthy can more easily afford price increases in fuels such as home-heating oil. They may willingly pay the additional charges rather than conserve by insulating their houses or by driving more fuel-efficient cars. If a carbon tax encourages a greater shift in behavior among lower-income households than among wealthier ones, that mitigates the regressivity of the tax in dollar terms.⁹¹

Those who emphasize the regressivity of a carbon tax also fail to consider the possibility that corporate producers of goods and fuel producers will bear a substantial portion of the tax burden. If this turns out to be the case, then it can be argued that wealthy owners of close corporations and well-off stockholders of publicly traded companies will bear a large burden of the carbon tax. For example, airlines may not be able to pass on the entire cost of the tax in the form of higher prices of tickets. If so, airline owners will bear the tax burden in the form of smaller dividends or a lower return on

89. See CBO: REDUCING THE DEFICIT, *supra* note 47, at 424.

Some economic studies conclude that a tax imposed on gasoline would, under the life-cycle measure of income, actually be somewhat *progressive*.

[L]ow-expenditure households devote a *smaller* share of their budget to gasoline than do their counterparts in the middle of the expenditure distribution. Although households in the top five percent of the total spending distribution spend significantly less on gasoline (as a share of expenditures) than those who are less well-off, gasoline’s expenditure share is much more stable across the population than the ratio of gasoline outlays to current income.

JAMES M. POTERBA, IS THE GASOLINE TAX REGRESSIVE?, (Nat’l Bureau of Economic Research, Massachusetts Institute of Technology Working Paper No. 3578, 1990).

90. Robert D. Hershey, *The Budget Agreement: Who Will Pay? Tax Burden Expected to Fall on People of Moderate Means*, N.Y. TIMES, Oct. 2, 1990, at 1A.

91. Of course, if the wealthy are the only individuals who can afford to change their behavior, then the tax might increase regressivity. Although regressivity might be mitigated should the poor shift behavior more than the rich, the shift itself represents an added burden on the poor. In this sense a carbon tax remains regressive.

investment. Under this scenario, the tax would not be as regressive as some in Washington claim.⁹² Additionally, a greater increase in the price of luxury goods than in the cost of "necessities" might reduce regressivity.⁹³

Political opposition, rather than good-faith concerns about the vertical inequities of the tax system, appears to be the motivating force behind arguments that carbon taxes are regressive. Taxes that are more regressive than a broad-based carbon tax currently exist (e.g., the social security payroll tax).⁹⁴ No serious political action has been taken to eliminate them or to make them less regressive. The regressivity justification for opposing carbon taxes seems hollow and has probably been emphasized more because of its rhetorical effect than because of any desire to institute sound tax policy.

b. Dealing with Regressivity

(1) Use of a Broad Base

Although a carbon tax is probably more progressive than traditional economic measures and current political rhetoric would indicate, it likely retains some regressivity. This regressivity could be addressed in a number of ways. The first way to minimize the regressivity of a carbon tax is to broaden its base as much as possible.⁹⁵

(2) Use of Companion Measures

The second way to reduce the possible regressive impact of the carbon tax would be to enact companion measures unrelated to the underlying purpose of the carbon tax. These would not be provisions which make the carbon tax directly progressive, but rather, ones that accomplish that goal indirectly. Companion measures are simply independent tax provisions which make the tax system as a whole more politically palatable, offsetting any vertical inequities which a pure carbon tax alone might impose. Examples of such companion measures include: reducing social security taxes (and

92. It should be noted that other corporate stakeholders could bear the burden of any tax borne by the corporate entity. If this were the case, a carbon tax falling on corporate producers of goods or of fuels may ultimately fall on lower-income employees rather than on upper-income households and could thus remain regressive. To determine the incidence of a carbon tax requires economic studies beyond the scope of this article.

93. Corcoran & Wallich, *supra* note 15.

94. See *Red Ink, Green Taxes*, *supra* note 15, at 11.

95. See *supra* notes 47-55 and accompanying text.

other highly regressive taxes);⁹⁶ providing a refundable tax credit for low-income individuals;⁹⁷ providing direct subsidies for those households in the lowest income brackets (those households which earn so little that they are not required to file returns at all); and/or instituting more progressive income tax rates, provided that the carbon tax can raise sufficient replacement revenue.⁹⁸

(3) Direct Progressivity Through a Multiple-Rate System

A multiple-rate tax system may provide a third way of making a carbon tax progressive, whether imposed on one entity or on many. A carbon tax would be imposed on fossil fuels (yet to be burned or already burned) at the stage where the finished good first becomes identifiable. A classification system differentiating among necessities, discretionary goods and luxury items would have to be developed, and the regular carbon rates would be multiplied by low, medium, or high product rates, respectively. Necessities would be taxed at the normal carbon rate, and luxury goods would be taxed at much higher carbon rates.

However, definitional and cultural problems concerning how to classify goods make this system difficult to implement.⁹⁹ It would also be difficult to administer because of the need to delay taxing fuel that has already been burned until the authorities can determine what kind of good will ultimately be produced. Much fuel would be burned in the production of intermediate goods (i.e., steel) before the proper rate of taxation for that combustion would be

96. See Dower & Repetto, *supra* note 9, at 712; see also Edward P. Jones, *Komanoff Proposes a Carbon Tax*, 42 TAX NOTES 1524 (1989) (citing Roger Sant of the Environmental and Energy Study Institute (EESI)); *Red Ink, Green Taxes*, *supra* note 15, at 11.

97. Sandra Postel & Christopher Flavin, *Reshaping the Global Economy*, in 1991 STATE OF THE WORLD, 170, 182-83 (Lester Brown ed., 1991); telephone interview with Marnie Stetson, Technical Staffer of Worldwatch Institute (Feb. 15, 1991).

98. See GORDON, *supra* note 5, at 180-81; Postel & Flavin, *supra* note 97, at 182; see also Tim Gray, *Downey and Gore to Propose Broad-based Energy Tax*, 50 TAX NOTES 1215 (1991); Gray, *White House*, *supra* note 15, at 813-14.

99. For example, is electricity a necessity or a luxury? If used for a lamp, most would agree that it is a necessity. If used to power a private greenhouse, many would call it a luxury. No desirable way of differentiating among consumer uses of electricity currently exists. Hence, a multiple rate system would, in this context, be both theoretically and pragmatically difficult to implement. Uses of transportation fuels pose the same classification difficulties. If someone flies across the country to attend a relative's funeral, that individual's use of the jet fuel might not be considered extravagant. On the other hand, a Sunday drive through the country could be considered a luxurious and wasteful use of transportation fuel. The above examples illustrate that cultural values (which vary across the taxable population) will affect whether or not an individual considers some specific use of fuel to be a luxury or a necessity. This complicates the fair implementation of a multiple-rate system as well as its enforcement.

known.¹⁰⁰ Under a CBT, producers of such goods would not know their tax liability until after they sold their finished product. This makes it difficult for the producers to pass their tax liability through to the purchaser of the intermediate good because they will not know how much they should increase their prices. Because authorities would have to defer taxation under a multiple-rate system until the final product of fuel consumption could be identified, a multiple-rate system should not be undertaken. A differential-rate sales tax would probably be a more effective and easily administered method of importing progressivity directly into a carbon tax. Such a sales tax would, however, retain the problems inherent in trying to classify goods as luxuries, necessities, or other subcategories.¹⁰¹

(4) Problems with Direct Progressivity

There exist several major obstacles to making a carbon tax *directly* progressive, as opposed to enacting companion measures to accomplish the same goal indirectly. The difficulties are present whether the government imposes the tax on one entity or on many (as in the CBT). The first problem relates to the theoretical purpose of a progressive system. Progressive taxes should improve the standard of living of the poor relative to that of the wealthy. Standards of living apply to people, not to corporations. Therefore, it makes little sense to import progressivity into the corporate tax rates. This is especially true since individuals ultimately bear the impact of corporate taxes and these individuals' relative wealth cannot be predicted in advance (i.e., they could be low-wage workers or wealthy corporate owners).

Inevitably, companies would bear some portion of a carbon tax somewhere along the production line.¹⁰² If carbon levies tax more heavily those goods designed to be consumed only by the wealthy, then wealthy consumers will bear the tax only to the extent that the charge can be passed along to them in the form of price increases.

100. It should be taxed at luxury rates if used to produce a luxury car but should be taxed at low rates if used to produce a more practical car.

101. For example, foods are normally considered necessities. Yet, within the broad category of food there are "staples" such as potatoes and "luxuries" such as chocolate. Who should determine what constitutes a staple and what constitutes a luxury? Also within the same type of good, there is product differentiation. Some varieties of the good are marketed to the wealthy; some are not. Should different varieties of mushrooms be classified differently according to whether an agency employee considers a "normal" mushroom to be sufficiently different from a "gourmet" mushroom? How fine-tuned should a classification system attempt to be?

