Carbon Taxes for Climate Protection in a Competitive World

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EXECUTIVE SUMMARY

Broad-based carbon/energy taxes are among the most promising and important of the emerging tools for promoting reductions in carbon dioxide emissions. Five European nations have adopted such taxes, but tax initiatives in the U.S., Australia and the European Union have failed or stalled. Where carbon/energy taxes have been rejected, especially in the U.S. and Australia, the core opposition came from a coalition of fuel producers and energy-intensive manufacturers. Opponents have argued that energy taxes would damage industries important to the national economy, destroy jobs, and drive fossil fuel-intensive production abroad. The potential for relocating fuel-intensive production in low-tax nations is especially troubling because it damages the taxing nation's industries without any corresponding benefit to the global environment.

Widespread adoption of carbon/energy taxes in developed countries is unlikely unless competitiveness concerns are addressed. To this end, we assess the potential competitive burden of a carbon tax on an industry-by-industry basis. Using data from the U.S. industrial sector, we find that only a handful of energy-intensive primary materials industries would suffer noticeable competitive disabilities from plausible carbon/energy tax rates, even in the absence of offsetting reductions in taxes on labor or capital. We then develop measures to offset those competitive burdens while maintaining the environmental incentive of the tax. We compare the measures we propose with competitive offsets contained in recent carbon/energy tax proposals in Europe and the U.S., using a consistent set of policy criteria. Finally, we discuss the competitive benefits to a nation's industries from a policy package using the revenues from a carbon tax to reduce taxes on labor, combined with an aggressive program promoting energy efficiency.

Most nations that have adopted carbon/energy taxes have largely exempted fuel-intensive industries. This exemption unnecessarily reduces the revenue from the taxes, impairs their effectiveness as environmental measures, and raises concerns over inter-industry and inter-sectoral fairness. Instead of exemptions or rate reductions, competitive offsets that preserve the tax’s environmental benefit should be adopted. Such offsets include:

- border tax adjustments,
- industry-targeted tax credits that preserve the environmental incentive, and
- efficiency investment credits.

These measures could be adopted individually or in combination.

Border tax adjustments on a few energy-intensive products provide a simple and administrable method of offsetting competitive burdens. However, it has been argued that they are incompatible with the system of trade rules under the General Agreement on Tariffs and Trade (GATT) as administered by the World Trade Organization (WTO). This argument is based on a faulty interpretation of those rules. There are clear legal, historical, and policy bases for allowing such adjustments. However, given the long history of dispute in this area, it would be desirable to adopt a protocol or resolution under the Framework Convention on Climate Change to avoid uncertainty about the legitimacy of such border adjustments in the event of a trade dispute.

Industry-targeted tax relief can be designed to preserve the incentive to invest in new technology and to substitute labor and capital for energy. Moreover, carefully targeted relief can eliminate competitive impacts with much less revenue loss than exemptions, caps, or lower rates require. However, unlike border tax adjustments, industry-targeted relief reduces the incentive to find substitutes for fuel-intensive materials and consumer goods.

Investment credits for energy efficiency and renewable technologies provide an effective complement to either of the two preceding offsets. The competitive burdens of energy taxes flow from higher energy prices. If energy consumption can be lowered by a similar percentage, this burden is fully offset. Moreover, such credits can be used to correct imperfections in the technology market such as network and information externalities. There is considerable evidence that firms under-invest in energy efficiency as a result of such imperfections.

Patterns of development that rely on ever-greater exploitation of exhaustible and depletable resources will inevitably run into increasing environmental and social costs. Such resource-intensive development patterns may provide short-term gains. However it is becoming increasingly clear that a smarter long-run alternative is to shift away from polluting natural resource consumption toward investments in clean technology and human resources.

Such investments provide positive feedbacks that lead to further improvement in the quality of the workforce and capital stock, a process which historically has been the primary engine of economic growth. Thus, nations which use pollution or natural resource taxes, such as carbon taxes, to reduce the tax burden on labor and investment will reap long-term growth benefits.

In conclusion, we find that only a few industries would suffer serious competitive burdens from a carbon tax. These burdens can be adequately offset in a variety of ways. Proposals to offset those burdens contained in recent tax proposals in Europe, the U.S., Switzerland and elsewhere reduce the environmental incentive of the tax and are unnecessarily costly. Alternative offsets are available which preserve the environmental incentive and are administrable, effective, fair and less expensive. By adopting such measures a nation could become a leader in promoting efficient, effective climate protection policy.

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1. INTRODUCTION

In recent years, interest in energy taxes as an environmental policy tool has grown tremendously. This interest has been stimulated in large part by a growing awareness that energy production and use (even with stringent environmental regulations) imposes health and amenity costs on society that are not considered in private economic decisions. Economic theory suggests that internalizing these external costs will improve economic efficiency. In addition, policymakers increasingly look to energy taxes as a tool for addressing more fundamental policy goals, such as protecting global climate stability and harmonizing environmental and economic development goals. This trend is likely to gain momentum over the next few years as developed countries begin to implement their commitments under the United Nations Framework Convention on Climate Change (FCCC), and negotiations about future, more stringent commitments proceed.

Since the FCCC was signed at the Rio Earth Summit in 1992, five northern European countries have introduced some form of carbon taxation, typically by restructuring existing energy taxes. However, other proposals for carbon or energy taxes have not succeeded, including initiatives by President Clinton and the Commission of the European Union. Concerns about the impact of these taxes on jobs and the competitiveness of domestic industry have been a critical barrier to their adoption.

Competitiveness issues also concern environmental proponents of such taxes. It is widely recognized that environmental tax-shift proposals must allay basic concerns about economic security and national competitiveness more effectively than they have to avoid repeating recent defeats. Moreover, if fuel taxes drive carbon-intensive production from high-tax to low-tax jurisdictions, the effectiveness of these taxes in protecting the climate is diminished, because carbon dioxide contributes equally to climate instability wherever it is emitted. Such relocations have an even more troubling implication for the long-term prospect of controlling greenhouse emissions. Regardless of the emissions reductions achieved in the industrial nations, economic progress in the developing world will make it impossible to stabilize global greenhouse gas levels unless the emissions/GDP ratio can be lowered drastically through new efficiency and renewable energy technologies. Developed countries must take the lead in commercializing such technologies because developing countries lack the resources to do this by themselves. If fuel taxes cause industries to relocate to low-tax jurisdictions, then not only are immediate emissions reductions offset, but the incentive to develop new clean technologies is also eliminated. Thus there is a strong environmental motive to prevent such industrial displacement, if it can be avoided in a way that preserves the incentive to develop cleaner alternatives.

The next section of this paper discusses the case for carbon and energy taxes as a tool for climate protection. Section 3 presents a brief summary of various taxes considered by national governments and the European Union, including successful and unsuccessful proposals. Failed or stalled proposals are discussed to improve understanding of the reasons for defeat or deferral. Section 4 presents a basic quantitative analysis of the likely impact of carbon/energy taxes on the international competitiveness of nations and industrial sectors. Section 5 outlines a set of criteria for assessing policies to offset the competitive impact of a carbon/energy tax and evaluates a range of policies under those criteria. Sections 6 and 7 examine some legal issues relating to these policies, especially border tax adjustments, under the World Trade Organization and the Framework Convention on Climate Change, respectively. Section 8 briefly discusses some of the offsetting competitive benefits of a tax shift, and section 9 offers a brief summary and conclusion.

While neither a definitive investigation of the competitiveness impacts of energy taxes nor a comprehensive survey of proposals considered by governments, this analysis aims to stimulate discussion of the practical issues facing policymakers who seek to use carbon taxes as a tool for climate protection. Contrary to conventional economic studies, taxes are discussed herein as integral elements in a tax and climate change policy tool kit that will be used to assemble integrated policy packages to serve environmental, economic and social goals.

2. THE CASE FOR CARBON/ENERGY TAXES

2.1 The Climate Change Convention and Developed Country Fossil Carbon Emissions

By April 1996, nearly four years after the adoption of the United Nations Framework Convention on Climate Change (FCCC)[1] at the Earth Summit in Rio de Janeiro, 158 countries, including all the major developed nations, had ratified the convention. In doing so, they agreed to its ultimate objective:

"...stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner."[2]

Recognizing the primary responsibility of developed countries for increased atmospheric concentrations of greenhouse gases, the convention calls upon those countries to take the lead in combating climate change.[3] Accordingly, developed country parties committed to return their greenhouse gas emissions to 1990 levels by the year 2000.[4] In 1994, as required by the convention, fifteen of these parties submitted national communications reporting current and projected emissions and describing national plans for reducing them.[5] These communications show that many developed countries were unlikely to return their emissions to 1990 levels by 2000, let alone achieve the stronger national targets the majority had adopted, unless additional reduction measures were implemented.[6] More significantly, 6 out of the 10 countries that provided projections beyond 2000 for the main greenhouse gas, carbon dioxide, forecasted continued growth in emissions. Only one country confidently forecasted a decrease.

It is now widely acknowledged that the commitment to return developed country emission to 1990 levels is inadequate. Further, developing country emissions continue to grow rapidly and further growth in their emissions is not precluded by FCCC. The Intergovernmental Panel on Climate Change (IPCC) has reported that stabilizing global emissions (i.e., the emissions of developed and developing countries combined) of carbon dioxide at present levels will lead to a steady increase in atmospheric concentrations. IPCC found that to stabilize atmospheric

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[1] United Nations Conference on Climate and Development: Framework Convention on Climate Change, May 9, 1992, in *Report of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change on the Work of the Second Part of Its Fifth Session*, INC/FCCC 5th Sess., 2d Part at Annex 1, U.N. Doc. A/AC.237/198 (Part 2)/Add.1, reprinted in 31 International Legal Materials 851.

[2] Article 2, *United Nations Framework Convention on Climate Change* (Geneva, Switzerland: United Nations Environment Programme and World Meteorological Organization Information Unit on Climate Change, 1992).

[3] Industrialized countries, including eastern Europe and Russia, account for approximately three-fifths of current anthropogenic greenhouse gas emissions but only one-fifth of world population. They account for an even higher share of historic emissions of long-lived greenhouse gases. See World Resources Institute, *World Resources 1994-95: A Guide to the Global Environment* (New York: Oxford University Press, December 1994).

[4] Article 4.2 (a) & (b), *United Nations Framework Convention on Climate Change* (Geneva, Switzerland: United Nations Environment Programme and World Meteorological Organization Information Unit on Climate Change, 1992).

[5] These fifteen countries accounted for 41 percent of global carbon dioxide emissions from fossil fuels in 1990. Intergovernmental Committee for a Framework Convention on Climate Change (INC), *Compilation and Synthesis of National Communications from Annex 1 Parties* (New York: United Nations, December 1994 (A/AC.237/81)).

[6] See also Climate Action Network, *Independent NGO Evaluations of National Plans for Climate Change Mitigation: OECD Countries, Third Review* (Washington DC: January 1995).

concentrations at, for example, roughly twice pre-industrial levels, global emissions would eventually have to drop well below 1990 levels.[7] Clearly, the current commitment falls considerably short of stabilizing global emissions, let alone atmospheric concentrations.

At the first meeting of FCCC's Conference of the Parties (COP) in late March through early April 1995, developed country parties acknowledged the inadequacy of their current commitments and the necessity of future emissions reductions. A new round of negotiations that is currently underway, known as the Berlin Mandate process, will challenge policymakers to consider long-term measures to reduce the growth of developed country emissions and pave the way for future limits on developing country emissions. These negotiations bring the issue of fossil fuel consumption into sharp focus.

The 1994 national communications submitted by developed countries indicated that carbon dioxide from fossil fuel combustion accounted for more than 75 percent of these countries' current emissions and an even greater share of their projected emissions growth.[8] This fact alone makes it clear that policymakers need to consider new ways to reduce fossil fuel consumption. But reducing consumption is a more difficult proposition than tackling conventional pollution problems. Carbon dioxide is an inherent result, not a by-product, of fossil fuel combustion and is emitted to the atmosphere by multiple sources, from lawn mowers to automobiles to power plants. Each new power plant powered by fossil fuel and every new urban freeway contributes another 30- to 50-year stream of emissions. Moreover, once in the atmosphere, this carbon dioxide stays there for about a century. What is needed, therefore, are strategies that take this extended horizon into account and redirect the economy toward low- and zero-carbon infrastructure and energy technologies. In particular, technologies that could make a low-carbon development path cost-effective for developed and developing countries need to be explored. Taxes can play an important role in these new strategies.

2.2 The Role of Taxes in the Climate Change Policy Toolkit

Economists often propose a tax on the carbon content of fossil fuels as a way of achieving the lowest-cost emission reductions across all fossil carbon sources.[9] Such a tax reduces carbon dioxide emissions in two ways: it encourages more efficient energy use, and it stimulates development of zero-emission technologies by increasing fossil fuel prices. By changing relative prices among fuels, this kind of tax encourages a shift in consumption from coal and oil to cleaner-burning natural gas.

The only policy tool other than a carbon tax that can address all energy-related sources of carbon dioxide emissions is a cap on the total amount of fossil carbon entering the economy combined with a system of tradable use permits. In theory, the two approaches are similar: a tax fixes the price of carbon emissions and allows the quantity to adjust accordingly. A permit system fixes the quantity and allows the price to adjust. However, as a domestic measure, a carbon tax has important practical advantages over a permit trading scheme. First, taxes are a familiar policy tool that easily can be implemented through existing administrative systems. Second, while a trading scheme provides a more certain environmental outcome, policymakers find the more predictable economic impact of a tax attractive.[10] Third, experience with trading schemes suggests that permits would be grandfathered rather than auctioned by the government, generating substantial windfalls for large coal and oil companies and raising fairness concerns.

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[7] Intergovernmental Panel on Climate Change, *Radiative Forcing of Climate Change: The 1994 Report of the Scientific Assessment Working Group of IPCC – Summary for Policymakers* (Geneva Switzerland: World Meteorological Organization, 1994).

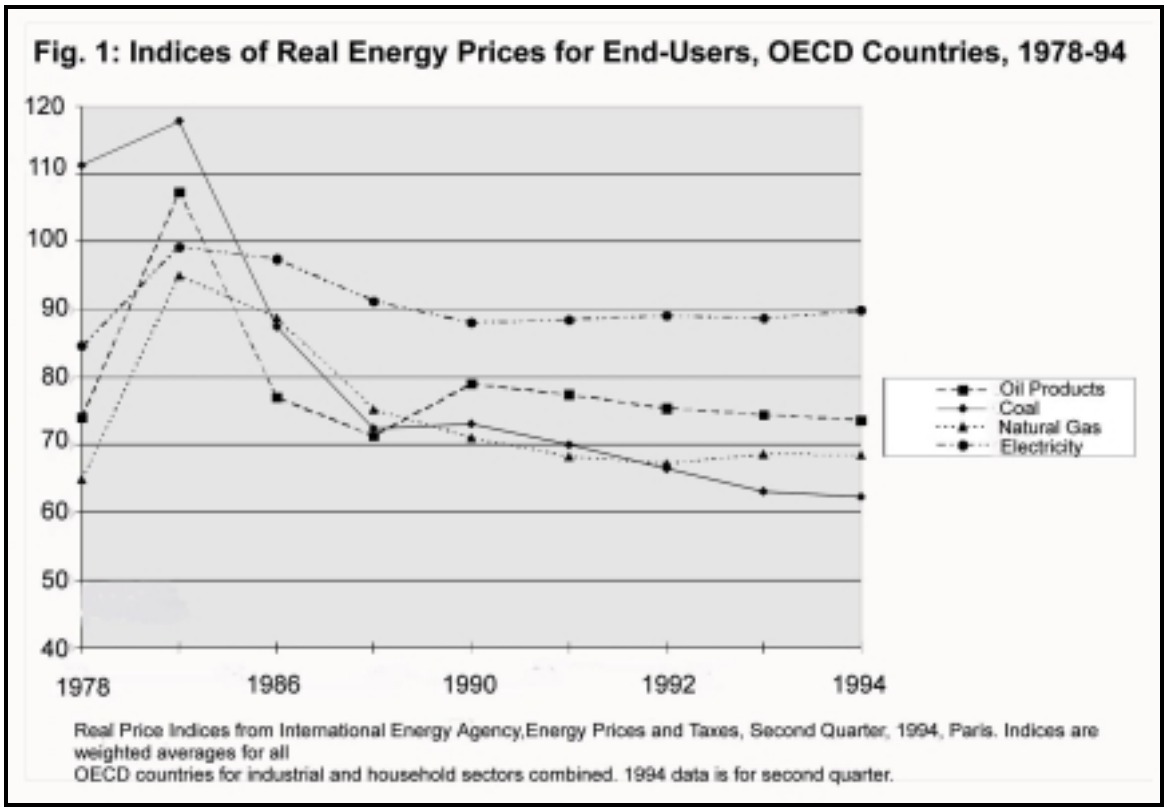
[8] See note 5, above.

[9] For example, see R. C. Dower and M. B. Zimmerman, *The Right Climate for Carbon Taxes: Creating Economic Incentives to Protect the Atmosphere* (Washington DC: World Resources Institute, 1992); and W. E. Oats and P. R. Portney, "Policies for the Regulation of Global Carbon Emissions (discussion paper CRM 91-02 for Resources for the Future, Washington DC, February 1991).

[10] Oates and Portney, note 9, above.

Finally, tax revenues can fund compensation for low-income families vulnerable to higher energy prices, adjustment assistance for fossil-fuel producing communities, and development of low-emission technologies and infrastructure.

Some economists suggest that either a carbon tax or a trading scheme will be sufficient for reducing fossil carbon emissions; public policy only needs to "get the prices right" and then the market system will achieve an appropriate level of emission reduction. However, the energy sector is a far from ideal market. Firms systematically fail to implement practices to improve energy efficiency that are profitable under current prices.[11] Moreover, targeted policy measures are critical to the timely development of emerging zero-emission technologies, like wind power and photovoltaics.[12] Indeed, specific public policies have played key roles in the development of existing major energy supply and use technologies, including oil production, highway transport, hydro and nuclear power, and centralized utility power plants.[13] In practice, then, a carbon tax is best viewed as one tool in a climate change policy tool kit that includes voluntary agreements, efficiency standards, technology-promoting policies, infrastructure investments, land use policies, and other measures.



[11] S. J. DeCanio, "Barriers within Firms to Energy-Efficient Investments," *Energy Policy*, 21, no. 9 (1993): 906-14; and S. J. DeCanio, "The Energy Paradox: Bureaucratic and Organizational Barriers to Profitable Energy-Saving Investments" (unpublished manuscript, Department of Economics, University of California, Santa Barbara, August 1995).

[12] J. A. Hoerner, A. S. Miller and F. Muller, *Promoting Growth and Job Creation Through Emerging Environmental Technologies*, Research Report No. 95-03 (Washington DC: National Commission for Employment Policy, April 1995).

[13] For example, see B. W. Cone, et al., *An Analysis of Federal Incentives Used to Stimulate Energy Production,* Revision II (Richland WA: Pacific Northwest Laboratory, 1980) and Office Technology Assessment, U.S. Congress, *Renewing Our Energy Future,* OTA-EIT-624 (Washington DC: Government Printing Office, September 1995).

While they should not be viewed as solitary instruments, energy taxes are a key element of the climate change policy toolkit. By affecting all sources of fossil carbon emissions, taxes reinforce other energy sector policy measures. As Figure 1 shows, fossil fuel prices and end-user energy prices have fallen in real terms since the oil price shocks of the 1970s. Market expectations that prices will remain low have become a major barrier to the improvement of energy efficiency and the development of alternative technologies and infrastructure. Even relatively modest carbon tax measures can help undermine this "cheap fuel" psychology by signaling a difference in future price trends. For example, once a tax is in place, investors in power plants, transport infrastructure, and other long-term projects will need to weigh the risk of future tax increases during the life of their investments.

3. RECENT CARBON/ENERGY TAX PROPOSALS

3.1 Summary of Proposals Considered by Governments

Carbon and energy tax proposals considered in recent years by governments in selected countries are summarized in Table 1. These include taxes adopted in five northern European countries and proposals that were rejected or deferred in the United States, Australia and the European Union.

While all these taxes were proposed in part for environmental reasons, including climate protection, none is a pure carbon tax. Denmark, Norway, and Sweden's taxes, and Australia's proposed tax are assessed on the carbon content of fuels but have lower rates or exemptions for specific fuels or sectors.[14] In Finland, the Netherlands, and the EU the tax is assessed partly on carbon content and partly on energy content. The proposed U.S. tax was based on energy content.[15]

The highest taxes have been adopted by Denmark, Norway and Sweden. However, it should be noted that a reduction in some existing energy taxes accompanied the imposition of these taxes. In all three countries, substantial tax relief is provided for industry.[16] The taxes adopted by Finland and the Netherlands, while smaller, provide fewer loopholes for industry. All five schemes were designed to contribute to national greenhouse gas reduction goals through their price-effect. However, several of these taxes also replace, in whole or part, the revenue base from existing energy. The Danish tax is also used in part to fund energy efficiency investments. This resembles the pattern, common in many nations with environmental taxes or fees, of using the revenues to establish environmental trust funds.[17]

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[14] Natural gas and gasoline are exempted from the Danish tax, as are fuels used in electric generation from the Swedish tax, and all petroleum fuels from Australian proposal.

[15] The U.S. proposal included a higher rate (per unit of energy) for petroleum fuels.

[16] Although Finland's tax is small, the government has signaled future increases in the rate. The small Netherlands tax was introduced in anticipation of and support of a larger EU tax.

[17] OECD. Environmental Taxes in OECD Countries. Paris: OECD (1995); Robert Gale & Stephan Barg (eds.) *Green Budget Reform: An International Casebook of Leading Practices. London, U.K.: Earthscan Press (1995).*

TABLE 1. CARBON AND ENERGY TAX SCHEMES

Country	Tax Rate ($/t of carbon)	Industry Exemptions	Domestic Fuel Production	% Electricity from Coal
Adopted Carbon and Energy Taxes				
Denmark	$27-$55	lower rate and refunds	oil and gas	76%
Finland	$18-$22		none	23%
Netherlands	$16-$22		oil and gas	38%
Norway	$55-$172	coal used in industry	oil and gas	negligible
Sweden	$38-$148	lower rate & cap on tax paid	none	2%
Unsuccessful Carbon and Energy Tax Proposals				
European Union	$63-$90	reductions for energy-intensive industries	varies	varies
United States	$9-$29	specific industries partially exempted	coal, oil, gas	51%
Australia	$3		coal, oil, gas	80%

NOTES: All tax rates (carbon, energy, and hybrid) have been converted to U.S. dollars per tonne of carbon (based on first quarter 1994 exchange rates). The ranges shown reflect variations among fuels and sectors. In Denmark, Norway, and Sweden reductions in some existing energy taxes accompanied the introduction of a carbon tax. The full U.S. and EU rates, which were to be phased in over periods of three years and seven years respectively, are shown here. The failed U.S. proposal included a higher rate (per unit of energy) for petroleum fuels and would have assessed the tax simply on energy content, rather than partly on carbon content and partly on energy content, as the Finnish, Dutch and proposed EU regimes do. The failed Australian proposal was assessed on carbon content, but exempted petroleum fuels. SOURCE: Data for domestic fuel production and the percent of electricity generated from coal are from International Energy Agency (IEA), *Energy Policies of IEA Countries: 1992 Review*, Paris: OECD, 1993). Tax rate and industry exemption data for the adopted taxes are from IEA, *Climate Change Policy Initiatives: 1994 Update* (Paris: OECD, 1994).

None of the five countries to adopt a carbon tax has significant domestic coal production, and two of the five produce no fossil fuels at all. Denmark alone uses coal as its primary source of electricity; Finland, Norway and Sweden's electricity systems are predominantly based on non-fossil generation. Consequently, international competitiveness concerns did not weigh as heavily in these countries as they have in nations with more carbon-intensive economies. Denmark and Sweden nonetheless chose to include broad exemptions for industry.

As Table 1 illustrates, proposals for comparatively low taxes somewhat similar to those adopted in the five European countries did not meet with success in either the United States or Australia. Both these countries have substantial domestic fossil fuel production, coal-based electric systems, and significant energy-intensive manufacturing. The failure of the United States and other key trading partners to adopt such proposals has hindered the implementation of the European Union (EU) scheme for a Europe-wide carbon/energy tax. For the moment, the EU has resorted to encouraging national initiatives by member states within a common framework. The adoption of carbon/energy taxes in the United States, the EU, and other developed countries like Australia is crucial to the development of an effective international climate protection regime. Policymakers need to learn from past failures if they are to develop effective strategies for advancing successful proposals. To that end, the following discussion provides background on the EU proposals and dissects the reasons behind the failures of the U.S. and Australian initiatives.

3.2 Recent Carbon/Energy Tax Initiatives

3.2.1 The European Union Proposal

The EU proposal differs from all of the other tax proposals discussed here in terms of the type of tax regime. Whereas the other measures are purely national , the EU proposed a multilateral agreement to harmonize national taxes. The Commission of the European Communities (now the EU) advanced the idea of a Europe-wide carbon/energy tax in a draft legal directive presented to the Council of Ministers in 1992.[18] The tax was to be collected by each member state and other national taxes had to be reduced to fully offset the increased revenues. The tax would be assessed half on the basis of energy content and half on the basis of carbon content of fuels. Nuclear power and large-scale hydropower projects would be taxed, but non-conventional renewable energy sources exempted. The tax was to be phased in over seven years, starting at the equivalent of $3 (U.S.) per barrel of oil and rising to $10 per barrel. In association with other measures, the tax was specifically designed to achieve the carbon dioxide reduction target the EU had already adopted through price incentives.

Because of concerns about European industry's international competitiveness, implementation of the tax was made conditional on other OECD countries adopting similar taxes or other financially equivalent measures. European policymakers were worried that the tax would benefit U.S. industry, which already enjoyed significantly lower energy taxes and prices (See, for instance, Figure 3 which illustrates the impact of proposed taxes on average electricity prices for industry. Figure 4 shows the effect on average natural gas prices, and the influence on automotive diesel prices is represented in Figure 5). In addition to the "conditionality" provision, the EU proposal addressed competitiveness concerns by allowing graduated reductions in the tax for energy-intensive industries disadvantaged by increased imports from countries which had not introduced a similar tax or equivalent measures.[19] Firms making substantial efforts to save energy or reduce carbon dioxide emissions could be fully exempted from the tax.
Implementation of the tax has encountered three major obstacles. First, the "conditionality" requirement has not been met. (In March 1993, senior representatives of the EU met with members of the Clinton Administration, but the United States showed little interest in the harmonized multilateral approach; it was ruled out altogether by the defeat of Clinton's Btu tax.) Some member countries argued that the EU should nevertheless proceed unilaterally because the proposal did include tax relief for energy-intensive industries. Competitiveness concerns, however, prevailed. Second, Britain objected to the tax as an infringement of national sovereignty. Although the proposal became entangled in a separate and long-standing dispute over Britain's place in the EU, it is not accidental that the British Government chose to take a stand on a tax issue. Nations always have protected their sovereignty in the area of taxation. Third, extensive negotiations on how to allocate the burden of meeting the carbon dioxide reduction target and on the timing of the tax's introduction by poorer EU members proved necessary. Absent the other two obstacles, however, it is likely that the burden sharing issue would have been resolved.

In December 1994, the EU decided to defer implementation of a Europe-wide tax and instead to establish guidelines under which individual member states could choose to adopt their own taxes. The amended proposal requires implementation of a harmonized tax system by 2000 and establishes flexible parameters for adoption of domestic taxes during the interim transition period.[20] The basic structure of a hybrid carbon/energy tax is retained. Members are to try to make their tax rates converge toward a target rate that is the same as the fully phased-in rate of the original proposal. How many member states adopt taxes consistent with this proposal remains to be seen.

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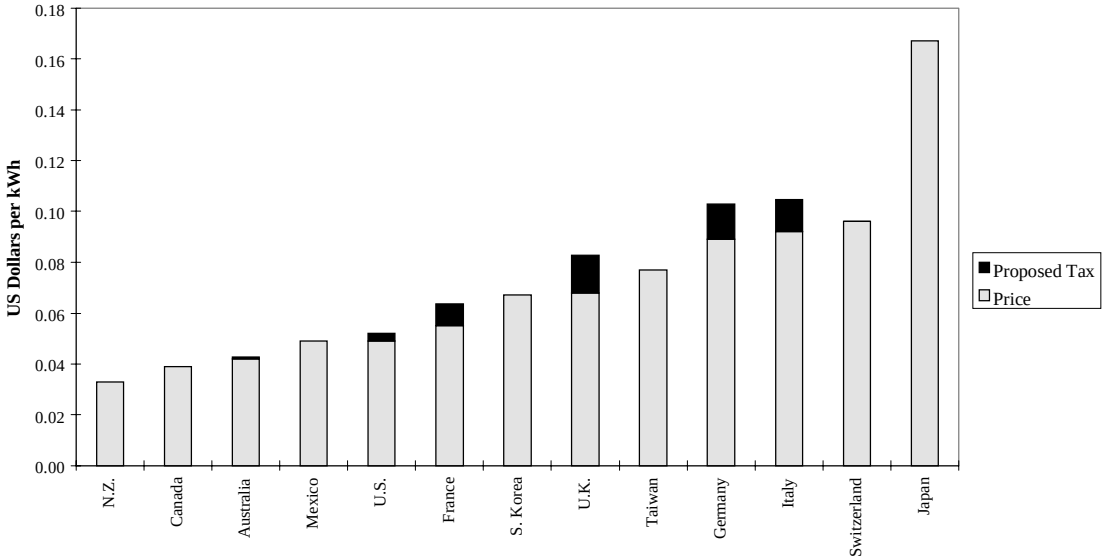
[18] Commission of the European Communities, *Proposal for a Council Directive Introducing a Tax on Carbon Dioxide Emissions and Energy*, CB-CO-92 250-EN-C (Luxembourg: Official Publications of the European Communities, 30 June 1992).
[19] An activity is defined as energy-intensive when total energy cost is at least 8 percent of value added.

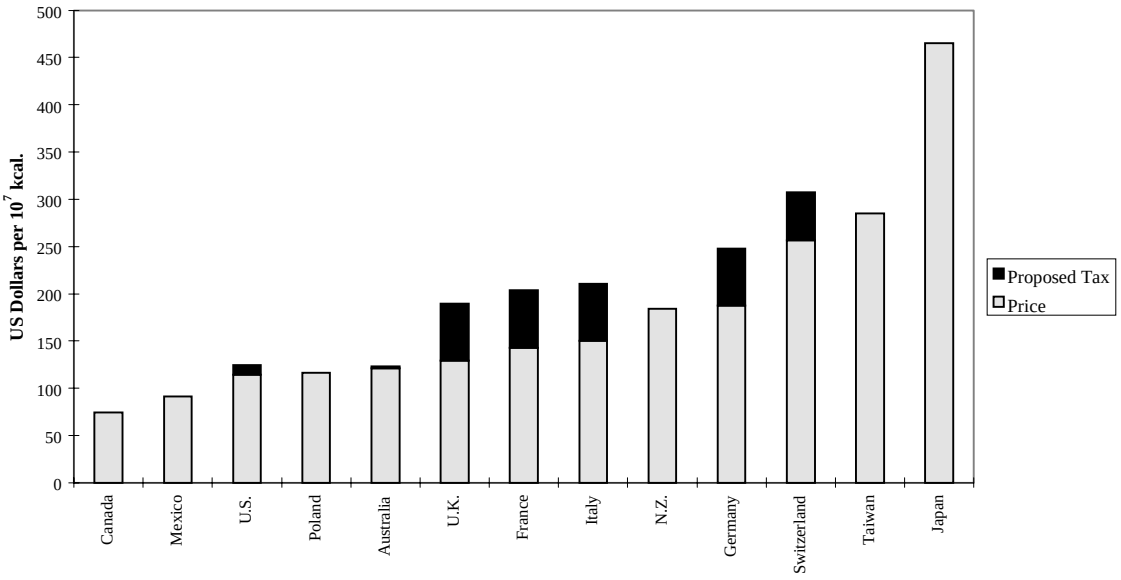
[20] Commission of the European Union, "Amended Proposal for an EU Directive Instituting an Energy/CO_2 Tax," in *Europe Environment*, no. 455 (May 1995): 1-14.

Fig. 2: Impact of Proposed Taxes on Average Electricity Prices for Industry



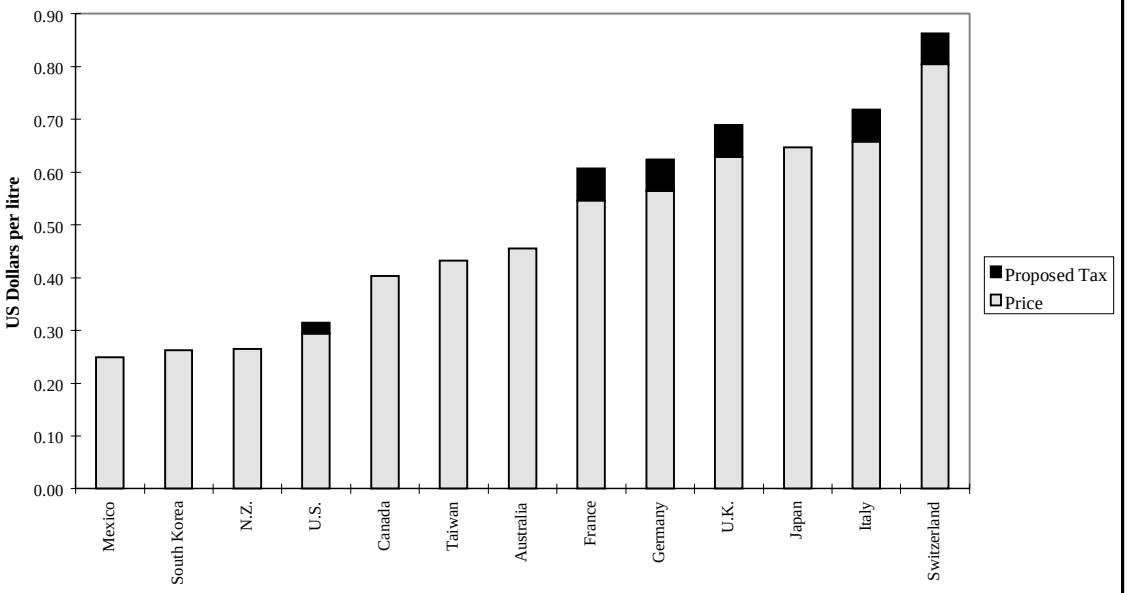
NOTE: Proposed tax for EU countries, Switzerland, the United States, and Australia were calculated by the author using national fuel and generation data. Fully phased-in rates are shown based on 1993 exchange rates.
SOURCE: Average prices for industry in 1993, including taxes (except value added tax (VAT) and U.S. state and local taxes), from International Energy Agency, *Energy Prices and Taxes, Third Quarter* , (Paris, 1994).

Fig. 3: Impact of Proposed Taxes on Average Natural Gas Prices for Industry



NOTE: Fully phased-in tax rates shown for E.U. countries, Switzerland, the United States, and Australia based on 1993 exchange rates.
SOURCE: Average prices for industry in 1993, including taxes (except value added tax (VAT) and U.S. state and local taxes) from International Energy Agency, *Energy Prices and Taxes, 3rd Quarter* (Paris, 1994).

Fig. 4: Impact of Proposed Taxes on Average Automotive Diesel Prices



NOTE: Fully phased-in tax rates shown for EU countries and the United States based on 1993 exchange rates.
SOURCE: Average prices for 1993, including taxes (except value added tax (VAT)) from International Energy Agency, Energy Prices and Taxes, Third Quarter (Paris, 1994).

3.2.2 President Clinton's Btu Tax

In February 1993, soon after taking office, President Clinton proposed a broad-based energy tax for the United States.[21] The tax was to be levied on the energy content of fuels, with a substantially higher rate for petroleum fuels than for coal and natural gas.[22] It also applied to nuclear power and large-scale hydropower. The tax was part of a broader budget proposal designed to reduce the federal government's fiscal deficit, while promoting investment and assisting low- and middle-income families. The three reasons in addition to deficit reduction that the Administration cited for the tax were reduction of environmental damage, energy conservation, and the alleviation of U.S. dependence on foreign energy sources.

The tax was carefully designed to spread the revenue burden evenly across the country's diverse regions. A carbon tax was ruled out specifically because of concerns about its economic impact and the attendant political fallout in coal-producing states.[23] However, the Btu tax would have reduced carbon dioxide emissions by encouraging greater efficiency in energy production, conversion, and use and by promoting development of renewable energy. (Non-conventional renewable energy sources were exempted from the tax.) Furthermore, because the tax applied to energy input rather than electric output, it favored efficient natural gas technologies over coal for electric generation.

Immediately after the proposal was announced, various industries began lobbying for special exemptions. The White House quickly granted concessions that encouraged further special interest lobbying. The administration

[21] U.S. Department of the Treasury, "Summaries of the Administration's Revenue Proposals Prepared by the Department of the Treasury: Draft as of Feb. 19, 1993," reprinted in special supplement of *Highlights and Documents* (Tax Analysts, Arlington VA, 23 February 1993).

[22] A basic rate of $0.257 (U.S.) per million British thermal units (Btus) was to be imposed on all fuels plus a supplemental tax of $0.342 per million Btus on oil.

[23] The new administration also did not wish to alienate an influential senator from the state of West Virginia where coal mining is a major industry.

released draft legislation for the tax in April 1993, and the House of Representatives passed an amended form of the bill in June.[24] The House version preserved the original proposal's basic structure but incorporated numerous special exemptions, including oil used in refineries, coke used in steel making, electricity used in aluminum and chlorine production, waste-to-energy facilities, and fuel used in production of another fuel. Since the exemptions were not conditional on firms improving energy efficiency or reducing emissions, they effectively removed incentives for those efforts.[25]

The exemptions did not diffuse industry opposition, however. The oil industry and the National Association of Manufacturers mounted major publicity campaigns against the tax. Direct mail and television advertising campaigns were orchestrated in key states, full-page advertisements placed in major national newspapers, and anti-tax materials widely distributed through gas stations. Claims that the tax would undermine the economies of fuel-producing regions, damage the international competitiveness of U.S. industry, and cause widespread job loss inflamed public concern. The administration, the environmental community, and businesses which stood to benefit failed to mount a public relations counteroffensive. The tax was defeated narrowly in the Senate, where the administration lost the support of several oil-state Democrats and failed to win over any moderate, pro-environment Republicans. The Senate chose a small increase in the gasoline tax as the alternative.