102. Not all of the tax would be passed on to final consumers in the form of price increases because of elastic demand, for example.

If part of the tax were borne by a producing company, and then ultimately by the company's low-wage workers, the tax would be highly regressive. Lower taxes on necessary items, which the poor purchase in greater proportions will result in lower relative costs to the poor only to the extent that the smaller price increase is passed on to them. Yet a portion of the low tax on necessary goods will be borne by the producing companies rather than by ultimate consumers. Assuming that the beneficiaries of the lower rate own the companies, the progressive rate structure creates a perverse result. The owners of production, who may be wealthy, would be taxed at a low rate because the incidence of a carbon tax falls partly on the producer, not entirely on the ultimate consumer. The progressive rates would not effectively be coordinated with the wealth of the person who ultimately bears the tax. Thus, the multiple-rate system may well fail to serve vertical equity.

For similar reasons, it would make no sense to tax producers at different rates based on the volume of carbon fuel they use. The amount of fuel burned by a company has no relationship to the wealth of the person who ultimately must bear the tax burden. These problems illustrate the absurdity of making carbon taxes directly progressive when imposed on a corporate entity rather than on individual consumers of fuels, manufactured goods and services (according to the wealth of the consumer).

A directly progressive carbon tax would pose a second problem by creating the potential for tax avoidance, which exists in any multiple-rate tax system. Assume that the fuel burner is the individual on whom the tax is imposed and that taxes are directly progressive based on the Adjusted Gross Income of the taxpayer. The more net income a company generates, the greater the rate of carbon tax which would apply to the company. One tax avoidance technique that could arise would be the unreported resale of fuel from low-rate companies to high-rate entities. The unreported resale would be accompanied by a side payment from the high-rate to the low-rate business, representing a division of the net tax savings occurring because of the transaction. The two companies would jointly save taxes at the government's expense. This problem could probably be addressed only through litigation.¹⁰³ This ineffective and inefficient means of dealing with unreported fuel resale weighs

103. Administrative functions similar to those performed in antitrust enforcement concerning the existence of an agreement, either tacit or express, would have to be undertaken in order to combat the problem.

against instituting progressivity into a carbon tax directly, especially since the tax can be made less regressive through indirect means.

Another tax avoidance technique that would invariably emerge under a directly progressive carbon tax is the recurring problem of income splitting. Assuming the same facts as in the above explanation, single entities would divide themselves into many corporate bodies, each small enough to ensure lowest-bracket net income. Any fuel burned would thus be taxed at the lowest possible carbon rate. This problem could be combatted either through litigation to prove intent,¹⁰⁴ by requiring a calculation of the carbon tax liability as though a consolidated tax return were filed, or by requiring all affiliated companies to use the same tax identification number for fuel-combustion purposes.

c. Conclusions Regarding the Regressivity of the Carbon Tax

Companion measures offer the best way to improve the progressivity of a carbon tax.¹⁰⁵ Designing a directly progressive carbon tax poses difficult administrative, theoretical and enforcement problems. Companion measures may provide more efficient and effective means for introducing progressivity into the tax system as a whole. Care should be taken in setting each measure, however, because each method can only roughly offset carbon-tax regressivity.

4. The Threat to International Competitiveness of a Carbon Tax

a. What Is the Effect on International Competitiveness?

Opponents of a carbon tax argue that its imposition would detrimentally affect the ability of U.S. companies to compete internationally. Those U.S. companies which burn carbon fuels to produce goods would see their costs increase as a result of the tax. Corporate advocates warn that either the resulting increased prices of U.S. goods would render those goods uncompetitive with foreign-made goods¹⁰⁶ or the manufacturer, in order to maintain current relative prices and to compete against foreign substitutes, would have to

104. Litigation would be an expensive and relatively ineffective method for combating this problem.

105. See *supra* text accompanying notes 96-98, 102-04.

106. Assuming equivalent total non-tax input costs, untaxed foreign goods would be cheaper both here and abroad than domestically-produced goods subject to the tax. Thus, for goods which compete on world markets, consumption would shift from those goods subject to the U.S. carbon tax to those goods which are not. To the extent that a carbon tax increases the domestic costs of production significantly, there would be an incentive for companies to move production facilities overseas. These companies would

bear the entire cost increase due to the tax. This would decrease profitability in such companies. For already floundering industries, any decrease in sales or in profitability could mean doom.¹⁰⁷

Some commentators suggest that it is fair to tax domestic producers of goods because many foreign producers must already pay large energy taxes.¹⁰⁸ Though a carbon tax would put U.S. companies "on par" with their foreign competitors in this regard, it is still arguable that the adverse effect of the tax on domestic producers would *not* be equitable. This would be the case, for example, if energy taxes imposed overseas were less than the proposed domestic tax. Currently only Sweden and Finland have set their fuel taxes high enough to account for the environmental damage associated with carbon dioxide emissions.¹⁰⁹ Other countries have not set their energy taxes sufficiently high. Therefore, an energy tax in the U.S. set at the "correct" level¹¹⁰ would exceed that which most foreign producers must pay. Imposition of a domestic carbon tax on U.S. producers would tend to exacerbate the harm to U.S. competitiveness that is already aggravated by other factors such as exchange rates and the higher domestic costs of many non-energy inputs.¹¹¹

then import the untaxed goods for consumption in the U.S. Of course, this method of tax avoidance would also exacerbate domestic unemployment.

107. See *supra* note 86.

108. 137 CONG. REC., H1109, 1110 (daily ed. Feb. 21, 1991)(statement of Rep. Stark). See also GORDON, *supra* note 5, at 49.

109. James M. Poterba, *Tax Policy to Combat Global Warming: On Designing a Carbon Tax* 4 (Sept. 1990)(unpublished manuscript on file with the UCLA Journal of Environmental Law and Policy). Sweden's carbon tax, however, exempts heavy industrial users of carbon fuels, undermining its effectiveness at reducing carbon dioxide emissions. *International Taxes*, *supra* note 8, at G-3.

110. See *infra* Section II.C.6 on the appropriate tax level.

111. Some authorities suggest that U.S. industry will not be adversely affected by a carbon tax if industry adopts currently available technology to improve energy efficiency. They argue that foreign companies currently compete in world markets even though subject to much higher energy costs than U.S. companies. See 137 CONG. REC., H1109, 1110, (daily ed. Feb. 21, 1991)(remarks of Rep. Stark). This implies that greater energy efficiency leads to greater competitiveness for foreign companies. Industry in some foreign countries, such as Japan, is currently somewhat more energy efficient than it is in the U.S. "Japanese industry uses energy twenty to forty percent more efficiently than we do." *Id.* However, the greater energy efficiency of Japanese industry does not account entirely for its ability to compete successfully (in the face of higher energy costs) against U.S. producers. Energy prices in Japan exceed those in the United States by more than twenty to forty percent. For example, gasoline sells at a price over 250 percent higher in Japan than in the United States. See GORDON, *supra* note 5, at 49. Therefore, factors other than superior energy efficiency must also contribute to the ability of Japanese producers to compete in the face of higher energy prices. One such factor is the perception in consumer markets that Japanese products offer superior quality. Another factor is a difference in non-energy input costs. Japanese labor, for example, costs much less than U.S. labor. See *Jobs for Japan's Next Generation*, ECONOMIST,

Imposing a carbon tax on domestic producers would place them, relative to foreign manufacturers, in a net inferior position in many instances. This would be true whether the tax were imposed on a single entity in the U.S. chain of production or on many (as in the CBT). Other unavoidable costs to U.S. industry that would temporarily harm its international competitiveness are the transitional costs associated with moving capital and labor from energy-intensive industries to those that are less so.¹¹²

Some analysts contend that, overall, a tax on carbon fuels (assuming taxation of both domestic and imported fuels) would reduce, not increase, the trade deficit. They reason that since fuel imports now comprise approximately forty to forty-two percent of the trade deficit,¹¹³ a tax-driven reduction in oil consumption would

Feb. 27, 1988, at 51 ("The measure of Japan's success is the containment of its unit labour costs: these rose a mere 1/2% in 1987, compared with 2 3/4% in America."); see also, U.S. DEPARTMENT OF LABOR, BUREAU OF LABOR STATISTICS, INTERNATIONAL COMPARISONS OF HOURLY COMPENSATION COSTS FOR PRODUCTION WORKERS IN MANUFACTURING 1975-90, (1991) (Japanese manufacturing labor costs were only 86% of the United States' labor costs). Essentially, foreign industries, such as those in Japan, fund the energy taxes they pay by using energy more efficiently and by incurring relatively lower wage expenses. Cheap Japanese labor subsidizes expensive energy. In the U.S., on the other hand, cheap energy currently subsidizes relatively expensive labor.

For U.S. industry to sustain increased energy prices without losing competitiveness in international markets would require a reduction in non-energy input costs. It may or may not be politically acceptable to sacrifice the individual standard of living (measured in terms of lower wages) for the ultimate goal of improving the overall standard of living (measured by the economic and non-economic benefits of avoiding the greenhouse effect and achieving cleaner air). To avoid a downward pressure on market wages, the government could use policy instruments to reduce the costs of other inputs instead (e.g., the government could use the revenue raised from a carbon tax to reduce the budget deficit. This would reduce interest rates, and lower the cost of capital. See 136 CONG. REC. D854 (daily ed. July 11, 1990) (statement of Rohatyn); *Red Ink, Green Taxes*, supra note 15, at 11; and CBO: CARBON CHARGES, supra note 8, at 33.

Finally, to mitigate the societal costs of reducing non-energy input costs, energy efficiency should be improved as much as possible. The adoption of already-existing technologies would improve energy efficiency and reduce carbon dioxide emissions. See OFFICE OF TECHNOLOGY ASSESSMENT, CHANGING BY DEGREES: STEPS TO REDUCE GREENHOUSE GASES 5 (1991) (asserting that the United States could cut thirty-five percent of its carbon dioxide output in twenty-five years without "major technological breakthroughs. . . Existing equipment would not have to be instantly scrapped and replaced with untested prototypes. The requisite energy-related technologies are either already available or are demonstrated and close to commercialization today." *Id.* at 6.) Additionally, much can be done to encourage development of new technology that can improve energy efficiency to an even greater extent. For example, the tax system could subsidize research and development in energy efficiency. This could be accomplished by instituting investment tax credits or accelerated depreciation (or immediate expensing) for energy-efficient equipment.

112. These costs are temporary. See discussion on phase-in in section I.E, and see supra note 11 and accompanying text.

113. Telephone interview with Cynthia B. Foreso, U.S. International Trade Commis-

cause a concomitant reduction in oil imports.¹¹⁴ The decrease in imports should, in turn, reduce the trade deficit.

Another argument advanced which also suggests a beneficial effect on the trade deficit from carbon charges concerns the use of carbon-tax revenue. If money raised from a carbon tax were used to decrease the budget deficit, then domestic interest rates should decrease. This reduced borrowing cost should decrease operating costs for all U.S. companies and improve the competitiveness of U.S. companies relative to foreign concerns.¹¹⁵ As long as the reduction in the cost of capital exceeds the net increase in energy costs (taking into consideration induced efficiency improvements), the overall trade position of U.S. industry should be enhanced.¹¹⁶

Whether or not a carbon tax would have an overall negative impact on the U.S. trade position poses a difficult question, one which is the subject of economic research. According to the Congressional Budget Office,

[t]hough carbon charges would be unlikely to affect the overall U.S. trade deficit indirectly, they might affect the competitiveness of some industries. Carbon charges could indirectly improve the U.S. overall trade deficit if they were used to reduce the federal deficit. [Citation omitted]. The overall trade position is determined largely by macroeconomic factors, such as the levels of national saving and investment. However, exports of industries that are relatively heavy users of carbon-based fuels would be reduced accordingly. Other, less carbon-intensive U.S. industries competing in import or export markets could gain from the carbon charges.¹¹⁷

b. Protection of Domestic Industry

(1) Border Adjustments

Assuming that energy-intensive industries would, in fact, face international competitiveness problems as a result of a carbon tax, the tax should be implemented in a way designed to combat the problem. Imposing border adjustments could serve concerns over international competitiveness.

sion, Energy and Chemicals within the Office of Industries (January 8, 1991). For the first eight months of 1991, imports of crude petrol, gasoline, refined products, and coal accounted for forty to forty-two percent of the trade deficit.

114. *Red Ink, Green Taxes*, *supra* note 15, at 11.

115. Although interest rates are relatively low as of the writing of this article, budget deficit reduction would lessen any upward pressure on rates.

116. See CONGRESSIONAL BUDGET OFFICE: POLICIES FOR REDUCING THE CURRENT-ACCOUNT DEFICIT (1989).

117. CBO: *Carbon Charges*, *supra* note 8, at 37.

(a) Functioning of Border Adjustments

In theory, for border adjustments to protect all U.S. industrial interests perfectly, all fuel, intermediate and finished imports as well as exports should be subject to an adjustment.¹¹⁸ Exporters of U.S. goods would receive a credit for the total amount of carbon tax incurred as a result of the production of that good. Importers of foreign fuels or products would be taxed according to the carbon content of the energy source imported or according to the quantity and type of carbon fuel consumed in the production of the imported good. To the extent that foreign governments have already imposed a sufficient energy tax on the fuel or good being imported (but have not granted their own export credit), the U.S. should not tax the import. Imposing an import tax in that case would effectively constitute double taxation of emissions and would discourage the purchase of the double-taxed goods. This would discourage foreign countries from enacting their own carbon tax legislation.

The result of taxing imports and granting refundable tax credits to exporters would be that the prices of all goods sold for use in the United States would include a component for the environmental cost of carbon dioxide emissions. The prices of goods sold for use outside of the United States would not include any of the costs associated with carbon dioxide emissions (unless foreign governments have instituted their own carbon taxes).

Taxing imports and granting credits for exports could compromise the goal of reducing carbon dioxide emissions worldwide. Prices abroad for energy-intensive U.S. goods would not take into account the environmental costs associated with producing the goods. Thus, this credit for exports would not adequately discourage the worldwide consumption of energy-intensive U.S. products.

(b) Legality of Border Adjustments

Border adjustments present two types of problems: their legality under various trade agreements and enforcement difficulties. At least one organization, the Natural Resource Defense Council (NRDC), has addressed the legality of border adjustments under the General Agreement on Tariffs and Trade (GATT) and the U.S.-Canada Free Trade Agreement (FTA). According to a project attorney for the NRDC, the imposition of a carbon tax on imported

118. "[T]ax imports based on consumption of fossil fuels in their manufacture to prevent countries with no fossil fuels tax from driving energy-intensive U.S. products off the market." Hoerner, *Climate*, *supra* note 15, at 1416.

goods would be permissible under Article XX of GATT and Articles 410 and 1201 of the FTA.¹¹⁹ Because the import tax would be "equivalent" to internally imposed taxes, it would not violate these international agreements.¹²⁰

Even if the border adjustments were construed to violate the GATT's prohibition against import taxes,¹²¹ GATT's prohibition

119. Letter from Eric Christensen, project attorney for the Natural Resource Defense Council to Kenneth W. Gideon, Assistant Secretary for Tax Policy, U.S. Dep't of the Treasury (October 10, 1990) available in LEXIS, Fedtax Library, TNT file.

Article 401 of the FTA specifically deals with the type of import tax . . . propose[d]. It requires that: 'Neither party shall increase any existing customs duty, or introduce any customs duty, on goods originating in the territory of the other Party. . . ' Article 410 defines 'customs duty' as: '[A]ny customs or import duty and charge of any kind imposed in connection with the importation of goods, including any form of surtax or surcharge on imports, WITH THE EXCEPTION OF: 1) A CHARGE EQUIVALENT TO AN INTERNAL TAX imposed consistently with the provisions of paragraph 2 of Article III of the GATT in respect of like domestic goods or IN RESPECT OF GOODS FROM WHICH THE IMPORTED GOOD HAS BEEN MANUFACTURED OR PRODUCED IN WHOLE OR IN PART. . . . '

The highlighted language contemplates precisely the kind of import fee . . . propose[d] because it is 'equivalent' to the proposed internal U.S. tax on carbon fuels, and those carbon fuels are used to produce the imported goods that would be taxed.

This view is confirmed by Article III of . . . GATT, which is incorporated by reference into the FTA. Article 410 of the FTA, as quoted above, allows import duties to be imposed if they are consistent with GATT Article III, paragraph 2. Article 501 of the FTA also incorporates GATT Article III by reference. GATT Article III, paragraph 2, states that 'The products of the territory of any contracting party imported into the territory of any other contracting party shall not be subject, directly or indirectly, to internal taxes . . . in excess of those applied, directly or indirectly, to like domestic products.' The proposed carbon tax would not violate Article III because it would merely equalize the burdens created by the carbon tax on domestic and foreign producers. It would not impose an import tax 'in excess of' those faced by domestic producers.

Even if the proposed import tax were held to be a new import duty in violation of Article 401 or other provisions of the FTA, it would still be legal under Article 1201 of the FTA. Article 1201 incorporates GATT Article XX into the FTA. GATT Article XX(g) allows otherwise impermissible measures if those measures relate to 'the conservation of exhaustible natural resources if such measures are made in conjunction with restrictions on domestic production or consumption.' Because the carbon tax is aimed at reducing consumption of fossil fuels, it can be viewed as a measure taken to conserve exhaustible [natural resources]. Therefore, even if it is considered a trade barrier, the proposed carbon tax would be allowed under Article XX(g) of GATT and, by reference, Article 1201 of the FTA.