In addition to the industry attack campaigns, several factors contributed to the Btu tax proposal's defeat: the administration's poor political strategizing and management of the situation, environmentalists' failure to mobilize support, general job insecurity, an anti-tax/anti-government political climate, and a lack of support from business who stood to benefit.[26] When combined, these factors fostered the popular perception that the tax would damage Americans' economic well being. The opposition of fuel producing regions and businesses to an energy tax was inevitable. General acceptance of the argument that the tax would damage the international competitiveness of U.S. manufacturing and threaten jobs, which was not inevitable, ultimately proved to be the fatal factor.

TABLE 2: BTU TAX IMPACT ON ENERGY-INTENSIVE TRADED GOODS

Industry	Tax as Percent of Value of Shipments
Primary Aluminum	2.1%
Nitrogenous Fertilizer	1.5%
Blast Furnaces & Steel Mills	1.1%
Industrial Inorganic Chemicals	0.9%

SOURCE: J. A. Hoerner and F. Muller, "The Impact of a Broad-Based Energy Tax on the Competitiveness of U.S. Industry," *The Natural Resources Tax Review*, July-Aug. 1995,428-458.

Business analysts often argue that low energy prices provide a critical comparative advantage for U.S. industry.[27] As Figures 3 through 5 and Table 2 show, however, the Btu would not have significantly eroded this advantage. Had both the United States and the EU adopted new energy taxes, U.S. industry would not have suffered any loss of advantage in relation to Europe (or to any other trading partners that followed suit). Indeed, as the figures

[24] U.S. Department of the Treasury, "The Revenue Reconciliation Act of 1993 as Prepared by the Department of the Treasury: Released April 30, 1993," reprinted in special supplement of *Highlights and Documents* (Tax Analysts, Arlington VA, 3 May 1993); and U.S. Department of the Treasury, "The Omnibus Budget Reconciliation Act of 1993, reprinted in ibid., 21 May 1993.

[25] For a discussion of these exemptions and the alternative approaches that would have preserved the environmental signal of the tax, see J. A. Hoerner and F. Muller, "The Impact of a Broad-Based Energy Tax on the Competitiveness of U.S. Industry," *The Natural Resources Tax Review*, July-August 1995, 428-458.

[26] Energy taxes do not command strong support among grassroots environmentalists and what support they did enjoy was further eroded by the public spectacle of an Administration bowing to pressure for exemptions from heavy industry. Notably, Congress rejected the Btu tax proposal but in the same budget bill raised the corporation income tax, which imposes a greater burden on most businesses than a Btu tax that raises the same revenue.

[27] For example, see "Clinton Tax Plan Ignored Cheap Energy Tradition," *Washington Post*, 12 June 1993, A4.

illustrate, the proposed EU tax was considerably higher. Ironically, a border adjustment on energy-intensive imports that ensured equivalent domestic and imported products would be treated equally was part of the Btu tax scheme the U.S. House of Representatives passed.[28] None of these factors impacted greatly on a debate that quickly became dominated by raw politics. A more thoughtful debate that distinguished between the interests of fuel producers and the broader national interest in maintaining a competitive manufacturing sector never developed.

3.2.3 The Australian Greenhouse Levy

A carbon tax was widely debated in Australia in the months before the first FCCC Conference of the Parties meeting. The national communication submitted by Australia in 1994 revealed the country was likely to fall well short of the 1990 emissions level commitment. Even though the government had adopted various reduction measures, greenhouse gas emissions were projected to increase by 7 percent between 1990 and 2000.[29] In December 1994, the Minister for the Environment proposed a package of additional measures that included a small carbon tax. The tax, known as a "greenhouse levy," would have been imposed on domestic consumption of fossil fuels, not including transport fuels, at a rate of nearly $3.50 (U.S.) per tonne of carbon.[30] Part of the revenue from the tax would have funded establishment of an Australian Sustainable Energy Authority to promote energy efficiency and renewable energy.

At first glance, Australia, the world's largest exporter of coal and the third largest exporter of primary aluminum metal, seems an unlikely early candidate for a carbon tax. Aluminum production depends on cheap electricity and four-fifths of Australia's electricity is generated with coal.[31] Strong public concern for the environment counters these immediate economic interests and has significantly influenced the outcome of several federal elections since 1983.[32] The Australian people are quite familiar with the economic and environmental effects of climatic extremes, regularly weathering droughts and floods. This contributes to the degree of public awareness and concern about climate change issues.

Public discussion of the proposal quickly focused on competitiveness concerns. Like the other taxes discussed in this paper, the levy would not have applied to exports of fossil fuels, including coal, Australia's most valuable export.[33] Nonetheless, business interests, economic commentators, and some government departments expressed strong concern about its impact on the competitiveness of energy-intensive exporting industries, especially those producing alumina and aluminum metal that, combined, are Australia's third most valuable export. The Minister for Trade, for example, argued that the levy would favor exports of raw materials (e.g., coal and bauxite) over value-added production, which creates greater employment and national income. The levy, however, was too small to

[28] A traded good was defined as energy-intensive if fuel and electricity accounted for more than 2% of production cost.

[29] Without the implementation of additional measures, emissions growth of 14 percent was projected. Carbon dioxide from fossil fuels accounted for 49 percent of 1990 emissions and 69 percent of the growth. *Climate Change: Australia's National Report under the United Nations Framework Convention on Climate Change* (Canberra: Australian Government Publishing Service, 1994).

[30] The proposed rate was $1.25 (Australian) per tonne of carbon dioxide. Details of the levy were discussed during government consultations with key stakeholders and widely reported in the media, but no official documentation was released.

[31] Large state government investments in coal power plants in the early 1980s facilitated a more than four-fold increase in aluminum production. Aluminum smelting now accounts for nearly 20 percent of electricity use in these states.

[32] See P. Kelly, *The End of Certainty: The Story of the 1980s* (Sydney: Allen & Unwin, 1992), chapter 28.

[33] Typically, carbon tax proposals have applied the destination principle to fossil fuels, meaning that the fuels are taxed in the country where they are consumed. According to this principle, fuel exports from a producing nation are not taxed, but fuel imports by a consuming nation are taxed at the same rate as domestically produced fuels.

significantly affect Australia's comparative advantage in fuel and electricity prices. As Figures 3 and 4 show, the levy was even substantially smaller than Btu tax proposed in the United States.[34] The levy would have increased the cost of producing aluminum metal by an amount equal to 1 percent of the world price of aluminum.[35]

Some critics argued that the levy, although small, would be viewed by investors as the "thin edge of the wedge" and would scare away investments in key industries to other countries with low-cost energy. The aluminum industry strongly encouraged this view. Although exaggerated, the argument has some merit: One of the levy's stated purposes was to send a signal about future policy directions. However, a carbon tax's environmental purpose is undermined if production, and hence emissions, is simply shifted elsewhere. One solution would have been to rebate the levy on carbon embodied in highly energy-intensive exports such as aluminum, just as border adjustment passed by the U.S. House of Representatives as part of the Btu tax scheme taxed energy-intensive imports. In both cases, such a border tax adjustment would have ensured that domestic and foreign energy-intensive goods received the same tax treatment. However, the same trade advisers who had raised concerns about the levy's competitiveness impact also opposed this approach.

In February 1995, the Australian Government dropped the levy proposal in favor of pledges by industry and electricity authorities to reduce emissions. As had been the case in the United States, industry opposition and competitiveness concerns were the main forces behind its demise. The debate was also similarly one-sided. The government never really publicly supported the levy and several ministers spoke out against it. With their support and the cooperation of their departments in addressing competitiveness concerns, the greenhouse levy might have met a different fate.

3.3 Competitiveness Concerns as a Barrier to Tax Reform

The EU, U.S., and Australian examples provide ample evidence that strong industry opposition to tax proposals is a key component in their defeat. Perceptions that the tax will damage the international competitiveness of national industry also played a critical role. While fuel producers and energy-intensive manufacturers formed the core of industry opposition in the United States and Australia, concern about competitiveness generally extended broadly across industry. Major business interests who stood to gain failed in all three cases to marshal significant organized support for the proposals. In Europe, the prevailing argument was that industry already faced considerably higher energy prices than competitors and could not afford further increases. In the United States and Australia , where substantially lower taxes were proposed, cheap energy was held up as a key source of comparative advantage and any new tax was described as eroding competitiveness. In all cases, the competitiveness argument fed upon public anxiety about job security.

Three main obstacles to the wider adoption of carbon/energy taxes are suggested by the EU, U.S., and Australian experiences. First, the competitiveness issue must be addressed. Second, environmentalists need to alleviate wider concerns about the impact of environmental policies, including tax measures, on job security. Third, new strategies and alliances must be forged to fracture business opposition to carbon/energy taxes.

With few exceptions, major business interests have not actively supported adoption of carbon/energy taxes and those businesses that could conceivably benefit have usually stayed out of the policy debate. For example, natural gas interests have tended to focus more on the shrinking of the fossil fuel market "pie" than on their expanding slice

[34] Large energy-intensive industrial consumers, such as aluminum smelters, typically contract for bulk energy supply at substantially below-average price. In the case of all the taxes examined here, prices for such customers would increase by a greater percentage than shown in the figures.

[35] Taking account of the electricity and process heat used from the mine to the smelter, the levy would have added between $22 and $27 (Australian) (in states with coal-fired electricity) to the cost of producing a tonne of metal, compared with a world price in mid-January 1995 of $2,626 (Australian) ($2,022 U.S.) at the then exchange rate of A$1=U.S.$0.77. By comparison, at this price and exchange rate, a one-cent increase in the value of the Australian dollar would reduce the price in Australian dollars (and thus profits) by $34.

in such a diminished market.[36] In the United States, corporations which had previously argued for energy taxes as an alternative to regulation (e.g., General Motors) provided only nominal support for the Btu tax proposal. Some major U.S. companies did allow their names to be used by the administration in support of the Btu tax, but none made any serious attempt to counter the vigorous campaign mounted by the oil industry and the National Association of Manufacturers.[37] In Australia as well as the United States, major companies that would have paid little energy tax stayed on the sidelines, even though the defeat of such proposals ultimately led to more burdensome increases in the tax on general business income.

Those who will be penalized by a proposed policy change, such as an energy tax, can always be expected to make more noise than those who will benefit, especially when the gains are distributed more widely than the losses. Nevertheless, energy tax proponents need to find ways of gaining sufficient business support to neutralize, at least partly, the opposition of fossil fuel producers. Relationships have to be developed and business support won for specific proposals before such proposals are advanced in the political arena. Otherwise, the natural tendency of business interests to stick together takes over when the proposal becomes a political issue. While important, business support should not be won at the expense of other key policy goals such as social justice. It is easy to design a tax shift that many businesses will support; an energy tax where all the revenues are used to reduce corporate income taxes is one example. Crafting a proposal that serves environmental, economic and social goals and that can gain the support of a winning coalition of interests is more difficult. Environmental policymakers should start by learning from past tax reform successes and failures in their own countries. In the United States, for example, the Tax Reform Act of 1986 may provide a model for the introduction of energy taxes. In that battle, a coalition of retail, services, information, and consumer goods industries favoring lower tax rates prevailed over traditional heavy industries defending various specific tax breaks.

One possible strategy is to advance energy taxes as part of a broader fiscal initiative designed to promote a long-term shift to a sustainable economy that provides full employment and relies more on building human skills and less on consuming energy and resources. Such an initiative would include tax and spending reforms to strengthen incentives for pollution avoidance, human capital investment, and growth in jobs and wages. It should over time partly shift the tax base from labor to pollution and consumption of energy and resources and provide for increased public and private investment in skill development and environmentally sustainable infrastructure and technologies. This design would appeal to both knowledge-based and labor-intensive industries as well as labor unions and the education and training communities. Before advancing such a proposal, however, environmental policymakers will need to spend more time talking with businesses that can gain from a shift to sustainability instead of talking only to businesses affected by environmental regulations.

The competitiveness argument combines political posturing and genuine economic concerns. On the one hand, carbon/energy taxes used as an environmental measure are different from most other taxes: they are intended to affect some industries more than others. But claiming uneven tax treatment does not constitute legitimate criticism. Not surprisingly, affected industries invoke the national interest to oppose such taxes, often through exaggerated claims of competitive impact. On the other hand, energy prices are a critical cost factor in some important industries producing traded goods, including aluminum, steel and basic chemicals. Nations will understandably resist imposing taxes on their own industries to provide a global benefit if this simply causes production or future investment to move to other nations without such taxes. Such shifts in production, and hence emissions, injure the nation's economy yet provide no global environmental benefit.

The Australian aluminum industry's situation illustrates both sides of this argument. Electricity prices are the most important factor determining the location of aluminum smelters. But the small tax proposed in Australia would have impacted minimally on the industry's competitiveness. Despite this, aluminum companies still raised the alarm about future investment. A few vertically integrated transnational corporations dominate the aluminum industry and they

[36] The interests of natural gas pipeline and distribution companies are different from those of natural gas producers that typically also produce oil. One major natural gas distribution company, Southern California Gas Company, did support President Clinton's Btu tax proposal, even though it was not a carbon tax.

[37] These companies included Avon Products, Colgate Palmolive, Dow Corning, General Electric, General Motors, Honeywell, International Business Machines, Proctor & Gamble, Sara Lee, Time Warner, Walt Disney, and Westinghouse Electric.

make the same argument in every country where energy and greenhouse policies are under consideration.[38] The real concern of these energy-intensive transnationals is not that an individual country might become less attractive for future investment, but rather that international momentum for carbon/energy taxes might develop. Such momentum would make their investments less attractive globally. By playing upon each country's fear of losing future investment, these companies have successfully retarded the growth of such momentum.

4. THE IMPACT OF A CARBON TAX ON INDUSTRIAL COMPETITIVENESS

4.1 Introduction

A carbon/energy tax, if not absorbed by fuel producers, will increase the cost of fuels consumed by industry in the production process. If a firm passes this cost increase through to output prices,[39] the resulting price increases may result in a loss of sales, in both domestic and export markets, to foreign producers not subject to such a tax. If, on the other hand, the tax is absorbed by the manufacturer, this can result in a loss of profits and a reduction in investment leading to competitive decline.

Such competitiveness concerns are serious only if a firm's fuel cost increase resulting from the tax is large enough to have a significant impact on the firm's output price. The impact of the tax on output price is the product of two factors: the share of fuel costs in the total cost of output, and the percentage increase in the fuel price. Thus an increase in fuel taxes should be of concern only to industries which are fuel-intensive, i.e., for which fuel costs are a substantial fraction of total manufacturing costs, and which compete in international markets.[40] However, even for such industries fuel price is not the sole determinant of market share. Similar industries in different countries maintain robust competitive positions on world markets despite substantial variation in fuel prices, variations shown in Figures 2, 3, and 4 above. For instance, Japan and the U.S. compete in each other's markets in the production of energy intensive goods such as steel, despite Japan's much higher industrial fuel prices. Such competition can be maintained because of product differentiation, use of different technologies, and different prices for other factors of production.

The impact of international variations in fuel price on output cost are often small beside the impact of variations in labor costs, presence of specialized skills or technology, access to markets, availability of raw materials, exchange rates, intangibles such as reputation and morale, and a host of other factors. For instance, over the last five years, quarterly variations in the exchange rates for Swiss franks (within calendar years) ranged from five to thirteen percent. Over the same period, average annual exchange rates have varied by more than seventeen percent.[41] It does not make sense to worry too much about energy taxes which result in price variations which are small compared to the normal price variations from exchange rate fluctuations and other cost factors. Tax-induced price variations of less than one percent are likely to be lost among the large number of factors that affect competitiveness. As demonstrated below, this implies that, for fuel taxes at the level being considered by Switzerland and the EU,

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[38] The term vertically integrated is applied to individual companies that typically control production at every stage from bauxite mining to product fabrication, usually in several countries through a network of subsidiaries. Some aluminum companies that depend primarily on hydroelectricity have supported pure carbon taxes. Large-scale hydro projects impose their own substantial social and environmental costs, however. For this reason, most environmentalists favor taxing hydroelectricity as well as the carbon content of fuels and nuclear power.

[39] Alternatively, the cost increase might be passed back in the form of reduced profits or reduced payments to the suppliers of other inputs to production.

[40] Competitiveness is not a concern for fuel-intensive goods, which are so perishable or so expensive to ship that they are generally produced in the community where they are consumed. Examples include liquefied gasses such as liquid oxygen, and often construction materials such as cement.

[41] Exchange rates relative to Special Drawing Rights, a basket of currencies used as the unit of account by the International Monetary Fund. *International Monetary Statistics*, IMF (April 1996).

competitiveness concerns should focus on a small number fuel-intensive industries constituting a small fraction of the Swiss economy.

4.2 The Reference Proposal for Switzerland

For purposes of analysis, we have selected a reference carbon tax benchmarked to the level of the of the Swiss Department of Interior 1994 environmental tax reform proposal.[42] That proposal would have established a carbon tax of 32 Swiss francs per tonne of carbon dioxide in 2000, starting from about one-third of that level in 1996. This is equivalent to a tax of slightly under 120 francs per tonne of carbon. This carbon tax rate was chosen to correspond approximately to the 1992 EU carbon/energy tax proposal, and is well above the levels of the U.S. and Australian proposals. See figures 2, 3 and 4 above for a comparison.

Under the 1994 proposal, the revenues from the tax were to be split between energy efficiency investments, reductions in the employer's social security payments, and per capita rebates to private households. The use of revenues for energy efficiency investments was regarded as a temporary adjustment measure and was to be limited to no more than the first ten years of the tax and no more than a third of the revenue. The revenue share devoted to the social security tax reduction was roughly proportional to the industry share of carbon emissions. The proposal included a rebate system to reduce the carbon tax burden on energy-intensive firms.

For purposes of analysis, we have not assumed that taxes on energy-intensive forms would be rebated, as we are examining alternative methods of offsetting the tax burden. Similarly, when we discuss the impact of revenue-recycling on industry in section 8 below we assume only that much of the revenue would go to reduce the cost of labor, without specifying the form of the reduction.

4.3 Analysis by Industry of the Impact of the Reference Proposal

4.3.1 Methodology

In order to determine which industries might suffer significant competitive impacts from a tax increase, it is desirable to estimate the tax burden on each industry as a percentage of the value of its output. If the full tax were passed through to purchasers, this percentage would be equal to the percentage increase in output price. Thus it is a reasonable proxy for the impact of the tax on competitiveness. Unfortunately, there is no comprehensive survey of fuel use by Swiss industry disaggregated to the level of individual industries. However, it is possible to set plausible upper bounds on price impact of the reference carbon tax. To estimate the upper bounds for the tax impact, we first estimated the impact that a carbon tax of equal magnitude would have on comparable U.S. industries (for which data is available).[43]

The estimated tax burdens shown here are deliberately overestimated to find plausible upper bounds on the competitive impact of the tax on Swiss industry. Six factors suggest that the actual tax burden on Swiss industry as a percentage of shipments would be lower than shown here. First, Swiss industry faces higher fuel prices than U.S. industry and might be expected to be more fuel-efficient. Second, Switzerland uses virtually no fossil fuels for electricity generation. Thus electricity-intensive industries, such as aluminum production, which would receive a large price increase from a carbon tax in the U.S. would see virtually no price increase in Switzerland. Third, this analysis assumes that 100 percent of the increase in fuel prices is passed through to output price. This incidence assumption exaggerates the competitive impact of the tax.[44] Fourth, we have not modeled the rebate scheme for

[42] Consideration of this proposal has been deferred until some time after the year 2000.