120. Note that taxing imported fuel and/or intermediate or final goods alone without taxing domestic fuel would be contrary to energy security goals and would violate international trade agreements. The imposition of an oil-import fee alone, for example, would promote depletion of domestic oil supplies, and increase future U.S. vulnerability. See *Red Ink, Green Taxes*, *supra* note 15, at 11.

121. A border adjustment taxing imports might violate the last sentence of Article III, paragraph 2. This sentence states "[m]oreover, no contracting party shall otherwise apply internal taxes or other internal charges to imported or domestic products in a manner contrary to the principles set forth in paragraph 1." Paragraph 1 states, "The

against subsidies,¹²² or to create a dual pricing situation fitting the definition of dumping,¹²³ it appears that one of the GATT's general exceptions would apply. Article XX allows exceptions for public health regulations.¹²⁴ Article XX(g) allows contracting parties to adopt measures "relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption" even though those measures otherwise conflict with GATT as long as the "measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail,¹²⁵ or [as] a disguised restriction on international trade."¹²⁶ As long as border adjustments meet these last two requirements, they would not violate the GATT.

It appears that border adjustments under a carbon tax would comply with the FTA. The United States and Canada incorporated GATT Article XX into the FTA. Border measures prohibited under FTA Article 401 could, therefore, be imposed if they meet any of Article XX's general exceptions. When incorporating GATT's Article XX into the FTA, the United States and Canada made Article XX "[s]ubject to the provisions of Articles 409 and

contracting parties recognize that internal taxes and other internal charges . . . affecting the internal sale . . . of products, . . . should not be applied to imported or domestic products *so as to afford protection to domestic production*" (emphasis added). Border adjustments in the carbon tax would be imposed for the purpose of protecting domestic production, ergo the violation. Since the requirement of Article III, paragraph 2 may not be met, the import adjustment may also violate Article II, paragraph 2. Article II, paragraph 2 permits charges such as the border adjustments described above but only if they are consistent with paragraph 2 of Article III. Nevertheless, sales taxes imposed on imports which are equivalent in burden to sales taxes on domestic goods have not been deemed to afford impermissible protection to domestic production and thus to violate GATT. See Report of the Panel, *United States—Taxes on Petroleum and Certain Imported Substances*, BISD 34S/136, 138, §§ 2.2, 2.3-2.6, 5.1.9, 5.2.5, 5.2.7 - 5.2.8, and 5.2.10, reported in HANDBOOK OF GATT DISPUTE SETTLEMENT (Pierre Pescatore et al., eds. 1991).

122. The tax credit for exports would constitute a subsidy. See General Agreement on Tariffs and Trade, 1947, art. XVI, 55 U.N.T.S. 250. Nevertheless, a tax credit for exports has not been deemed to be a "subsidy" under GATT in the VAT context. See *supra* note 121, at § 5.2.4.

123. General Agreement on Tariffs and Trade, *supra* note 122, at art. VI, 55 U.N.T.S. 212.

124. Kenneth W. Abbott, *Introduction to Regulation of International Trade: The General Agreement on Tariffs and Trade* (1989), LEXIS, I trade library Basic Documents of Import-Export Law (1 b.d.i.e.l. 3).

125. E.g., imports that have already been subjected to a foreign carbon tax should not be taxed again by the United States.

126. General Agreement of Tariffs and Trade, *supra* note 122, at art. XX, 55 U.N.T.S. 262, 264.

904.”¹²⁷ Article 904 provides that GATT’s Article XX(g) applies in the energy context only if certain conditions are met.¹²⁸ These conditions would seem to be met by a carbon tax. Thus, GATT Article XX(g) would likely apply under FTA Article 1201.

It appears that border adjustments imposed because of a domestic carbon tax would comply with both the GATT and the FTA provided that the import tax did not exceed the tax on domestic goods and that an export credit refunded no more to domestic corporations than the amount of carbon tax incurred. If an import tax based on the carbon dioxide emitted in a good’s manufacture were, nevertheless, found to violate international trade agreements, the United States should attempt to negotiate amendments to the treaties to allow for the imposition of such a tax. If negotiations fail, the use of border adjustments would then have to be foregone unless the United States wants to violate treaties with its trading partners. Assuming no such violation, the reduced international competitiveness of energy-intensive U.S. goods and the flight of production facilities to foreign countries would remain.

(c) Implementation and Enforcement of Border Adjustments

Implementation and enforcement present other problems associated with the institution of border adjustments. In the case of fuel imports, implementation of an import tax requires knowledge only of the quantity and type of fuel imported. In the case of imports of intermediate or finished goods, however, implementation of an import tax necessitates knowledge of the quantity and type of fuel burned in the production of the import in question. For this reason, taxation of fuel imports is relatively easy to implement. Fuel im-

127. Free-Trade Agreement, Jan. 2, 1988, U.S.-Can., art. 1201, 27 I.L.M. 281, 352 (1988) [hereinafter United States Trade Agreement].

128. Article XX(g) of the GATT only applies if:

(a) the restriction does not reduce the proportion of the total export shipments of a specific energy good made available to . . . [Canada] relative to the total supply of that good of the [United States] . . . as compared to the proportion prevailing in the most recent 36-month period for which data are available prior to the imposition of the measure . . . ;

(b) the [United States] does not impose a higher price for exports of an energy good to . . . [Canada] than the price charged for such energy good when consumed domestically, by means of any measure such as licences, fees, taxation and minimum price requirements. . . ; and

(c) the restriction does not require the disruption of normal channels of supply to . . . [Canada] or normal proportions among specific energy goods supplied to . . . [Canada] such as, for example, between crude oil and refined products and among different categories of crude oil and of refined products.

Id. at art. 904, 27 I.L.M. at 344.

ports would be taxed at the same rates as domestic fossil fuels: high rates for coal, intermediate rates for petroleum, and low rates for natural gas. The rate would reflect the carbon content of the fuel. Only information about the volume and type of fuel imported must be collected.

Where non-fuel goods are imported, however, implementation of an import tax presents increased difficulties.

A charge on imported goods other than fossil fuels, based on their carbon content, would significantly increase the administrative costs of a carbon charge. As the charge would have to be levied on each good according to the fossil fuel used in producing it, the information requirements alone would be extremely burdensome.¹²⁹

Since carbon dioxide "emissions are a direct function of the amount and type of fuel burned,"¹³⁰ the Treasury would require information from foreign producers regarding the quantity and type of fuel burned in the manufacture of each import. Of course, these foreign entities would have little incentive to provide accurate information. They would tend to underestimate the quantity of fuel that was burned in the production of the imports and to misreport the type of fuel burned.

In order to combat this problem, the Treasury could develop estimates of the amount of fuel normally burned to make a product. If the Treasury estimates were too low, a producer burning more fuel than estimated would have no incentive to conserve fuel burned beyond that threshold. High estimates can be used to correct this problem, giving producers the burden of proving less fuel consumption if they have not burned as much fuel as the estimate. High estimates, however, pose the threat that the import tax would not be considered the "equivalent" of any domestically imposed tax, and would thus violate the GATT and the FTA.¹³¹ Additionally, creating presumed fuel-consumption estimates does not address the problem of producers misreporting the type of fuel burned.

Estimating fuel consumed in the production of imports is probably an administratively impossible task. In addition to the above weaknesses inherent in estimates, there exist the following problems: estimates would have to be devised for every single type of good imported; estimates for each good would vary according to the country from which the imported good originates;¹³² all esti-

129. CBO: CARBON CHARGES, *supra* note 8, at 39, 42.

130. *Id.* at 17.

131. *See supra* note 121, at § 5.2.9.

132. Estimates vary according to the country of origin because different producers

mates would have to be revised every three to five years as the time horizon for technological improvements lapses (yielding more efficient use of carbon fuel or allowing the substitution of non-carbon fuels) lapses; and no international organization exists to police the accuracy of information provided for the initial or revised calculation of the estimates.

Determining the amount of tax to be refunded (as a refundable credit) to fuel exporters would require knowledge of the quantity of unburned fuel exported. An owner of fuels that have already been taxed at the mine-mouth or well-head and which are exported would be eligible for a tax refund equal to the tax rate for the type of fuel in question multiplied by the quantity of fuel being exported.¹³³ Verification of the quantity and type of fuel exported could be accomplished by coordinating policing functions with customs agents.

Because of the difficulty of verifying the numbers reported, estimating the amount of tax to be refunded is more complicated when intermediate or finished goods, rather than fuel, are exported. Exporters would have an incentive to overestimate the quantity and to misreport the type of fuel burned in the production of the exported good. This would complicate implementation of border adjustments in the same way that underestimation made administration impossible in the import context. Estimates of carbon dioxide emitted in the production of various goods could be established, but

have access to different means of production, some of which are more fuel efficient (where the production process is labor-intensive or where machinery is new) and some of which are less fuel efficient. Variations in carbon dioxide emissions among producers of the same good also result from the availability of production equipment with differing degrees of energy efficiency. Those countries with the most economic and technological access to advanced, energy-efficient equipment would emit the least carbon dioxide per unit of product imported into the United States.

133. When the original fuel extractors actually bear part of the tax and then sell the fuel to other entities which subsequently export and receive the tax credit, a distortion would exist adversely affecting producers to the direct benefit of non-producer fuel exporters. This is the same problem as that described above concerning credits to concerns which use fossil fuels as feedstocks when the ultimate incidence of the carbon tax is such that it is not borne entirely by the fuel user. *See* text accompanying notes 85-87, *supra*. Since it is virtually impossible to determine the actual incidence of a carbon tax, splitting the credit in either case is not recommended. *See* text following note 87, *supra*. Either the extractor can receive the credit for fuel that is ultimately exported (at the expense of the exporter) or the exporter can receive the credit for fuel that is exported (at the expense of the extractor). Under either scenario, total revenue to the government is the same. Unlike the feedstock situation, no environmental benefit would be gained from giving the credit to one party or the other. For administrative convenience, therefore, such a credit should simply be granted to the exporter even though the fuel producer bore a portion of the tax.

these estimates would suffer from the same defects as those from the import context: estimates should be designed to be low so that exporting companies cannot be presumed to get a greater credit than that to which they would actually be entitled if actual carbon combustion could be measured and verified; estimates would have to be devised for every type of finished and intermediate good; theoretically, the estimate should vary according to the energy-efficiency of each manufacturer;¹³⁴ estimates should be revised every few years after implementation of more energy-efficient technology; and in devising initial estimates, it would be difficult to verify whether manufacturers had provided correct information as to quantity and type of fuel burned. Even if estimates could be formulated, taxpayers could still misrepresent the fuel type burned.

(2) Narrow the Scope of the Border Adjustments

In spite of the possibility that some enforcement functions could be coordinated through interaction of tax officials and customs officials, establishing a comprehensive import tax and export credit would probably be prohibitively expensive from an administrative perspective. Omitting all forms of border adjustments from a carbon tax, however, would not be an attractive alternative because of the underlying competitiveness problem. Production inefficiencies would result which would drive production overseas, increase unemployment and reduce total tax revenue to the government.

In order to make the border adjustments administrable, they should be narrowed. All *fuel* imports and exports would be subject to tax and credit respectively. Of intermediate and finished goods, only those which account for a large portion of combusted fossil fuel would be subject to border adjustments. Limiting the number of goods subject to the adjustments would reduce the number of estimates that the taxing authorities would have to derive and the policing that they would have to undertake. Consequently, administrability would be simplified.

If economic studies demonstrate that just a few such intermediate or finished goods account for a large portion of burned fuel, and if such studies can identify these goods with sufficient certainty, those goods should be the products chosen to be subject to the import tax and/or export credit.¹³⁵ If the analysis shows that the total fuel

134. See note 112 *supra*.

135. Estimates would still need to be devised for these goods but the total number of estimates would be greatly diminished by narrowing the system of border adjustments. One economic study measured the significance of total fossil-fuel use in the production

burned producing imports and exports is insignificant compared to total fuel burned in the production of taxed domestic goods that are not exported, then the difficulties inherent in devising estimates would justify omitting border adjustments altogether.¹³⁶

(3) Subsidies

As an alternative to developing a border-adjustment system, the government could allocate some of the revenue generated by the carbon tax to those industries that suffer the most from reduced international competitiveness.¹³⁷ The subsidies would *not* serve to compensate companies *because they burn fuel*, but rather, *because they face foreign competition*.¹³⁸ Consumption in the United States of those energy-intensive goods which face significant foreign competition would not be discouraged sufficiently because of the subsidy; however, the system would still discourage production and consumption of energy-intensive goods not facing foreign competition. Therefore, to the extent that energy-intensive goods do not compete with foreign products, subsidies would not circumvent the environmental goals of the carbon tax.

Using a direct-subsidy approach would, nevertheless, lessen the carbon tax's ability to reduce carbon dioxide emissions. Manufac-

of imported goods. This study suggests that "embodied energy imports are not trivial" and hence, cannot be ignored without risking major production inefficiencies (which would, most likely, result in the flight of production to foreign countries). The study also identified three main types of goods as constituting "a very large share of the embodied fossil fuels": steel, autos, and chemicals. The study's author suggested that the administrative burdens of a carbon tax could be reduced by taxing only those imported goods that have substantial amounts of embodied fossil fuel energy.

However, in stating which goods account for substantial embodied energy, the study fails to differentiate between the categories of energy burned and energy used as feedstocks. If the feedstock use of fuel should not be taxed because such use does not contribute to the emission of carbon dioxide, then new studies should be undertaken which focus on identifying those imported goods that account for a substantial amount of fossil-fuel combustion.

The author of the economic study points to the current U.S. treatment of CFC imports as support for the feasibility of an import tax. Under I.R.C. § 4681, "[t]he Treasury is empowered to estimate the CFC content of imported goods, and in cases where this estimate is impossible, can levy [a] tax of up to five percent on imports." See Poterba, *supra* note 109, at 24, 25 n.18.

136. The problem remains, however, that production facilities could flee the country to avoid the tax.

137. 137 CONG. REC., *supra* note 15, at 1110. Also, *any* policy which reduces costs of operating for companies facing international competition would offset the increased cost of fossil fuels. Dower & Repetto, *supra* note 9, at 712.

138. Of course, instituting such a subsidy system domestically, especially for these reasons, could constitute a violation of the GATT prohibition against subsidies. See GATT article XVI.

turers of energy-intensive goods that do receive a subsidy because of foreign competition would overproduce, thereby continuing to emit too much carbon dioxide. If the government nevertheless guaranteed the subsidy for a number of years, regardless of whether producers reduced their actual fossil fuel consumption, environmental goals could still be served somewhat. Under a guaranteed-subsidy plan, producers would have an incentive to conserve energy because they could reduce their total energy costs by cutting energy consumption without losing the governmental subsidy. As a result, their carbon dioxide emissions could eventually diminish.

c. Reasons to Act Unilaterally in Spite of a Threat to International Competitiveness

Even if a carbon tax would dampen U.S. international competitiveness, unilateral action domestically could promote world wide reduction of carbon dioxide emissions in the long run. Because of every country's concerns over international competitiveness, a collective action problem exists which impedes including environmental costs in the price of goods. No one country wants to act first because, in the absence of border adjustments, its own relative trade position would deteriorate. Each country faces the choice of either maintaining the status quo or adopting a carbon tax while suffering a consequent reduction in the competitiveness of its goods.

Once one major trading country acts without instituting adjustments, however, the choice facing other countries changes. The foreign countries will be aware that should they fail to institute their own systems of carbon tax, the competitive trade advantage they enjoy because of a U.S. tax would be short-lived because the United States could and would revert to its original position by repealing the tax. Therefore, once the United States adopts a carbon tax, the options available to foreign countries become *either* to enjoy a short-lived trade advantage that fosters the spiral down toward more global warming (i.e., the countries do not enact their own carbon taxes and the U.S. repeals its tax as a result) *or* to adopt their own carbon taxes, which would lead to greater reductions in carbon dioxide emissions around the world without causing any net change in trading positions.

The fact that under either scenario a foreign country would eventually lose its trade advantage indicates that the decision it makes can be formed by environmental and production issues. The choice need not be shaped by trade issues. The institution of a carbon tax by the United States would act essentially as an invitation to other

countries to adopt similar measures. Therefore, if the United States were to adopt a carbon tax, the probability that worldwide emissions could stabilize or decrease improves because trading partners may find it more politically and economically feasible to enact their own carbon taxes.