[43] See footnotes to Table 3 for data sources. The Swiss tax was converted to a U.S. dollar equivalent at the 1994 average exchange rate.

[44] If the tax is passed back to fuel-producing nations in the form of reduced fuel prices, as is it is likely to be at least in part if most of the industrial nations raise their fuel taxes, the competitive impact on non-fuel-producing industries is reduced to that extent. If the tax is absorbed by firm owners, this reduces the firm's competitiveness only if the producer is unable to raise needed capital from sources other than retained earnings.

energy-intensive industries contained in the March proposal, because we believe that alternative competitive offset devices, described in Section 5 below, offer better protection of Swiss industrial competitiveness, stronger environmental incentives and lower revenue losses. Fifth, we do not assume any behavior change by industry in response to the tax. Normal price elasticity assumptions would lead us to assume that a fuel tax increase would lead to some substitution away from fossil fuels. Finally, we make no effort to model the offsetting decreases in costs from the use of the carbon tax revenue to reduce labor taxes. As discussed in section 8 below, this revenue recycling should result in *lower* average output prices and increased international competitiveness for much of industry.

4.3.2 Results

The results of our industry analysis are presented in Table 3. This upper bound analysis establishes that competitiveness is a concern for only a few highly energy-intensive industries. The average increase in industry prices from the tax is 0.77 percent. If the revenue from industry were used to reduce the tax burden on industry, this average increase would be fully offset. The "Other Industry" category shown in the table represents the sum of all industries that have reference tax burdens of less than half of one percent of their value of shipments. Other Industry constitutes about two-thirds of the value of shipments for both U.S. and Swiss industry.[45] The average price increase from the tax in this category is only 0.28 percent (using U.S. fuel intensities and industry weights). Virtually all the firms in this category should receive a net tax decrease when the reduction in labor costs from the Swiss tax reform proposal are considered.

[45] The "other industry" category constitutes approximately 67 percent of U.S. industry and 65 percent of Swiss industry. U.S. data from *Annual Survey of Manufacturers,* U.S. Bureau of the Census, various years. Swiss data from Industry Structure Statistics, Paris: OECD, various years. Category equivalencies are approximate due to differences in industry categories used in reporting and measurement techniques.

Table 3. Effect of a Carbon Tax Equivalent to SF 32/tonne CO_2 on U.S. Manufacturing Industries*

SIC code	Industry	Carbon Tax Revenue (SF Bill.)	U.S. Value of Shipments (SF Bill.)	Tax as a % of Value of Shipments
33	PRIMARY METALS	8.1	218	3.7
3312	Blast Furnaces and Steel Mills	5.6	70	8.0
3334	Primary Aluminum	1.1	10	10.8
	Residual Primary Metals	1.5	138	1.0
32	STONE, CLAY & GLASS	2.4	92	2.6
26	PAPER PRODUCTS	3.0	180	1.7
2621	Paper Mills	1.6	47	3.4
2631	Paperboard Mills	0.9	23	4.0
	Residual Paper	0.5	110	0.5
28	CHEMICAL PRODUCTS	5.7	380	1.5
2819	Industrial Inorganic Chemicals	0.8	16	4.7
2821	Plastics and Resins	0.6	50	1.1
2869	Industrial Organic Chemicals	1.6	63	2.6
2873	Nitrogenous Fertilizers	0.3	5	7.2
	Residual Chemicals	2.4	247	1.0
29	PETROLEUM & COAL PROCESSING	2.1	193	1.1
2911	Petroleum Refining	2.0	166	1.2
	Residual Petroleum and Coal	0.1	27	0.5
22	TEXTILES	0.8	95	0.9
30	RUBBER & MISC. PLASTIC	0.8	138	0.6
	Subtotal, Energy Intensive Industry	**23.0**	**1,296**	**1.8**
20	FOOD & KINDRED PRODUCTS	2.3	524	0.4
24	LUMBER & WOOD PRODUCTS	0.4	106	0.4
34	FABRICATED METALS	0.9	233	0.4
31	LEATHER & LEATHER PRODUCTS	**	14	0.3
25	FURNITURE AND FIXTURES	0.2	57	0.3
36	ELECTRONIC EQUIPMENT	0.7	274	0.3
35	INDUSTRIAL MACHINERY	0.8	357	0.2
39	MISCELLANEOUS MANUFACTURING	0.1	51	0.2
38	INSTRUMENTS & RELATED PRODUCTS	0.4	168	0.2
37	TRANSPORTATION EQUIPMENT	1.0	519	0.2
23	APPAREL AND TEXTILE PRODUCTS	0.2	95	0.2
27	PRINTING AND PUBLISHING	0.4	211	0.2
21	TOBACCO PRODUCTS	0.1	35	0.2
	Subtotal, Other Industry	**7.5**	**2,643**	**0.3**
	TOTAL	**30.4**	**3,939**	**0.8**

*Totals may not sum due to rounding. **Less than 50 million francs.

NOTES: Franc rates converted to U.S. dollars using the 1994 average annual exchange rate. Imputed tax on electricity use based on U.S. average fuel mix. SOURCE: Fuel consumption data from U.S. Energy Information Administration, *Manufacturing Energy Consumption Survey 1988*, DOE/EIA-0512(88). Value of shipments data from U.S. Bureau of the Census, *Annual Survey of Manufacturers 1988*, converted to 1994 dollars using the implicit GDP deflator. Average market exchange rate data from International Monetary Fund, *International Financial Statistics Yearbook 1995*. Fuel consumption by electric utilities from U.S. Energy Information Administration, *State Energy Data Report 1960-1990*, DOE/EIA-0214(90).

Turning to the energy-intensive industrial sector, only a handful of basic materials industries have estimated upper-bound price increases from the tax exceeding one percent. The average tax burden for the energy-intensive sector as a whole is only 1.8 percent (again, for U.S. industry). Even among energy-intensive primary materials, the tax burden is highly concentrated in a few processes. For instance, although primary metals as a whole see estimated upper-bound increases exceeding three percent, once blast furnaces and primary aluminum have been removed, the remainder of primary metals -- representing 63 percent of the value of shipments in the U.S. -- have an increase of only about one percent. Similarly, the paper industry as a whole faces upper-bound price increases of about one and a half percent. However, once paper mills and paperboard mills are excluded, the remainder of the industry -- 61 percent of the value of shipments -- would see increases of less than one-half percent.

The conclusion of this analysis is that the reference Swiss carbon tax raises significant competitiveness concerns for only a few products. For most industries, the reduction in labor taxes funded by the carbon tax will more than offset the carbon tax increase. As a result, policies to offset competitiveness concerns can be focused on a few basic materials industries. As we shall see in the next section, this considerably simplifies the task of creating offset policies, and reduces the administrative burden of such policies to manageable proportions.

5. POLICIES TO OFFSET COMPETITIVE IMPACTS

5.1 Criteria for Policy Evaluation

Policies to address the competitive burden of fuel taxes have not been systematically analyzed using a consistent set of criteria. The result has been a hodgepodge of offset policies which are expensive, poorly targeted, and fail to preserve environmental incentives. Measures to offset competitive burdens should be required to achieve reasonable levels of performance on each of the following five criteria:

1. Effectiveness. Is the measure effective in protecting the competitive position of energy-intensive industries against untaxed foreign competition in both domestic and international markets?

2. Environmental Incentive. Does the measure maintain the tax's price incentive to reduce emissions, both by developing new clean technologies and processes and by shifting toward less carbon-intensive patterns of consumption?

3. Administrability. Can the measure be administered consistently and at a reasonable cost (including compliance costs accrued by the taxpayer)?

4. Fairness, Actual and Perceived. Is the measure fair in the way that it distributes energy tax burdens among taxpayers? Will it be perceived as fair by the public?

5. Revenue Loss. Does the measure cause excessive loss of tax revenue?

(A sixth criteria, compatibility with international trade rules, is separately discussed in section 6, below.)

5.2 Competitive Offsets in Existing Carbon Taxes and Recent Proposals

5.2.1 Recap of Offsets

As shown in Table 1, three of the five nations that now have carbon taxes have exemptions or substantial rate reductions for energy-intensive industries. Finland and the Netherlands do not have such exemptions, and neither did the small carbon tax debated in Australia (although the Australian proposal did exempt oil). However, these nations have considerably lower tax rates. The EU proposal also included partial or full exemptions for all industries which pass thresholds of energy intensity. The U.S. tax proposal included a scattershot group of partial industry exemptions, but would also have imposed a tax on the energy embodied in imported energy-intensive products.

5.2.2 Assessing Existing Proposals

All the major carbon/energy tax proposals discussed above either have fully phased-in rates below $22 U.S./ton of carbon, or have fully or partially exempted industry from the tax. In some cases, such as the EU proposal, those exemptions are systematic; in others, such as the U.S. BTU tax proposal, they seem to be more a product of political bargaining.

Are such exemptions a good way to offset competitive burdens? Turning to the five criteria of section 5.1 above, we observe the following:

1. Effectiveness. Full exemption of energy intensive industries effectively eliminates competitive burdens. However, many of the existing or proposed taxes employ reduced rates, or exempt only particular fuels or processes. Such partial exemptions are only partially effective, although they may be sufficient to reduce the burden below the threshold of concern.

2. Environmental incentive. The primary criticism of industry exemptions is that they eliminate (or in the case of partial exemptions, reduce) the tax incentive to develop more efficient processes and to substitute away from carbon-intensive products. Moreover, by targeting reduced or zero-rates to the most fuel-intensive industries, they undermine the effectiveness of the tax in reducing greenhouse gases and the efficiency of the tax as a policy instrument.[46] However in some cases industry exemptions have been coupled with other emissions reduction policies (e.g. emission reduction targets and timetables) in the exempted industries. If these alternative policies are effective, the overall policy package may still provide adequate environmental incentives.

3. Administrability. Full or partial exemptions add administrative complexity to the tax. They also create potential for evasion by firms that can inaccurately characterize a fuel as being used for an exempt purpose or by an exempt industry.[47] However, most alternative proposals to offset competitive burdens of energy taxes involve comparable or greater levels of administrative burden.

4. Fairness. Exempting some industries or fuel uses undermines the public's perception of a tax as fair and equitable. This erosion can affect the political viability of tax proposals. For example, in the U.S. the addition of tax breaks for major polluting industries led to a decline in support of the tax by major environmental organizations. In general, simple proposals are perceived as more fair, while complex special interest provisions are seen as eroding fairness while increasing administrative and compliance costs, especially if those provisions are not based on any consistent, coherent rationale.

5. Revenue Loss. Full or partial exemptions can significantly reduce the revenue from a fuels tax. For example, exempting of the most energy-intensive one-fifth of U.S. industry from a carbon tax would lose more than one-half of the tax's total revenue from industry.

In summary, industry exemptions are relatively effective and administrable, but do not meet minimum expectations in preserving environmental incentives, in distributing the tax burden fairly across industries or sectors, or in maintaining the tax's revenues.

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[46] Economic theory suggests that exemptions result in inefficiency by promoting higher-cost emission reductions in taxed industries or economic sectors. For any given level of reductions, lower overall costs could be achieved by equalizing costs across sectors.

[47] Revenue loss from this form of tax fraud can be considerable. For instance, in most U.S. jurisdictions the sale of diesel for home heating is untaxed or taxed at a low rate compared to the tax rate on the sale of the same product as a motor fuel. Before fuel dyeing, fraudulent use of untaxed fuel in trucks was estimated to cost between 10 and 25 percent of the total diesel tax revenue, and continues to cost three to ten percent. U.S. Department of Transportation, Federal Highway Administration, Fuel Tax Evasion: The Joint Federal/State Motor Fuel Tax Compliance Project, Report No. FHWA-PL-92-028 (1992).

5.3 Alternative Approaches to Offsetting Competitive Burdens

5.3.1 Introduction

Instead of exemptions or rate reductions, it would be preferable to adopt competitive offsets that preserve the environmental benefit of the tax, cause less revenue loss, and distribute the tax burden more fairly. Such offsets include border tax adjustments, efficiency investment credits, and targeted tax relief. These measures could be adopted individually or in combination.

In principle, a multilateral agreement to harmonize national taxes at a common rate or to establish a global or multilateral tax would address the competitiveness issue. We do not examine these options, however, because it seems highly unlikely that enough nations will agree to establish any of these regimes in the foreseeable future. Overall, the harmonization approach appears the more promising of the two. But even the EU, which has a strong tradition of tax harmonization, is having difficulty implementing such a system.

Through its conditionality clause, the original EU proposal effectively called for other major trading partners -- basically, the OECD nations -- to adopt harmonized taxes at rates comparable to the EU level. However, this idea attracted little interest in the United States or Japan. The proposal for OECD-wide harmonization presents three practical difficulties. First, the disparities among existing fuel tax rates within the OECD are somewhat greater than those within the EU. Disagreement over whether to introduce a new tax or a harmonized system that covers the sum of new and existing taxes is likely. Second, it is unclear that an OECD initiative would be sufficient to alleviate competitiveness concerns in energy-intensive industries like aluminum and steel. These industries might just shift production to non-OECD locations such as Korea, Taiwan, China, Russia, or South America. Third, it is highly unlikely that the U.S. Congress will agree to an international process for setting domestic tax rates. The amended EU proposal of May 1995 requires a harmonized EU tax by 2000, regardless of whether other OECD countries adopt equivalent measures. But whether Europe will go it alone remains to be seen. If it does, energy-intensive industries are sure to be exempted.

5.3.2 Border Tax Adjustment.

When dealing with consumption taxes,[48] it is the normal practice of virtually all jurisdictions to employ border tax adjustments (BTAs), imposing the tax on imported goods and exempting or rebating the tax on exported goods.[49] This is not a trade policy per se, but rather an essential feature of tax systems that use national consumption as the tax base. Some taxes, such as value-added taxes (VATs) and many excise taxes not collected at the retail level, require special administrative procedures to implement BTAs. Other taxes achieve border adjustment without the need for special procedures. For example, sales taxes collected by the retail dealer are automatically collected on imports and exempt exports, without the need for special treatment of international trade flows.

All carbon/energy tax proposals impose border adjustments on fuels. The competitive burden of the tax on international trade can be fully offset if border adjustments are also imposed on the carbon content of traded goods,

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[48] Consumption taxes include VATs, sales taxes, and excise taxes. Excise taxes can be ad valorem (set at a percentage of the market price) or specific (a fixed rate per physical unit). Carbon and Btu taxes are specific excise taxes.

[49] This describes a destination system of BTAs. Border adjustments can be designed to be consistent with either the origin or destination principles of taxation. Under an origin system, an importing country could impose a tax on energy and carbon embodied in energy-intensive imports at the same rate as the domestic tax, if a rebate up to the full amount of the import tax is provided for any carbon/energy tax already paid to the exporting country. If the U.S., for example, were to adopt such a system, its trading partners might follow suit to gain revenues that otherwise would flow to the U.S. government. However, unless simultaneously adopted by importing countries, an origin system of BTAs would not address the competitiveness concerns of energy-intensive exporters. See Hoerner and Muller, id. footnote 25, for a discussion of the relative merits of an origin and destination system for a carbon tax.

i.e., the carbon in the fuels used to produce the traded goods (whether or not those fuels are physically present in these goods). We will refer to the carbon in fuels used to produce a good as "embodied" carbon (sometimes called "gray" carbon). Such border adjustments are a natural and necessary part of tax on carbon emissions associated with a nation's consumption, by which we mean the emissions from combustion of fuels used to produce goods consumed within national boundaries.[50]

A carbon consumption tax can be implemented through BTAs that rebate the tax on fuels used to produce exported goods and impose a comparable charge on the embodied carbon in imports. Such a system of rebates and import charges would be highly complex and burdensome if it were applied to all goods that move in international trade. Fortunately, as demonstrated in section 4 above, only a handful of carbon-intensive raw materials industries will see price increases under the reference Swiss tax that are large enough to pose a meaningful threat to competitiveness. BTAs on bulk transfer of ten to twenty basic materials -- unfabricated metals, bulk glass and paper, fertilizer and a few chemicals -- should suffice to offset nearly all discernible impacts.

It is not generally necessary to impose BTAs on more sophisticated goods manufactured using those basic materials. For instance, at the tax rates considered here, BTAs are not needed on the paper in books or the metal in automobiles. The cost of basic materials is such a small part of the total price of most finished goods that price increases resulting from the reference tax would have negligible impact on the final sale price.

Tracking fuel used in exported goods is a manageable problem. One approach is to use an "energy-added tax" method, administratively similar to a invoice method value-added tax (VAT) used throughout Europe. Like the VAT tax, the tax paid on the fuels or embodied in the electricity used to produce a good would be recorded on the invoice. As with the VAT, the domestic exporter would present the invoices for taxes previously paid on exported goods to the tax authority for a rebate.[51] Alternatively, the tax rebate on export could be based on the national average carbon consumption per unit of production.[52] Attributing embodied carbon content to imports is somewhat more difficult and will be discussed in Section 6.

Many nations (including Switzerland) have considerable experience in administering BTAs and have taxes in places that use them. Imposing BTAs on a handful of additional basic materials is well within the administrative capacity of any revenue agency in the developed world.

Returning to our evaluation criteria, BTAs on embodied energy are fully effective in offsetting competitive burdens on the products to which they are applied, although some minor impacts may remain for products that fall below the carbon-intensity threshold chosen for applying BTAs. BTAs preserve the environmental incentive to reduce emissions in the production of goods for domestic consumption, whether those goods are produced within the country or abroad. However, by rebating the tax on exports, BTAs can reduce the environmental incentive for export-oriented industries if importing nations do not also impose a carbon/energy tax with BTAs. They are relatively straightforward to administer, although somewhat more complicated than industry exemptions. Because BTAs are a normal part of taxes on national consumption and not a special exception or tax exemption, they are usually perceived as fair. Revenue losses are likely to be small except in nations whose economies depend heavily on carbon-intensive export industries. Indeed, if the carbon emissions embodied in imports exceeds the emissions

[50] Contrast such a national carbon consumption tax with a national carbon emissions tax. A carbon consumption tax is a tax on carbon, emitted anywhere in the world, and used to produce goods consumed in the nation. A carbon emissions tax is a tax on fuels consumed within national borders to produce goods consumed anywhere in the world. For a discussion of the difference between these two tax bases and their relative advantages, see Franks Muller & J. Andrew Hoerner, "Greening State Energy Taxes: Carbon Taxes for Revenue and the Environment," *Pace Environmental Law Review*, v. 12 (Fall 1994), pp.30-35.

[51] Some accounting and auditing rules would be necessary to assure that firms allocate their carbon tax payments between different product lines proportionally to the carbon consumed in producing those products.

[52] BTAs on trade might be based on either physical or value units of measurement. See note 60 for a discussion of this measurement issue.

embodied in exports, border tax adjustment will increase net carbon tax revenue. Overall, BTAs for energy-intensive industries are preferable to reduced tax rates for those industries on all criteria except administrative ease.

It is worth observing that a nation such as Switzerland, which already has significant energy taxes, might wish to restructure its energy tax system to replace some of the existing taxes on fuels with higher carbon taxes. Denmark, Norway, and Sweden did such restructuring when they designed their carbon taxes. Under such a restructuring the international competitiveness of energy-intensive Swiss companies could actually be improved, by providing border adjustments not only for the incremental tax, but also for some of the existing fossil fuel taxes. This is appropriate from an environmental perspective, so long as the incentive to produce fuel-intensive goods in a fuel-efficient way is preserved.

5.3.3 Efficiency Credits

The competitive burden of fuel taxes comes from increased fuel bills caused by higher fuel prices. If energy consumption per unit of output can be lowered by an equal or greater percentage through the adoption of new and more efficient technology, the burden of these taxes can be fully offset.[53]

A large number of engineering studies in many nations have suggested that, even at current prices, energy efficiency gains on the order of twenty percent could be achieved by adopting available best-practice technologies.[54] This figure appears to be roughly constant over the last twenty years despite considerable improvement in industrial energy efficiency throughout the OECD over that period, suggesting that the process of adopting existing efficiency technologies leads to learning about new opportunities for further efficiency gains.[55]

The failure of many firms to adopt cost-effective efficiency technologies is a sign that the market for efficiency technology is highly imperfect.[56] Barriers to the adoption of new technologies by firms include inertia, ignorance, high internal capital-investment hurdle rates, institutional barriers, competition of cost-saving opportunities for scarce management attention, and others. The problem of under-investment in new technologies is severe in the energy-efficiency sector, but not peculiar to it. There is considerable evidence that firms generally under-invest in technology because some of the benefits of such investment are not enjoyed by the investor, but rather flow to other firms or to society as a whole.[57] This issue is explored further in section 8 below where the ancillary competitive benefits from promoting new efficiency technologies are discussed.

Thus it is desirable, both economically and environmentally, to accompany an energy tax with a package of measures that encourage the adoption of more energy-efficient processes. One such measure is a tax credit for investments in energy-efficiency technology. Such a credit encourages adoption of energy efficiency technologies by reducing the cost of capital devoted to those investments.

An efficiency credit should be capped at the firm's total carbon tax payment, or some percentage thereof. This is desirable both to limit the loss of revenue and to focus the credits on fuel-intensive industries. However, as an administrative matter, it makes more sense to provide a credit against corporate income tax payments rather than

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[53] Howard Geller, John DeCicco & Steven Nadel, *Structuring an Energy Tax So That Energy Bills Do Not Increase,* American Council for an Energy Efficient Economy Research Report, Washington DC:ACEEE (1993).

[54] Intergovernmental Panel on Climate Change Working Group III Second Assessment Report, *The Economic and Social Dimensions of Climate Change* (*forthcoming* 1996).

[55] Michael Grubb, Thierry Chapuis & Minh Ha Duong, "The Economics of Changing Course: Implications of Adaptability and Inertia for Optimal Climate Policy," Energy Policy 23(4/5):417 (1995).

[56] DeCanio, Id at footnote 11.

[57] For a review of the evidence that private research creates external benefits, see Zvi Griliches, "The Search for R&D Spillovers," *National Bureau of Economic Research Working Paper No. 3768* (1991). For a discussion of the impact of such spillovers on environmental policy, see Hoerner, et al., id. at footnote 12.

against the carbon tax directly. The administrative system of a carbon tax is designed to track only fuels, while the administrative system of the income tax is designed to track capital investment.

The most difficult part of designing a good efficiency credit is determining which investments will be eligible. Ideally the credit should be targeted to investments with high reductions in energy consumption relative to the tax revenue foregone. However, this sort of balancing would require engineering analysis that the taxing authority is not well equipped to audit. Tax officials are trained in financial, not engineering analysis.

There are several possible approaches to dealing with this problem, none of which are perfect. First, the authority responsible for energy or environmental policy could develop a list of approved technologies, technologies with high-expected energy saving per unit of tax revenue lost. The tax credit would be available for any investment in an approved technology. Denmark adopted a system of this sort to accompany its carbon tax. The system could include an annual process for adding technologies to the approved list. In addition, once a new technology has become standard industry practice, it should be removed from the list of eligible technologies. This both saves revenue and provides an additional incentive for firms to adopt new technologies early, while the credit is still available. Although this approach appears to be working well in Denmark, it requires considerable technical expertise and administrative resources on the part of the certifying agency.

A second approach is self-certification by firms, combined with technical audits. Firms desiring an investment credit would present an engineering analysis of the energy savings from the proposed investment, and its cost. Again, the investment would have to meet a pre-determined threshold of carbon savings per unit of tax credit to be approved. Because of the potential for tax avoidance by presenting inflated carbon savings estimates, a system of engineering audits would be required.

A final approach is to rely on assessments of changes in a firm's aggregate energy efficiency rather than conducting investment-specific assessments. A firm would apply for an investment credit based on the firm's total investment in equipment of all kinds and its reduction in aggregate carbon emissions.[58] Again, credits would be granted to firms that meet a specified ratio of carbon reduction per franc of credit. A firm could apply for credits on only a fraction of its total investment to allow for more modest efficiency programs. The advantage of the final approach is that it can be audited based entirely on observable accounting aggregates, with no engineering analysis. A firm's total carbon consumption can be measured by the carbon tax it pays on fuels and electricity, a financial measure auditable by normal accounting techniques. If a firm fails to achieve the efficiency gains it projects, the credit amount would be recaptured. Moreover, this approach provides firms with complete flexibility in technological choice. However, for firms with a changing mix of product lines with different levels of carbon intensity this approach would have to be applied on a product-by-product basis. The administrative complexity of this disaggregation may offset the benefits of flexibility and accounting-based administration.

Returning to our evaluation criteria, a stand-alone efficiency credit, however effective, is probably inadequate to offset industrial competitive burdens. This is because its benefit is uneven across firms and industries. A credit provides the most assistance to firms and industries that are using old, inefficient technology or that enjoy a rapid rate of innovation and capital turnover. The credit is perhaps best seen as a transitional measure to help energy-inefficient firms cope with the energy price increase and to help innovative firms commercialize new efficiency technologies. Although some of the credit will doubtless go to firms that would have invested in new technology based on the carbon tax alone, this is not too troubling in a provision intended to ease the burden of transition to a lower-emissions industrial system. Thus a credit could be quite effective in helping the firms it benefits, but might not benefit all firms which bear a significant competitive burden.

The environmental incentive of a credit is potentially substantial. The emission reductions caused by a credit go beyond the efficiency gains achieved by the recipient firms. By accelerating the development and commercialization of new clean technologies, a credit can promote emission reductions in all firms that adopt the

[58] A slightly more complicated formulation of the carbon reduction test is necessary to avoid unjustified provisions of credits to shrinking firms and denial of credits to growing firms. Instead of comparing carbon consumption in the base year and the subsequent year, base-year consumption would be compared to the subsequent year's ratio of carbon consumption to value added, multiplied by the base year value added.

technology. Such firms need not be recipients of the credit. These spillover benefits of new technology are discussed further in section 8.

As discussed above, the administrative and compliance burden of efficiency credits with different designs may vary considerably. However, even the more complex technology-specific forms of eligibility determination are administrable, as the Danish model demonstrates.

A credit might be seen as unfairly benefiting firms that have dragged their feet in adopting high environmental standards. This fairness concern may be an important concern if the credit is so generous that it provides its beneficiaries with a major cost advantage not available to more environmentally advanced firms. High credit rates have also been associated with tax shelters and other forms of tax avoidance. To avoid these problems the credit rate should probably not exceed ten or twenty percent of equipment value. Similarly, the credit could be seen as violating the polluter-pays principle by providing capital subsidies to polluters. However, if the purpose of the credit is to provide transitional assistance to firms facing new, tighter standards then it does not violate the polluter-pays principle.[59] The revenue loss from a credit will vary with its scope and generosity, but should not exceed a few percent of the total revenue from the tax.

A modest credit program will both amplify a carbon tax's environmental benefits and reduce its economic burden. By reducing cost of capital and lowering fuel bills through enhanced technical efficiency, the credit enhances the competitiveness of eligible firms. If the carbon tax has an effective system of BTAs or targeted tax relief, the addition of efficiency credits may in some cases leave fuel-intensive firms in a better competitive position than if no tax were enacted. The credit also promotes development of new clean technologies for both domestic use and export. Thus it is likely to be a desirable component of an overall tax package.

5.3.4 Targeted Tax Relief

As discussed in section 5.2.2, industry exemptions can be costly in both environmental and revenue terms. If direct tax relief is to be provided to energy-intensive firms to protect their competitive position, that relief should preserve the incentive to develop new efficiency technologies. Moreover, the tax relief should be no greater than necessary to reduce the competitive burden to acceptable levels. This is desirable both to avoid a public perception that selected firms have been unfairly favored, and to avoid the unnecessary squandering of public revenues.

One method of achieving these ends is through a system of targeted tax relief. The workings of such a system is presented in Box 1 below. Targeted tax relief chooses both the eligible industries and the level of relief based on objective criteria such as the payment of carbon tax by the industry per dollar of value added. However, unlike industry exemptions, targeted tax relief is not based on current fuel consumption. Fuel-intensive firms will still pay the full carbon tax rate, thus insuring that the incentive to invest in energy-efficient technology is preserved and equalized across industries. Yet the offsetting tax benefit limits the total tax burden on each industry to an acceptable level (a level called the "maximum tax rate" in the example in Box 1). The level of tax relief to an industry is based on the average carbon-intensity of the industry's products. For each firm within an industry, the tax relief is set as a percentage of the firm's sales of the energy-intensive product, measured either by value or by tonnage.[60]

[59] OECD, Recommendation of the Council on Implementation of the Polluter-Pays Principle, Recommendation C(74)223, adopted Nov. 14, 1974, reprinted in 14 ILM 234(1975); see also Sanford E. Gaines, The Polluter-Pays Principle: From Economic Equity to Environmental Ethos 26 Texas International Law Journal 463-96, 476 (1991).

[60] The choice between value and physical unit as a base for relief should depend on which base is more tightly correlated to carbon consumption and on which base is easier to audit. This determination may vary by industry. The relief should depend on shipments of the specified energy-intensive product, rather than total shipments from the firm, since a firm with multiple products could otherwise reduce its tax burden by changing its product mix.

Box 1. Targeted Relief: A numerical example

Suppose Switzerland sets a maximum tax rate equal to one percent of the value of a firm's sales. Acme Paper has sales of 20 million francs. It purchases fuels and electricity associated with 18,750 tonnes of carbon dioxide emissions, and its fuel payments include a carbon tax of SF 600,000. This is three percent of sales, so the firm is entitled to a credit.

Let us suppose that the industry average tax burden in the base year is also three percent. The tax credit for the paper industry is a percentage of sales equal to the industry average tax burden in the base year less the maximum tax rate, or 3% - 1% = 2%. So Acme Paper would get a tax credit equal to two percent of its sales, or SF 400,000. This leaves Acme with a net tax burden of SF 200,000, which is one percent of sales, the maximum tax rate.

Suppose that in the following year Acme Paper invests in a new process that allows it to produce the same amount of paper with twenty percent less fuel. Its carbon tax payments decline to SF 480,000. However, its tax credit remains the same. The result is that the net tax burden falls to SF 80,000, a sixty-percent reduction in net tax burden. The efficiency investment reduces the tax burden by the same amount as if there were no credit.

To avoid excessive loss of revenue from efficiency improvements over time, the base year used to calculate industry averages should be updated every few years.

This example shows the benefits of targeted relief: because firms can reduce their tax burden by investing in efficiency improvements, the incentive for such investments is preserved. Only industries with tax burdens above the maximum tax rate cap receive tax benefits, and the benefit is equal to the carbon tax burden in excess of the cap. Thus tax relief is based on competitive burden and is no greater than necessary to relieve that burden.

Targeted tax relief provides firms that lag behind industry average efficiency with less protection from the competitive burden of the tax. Such firms could be given special exemptions, but this has all the disadvantages previously discussed of exempting fuel-intensive firms. Instead, it makes more sense to provide those firms with assistance in catching up to the industry efficiency norm, using policies like the efficiency investment credit described in the previous section.[61]

How does targeted tax relief perform under our evaluation criteria relative to other offsets discussed above? It limits the competitive burden of the carbon tax by limiting the increase in net tax burden to a specified maximum net tax rate. This rate can be as low as desired, but lowering the cap increases revenue loss at an accelerating rate, especially for maximum rates below one percent. Similarly, a lower maximum rate increases the number of industries eligible for the credit, increasing administrative and compliance costs. Thus the maximum net tax rate needs to be set at a level that affords sufficient protection to industry while avoiding excessive revenue loss. For the reference tax, this rate would probably fall in the one to three percent range. This residual burden on exports (and the parallel advantage for imports) contrasts with BTAs, which leave no residual burden or advantage on covered traded products.

When assessing the effect of competitive offsets on environmental incentives, there are three different incentives that need to be considered. First, by raising the cost of fossil fuels, the tax encourages firms to develop new, more fuel-efficient production technologies. Second, by increasing the price of fuels relative to labor, capital and other

[61] Alternatively, it would be possible to use a firm's historical carbon intensity rather than industry average carbon intensity in calculating the level of relief necessary. However this raises complex administrative issues, especially if the credit is maintained for a number of years. See Hoerner and Muller, id. footnote 25, p. 442 for a discussion of these issues.

manufacturing inputs, carbon taxes encourage firms to substitute other inputs for fuels, even without technological advances. Third, to the extent that the carbon tax is passed on through increases in the price of the firm's output, the tax encourages purchasers to shift toward less carbon-intensive alternatives. Targeted relief preserves the full incentive to invest in new efficiency technology, as well as the manufacturing-substitution incentive to replace fuels with other inputs. However, the targeted relief implies that the tax-induced price increase will be no greater than the maximum tax rate. This limits the price incentive for purchasers to move toward cleaner substitutes, especially for the very most carbon-intensive products. By contrast, BTAs preserve all three incentives on goods consumed domestically. In most cases this implies that BTAs preserve the environmental incentive better than targeted relief, but there may be a few export-oriented industries for which the converse is true.[62]

The administrative burden of a targeted relief system would be comparable to that of a BTA system with the same carbon intensity threshold of application. Both systems appear to address fairness concerns, although BTAs form part of the tax whereas targeted relief is an exception to the tax. The revenue loss from targeted relief depends on the level of the cap, but is likely to be modest. As discussed in section 5.3.2, BTAs do not *a priori* lose revenue and may be net revenue producers.

Considering all five criteria, targeted tax relief offsets competitive burdens better than industry exceptions, but not as well as BTAs. Both targeted relief and BTAs are better at limiting competitive burden and achieving environmental goals if they are combined with measures such as efficiency investment credits which promote clean technology.

6. COMPATIBILITY OF OFFSETS WITH INTERNATIONAL TRADE RULES

There is no question that taxes on fuels can be imposed on energy imports and rebated on exports. Such border adjustments directly on products predate the General Agreement on Tariffs and Trade (GATT), were clearly anticipated by GATT, and have never been challenged. However, some[63] have argued that such border adjustments are not available for carbon/energy taxes on the energy embodied in traded goods. For instance, aluminum is manufactured using large amounts of electricity, sometimes generated from fossil fuels. However aluminum does not physically incorporate those fuels. A tax on fossil-fuel inputs to the electricity used in manufacturing aluminum can be regarded as a tax indirectly applied to the aluminum. As we shall demonstrate, law and precedent under GATT and under the new World Trade Organization (WTO), properly interpreted, allow border adjustments on the taxes on such embodied energy or carbon.

In 1994, the GATT was modified by the Uruguay Round Final Act.[64] The Uruguay Round Final Act required its parties to accept a uniform text of the GATT, and included the Agreement Establishing the World Trade Organization and a new Agreement on Subsidies and Countervailing Measures (Subsidies Agreement) which

[62] A carbon tax with BTAs applies to goods consumed in the taxing notion, whether those goods are produced domestically or abroad. It does not apply to exports. Therefore, a firm that exports all of its production (to an untaxed nation or a taxing nation without BTAs) is exempted from tax and loses all three incentives: technology promotion, production-factor substitution, and product substitution. From such a firm, targeted relief would provide a stronger environmental incentive, because targeted relief preserves the technology-promotion and production substitution incentives. On the other hand, targeted tax relief reduces the price incentive for product substitution to the level of the maximum tax, and does so for the entire output of domestic production, whether the purchaser is domestic or foreign. For firms that sell to both domestic and foreign markets, BTAs are preferable to targeted relief if the elimination of all three incentives with respect to the export market would still leave a stronger environmental incentive from the carbon tax than from the elimination of a single incentive—product substitution—in both markets.

[63] Several delegations to the Subcommittee on Trade and Environment of the Preparatory Committee for the WTO expressed the view that "adjustment of taxes or charges on unincorporated processes and production methods is not permitted." *Trade and the Environment Bulletin*, No. 10, 11 October 1994, GATT Document TE 010.

[64] Final Act Embodying Uruguay Round of Multilateral Trade Negotiations, Marrakech 15 April 1995, entered into force 1 January 1995.

replaced the 1979 GATT Subsidies Code.[65] GATT rules relevant to BTAs have not been altered by the Uruguay Round Amendments, except for some minor modifications to the Subsidies Code discussed in section 6.4 below. However it is worth noting that under the Agreement Establishing the World Trade Organization (WTO), the GATT rules as amended can now be enforced through the WTO dispute resolution process. Decisions of the old GATT dispute resolution panels did not become effective until they were unanimously adopted by the contracting parties; in contrast, WTO panel decisions, if not appealed or after appellate review, are effective unless they are rejected by the WTO members. The new dispute resolution process is considerably faster than the old GATT process.

Two arguments have been adduced to support the proposition that taxes on embodied energy are not border adjustable. First, some maintain that equalizing taxes cannot be imposed on energy-intensive goods because GATT/WTO rules only allow such equalization on "like products," and energy-intensive products are not sufficiently "like" the fuels themselves to allow equalizing charges. Often this claim is bolstered by arguing that only characteristics of the traded product, and not of the process used to produce it, may be considered in determining whether two products are "like." This "process/product" distinction is said to bar border adjustments on taxes imposed on fuels used in manufacture of traded goods. Second, some argue that the rebate of carbon/energy taxes is barred by technical rules in the GATT subsidies code, rules that have been incorporated, with minor modifications, into the new WTO subsidies code. These rules ban the rebate of "prior stage cumulative indirect taxes" (PSCI taxes), taxes previously imposed on exported goods. It is argued that carbon and energy taxes are PSCI taxes and so fall under this ban. These two arguments will be addressed in sections 6.1 and 6.2, respectively.

6.1 The "Like Product" Standard

Article III:2 of the GATT provides that a nation cannot subject imported "products" to taxes or other charges "in excess of those applied, directly *or indirectly*, to like domestic products" [emphasis added]. Because the provision allows taxes to be imposed to equalize the indirect tax burden, it appears to allow the imposition of border taxes to equalize the burden on embodied manufacturing inputs.