5. Regional and Industrial Inequities of a Carbon Tax

a. Sources of Inequities

The institution of a carbon tax, whether imposed on only one entity or on many, as in a CBT, would adversely affect some regions of the country and some industries more than others.¹³⁹ This results because some regions depend more on fossil-fuel energy than others, due to relative labor costs or a local supply of dirty fuel,¹⁴⁰ or because of the need to travel greater distances to accomplish daily tasks in rural locales. Similarly, some industries are more highly energy-intensive or have historically used dirtier fuels than have other industries. The sources of industrial inequities of a carbon tax include the feedstock use of fossil fuels in some industries but not in others, the fact that some industries face international competition while others do not, and the simple fact that some industries burn more fuel than others. A carbon tax would affect some industries more adversely than others to the extent that the tax code does not or cannot address the feedstock issue or the reduced international competitiveness problem.¹⁴¹ Assuming that the special problems of feedstocks and international competitiveness can be dealt with in the code, tax designers must find a way to reduce the regional and industrial inequities likely to result from a carbon tax.

b. The Use of a Broad Tax Base to Lessen Inequities

Both regional and industrial inequities would be reduced by a broader-based carbon tax.¹⁴² "The broader the tax, the more

139. See, e.g., 137 CONG. REC., *supra* note 15, at 1110; Dower & Repetto, *supra* note 9, at 711; Hoerner, *Future*, *supra* note 24, at 12.

140. Energy-producing states like Texas, California, Ohio, and Pennsylvania would be hurt more than other states. See National Coal Association, *Incidence of a Carbon Tax by State*, TAX NOTES, *microfiched on* Doc. 90-6688, for an analysis of the relative effects of a carbon tax on different states.

See also Corcoran & Wallich, *supra* note 15, at 171 (claiming that citizens in states in the West and South which use more nuclear power and/or hydroelectricity would be unfairly advantaged by a carbon tax).

141. See sections II.C.2 and II.C.4 *supra*.

142. See section II.C.3.b (1) *supra*, and text accompanying notes 47-51.

widely its burden is likely to be shared across the country."¹⁴³ For example, a carbon tax would hurt coal producers and coal-producing regions of the country less if it were imposed not only on coal (at high rates) but also on oil and natural gas, thus, making it possible (given constant revenue) to lower all rates charged. A carbon tax should apply to *all* carbon dioxide-emitting fuels, for the burden to be shared as widely as possible among all regions and among all types of fuel-burning industries.¹⁴⁴

Likewise, inequities among industries which burn fossil fuels would be mitigated by making the tax broadly based. If only coal were taxed, for example, the steel industry (a heavy coal burner) would bear a greater tax burden (both in absolute and in relative terms) than industries which do not burn much coal. So would the electric utility industry since it consumes coal heavily.¹⁴⁵ If oil and natural gas as well as coal were taxed based on relative carbon contents, then those industries which primarily burn oil and natural gas would share with the steel and electric utility industries the burden of the carbon tax. All rates would be lower than if only coal were taxed, and the steel and utility industries would not be treated in such an inequitable fashion.

c. *The Role of a Phase-In*

Phasing in the carbon tax would provide another manner of reducing both regional and industrial inequities.¹⁴⁶ A phase-in helps mitigate these inequities by giving consumers and producers in heavily hit industries or parts of the country time to adapt to higher energy prices before they occur. For example, people who live in rural regions of the country, who have to drive further than city dwellers, will have a few years before the full brunt of the tax must be borne, allowing them to consider fuel efficiency when buying new cars. Since they will be more heavily affected by the full-fledged

143. See *Red Ink, Green Taxes*, *supra* note 15, at 11.

144. See Komanoff, *supra* note 72, at A15; Steven Mufson, *Will Industries Really Suffer from Tax Rise?, Targeted Sectors See Dire Results; Economists Eye Offsetting Benefits*, WASH. POST, July 15, 1990, at H1 (proposing that the broader the tax base, the less regressive and the more equally shared among different industries the tax will be). See generally, Hoerner, *Energy Taxes for Deficit*, *supra* note 15; Hoerner, *Future*, *supra* note 24, at 12 (discussing narrow taxes on gasoline, SO_x/NO_x, ozone emissions, and on solid wastes).

145. Although in the utility industry, regulators can pass the tax burden on to ultimate consumers by increasing prices. It is likely that kilowatt-hours consumed would decrease, however, which could reduce profitability of electric companies.

146. See, e.g., Dower & Repetto, *supra* note 9, at 712; CBO: CARBON CHARGES, *supra* note 8, at 35-37.

carbon tax than those who live in the city, they will become more efficient users of gasoline during the interim phase-in period than will city dwellers. Consumers will know to buy more fuel-efficient appliances and will have a few years to acquire them as old ones wear out.

The phase-in also mitigates industrial inequities. The time period before the tax achieves full force provides time for companies to institute plans for increasing efficiency and promoting conservation. Fossil fuel burners will have time to change production methods from those which use dirty fuels to those which use cleaner fuels. They will also have time to identify and contract with suppliers of those cleaner fuels. Some utility companies may be able to retool and switch some of their input fuel from coal to cleaner fuels. During the phase-in period, both human and financial capital would have time to move out of industries which contribute greatly to carbon dioxide emissions and to move into those which do not, while manufacturers could alter their product lines in environmentally sound ways. For example, car manufacturers would have time to bring more fuel-efficient autos to commercialization. Thus, they can make adjustments that will minimize cost increases and others which will minimize reduction in demand for their products. While the phase-in does not completely eliminate the inequities that a carbon tax presents, it does reduce their impacts.

d. The Use of Subsidies

It has been suggested that revenue derived from the imposition of a carbon tax could be used to offset some of the regional and industrial inequities the tax creates.¹⁴⁷ The use of carbon tax revenue in this manner would help to reduce its inequities. To the extent such rebates encourage retraining and relocation of displaced workers or retooling by inefficient fuel burners (or burners who use the dirtiest fuels such as electric utilities), these rebates would not hamper the environmental goal of reducing carbon-dioxide emissions. Rebates should not, however, be used to address those industrial inequities that result solely from the fact that some industries *require* more combustion of fossil fuels than others. In essence, such rebates

147. See 137 CONG. REC., *supra* note 15, at 1110 ("A carbon tax will not affect all sectors of the national economy equally. I believe that some of the money raised by the carbon tax should be used to mitigate problems caused by the carbon tax whether the problems are regional or those felt by low-income individuals.") See II.C.3 *supra*; Dower & Repetto, *supra* note 9, at 712; telephone interview with Perry Plumart, aide to Rep. Stark (January 29, 1991)(revenue should be used to offset industrial inequities).

would subsidize the worst carbon-dioxide polluters solely because they are the worst carbon-dioxide polluters, thus subverting the purpose of the carbon tax and undermining its environmentally sound effects. A carbon tax is designed to make energy-intensive goods more expensive than other goods. To grant rebates because the tax falls more heavily on those industries that burn more or dirtier fossil fuel would allow the price of energy-intensive goods to remain too low. Consumption patterns would not shift toward more environmentally sound goods. Since the carbon tax is designed to cause the contraction of those industries which require large amounts of fossil-fuel combustion, rebates to these industries should be avoided.

6. Factors to Be Taken into Account When the Level or Amount of Tax Is Set

a. The Environmentally Correct Level

Theoretically, a carbon tax, regardless of its design, should reflect the environmental costs of fossil-fuel combustion.¹⁴⁸ "Ideally, one would estimate the expected value of future risks associated with the discharge into the environment of an additional unit of pollution"¹⁴⁹ and would set the tax to adjust fuel prices accordingly. Of course, the precise estimates of environmental damage remain uncertain. In the absence of an ability to set the tax at the theoretically correct level, care must be exercised to determine the minimum level necessary to achieve environmental goals.

b. Raising Revenue Versus Changing Behavior

In setting the level of any tax, a tension exists between raising revenue and affecting shifts in behavior. "The level of tax determines the effect: small taxes serve only to raise revenue, while high taxes shift demand. The major limitation of taxation is the political resistance to setting high enough taxes to change demand and promote innovation."¹⁵⁰ The level of tax should be high enough to promote change in technology. If the tax remains too low, for example, many electricity users will forgo conserving energy and will instead

148. See Dower & Repetto, *supra* note 9, at 711.

149. *Id.* Since the carbon tax addresses the environmental impact of only carbon dioxide emissions, the rate of tax to be imposed would be set by taking into account the environmental harm caused only by carbon dioxide emissions. It would not take into account the environmental impact of other substances emitted upon fossil-fuel combustion.

150. GORDON, *supra* note 5, at 178-79.

choose to pay higher bills. The small amount of tax avoided would not justify the expenditures required to purchase energy-efficient appliances or to insulate homes. Likewise, a low tax could not induce transportation companies to purchase more energy-efficient machinery. It certainly would not prompt research into and development of newer, cleaner technologies.

c. Inflation

The legislature should not overlook the effect over time that inflation has on fixed tax amounts. Inflation erodes the tax's ability to discourage fuel consumption by reducing the constant-dollar value of the tax over time.¹⁵¹ Therefore, any non-ad valorem energy tax should be indexed to inflation.

d. Effect of Dynamic Underlying Fuel Prices

In implementing a carbon tax that will be effective in shifting energy users from dirty to relatively clean fuels, the tax rates must be set so that the post-tax fuel prices will reflect relative carbon contents.¹⁵² In other words, the tax rate on coal, the dirtiest fuel, should be set so that the ultimate price of coal will exceed that of a cleaner fuel, thereby ensuring that relative final prices proportionally reflect relative carbon contents.¹⁵³ Tax rates initially fixed according to current relative fuel prices would not keep post-tax coal, oil and natural gas prices perfectly calibrated because the underlying pre-tax fuel prices change.¹⁵⁴ Underlying fuel prices are not

151. See CBO: REDUCING THE DEFICIT, *supra* note 47, at 433; H.R. 1086, 102d Cong., 1st Sess. (1991); see also notes 160-62 *infra* and accompanying text. This second version of Rep. Stark's carbon tax bill adds a provision to index the tax to inflation.