It was the intent of the GATT negotiators that process as well as product charges be border adjustable. Records of the discussions held in drafting the Havana Charter for an International Trade Organization, which served as a basis for the GATT, establishes that all taxes on inputs to a product, whether of physically incorporated raw materials or process inputs or outputs not physically incorporated, were intended to be adjustable. The original draft of Article III:2 referred to taxes or internal charges "applied on or in connection with like products." This draft was rejected only because of difficulties in translating it into French. At the subsequent discussions of the London Preparatory Committee, U.S. negotiator Oscar B. Ryder proposed the current "directly or indirectly" language as an alternative to the "on or in connection with" phrasing. The American proposal was challenged by Mr. Rodrigues, the Brazilian delegate, who wanted to know what was meant by the addition of the term "or indirectly," pointing out that an "indirect tax can not be imposed directly on products." Mr. Ryder replied that the language was to allow border adjustments on "a tax, not a tax on a product as such, but on the processing of a product, which are covered by the word 'indirectly' here."[66]

However this straightforward result has been brought into question by the distinction drawn by several GATT dispute resolution panels -- most notably the Tuna-Dolphin Panel Decision[67] -- between process and product. These decisions appeared to hold that measures affecting trade must be based on the nature of the product and not on the

[65] Agreement on the Interpretation and Application of Articles VI, XVI and XXIII, Basic Instruments and Selected Documents 26S/56 (Geneva, GATT Secretariat, 1980), entered into force January 1, 1980.

[66] Quotations from EPCT/A/PV/9, pp. 18-19. See also EPCT/C.II/W.5, p. 5; and EPCT/W/181, p. 3, referred to in the GATT Analytical Index 1993. For a discussion, see Paul Demeret and Raoul Stewardson, *Environmental Taxes and Border Tax Adjustments,* Liege, Belgium (1993), p. 9.

[67] Report of the Panel, *United States—Restrictions on the Import of Tuna,* 30 ILM 1594 (1991). By joint agreement of the U.S. and Mexico, the report has not been submitted to the contracting Parties.

process by which it is produced.[68] These cases suggest that products can be regarded as "unlike" only if they differ in physical characteristics related to their use. As applied to taxes, these decisions cannot be reconciled with the Article III provision allowing charges to equalize “indirect” tax burdens.

All of the panel decisions proposing a process/product distinction fail to cite, and appear to be unaware of, the negotiating history outlined above. Moreover, none of the decisions proposing this distinction has been adopted by the GATT contracting parties or by the WTO. Finally, the question of the availability of BTAs on manufacturing process taxes has not been directly put before any GATT or WTO panel to date. Despite these limitations, the process/product distinction appears to be considered a live doctrine in much of the trade community. Thus we will discuss its origins and evolution in the next two sections.

6.1.1 The Process/Product Distinction and the Tuna-Dolphin Cases

Although the question of the rebate of taxes on inputs has not been faced directly, the Tuna-Dolphin I Panel discussed the tax provisions of GATT Article III:2 as part of its efforts to interpret analogous provisions with respect to regulation in Article III:4 and Interpretive Note Ad Article III. The U.S. Marine Mammal Protection Act banned the import of tuna caught in ways that involved the killing of large numbers of dolphins. The Panel decided that import restrictions on tuna could not be based on how the tuna was produced.

The Panel decision banned import restrictions that depend on how those imports were produced. This ban was based on an analogy to the scope of allowable border tax adjustments as the Panel saw them. The Panel concluded that, because border adjustments are not allowed on taxes that are not directly levied on products, import restrictions based on how a product is produced and not on its characteristics as a product are also not allowed. This reasoning has been widely cited and is worth reproducing at length:

> "[T]he Working Party Report on Border Tax Adjustments, adopted by the Contracting Parties in 1970, had concluded that '... there was a convergence of views that taxes directly levied on products were eligible for tax adjustment ... Furthermore, the Working Party concluded that there was convergence of views to the effect that certain taxes that were not directly levied on products were not eligible for adjustment, [such as] social security charges whether on employers or employees and payroll taxes.' Thus, under the national treatment principle of Article III, contracting parties may apply border tax adjustments with regard to those taxes that are borne by products, but not for domestic taxes not directly levied on products (such as income taxes).... The Panel considered that it would be inconsistent to limit the application of this Note to taxes that are born by products while permitting its application to regulations not applied to the product as such."[69]

Although this argument has a certain surface plausibility, it is simply invalid to base the process/product distinction on the classification of taxes by the Working Party on Border Tax Adjustments. This is because the Working Party divided taxes not into two categories but three: those on which they agreed that border adjustments are allowed, those on which they agreed that border adjustments are not allowed, and a third category of taxes on which they did not pass judgment. This third category is defined in the next sentence in the Working Party Report after the one quoted by the Panel and reproduced above:

> "[T]here was a divergence of views with regard to the eligibility for adjustment of ... (a) 'Taxes occultes' which the OECD defined as consumption taxes on capital equipment, auxiliary materials and services used in the transportation and production of other taxable goods. Taxes on advertising, energy, machinery and transport were among the more important taxes which might be involved."[70]

The Marine Mammal Protection Act set import restrictions on tuna produced in ways that killed large numbers of dolphins. In effect, it was a limit on the number of dolphins that could be killed in producing that tuna. As such, it

[68] See sections 6.1.1 and 6.1.2 below for a discussion of these cases.

[69] Tuna-Dolphin Panel, id. footnote 67, p. 1618 para. 5.13.

[70] *Working Party Report on Border Tax Adjustment,* BISD 18S/97, p. 101 para. 15 (1970).

is clearly more analogous to a tax on a specific input to production than to general taxes, such as taxes on income or payroll or social security taxes. Moreover, the Panel made no attempt to reconcile its claim that border adjustments are allowed only for taxes "directly" levied on products with the clear language of Article III:2 allowing taxes or charges no greater than those "applied, directly or indirectly, to like domestic products" or with the negotiating history of that provision. Thus the reasoning of the Panel was erroneous and the doctrine should not be regarded as having continued life.

The Panel's distinction between process and product, even if it had been based on sound legal reasoning, failed to support the Panel's result when applied to the American tuna market. Public awareness of the dolphin-tuna connection is high in the U.S., and several major U.S. tuna canneries had insisted on more expensive dolphin-safe netting processes so that they could label their tuna as dolphin-safe. In other words, dolphin-safe tuna and tuna the capture of which involved the killing of dolphins were not regarded as "like products" *by consumers*. This is not a special environmental circumstance: many physically identical products differ in value based only on intangibles. Consider the increase in value a product acquires when it can use an established brand name, the difference between a genuine or forged piece of art, or sound recordings produced with or without the permission of the copyright holder. Such intangible values are part -- often a large part -- of the value of goods that normally flow in international trade. Trade rules with respect to intellectual `property are based on such intangible distinctions. It would be inconsistent if tax rules were barred from considering them. The process/product distinction is only valid if the consuming population is *indifferent* to the environmental damages caused in the production of the goods they consume or ignorant of those damages. Such indifference is increasingly uncommon as public environmental consciousness develops.

6.1.2 Like Products and Discrimination

Several recent GATT and WTO decisions have retreated from the strict process-product distinction drawn by the Tuna-Dolphin case. These decisions have enunciated a standard for defining "like product" which is potentially much more sensitive to environmental and other non-trade policy goals. However, the new standard has not been consistently applied by GATT and WTO panels.

Starting with the Japan Alcohol Panel Report in 1987,[71] GATT conciliation panels have been developing a definition of like product which recognizes that the motivation for a government's product categorization scheme should play an important role in determining its legitimacy. The Japan Alcohol Report involved a complaint about different tax rates on various alcoholic beverage types. Imported beverages were treated in the same way as domestic Japanese beverages, and there was no category without both imports and domestic production. However most of the domestic production fell into low-tax categories, and most imports fell into high-tax categories. Moreover, Japan provided no clear, non-discriminatory rationale for the categorization system.

The Panel enunciated a two-part test for determining whether a tax categorization scheme discriminates against "like products." First, the two categories of taxable products should be directly competitive or substitutable in the sense of GATT Ad Article III, Paragraph 2. Second, the categorization must be "applied to imported or domestic products so as to afford protection to domestic production." The panel found that the Japanese alcoholic beverage taxes did discriminate against imports.

In the U.S. Alcohol case,[72] a GATT panel held that a U.S. tax which discriminated between similar wines and beers based on their ingredients in a way that gave advantage to U.S. producers also violated GATT Article III:2. Although the Panel ruled against the U.S., it adopted language recognizing that GATT should defer to legitimate internal policies. The panel held:

> The purpose of Article III is thus not to prevent contracting parties from using their fiscal and regulatory powers for purposes other than to afford protection to domestic production. Specifically, the purpose of

[71] Panel Report, *Japan – Customs Duties, Taxes and Labeling Practices on Imported Wines and Alcoholic Beverages*, BISD 34S/83 (adopted 10 November 1987).

[72] GATT, Report of the Panel, *United States—Measures Affecting Alcoholic and Malt Beverages*, DS23/R, (adopted 19 June 1992).

> Article III is not to prevent contracting parties from differentiating between different product categories for policy purposes unrelated to the protection of domestic production. The Panel considered that the limited purposes of Article III had to be taken into account in interpreting the term 'like products' in this Article. Consequently, in determining whether two products subject to different treatment are like products, it is necessary to consider whether such product differentiation is being made 'so as to afford protection to domestic production.'[73]
>
> In the view of the Panel, therefore, it is imperative that the like product determination in the context of Article III be made in such a way that it not unnecessarily infringe on the regulatory authority and domestic policy options of the contracting parties.[74]

This developing standard finally bore fruit in the *U.S. Taxes on Automobiles* Report.[75] After extensive quotations from the language of the U.S. Alcohol Report, the U.S. Auto Panel upheld the validity of both the U.S. luxury tax and the U.S. gas-guzzler tax. Both taxes appeared to weigh somewhat more heavily on imports than on average domestic production. The Panel defined the issue as "Which differences between products may form the basis of regulatory distinctions by governments which accord less favorable treatment to imported products? Or conversely, which similarities between products prevent regulatory distinctions by [such] governments... ?"[76]

The panel found that the key inquiry was whether the distinction between products was made "so as to afford protection to domestic production."[77] It observed that the phrase "so as to" suggested both aim and effect, and enunciated a standard for evaluating each.

With respect to aim, the panel held:

> A measure can be said to have the *aim* of affording protection if an analysis of the circumstances in which it was adopted, in particular an analysis of the instruments available to the contracting party to achieve the declared domestic policy goal, demonstrated that a change in competitive opportunities in favor of the domestic policy was a desired outcome and not merely an incidental consequence of the pursuit of a legitimate policy goal.[78] [Emphasis in the original.]

With respect to effect, the Panel held:

> A measure could be said to have the *effect* of affording protection to domestic production if it accorded greater competitive opportunities to domestic products than to imported products.[79] [Emphasis in the original]

The decision was artfully drafted to avoid specifying whether both discriminatory aim and discriminatory effect must be shown, or whether either aim or effect alone is sufficient.

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[73] U.S. Alcohol, id footnote 72, at para. 5.25.

[74] Id at para. 5.72.

[75] GATT, Report of the Panel, *United States—Taxes on Automobiles*, DS31/R (decided 29 September 1994).

[76] U.S. Auto at para. 5.6.

[77] Id at para. 5.7.

[78] Id at Para. 5.10.

[79] U.S. Auto, id footnote 75, at para. 5.10.

The effect test is based not on the actual impact, but on the impact on the terms of competition. If the tax inherently falls more heavily on foreign products, it will be treated as having discriminatory effect. However, evidence that it *actually* falls more heavily on foreign products is irrelevant unless it also infringes on the legitimate expectations of foreign producers that they will receive fair conditions of competition. The measure chosen need not be the least trade-restrictive means of achieving the policy end if it is non-discriminatory and reasonably adapted to that end.

This new test, if consistently applied, can implement the original intent of Article III:2 in regards to process taxes. The process-product standard of the Tuna-Dolphin Report should properly be relegated to the status of a temporary aberration, or perhaps remain as a minor member of a long list of factors used to determine whether two products are "like."

However it is by no means clear that the WTO will continue to apply the aim and effect test of *U.S. Taxes on Automobiles* in a consistent manner. The recent report of the dispute settlement panel in the U.S. Reformulated Gasoline case[80] appeared to retreat to the original unmodified process/product distinction of Tuna-Dolphin I report. The panel held that domestic and imported gasoline were “like” because they were chemically identical, and conducted no analysis of discriminatory intent and only cursory analysis of discriminatory effect.

The *U.S. Taxes on Automobiles* decision confined the process/product doctrine of the Tuna-Dolphin case to an unquiet grave, but failed to drive a stake through its heart. The reformulated gasoline case raises the unfortunate possibility that it may yet rise from the dead.

6.2 Rebate of Environmental Process Taxes on Exports

The GATT allows taxes on inputs to manufacturing processes that are physically incorporated into a good to be rebated when that good is exported. However it has been argued that the provisions governing taxes in the original 1979 GATT Subsidies Code and the slightly modified provisions in the 1994 Subsidies Agreement[81] bar similar rebate of taxes paid on manufacturing inputs that are embodied without being physically incorporated into the traded good (sometimes called *taxes occultes*). Carbon and energy taxes are *taxes occultes*. Both the GATT and the WTO version of the Subsidies Code bar the rebate of prior stage cumulative indirect (PSCI) taxes, and it is claimed that this ban includes taxes on manufacturing inputs. As with the process/product distinction, we will show that this argument is based on a faulty reading of the history and purpose of the underlying trade agreements. In reality, the ban on PSCI taxes was originally intended to apply only to cascade taxes. Cascade taxes were a precursor to value added taxes and are now virtually extinct. Moreover, even if the ban on PSCI taxes applied to carbon taxes under the GATT, the WTO Subsidies Code specifically exempts taxes on fossil fuels from the scope of its ban on rebate of PSCI taxes.

The original GATT did not contain a ban on export subsidies. Such an obligation was added by the 1955 review session amendments to Article XVI.[82] Two subsequent instruments under the GATT obligate their respective parties to avoid subsidizing exports: the 1962 Declaration Giving Effect to the Provisions of Article XVI:4 (Subsidies Declaration), and the 1979 Subsidies Code. Most industrialized nations are signatories of both.

[80] WTO Panel Report, United States—Standards for Reformulated and Conventional Gasoline, WT/DS2/R, 29 January 1996, affirmed 29 April 1996 WT/DS2/AB/R.

[81] Id. footnote 64 and 65 and accompanying text.

[82] A majority of GATT contracting parties have never acceded to the portions of the 1955 amendments to Article CVI that were not self-executing. Thus most contracting parties have no obligation under Article XVI:4 to avoid subsidizing exports, although those subsidies may be subject to countervailing duties under Article III. However, all signatories of the Uruguay Round Final Act agree to be bound by the revised Subsidies Agreement.

6.2.1 Prior Stage Cumulative Indirect Taxes

The argument that the Subsidies Code bars BTAs on *taxes occultes* is usually based on the Code's ban on "prior stage cumulative indirect taxes."[83] The ban on PSCI taxes is an exception to a Subsidies Code's broader rule allowing the rebate of "indirect taxes"[84] on export of a product.

Article XVI:4 bans subsidies on exports other than primary products. The GATT Subsidies Code,[85] paragraph (h), bars rebate of PSCI taxes related to the manufacture of exported products, unless those taxes are levied on articles which are physically incorporated into the exported product. The ban on rebating PSCI taxes applies to the rebate of environmental taxes on embodied inputs if those taxes are PSCI taxes.

A tax is a prior stage cumulative indirect tax if it is a) an indirect tax, i.e., *any* tax which is not a tax on wages, profits, rents or any other form of income,[86] b) it is a prior stage tax, a tax "levied on goods or services which are used indirectly in making the product,"[87] and c) the tax is cumulative. Cumulative taxes are "multi-stage taxes levied where there is no mechanism for subsequent crediting of the tax if the goods or services subject to the tax at one stage of production are used in succeeding stages of production."[88]

The purpose of forbidding PSCI taxes is to prevent nations from subsidizing their exports through excessive tax rebates or credits. PSCI taxes are believed to be especially prone to this abuse because it is often difficult for a company or the government to know precisely how much tax was paid over the various stages of production. This policy explains the major exception to the PSCI tax ban: goods physically incorporated into the exported good.[89] These incorporated goods are exempted because it is usually possible to determine how much of the taxed good is present in the final product.

From the point of view of this policy, the rebate of a tax on manufacturing processes or embodied inputs -- inputs used to produce a product but not physically incorporated in that product -- is a potential vehicle for abuse. GATT law has suggested that the rebate of energy taxes and other *taxes occultes* is problematic at least since the 1970 Report of the Working Party on Border Tax Adjustments.[90] Manufacturing inputs such as energy are often

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[83] Subsidies Code, id. footnote 65. Note that the Subsidies Code is not part of the GATT itself and has a considerably smaller number of signatories. However, the drafters of the Subsidies Code claimed that it was merely a codification of preexisting GATT law and so generally applicable. The new WTO Subsidies Agreement applies to all members. See footnote 82.

[84] Subsidies Code Annex, BISD 26S/56-83 (Geneva, GATT Secretariat, 1980), "Illustrative List of Export Subsidies" para. (g) lists as a subsidy the exemption or rebate on export "of indirect taxes in excess of those levied in respect of the production and distribution of like products when sold for domestic production."

[85] Subsidies Code and Subsidies Code Annex, BISD 26S/56-83 (Geneva, GATT Secretariat, 1980).

[86] The term 'direct taxes' shall mean taxes on wages, profits, interest, rents, royalties and all other forms of income, and taxes on the ownership of real property; the term 'import charges' shall mean tariffs, duties, and other fiscal excise, turnover, value added, franchise, stamp, transfer, inventory and equipment taxes, border taxes, and all taxes other than direct taxes and import charges;…." Subsidies Code Annex note 1, id.

[87] Subsidies Code Annex note 1, id.

[88] GATT Subsidies Code Annex, note 1, id footnote 85.

[89] Subsidies Code Annex, id footnote 85, para. (h).

[90] Until recently, this issue of BTAs on *taxes occultes* has not given rise to much controversy. The Working Party observed in 1970 that border adjustment "was not normally made for taxes occultes except in countries having a cascade tax." *Report of the Working Party on Border Tax Adjustments, GATT Basic Instruments and Selected Documents*, 18th Supp. 97, 101 (1971) paragraph 15(a).

consumed in many stages of production. It may be difficult to determine how much energy is embodied in the final product. A firm which purchases goods for resale or which purchases intermediate goods as inputs to manufacturing would often find it difficult to determine precisely how much of the taxed embodied input went into the production of those goods. Under these circumstances, rebate of tax at the border could often be a matter of guesswork or caprice, or an instrument for subsidizing favored exports.

Although the policy that led to the ban of rebates on PSCI taxes may also apply to *taxes occultes*, *taxes occultes* are not PSCI taxes because they are not cumulative. Under environmental excises any given quantum of the embodied input is taxed only once. In this it is similar to VAT taxes, which tax increments to value at several stages of manufacture but tax each increment only once, at the stage where it is added. Carbon taxes and other *taxes occultes* are not cumulative because they are not "multi-stage" taxes. A tax on embodied inputs is not a multi-stage tax because a specified unit of carbon or energy that is taxed "at one stage of production" is never used "in a succeeding stage of production" as the definition of a cumulative tax requires.

We also know that *taxes occultes* cannot be forbidden PSCI taxes because some types of *taxes occultes* are explicitly allowed by the Subsidies Code. The Report of the Working Group on Border Tax Adjustments lists taxes on "machinery and transport" as instances of "*taxes occultes*."[91] The Subsidies Code states that indirect taxes (for which border adjustments are allowed) include "equipment taxes."[92] The Subsidies Code also allows taxes not in excess of indirect taxes on the "production *and distribution*" (emphasis supplied) of like products, thus encompassing transport taxes.[93]

Taxes on embodied inputs can be contrasted with the archetypal PSCI tax, the cascade tax. Cascade taxes, once popular in Europe and now nearly non-existent, imposed an ad valorem tax on all transfers of goods, including those used as inputs to manufacture. Cascade taxes are different from VAT taxes in that the former tax the total value of the product on each transfer, while the latter asks each producer to pay tax on only the increment to value which has taken place since the last transfer. Under the VAT, only the final consumer pays tax on the entire value of the good. Thus, unlike VATs, cascade taxes cumulate. A cascade tax on purchased inputs increases the cost of producing a good, and this increase was then itself subject to cascade tax when the good was sold. Because the same increment to value is taxed at several stages, cascade taxes, unlike *taxes occultes*, are "multi-stage taxes" as required by the definition of cumulative taxes. Cascade taxes no longer exist in industrialized economies. By the European Commission VAT directive all European cascade taxes were replaced by VATs no later than 1970,[94] later postponed to 1972.[95]

The tax typology used in the Subsidies Code can be traced back to the 1968 OECD report on BTA practices.[96] The report divides consumption taxes into four types: "single-stage" (e.g. sales) taxes, "multi-stage non-cumulative" taxes (e.g. VATs), "multi-stage cumulative" taxes (e.g. cascade taxes), and "specific consumption" taxes (e.g. excise taxes). This four-type categorization system was adopted by the GATT in its own internal review and updates of parties BTA practices.[97] PSCI taxes are a subset of multi-stage cumulative taxes. They are multi-stage

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[91] BISD 18S/97, 101, para 15.

[92] Subsidies Code Annex, id footnote 85, note 1.

[93] Subsidies Code Annex, id footnote 85, para (g).

[94] Council of the European Economic Community, *First Council Directive on Harmonization of Member State Laws on Turnover Taxes*, No. 67/227/EEC (1967).

[95] Council of the European Economic Community, *First Council Directive on Harmonization of Member State Laws on Turnover Taxes—Introduction of the Value-Added Tax in Member States*, No. 69/463/EEC (1969).

[96] OECD, *Report on Tax Adjustments Applied to Exports and Import on OECD Member Countries* (1968).

[97] See, e.g., Consolidated Document on the Examination of Practices of Contracting Parties in Relation to Border Tax Adjustments, GATT Restricted Document L/3389 (6 May 1970).

cumulative taxes excluding the last stage, i.e., the last stage of a multi-stage cumulative tax can be border adjusted, but preceding stages can not. Since under this system of categorization *taxes occultes* are specific consumption taxes rather than multi-stage cumulative taxes, they are not PSCI taxes.

The confusion between *taxes occultes* and PSCI taxes arose because many nations which had cascade taxes also had relatively high *taxes occultes* and administered both sets of taxes as a single system.[98] Under cascade taxes the BTAs were based on estimated average burdens, and most nations with cascade taxes included the *taxes occultes* when they estimated tax burdens under the combined system. Most nations without cascade taxes did not apply BTAs to their *taxes occultes*. Moreover, *taxes occultes* become cumulative taxes when they are collected in a cascade system, because the increase in the cost of intermediate goods caused by the tax becomes part of the cost on which subsequent stages of the cascade tax are collected. But none of this suffices to turn *taxes occultes* into cumulative taxes when they are not collected as part of a cascade tax.

In summary, carbon and energy taxes and other *taxes occultes* are not prior stage cumulative indirect taxes because the are not cumulative. Therefore BTAs on such taxes are not barred by the GATT's ban on rebating PSCI taxes on exports.

6.3 Administration, Compliance and the Burden of Proof

Given that *taxes occultes* are not PSCI taxes, how do we address the problems of administration and compliance monitoring that they share with PSCI taxes? And on the import side, how can a nation assign imputed carbon content to goods in a fair, consistent, and administrable way?

With respect to exports, the answer to this question is straightforward, and can be found in the Report of the Working Party on BTAs. After examining the problem of establishing the proper level of BTAs for cascade taxes and other problem taxes, the report made the following recommendation for all BTAs:

> It was generally agreed that countries adjusting taxes should, at all times, be prepared, if requested, to account for the reasons for adjustment, for the methods used, for the amount of compensation and to furnish proof thereof.[99]

It would be entirely appropriate to convene a working party to examine the question of the type of proof and administrative procedures that would be required to give proper effect to this paragraph of the 1970 Working Party Report.

One plausible approach to determining whether BTAs meet this requirement is found in the 1991 draft of the Final Act Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations (the "Dunkel Draft")[100]. The Dunkel Draft proposed to eliminate the physical incorporation exception to the ban on BTAs for PSCI taxes and replace it with a rule that PSCI taxes could be rebated where the exporting country had an accounting system adequate to confirm the amount of the taxed goods or services consumed in production. This same approach could be applied to *taxes occultes*.

On the import side, there are a number of precedents for border adjustments based on administrable systems of imputing taxed-good content to tradable goods. Two U.S. examples are the Superfund Tax on traded chemicals which are not themselves directly taxable, but are produced with taxed chemical feedstocks, and the Ozone-Depleting Chemicals (ODC) Tax on goods manufactured with but not physically containing such chemicals (such as electronic equipment cleaned with ozone-depleting solvents). The administrative mechanism of the Superfund Tax on feedstocks, described below, could be directly applied to carbon content.

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[98] Id., footnote 97.

[99] Id., footnote 90 at p. 101, para. 17.

[100] MTN.TNC/W/FA (20 December 1991).

As stated in GATT Article II:2(a), imports may be subject to a charge equivalent to an internal tax on "an article from which an imported product has been manufactured or produced in whole or part." One such tax -- on the import of chemicals not subject to U.S. taxation but made from chemicals which were subject to U.S. domestic tax -- was explicitly approved by the GATT Superfund Panel Report.[101]

The United States Superfund Amendments and Reauthorization Act of 1986 created a system of import duties on products manufactured using more than 50 percent (by weight or value, whichever is greater) of products taxed domestically by the Superfund Tax. The import tax rate was very slightly higher than the domestic rate. The import tax applied even when the product was chemically incorporated into the final good and had lost its chemical identity. A rebate of the tax was provided on export of taxed chemicals themselves. No rebate of the tax was provided on export of goods manufactured domestically using or incorporating taxed chemicals.

Canada, Mexico and the European Economic Community all requested consultations under GATT Article XXII:1. They maintained that the higher rate on imported products violated GATT Article III:2 and constituted an impairment of trade under Article XXIII. The Conciliation Panel agreed that the higher rate constituted an impairment of trade even if the difference in rates was so small that it was commercially meaningless. The Panel found that Article III:2 did not protect actual export volumes, but rather guarantied that imported products would face fair conditions of competition with respect to domestic products.[102] In essence, the Panel held that there is no *de minimis* exception to the rule that taxes on imports may not exceed taxes on domestic products.

Although it rejected the higher rate on imports, the Panel approved the BTAs themselves. The panel found that for purposes of Article III the tax on the imported goods manufactured with taxed products[103] did not treat those goods differently than similar goods produced in the United States.[104] The Panel stated that:

> The tax is imposed on imported substances because they are produced from chemicals subject to an excise tax in the United States and the tax rate is determined in principle in relation to the amount of those chemicals used and not in relation to the value of the imported substance.[105]

The charges imposed by the Superfund Tax were equivalent to the U.S. tax on feedstock chemicals used to manufacture the traded chemicals, where the traded chemicals were not directly taxed in the U.S. Although the feedstock chemicals considered in the Superfund case were physically incorporated into the traded chemicals, nothing in the Panel's reasoning depended on the physical incorporation. Thus this standard should also apply to feedstock chemicals used in manufacture and not physically incorporated: embodied feedstock chemicals, including taxes on energy or carbon and taxes occultes more generally.

Where the foreign manufacturer provides detailed information on the chemicals used in manufacture, the tax is based on actual use of taxed feedstock chemicals in the manufacture of imported chemicals. In cases where no such information is provided, the Superfund legislation created two alternative systems for calculating tax liability. On issuance of appropriate regulations by the U.S. Treasury Department, imports would be taxed based on the amount of taxable products that would have been used to produce the goods in the United States using the U.S. predominant method of production. We will refer to this combination of voluntary reporting and backup imputation based on national production technology as the "predominant method" system of assessing tax liability. Second, where no regulation has been issued, a penalty tax of five percent of the value of the import was imposed. The five

[101] GATT Panel Report, *United States – Taxes on Petroleum and Certain Imported Substances*, L/6175, BISD 34S/136, 154 ff., adopted on 17 June 1987.

[102] Id. footnote 101 st 158, paragraph 5.1.9.

[103] I.e., chemicals which would have been taxed if the manufacturing had taken place in the United States.

[104] Id. at 162-3, paragraph 5.2.8.

[105] Id.

percent tax could be much higher than the highest possible tax importers would pay if they provided full information.

The Conciliation Panel approved the predominant method system, but stated that the five percent penalty tax would be a GATT violation because it imposed a higher tax on imports than on similar domestic production.[106] Such a predominant method system of calculating taxes on imports was later incorporated into the Ozone-Depleting Chemicals Tax and into the proposed Btu tax legislation introduced by the Clinton Administration in 1993.[107]

Like the Superfund Tax, the ODC Tax is based on the actual consumption of ODCs when that information is reported by the taxpayer. Congress employed the "predominant method" system as a backstop when the foreign producer did not provide adequate information to determine the actual quantity of taxable chemicals used in manufacture. However, the ODC tax applies to chemicals used in the manufacture of traded goods but not physically present in the good.[108] To date, no country has alleged that applying the Ozone-Depleting Chemicals Tax to imports violates any GATT or WTO standard.[109]

The predominant method system of imputing taxable content could be directly applied to imputing carbon content without modification. U.S. experience has proven this method administrable and compatible with international trade rules. The predominant method approach does not perfectly equalize the treatment of foreign and national producers because foreign producers using dirtier or less efficient production methods will normally chose the imputed value, while more efficient producers will present direct evidence of taxable content. However this imperfection is minor from the viewpoint of protecting a domestic industry from predation by untaxed high-emissions foreign producers, who still have to pay at least what domestic producers do.

6.4 Effect of the Uruguay Round Amendments

Although the Uruguay Round Agreement creating the WTO is a far-reaching and fundamental redesign of the GATT structure, the modifications relevant to border tax adjustments are modest. The Agreement makes no changes to obligations under Article III, which is adopted intact. However, all members of the World Trade Organization[110] automatically accept the revised Subsidies Code, eliminating its current status as a club within the larger group of GATT parties.

The major change relevant to legal analysis of BTAs is that taxes on fuels and energy are exempted from the ban on rebating PSCI taxes on exports. The new Subsidies Agreement allows PSCI taxes to be rebated or exempted on exported goods if the taxes "are levied on inputs that are consumed in the production of the exported product (making normal allowance for waste)."[111] Inputs consumed in the production process are defined as "inputs physically incorporated, *energy, fuels and oil used in the production process* and catalysts that are consumed in the

[106] Id. footnote 101 at 163, paragraph 5.2.9.

[107] U.S. House of Representatives Resolution H.R. 2141 at proposed Internal Revenue Code section 4456 and 4457.

[108] Under current regulations ozone-depleting chemicals are considered to be used in the manufacture of an imported product if they are physically incorporated into the product, released into the air in the process of manufacturing the product, or "used in the manufacture of the product and the cost of the ODC is properly allocable to the product." Reg. Section 52.4682-3(d)(2).

[109] This is not entirely conclusive because the tax on embodied ODCs is usually very small relative to the price of the traded good.

[110] As of June 1, 1996, membership in the WTO stands at 121 nations, including virtually all industrialized nations. An additional 29 nations have applied for membership.

[111] Subsidies Agreement, id. footnote 65, Annex I, Par. (h).

course of their use to obtain the exported product."[112] [Emphasis supplied.] . This change might seem important if one forgets that *taxes occultes* -- including carbon and energy taxes -- are not PSCI taxes and so do not normally need exemption from the PSCI rebate ban.

By including taxes on energy -- one of the *taxes occultes* -- in an exemption to the general ban on PSCI taxes, the Act seems to imply that, absent such an exemption, the ban would cover energy taxes (and by extension other *taxes occultes*). However this is not a correct reading. It is reported that this exemption was inserted at the request of India and a small number of other countries that still operate cascade tax systems.[113] As explained in section 6.2.1 above, *taxes occultes* become PSCI taxes when administered as part of a cascade tax system. Thus for the few nations with cumulative indirect taxes, such an exception is necessary. Even absent this history, however, one need not read footnote 61 of the Subsidies Agreement as implying that other *taxes occultes* are PSCI taxes. One should simply recognize that the availability of BTAs on *taxes occultes* has been a matter of controversy, and that preservation of BTAs on fuel or energy taxes is a matter of concern to many nations for many reasons. In any case, it is now clear that BTAs on embodied fuels are not banned as PSCI taxes under the WTO Subsidies Code.

It has been reported that the Uruguay Round negotiators reached a private 'gentleman's agreement' that they would not use border adjustments for carbon/energy taxes without prior consultation.[114] The force and purpose of this agreement remains unclear. However, its existence lends strength to the claim, made in the next section, that the WTO is a poor forum for resolving trade/environment disputes relating to climate change.

7. BORDER TAX ADJUSTMENTS AND THE FRAMEWORK CONVENTION ON CLIMATE CHANGE

7.1 Overview

As demonstrated in section 6, BTAs on *taxes occultes* -- including carbon and energy taxes -- are allowed under the GATT/WTO. However, there is a long history of contention on this issue. Some nations and advocates of unbridled free trade continue to argue that BTAs are or should be barred under one or more of the rationales outlined in the last section.[115] Continued uncertainty over the GATT/WTO rules governing such BTAs has been a major barrier to their adoption. If carbon/energy taxes are to take their place as a central element of national plans to implement the FCCC, assurances may be needed that trade rules can not be used to attack appropriately designed BTAs for such taxes.

As things stand, conflicts between international trade rules and national climate policy are likely to be resolved through the WTO, which has been an unfavorable forum for environmental concerns. GATT/WTO panels (and the wider trade policy community) have shown little understanding of environmental issues and instinctively resist environmental policies that affect trade.[116] Should a low-energy-tax nation lodge a complaint with GATT about

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[112] Subsidies Agreement, id. footnote 65, Annex II, footnote 61.

[113] Paul Demeret & Raoul Stewardson, "Border Tax Adjustment Under GATT and EC Law and General Implications for Environmental Taxes," *Journal of World Trade*, Vol. 28, No. 4 (1994) at pp. 29-30.

[114] Letter from Donald M. Phillips, Assistant U.S. Trade Representative for Industry, to Abraham Katz, United States Council for International Business (5 January 1994), reprinted in *Inside U.S. Trade*, p. 20 (28 January 1994).

[115] Id. at footnote 63.

[116] Attempts to use GATT exemption for measures "necessary to protect human, plant or animal life or health" or the Article XX(g) exception for measures "relating to the conservation of exhaustible natural resources" to protect environmental measures have been uniformly unsuccessful. Janet McDonald, "Greening the GATT: Harmonizing Free Trade and Environmental Protection in the New World Order," *Environmental Law*, Vol. 23 No. 2 (1993). *See also* Report of the Panel on *United States – Section 337 of the Tariff Act of 1930*, adopted 7 Nov 1989. L/6439, 36S/345.392.par.5.26.; Report of the Panel on *Thailand – Restrictions on Importation of and Internal Taxes on Cigarettes*, DS10/R, adopted 7 Nov 1990. 37S/200.223. Dispute resolution panels have created a rule that these

competitive offsets adopted by a high-energy-tax country, a WTO dispute resolution panel might hold the offsets to be "disguised protection" and rule against them. More importantly, the prospect of such an adverse ruling imposes a major constraint on national policy. In the context of the already substantial political barriers to adoption of climate protection measures, the additional threat of a WTO challenge and trade sanctions poses a serious obstacle to further progress. Governments may be reluctant to adopt competitive offsets, and therefore higher energy taxes, without adequate assurance that the tensions between trade rules and climate protection can be resolved.

As such assurances seem unlikely to be forthcoming from the WTO, at least within the timeframe momentum for FCCC implementation to be maintained,[117] resolution efforts should proceed under the United Nations Framework Convention on Climate Change (FCCC). To date, in those countries where the competitive implications of energy taxes have been debated, the trade community rather than environment departments have had the upper hand in defining policy choices. Although a new committee has been established under the WTO to address the trade/environment relationship,[118] to date it has had no visible influence on the dispute resolution process.[119] Shifting the debate to the FCCC would change this dynamic and improve the prospects for a reasonable balancing of trade and climate protection goals. The Montreal Protocol, which includes stringent trade provisions, provides a precedent for this approach,[120] as does the Basil Convention on the Transboundary Movement of Hazardous Wastes and Their Disposal.

Action by the Conference of Parties to coordinate taxes and other economic instruments is specifically envisioned by the FCCC, Article 4, Section 2 (e)(i) (requiring parties to coordinate economic instruments developed to achieve the objective of the convention), and Article 7, Section 2(c) instructing the Conference of Parties to facilitate such coordination. Moreover, the FCCC includes a basic principle that "parties should cooperate to promote a supportive and open international economic system," and further states that "measures taken to combat climate change... should not constitute ... a disguised restriction on international trade."[121] This contrasts with the governing instruments of the GATT/WTO, which included no basic environmental principles and offers only the narrow environmental exceptions of Article XX(b) and (g), which have never been successfully asserted.[122] Thus the FCCC is the more appropriate forum for resolving conflicts between trade and climate change policies.

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exceptions apply only when no less trade-restrictive measure would meet the same health or conservation goals. Ingenious trade panels, unburdened by an excessive understanding of national political processes or administrative constraints, seem to have no difficulty in finding less trade-restrictive solutions to any problem.

[117] The reference to the speed of WTO deliberations refers to decisions at the level of the Council of Ministers or other general deliberative processes. WTO decisions through the dispute resolution process can be much faster. However, WTO panels are not bound by the decisions of previous panels, so such panel decisions can not provide reliable assurances of WTO non-interference with climate policy.

[118] *Trade and Environment*, decision of 15 April 1994. MTN.TNC/MIN(94)/1.

[119] See, e.g., the continued assertion that only physical characteristics of products can be considered in determining whether they are "like" in the U.S. Reformulated Gasoline report. Id. footnote 80.

[120] The Montreal Protocol provisions affect trade both in ozone-depleting chemicals themselves as well as trade in goods containing, or produced with but not containing, these chemicals. The Protocol bans trade between parties and non-parties in ozone-depleting chemicals and technology for "producing and utilizing" ozone-depleting chemicals. Article 4, Montreal Protocol on Substances that Deplete the Ozone Layer, September 16, 1987, 26 ILM 1541.

[121] FCCC Article 3:5.

[122] See footnote 116.