152. See CBO: CARBON CHARGES, *supra* note 8, at 19; and CBO: ENERGY USE, *supra* note 2, at ch. 1, +6.

153. The difficulty of accomplishing this is exacerbated by the fact that it is virtually impossible to determine (ex-ante or even ex-post) how much a given tax will affect the final consumer prices of fuels and goods.

154. This problem is likely to occur in the carbon tax scenario because once the post-tax price of coal rises sufficiently to stave off demand, the pre-tax price will decrease. The smaller pre-tax price plus the fixed tax amount will no longer add up to the "desired" final price. A new equilibrium price will result but will be lower than the desired final price. Coal will be too cheap and demand will increase again to a certain extent. Some of the initial decrease in the demand for coal likely resulted from consumer substitution of oil or natural gas for coal. The increased demand for natural gas, for example, would have increased the pre-tax price so that this larger (new equilibrium) pre-tax price plus the fixed tax amount would add up to too high a final price. Natural gas would thus be too expensive, and demand would decrease somewhat. The effects of external supply shocks on the pre-tax relative prices of the various fuels also exemplifies the problem of fixing the tax according to the relative pre-tax prices of the fuels at one particular point in time.

static. Therefore, the tax rates must be adjusted as relative fuel prices change.

e. Effect of Carbon Tax on the Economy

Different levels of carbon tax will have different effects on overall GNP.¹⁵⁵ Most estimates of the effect on GNP do not account for the positive environmental benefits that such a tax might achieve (or the negative environmental effects of failing to take precautions against global warming). In determining whether or not to institute action discouraging carbon dioxide emissions, estimated costs to the economy should include the environmental benefits or harms from acting or failing to act.¹⁵⁶

Because the use of fossil fuels pervades almost every facet of industrial society, estimates of the effect of a certain level of carbon tax on the economy are subject to much uncertainty.¹⁵⁷ Notwithstanding this uncertainty, a carbon tax will likely result in some net cost to the economy (when environmental costs of failing to act are not taken into account). One model estimates that a tax of \$100 per ton of carbon would reduce consumption of electricity by about eight percent and of transportation by about six percent.¹⁵⁸

155. According to the Congressional Budget Office, a tax of \$100/ton of carbon on fossil fuels (enough to stabilize carbon dioxide emissions at 1988 levels) would increase the price of oil and natural gas at the point of extraction by about 50% and the price of coal by about 250%. The price increase of oil and natural gas to ultimate consumers is estimated to be only 25%. The estimated long-term reduction in GNP of a tax at this level is only 1%. CBO: CARBON CHARGES, *supra* note 8, at 19, 20 (table 2), 35 (table 5).

156. See Hoerner, *Climate*, *supra* note 15, at 1417. *But see id.*, at 1416.

157. According to a recent report published by the Office of Technology Assessment, the estimated total cost to the economy from the institution of a tax sufficient to stabilize carbon dioxide emissions ranges from a \$20 billion savings to a \$150 billion loss. OFF. OF TECH. ASSESSMENT, CHANGING BY DEGREES: STEPS TO REDUCE GREENHOUSE GASES, *cited in* Michael Weiskopf, *No 'Breakthroughs' Needed to Curb Global Warming, Hill Agency Suggests*, WASH. POST, Feb. 9, 1991, at A3. The following passage sheds some light on how the imposition of carbon charges could introduce net savings into the economy (without taking into account the environmental benefits that could result): "The carbon tax will have many positive effects on the economy. There will be new investment in energy saving devices by both individuals and corporations. The tax will encourage increased use of alternative energy sources. Research and development in energy efficiency will be spurred. [Thus, new industries will emerge]. Money saved on energy will be spent for other goods [to the extent that the amount of money saved exceeds tax revenues]. The economic advantages of a reduced budget deficit will ripple through the economy and help international competitiveness." 137 CONG. REC., *supra* note 15, at 1110.

158. CBO: CARBON CHARGES, *supra* note 8, at 29, Figure 2.

7. General Enforcement Concerns

Tax evasion presents a pervasive challenge in enforcing a carbon tax. Since taxpayers can manipulate reported figures easily and with little fear of detection,¹⁵⁹ there will be an incentive for fossil-fuel burners to underreport their tax liability. A carbon tax must, therefore, create a reasonable possibility that non-compliance will be detected and that appropriate penalties will be applied.

Audits should be undertaken (including examinations of a company's operating facilities) to induce taxpayers to report their fuel consumption accurately. In order to foster compliance by mid-level burners, the IRS should audit both companies which burn large volumes of fossil fuels as well as those that burn smaller volumes. This is a critical step since the sum of the taxes owed by companies responsible for burning medium or small amounts of fuel may exceed the total amount owed by those taxpayers who burn relatively large amounts of fuel.

If the administrative burden of policing so many small and medium-volume burners exceeds the revenue to be generated, a better approach might be for designers to set a threshold volume-burned level beneath which no tax payment would be triggered. Although this would reduce the incentive of small and medium-volume burners to alter their behavior, administrability would be simplified. Some degree of auditing would still be necessary, however, in order to make sure companies claiming no liability actually operate below the threshold.

If possible, the IRS must show taxpayers that it has independent knowledge of fuel consumption. Accomplishing this task would minimize a taxpayer's belief that it could misreport fuel consumption without being caught. Requiring *two* entities to report a transaction in their respective tax returns (as under a CBT) will assist in achieving this goal.

Upon discovering misreporting through an audit or a cross-check with other returns, the IRS should impose a penalty in excess of the actual tax owed; otherwise, taxpayers would have no incentive to report correct consumption levels. The correct tax would eventually be paid but only after discovery of the cheating. To deter repeated cheating and to provide other taxpayers with an example of what happens as a result of misreporting fuel consumption, penalties should be set fairly high.

159. E.g., the amount and type of fuel used as a feedstock, the amount and type of fuel burned in the production of imports or exports, etc.

D. *Political Problems and Prospects*

Enacting a carbon tax presents a major credibility problem. If constituents believe that lobbying would result in the repeal of the tax, then they would resist making the necessary investments for achieving more efficient fossil-fuel use. If industry believes that the tax will be short-lived, it will invest neither in currently available, energy-efficient equipment nor in research and development for the creation of more advanced technology. For an energy tax to affect consumption patterns, Congress must convince the public that the tax has been adopted for the duration. Otherwise, it may be impossible for the tax to induce sufficient reductions in carbon dioxide emissions. Utility companies would not switch from coal-burning equipment. Transportation companies would not retool. Car manufacturers would refrain from introducing ultra-energy-efficient automobiles into their product lines because of fear that consumer purchasing habits would not shift.

So far, Congress has considered only one specific carbon tax proposal, H.R. 4805, 101st Cong., 2d Session (1990) (reintroduced in virtually identical form as H.R. 1086, 102d Cong., 1st Session (1991)). This proposal, submitted by House Democrat Fortney Pete Stark of California, proposes different rates for different types of fuels according to their carbon content. The bill also provides that the tax be imposed at the dock, mine-mouth or well-head (i.e., on the entity that introduces the energy source into the economy). The bill would tax fuel producers who burn fuel on their premises.

However, the Stark proposal does little to fine-tune the tax to actual carbon dioxide emissions since, for example, it provides no feedstock credit. Also, the Stark proposal probably sets the tax level too low to affect a shift in consumption patterns away from energy-intensive goods. Stark sets the tax at \$30 per ton of carbon contained in the fuel, much less than the \$100 per ton tax the Congressional Budget Office estimates is necessary to stabilize carbon-dioxide emissions at 1988 levels by the year 2000.¹⁶⁰ Thus, the tax would probably be more effective in raising revenue than in reducing carbon-dioxide emissions.

The Stark bill contains the following features: it indexes the level of the tax to account for inflation, and it cushions the economy by providing that the tax be phased in. However, the Stark bill lacks provisions to account for imports and exports of intermediate and

160. CBO: CARBON CHARGES, *supra* note 8, at 19.

finished goods, problems of decreased international competitiveness, and enforcement.

The Stark proposal has been languishing in the House Committee on Ways and Means. It has no co-sponsors and its odds of passage are low as evidenced by the passage of H.R. 438 in the fall of 1990. This resolution expressed the House sentiment that excise taxes on fossil fuels and carbon emissions should not be imposed. Although the political chances for the Stark bill seem slim at this time, there have been indications of bilateral public support for some kind of carbon tax (though probably not at the level required to influence consumption patterns significantly).¹⁶¹ Educating the public about the relationship between fossil-fuel combustion and the greenhouse effect and its consequences appears to be the most likely manner of garnering political support for a carbon tax.¹⁶²

Producers of clean fuels would probably experience gains relative to the dirtier fuels (the natural gas industry, for example, would probably be subsidized relative to the coal industry). As a consequence, clean-fuel producers might lobby in favor of a carbon tax, thus improving its likelihood for passage. Major opponents of a carbon tax will include coal producers, coal-producing states, and industries which have historically used the dirtier fossil fuels (e.g., the utility and transportation industries).

Given signs of public support for a tax that promotes environmental goals, other specific proposals will likely be forthcoming once the economic slowdown reverses. The political palatability of a carbon tax can be improved to the extent it can be made progressive and broad-based. The public would probably favor a tax imposed at the dock, the mine-mouth or the well-head as opposed to being imposed directly on consumers.¹⁶³ Also, the smaller the tax, the stronger the public support. If the issues of international competitiveness and feedstocks can be addressed adequately, the chances for passage of a carbon tax would improve. Some of the aids to political palatability would further environmental goals (e.g., feedstock credit) while some may inhibit those objectives (e.g., a public desire for a smaller tax). Care should be exercised that the

161. See J. Andrew Hoerner, *Taxes and Energy Strategy: Will Congress Supplant Bush?*, 50 TAX NOTES 432, 434 (1991); *America at the Crossroads: A National Energy Poll*, TAX NOTES TODAY, Jan. 15, 1991, available in LEXIS, Fedtax Library, TNT File; 90 TNT 210-70. But see *Public Opposes Energy Taxes, Claims Edison Electric*, TAX NOTES TODAY, Oct. 15, 1990, available in LEXIS, Fedtax Library, TNT file.

162. See structure of the national energy poll questions, available in LEXIS, Fedtax Library, 91 TNT 12-23, which essentially do this.

163. See Hoerner, *Energy Taxes for Deficit*, *supra* note 15, at 1588.

designers of the tax, in making it politically acceptable, do not completely undermine the underlying environmental goals.

III.

CONCLUSION

A. *Design Recommendations*

A carbon tax would serve to correct the failure of the market to account for some of the environmental externalities associated with fuel combustion. Since the tax would pose inequities and could be complicated to enforce, its design is of utmost importance. Either taxing the fuel once at the dock, the mine-mouth or the well-head, or using a CBT structure, would render the tax broad-based. On the other hand, imposing the tax on one entity at a later stage of production would inhibit a broad base.

Many of the enforcement problems involved in policing a tax based on the volume of fuel available for combustion would be mitigated if a CBT were implemented instead of a dock, mine-mouth or well-head tax. Under a CBT, the buyer of a fuel must report all of it as having been burned (with the exception of feedstock fuel) unless it can find another party willing to incur tax liability and report that it has, in turn, bought some of the fuel. Because of this mechanism for heightened compliance, a CBT is preferable to a system that imposes the tax on just one entity.

Taxpayers should receive a credit for fuel used as a feedstock since such use will not result in carbon-dioxide emissions. Whether or not the government institutes a CBT system, the credit should not be split among the many bearers of the tax because of the great administrative costs in trying to do so.

A carbon tax is likely to be somewhat regressive. Authorities should not attempt to make the tax directly progressive through the use of multiple rates because of the enforcement and administrative complications that would result. Rather, regressivity should be combatted by making the tax base as broad as possible and by enacting companion measures. Such measures could include reducing other regressive taxes, increasing the progressivity of other taxes, providing a refundable credit for low-income households, and providing for direct transfers to the lowest-income individuals.

The carbon tax may harm the international competitiveness of some U.S. industries which are heavy burners of fossil fuels. A narrow border-adjustment system (if permitted under trade treaties) would provide a workable mechanism to counteract this harm. Al-

ternatively, the government could grant subsidies to those energy-intensive industries which face significant foreign competition (as long as such subsidies would not violate trade agreements). In spite of the damage to short-run international competitiveness, many energy-using industries can improve their positions by becoming more energy efficient and by using cleaner fuels. Additionally, unilateral action by the United States removes the disincentives many other countries face when considering their own unilateral measures.

Imposing a carbon tax will result in many regional and industrial inequities. Designing the tax to be broad-based and phasing it in over time would lessen the severity of such inequities. Revenue from the tax should be used to retrain and relocate displaced workers and to help dirty-fuel industries retool. The revenue should not be used, however, to subsidize energy-intensive industries simply because of the tax burden they must bear. Such subsidies would subvert the purpose of the tax altogether, which attempts to discourage the combustion of dirty fuels.

A carbon tax should be set high enough to encourage conservation and the shift to cleaner fuels. It should be indexed to inflation and should function to make post-tax fuel prices proportionate to various fuels' relative carbon contents. To mitigate any net adverse effect the tax may have on the economy, the tax should be phased-in.

To make the tax effective, the public must perceive it to be a permanent addition to the Code. To improve compliance, taxpayers must be shown that the numbers they report can be verified, auditing must take place, and penalties for non-compliance should be high.

The success of a carbon tax depends, to a large extent, on the quality of its design and implementation. The dual goals of environmental soundness and actual administrability constantly conflict. A carbon tax, if carefully designed, can be administered adequately and can also serve to reduce the threat of global warming.

B. *Reevaluation Over Time*

In administering a carbon tax over time, officials should periodically reassess its effectiveness. Changes in industry structure, improvements in technology, and expansion of scientific information regarding the consequences of global warming necessitate this periodic reassessment of the tax's design. Any of these dynamics may affect how the tax should be structured.

C. *Choice of Policy Tools*

The desirability of a carbon tax depends, to a large extent, on how its efficiency in reducing carbon-dioxide emissions compares with that of other avenues such as direct regulation. Other tax measures could also be implemented to promote environmental goals, including quick depreciation, or immediate expensing, of energy-efficient equipment instead of capitalization and investment tax credits for research and development directed at improving either energy efficiency or the availability of cleaner fuels. To reduce or stabilize carbon dioxide emissions effectively, it will probably be necessary to institute a variety of policy options, including both tax and regulatory policies. Those programs which currently promote fossil-fuel use should be reduced or eliminated. Congress should consider the relative expenses of running different programs in determining the mix of policy devices to be used and should choose a mix that sufficiently reduces carbon dioxide emissions at the least possible total cost to economic welfare.

D. *Reasons to Act Unilaterally*

Unilateral action by the United States would provide benefits sufficient to justify instituting an environmental policy against carbon dioxide even if no other nation followed suit. Unilateral action would prepare the United States to be more competitive by reducing consumption of one major production input (allowing U.S. industry to deal more easily with future supply shocks). If any international carbon dioxide-reduction agreements were to be negotiated in the future, unilateral action by the United States now would facilitate compliance with such a treaty.¹⁶⁴ It would also improve the United States' image in the world community and increase the probability that other countries or the European Community would adopt its own emissions-reduction policies.¹⁶⁵ Without United States' action, other countries would have little incentive to decrease their own emissions because the United States emits twenty-five percent of worldwide carbon dioxide.¹⁶⁶ Taking

164. 137 CONG. REC. *supra* note 15, at 1110; telephone interview with Marnie Stetson *supra* note 99.

165. Jennifer Woodward, *Turning Down the Heat: What United States Laws Can Do to Help Ease Global Warming*, 39 AM. U. L. REV. 203, 217 (1989). See also ROGER FISHER, GETTING TOGETHER, xiv - xv, 24, for a description of the dynamics of negotiation.

166. Woodward, *supra* note 165, at 217 (citing The Global Environmental Protection Act of 1988 Joint Hearings on S. 2666 Before the Subcomm. on Hazardous Wastes and Toxic Substances and the Subcomm. on Environmental Protection of the Senate Comm.

unilateral action would also make it *possible* for other nations to follow the example because any technological developments to improve efficiency of fossil-fuel use or to make alternative energy sources more readily available probably could not be financed in most of those other countries.¹⁶⁷ The above factors all point towards U.S. adoption of a unilateral emissions-reductions policy.

on Environment and Public Works, 100th Cong., 2d Sess. 286 (1988), at 364); 134 CONG. REC. D1155 (1988)(statement of Dr. Irving Mintzer of the World Resources Institute). See also CBO: CARBON CHARGES, *supra* note 8, at 7.

167. See Section II.C.4.c on international competitiveness.