7.2 Alternative Approaches Under the FCCC

There are two basic approaches under the FCCC to clarifying potential trade/climate policy disputes: a resolution of the Conference of Parties (COP) or a protocol under the Convention. Neither measure would establish an international tax; both would simply provide a framework for countries to adopt their own taxes to implement commitments under the Convention. A major purpose of such a resolution or protocol would be to remove actual and perceived barriers to such taxes that are posed by existing trade rules. A protocol should specifically state that it overrides any conflicting provisions of the GATT and other international trade agreements.

A resolution or protocol could include rules specifying the kinds of taxes that the international community would recognize as legitimate climate protection instruments; rules identifying the kinds of competitive offsets (including border adjustments) that are allowable, if necessary including tightly limited exemptions to existing trade rules; accounting and labeling rules for the carbon/energy content of traded goods; monitoring, reporting and data collection provisions; and non-compliance and dispute resolution provisions.

A resolution can be passed by the members of the FCCC Conference of Parties (COP). In the event of a complaint being brought through the WTO, a resolution would not be legally binding on the WTO panels, but would constitute persuasive authority. Some dispute resolution panels have been willing to consider the existence of an international environmental agreement authorizing a measure as a factor militating against finding a trade violation.[123] A resolution would be equally effective in persuasive force regardless of whether the complaining or defending nations were signatories of the FCCC or voted for the resolution.

A protocol is a legally binding instrument of international law. Under general international law principles, legal instruments bind those sovereign states which ratify them, and only those nations. Under the Vienna Convention on Treaties, when two nations are both parties to two conflicting treaties, the treaty more recently ratified is controlling.[124] Thus a protocol specifying that BTAs on embodied carbon or other climate policies will not be treated as a trade violation would override any GATT/WTO rule to the contrary, provided the dispute is between two signatories of the protocol. If the defending nation but not the complaining nation is a signatory, the protocol would provide the same persuasive authority as a resolution.[125]

If a resolution or protocol on fiscal measures including border adjustments is adopted by the FCCC, the WTO can defer to it without amendment and without major shifts in interpretation.[126]

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[123] See footnote 126.

[124] Vienna Convention on the Law of Treaties, Article 30:3, UN Fov. A/CONF.39/27 (1969) reprinted in 63 AJIL 875 (1969), 8 ILM 679 (1969).

[125] Note that protocols must be accepted by the COP before being opened for signature by the parties. FCCC Art. 17. Thus a protocol offers the same persuasive authority as a resolution, even for conflicts involving nations which have not joined the protocol.

[126] Several GATT panel decisions suggest that the GATT can give weight to multilateral environmental agreements. In the Canadian Tuna dispute, the panel determined that tuna is an exhaustible natural resource that merits conservation. This decision was based largely on the existence of an international agreement on fisheries conservation that had been signed by both parties. *United States—Prohibition of Imports of Tuna and Tuna Products from Canada*, GATT Doc. L/5198 (Feb 22, 1982) at 92 n.1, 97-99, 107-08. The panel in that case ultimately denied an Article XX(g) conservation exemption, but on the grounds that the import ban was not accompanied by a parallel domestic restriction on tuna consumption, and thus failed the test in the second clause of Art XX(b). (GATT Article XX(g) limits the availability of the conservation exemption to measures "made effective in conjunction with restrictions on domestic production and consumption.") The finding of Tuna-Dolphin I that the restriction on Mexican tuna was not within the scope of an Article XX(b) health exemption was largely based on the failure of the U.S. to demonstrate that it had "exhausted all options available to it through … the negotiations of international cooperative agreements." Tuna-Dolphin I, para. 5.28. The panel appeared to concede that such agreements, which might include authorized trade sanctions, are consistent with the GATT or are coordinated with

7.3 Elements of a Fiscal Agreement

In this section we will describe a range of fiscal instruments and related trade practices which are of central importance to achieving the goals of the FCCC. These instruments and practices should therefore be addressed in any resolution or protocol. However, when asserting that specified trade practices are allowed or encouraged, it is essential to avoid ceding the disputed points of GATT/WTO law as it applies to carbon/energy taxes and to environmental taxes more generally. This is particularly important because the practices singled out for mention, encouragement and protection below are considerably narrower than the range of practices which we have shown in section 6 to be allowed under current trade law. A fiscal agreement under the FCCC should not provide ammunition to trade enthusiasts who wish to narrow the scope of allowable environmental tax instruments.

As shown in section 6, under a proper interpretation of GATT law nations can unilaterally adopt a carbon/energy tax with border adjustments. Countries which support a strong climate regime might consider taking the lead in adopting BTAs on embodied carbon in order to encourage the FCCC to accelerate its consideration of fiscal issues and encourage other nations to follow suit. Nations without BTAs may also wish to bring the issue before the FCCC to preempt WTO action on the issue, as the FCCC is a better forum for balancing trade and environmental concerns. (See section 7.1).

7.3.1 Eligible Taxes and BTAs

Only tax measures which are legitimate instruments of climate protection policy should receive protection from trade rules under the FCCC. Not all fuel tax regimes meet this restriction. In general, fuel taxes which place a higher burden on natural gas than on oil or coal, or on oil than coal, can induce fuel substitution toward fuels with higher carbon content per unit of energy, thus running counter to the intent of the Convention (although such taxes may still promote other climate policy goals such as the development of renewable alternative energy sources). A protocol or resolution should support taxes which effectively promote emissions reduction goals. Similarly, BTAs should be protected from generally applicable trade rules only to the extent that they contribute to the goals of the FCCC.

There are two basic approaches to delimiting BTAs that meet climate protection goals. The first, the partial adjustment approach, allows BTAs on any national system of fuel taxes, but sets border adjustment rates on a fuel-by-fuel basis. Under this approach, whatever fuel has the lowest tax rate measured on a per-unit of carbon basis would be fully border-adjustable. Taxes on other fuels would be border-adjustable as if they paid this lowest rate. For example, if the tax rate on coal were ten francs per tonne of carbon dioxide, and that tax rate on oil and natural gas were twenty francs per tonne, the coal tax would be fully border adjustable but only half of the oil and gas taxes would be border-adjustable. This system assures that only that portion of the fuel taxes which encourage emissions-reducing substitutions between fuels receives full adjustment.[127] The competitive burden of a uniform carbon tax would be fully adjustable. Nations are free to adopt whatever fuel tax regime they please, but constrained (by the fiscal resolution or protocol under the FCCC) in the extent to which those taxes are adjustable.

GATT by means of the Article XX exemptions. Thus the WTO can and should allow a briader interpretation of the GATT Article XX(b) and (g) exemptions for health and conservation when a trade restriction has been sanctioned by a multilateral environmental agreement. By sanctioning specified trade measures, the international community provides assurances that they are not disguised protectionism. A simple *per se* rule granting such exemptions for trade sanctions authorized by multilateral environmental agreements is probably appropriate. This would provide complete protection to, e.g., trade sanctions authorized by the Montreal Protocol and the FCCC.

[127] Under either the partial adjustment approach or the qualified system approach discussed below, it might seem desirable to allow border adjustment on taxes that discourage carbon emissions more than a carbon tax does, such as a carbon tax with a coal surcharge. Considering only inter-fuel substitution, this makes sense from a climate policy perspective, although such uneven systems may provide a less effective incentive for the development of conservation and renewable energy technologies. However, the additional administrative complexity that would be added by this refinement is potentially formidable. In light of the modest and ambiguous environmental benefit, the authors believe that it is not necessary to incur this additional administrative burden.

In the alternative, the qualified tax system approach allows BTAs on all fuel taxes paid, but only for fuel tax systems that meet climate protection conditions. To be border adjustable, a fuel tax or set of fuel taxes should meet the same condition as in the partial adjustment approach: the tax rates per tonne of carbon should be equal. BTAs on fuel taxes that do not meet this criterion would not be protected by the resolution or protocol, though of course they may still be allowed under current GATT law. Qualification would be addressed on a tax-by-tax basis. For instance, if a nation had both a carbon tax and a petroleum tax a protocol would protect the BTAs on the embodied carbon taxes but not on the additional embodied petroleum taxes.

The qualified tax system approach is more restrictive than the partial adjustment approach, in that there are tax regimes that would not be adjustable under the qualified tax systems approach that would be partially adjustable under the partial adjustment approach. For example, a tax on fuels proportional to energy content would not be adjustable at all under the qualified system approach. Under the partial adjustment approach, the energy tax on coal would be fully adjustable and the tax on oil and natural gas would be partially adjustable. However, a nation could always achieve the same degree of adjustability under the qualified tax system approach by tax restructuring. Taking the energy tax example, a nation could set a carbon tax on all fuels with a carbon tax rate equal to the energy tax rate on coal. This tax, like all carbon taxes, would be fully border adjustable under the qualified tax approach. Then non-adjustable excises could be added to natural gas and petroleum to bring them up to the energy tax level.

Under either the partial adjustment or the qualified tax approach, a firm need keep track of only a single number, its total border-adjustable tax payments. This number could be imputed based on a firm's fuel consumption in physical units or could be taken from the firm's energy bills if the tax (or in the case of the partial adjustment approach, the border-adjustable portion of the tax) appears on the face of the bill. To do border adjustment on the tax on fuels used to produce electricity, the seller of the electricity must provide the purchaser with information about the carbon tax paid per unit of electricity. Because electricity generated from various fuels and non-fuel sources is fungible, some accounting rules will be required to prevent collusive agreements to disproportionately allocate electricity from low-carbon sources to border-adjustable industries.

Just as higher taxes on low-carbon fuels can produce perverse results from a climate policy perspective, so can taxes which exempt fuel-intensive industries from taxation or which apply lower tax rates to such industries. Such industry exemptions provide perverse incentives to concentrate investments in efficient technology in sectors with relatively low emissions.[128] An effective system of border adjustments fully offsets the additional burden of energy taxes on exports and makes such special exemptions and multiple rates unnecessary. Multiple rates, caps and the like complicate the task of administering border adjustments considerably and should be regarded with disfavor for that reason. Perhaps worse of all, if border adjustments based on the full or normal tax rate are applied to firms with lower rates or other forms of special treatment, the result can be a net *subsidy* of energy-intensive exports without any guarantee that those exports are produced efficiently. Again, because this result runs contrary to the intent of the Climate Convention, special protection should not be available for border adjustments to taxes that have lower rates or special exemptions for fuel-intensive industries.

A rule discouraging such industry exemptions should be incorporated into either of the two approaches to BTAs described above. Under the partial adjustment approach, the adjustable portion of the tax on each fuel should be no greater than the lowest rate applying to any industry. Under this rule, if any industry receives full exemption from the tax on a fuel, the entire tax ceases to be border adjustable. Under the qualified tax system approach, taxes with industry exemptions would not qualify. Note that neither of these approaches bars nations from adopting industry exemptions. Instead, the recognize that exemptions and BTAs are incompatible approaches to dealing with competitiveness issues.

Basing BTAs on taxes alone can produce perverse results when fuels both bear taxes and receive subsidies. For instance, if a nation were to adopt a carbon tax and an equal-value subsidy on each fuel, so that there is no net subsidy or burden on domestic production sold domestically, a tax-only approach to BTAs would result in a net

[128] The otherwise progressive European Commission proposal for a carbon/energy tax includes such lower rates for energy-intensive industries. Id. footnote 18.

subsidy to fuel-intensive exports and a charge on fuel-intensive imports. Because of differences in the underlying approach, the partial adjustment approach and the qualified system approach would deal with fuel subsidies differently. The partial adjustment approach is based on an examination of all of a nation's specific energy taxes,[129] while the qualified tax system approach is based on the evaluation of a single tax instrument. To be consistent with its logic, the partial adjustment approach should treat subsidies as negative tax rates when summing up the total tax burden on each fuel. Under the qualified system approach dictates that a tax instrument be assessed in isolation, the logic of the system would seem to suggest that subsidies not integrated into the tax instrument should not be considered. However, as shown above, this creates unacceptable opportunities for nations to game the system. Instead, a better approach would be to judge a candidate tax system together with any fuel subsidies enacted by the nation after the adoption of the fiscal resolution or protocol.

This section has described a pure climate policy approach to determining allowable BTAs. However in the political arena energy tax measures are seldom designed to serve single goals. In particular, the high social and environmental costs associated with the consumption of transport fuels suggest that some nations may wish to impose higher tax rates on petroleum products, as the U.S. Btu tax proposal did. Similarly, electricity generated from nuclear power and large-scale hydropower systems impose their own environmental costs, which can extend beyond national boundaries. Many nations may wish to incorporate taxes on these energy sources into their carbon/energy tax system and allow BTAs on them as well. Finally, concerns over international or inter-regional equity have played an important role in shaping many energy tax proposals, including the EU and U.S. proposals. The EU and U.S. tax proposals discussed above both taxed nuclear and hydropower in order to avoid the environmental consequences of further encouraging their development. The FCCC clearly positions the task of climate protection within the framework of the larger challenge of sustainable development. It would be fully consistent with the principles of the FCCC to establish a fiscal framework that acknowledged broader environmental considerations than climate alone. For example, the tax ratios required for border adjustability might be based on the energy rather than the carbon content of fuels while exempting non-hydro renewables. At the end of the day, these issues are matters of political judgment that will have to be hammered out by negotiations within the COP.

7.3.2 Allowable Measures

A fiscal resolution or protocol should contain a non-exhaustive list of measures allowed or encouraged by the Climate Convention that should not be treated as trade infringements. This list should include: taxes on fossil fuels as described in the preceding section; border tax adjustments; tax credits and other tax subsidies to encourage research, development and commercialization of renewable energy and energy efficiency technologies; information reporting requirements on traded goods to support these measures; and perhaps other measures. The resolution or protocol should include an efficient, flexible procedure for adding tax measures to the approved list and dealing with other fiscal coordination issues as they arise. To achieve the necessary adaptability such a procedure should include decision-making by a qualified voting majority, similar to the procedure under the Montreal Protocol on Substances that Deplete the Ozone Layer[130] or the 1994 Sulfur Protocol to the Long Range Transboundry Air Pollution Convention.[131]

7.3.3 Covered Industries

For which industries should BTAs be available? As shown in section 4, for plausible tax rates only a small number of industries suffer carbon tax burdens high enough to require BTAs. Still, in order to promote international tax coordination and assuage the fear of complex and burdensome BTA system, it may be desirable to create a standard

[129] I.e., energy taxes measured on a tax base defined in physical rather than value units.

[130] Done at Montreal 16 September 1987, 26 ILM 1550 (1987), entered into force 1 January 1989.

[131] Helsinki Protocol to the 1979 Convention on Long-Range Transboundry Air Pollution on the Reduction of Sulfur Emissions or Their Transboundry Fluxes by at Least 30 Per Cent, done at Helsinki 8 July 1985, entered into force 2 September 1987. U.N. Doc. EB.AIR/12, reprinted in 27 ILM 707 (1988).

list of covered industries for which BTAs would be allowed, or an international standard for selecting such industries.

The COP could set a list of industries that require BTA relief, or create a process by which such a list could be adopted. Because the fuel mix and energy efficiency of industries varies considerably from nation to nation, the creation of such a list would require a number of policy decisions. Should the availability of BTAs be based on best available production technology, on world average efficiency, or on the least efficient plants competing in international markets? Should they be based on the carbon intensity of goods, on the energy intensity, or on a some weighted average of the two? If such a list is to be based at least in part on carbon intensity, how should the diversity of fuel mix be addressed? For instance, electricity is sometimes produced by coal and sometimes by hydropower. The carbon intensity of electricity-intensive goods such as aluminum will therefore vary considerably depending on whether it is based on the most, least, or average carbon intensity of production. Similar concerns will apply to many industries which use different fuels in different regions. There would need to be a process for updating such a list, similar to the process for adding allowable tax measures discussed in the previous section.

An alternative approach is to set an international standard for selecting the industries which will receive BTAs and ask nations to apply it to their own national production. This approach offers less by way of tax system harmonization, but can be more flexibly adjusted to national needs. For instance, the resolution or protocol might suggest that BTAs be made available only to those industries for which the national industry mean tax burden of a reference tax exceeds one percent of sales. The reference tax might be a carbon tax with a specified rate or the tax actually applied by the nation. Using a reference carbon tax would lead to greater international uniformity, as nations with similar technologies and fuel mixes would adopt similar BTAs.[132] On the other hand, using the actual tax would produce the best match between the need for BTAs and their availability, and would imply that nations adopting lower taxes would have smaller, simpler BTA systems.

For purposes of defining covered industries, an industry should be narrowly defined, say at the four-digit International Standard Industrial Classification (ISIC) level. Because energy consumption tends to be highly concentrated in a narrow range of energy-intensive processes, finer subdivision of industry will result in BTAs for a smaller share of trade.

7.3.4 Standard of Review

In a number of trade disputes involving environmental protection measures, GATT/WTO panels have held that an environmental measure that has the effect of discriminating against imports will be approved only if no non-discriminatory policy to meet the same environmental goal exists. We call this the "strict scrutiny" standard of review. The strict scrutiny standard gives no deference to national environmental goals and expertise. No nation has successfully defended an environmental measure to which this standard was applied.[133]

It is not clear that strict scrutiny was ever the proper standard for evaluating environmental measures under GATT law.[134] Leaving this question aside, it is inappropriate to apply such a restrictive standard to measures approved by a multilateral environmental agreement or adopted to meet a nation's obligations under such an agreement.

A resolution or protocol should suggest that a more deferential standard of review be used by the WTO. Measures explicitly approved by the resolution or protocol should be treated as trade violations only if the method of implementation gives clear evidence of discriminatory intent. Measures taken in pursuance of FCCC obligations, but not explicitly approved by a resolution or protocol, should first be shown to be legitimate instruments of climate policy. A nation would make this showing by demonstrating that the measure either reduces greenhouse gas emissions or constitutes an integral part of a comprehensive scheme to reduce such emissions. The nation with the

[132] Still greater uniformity could be achieved by using a reference energy tax rather than a reference carbon tax, at the cost of a looser match between the need for BTAs and their availability.

[133] Id. footnote 116.

[134] See e.g., the U.S. Reformulated Gasoline WTO appellate decision, id. footnote 80.

measure under consideration would have the burden to prove that it is a legitimate instrument of climate policy. The burden would then shift to the complaining nation to show that the environmental rational is merely a pretext for protectionism. Pretext would be shown by establishing either that the primary intent of the measure is to protect domestic industry, or that the trade impact is grossly disproportionate to the environmental benefit.

8. REAPING COMPETITIVE BENEFITS FROM ENVIRONMENTAL TAX REFORM

8.1 Introduction

Ecological tax reform is a shift in the tax base whereby taxes on pollution, natural resource consumption, or other environmentally damaging activities take the place of some portion of existing taxes on work and investment. We will address ecological tax reform of the type proposed by the EU and considered in Switzerland, in which carbon/energy taxes are increased and the bulk of the revenues are used to reduce labor taxes such as social insurance taxes. When this type of reform is accompanied by appropriate competitiveness offset policies, it promotes the competitiveness of the adopting nation in four ways. First, it lowers the price of labor-intensive exports without imposing a comparable increase in the price of fuel-intensive exports. Second, it shifts the tax base from labor taxes, which are not border adjustable, toward energy taxes, which are. Third, it promotes technological and environmental leadership that leads to export opportunities. Finally, it steers economic development in the direction of long-term growth and sustainability.

8.2 Competitive Gains

8.2.1 Price Effects

As shown in section 4 above, most manufacturing is not very energy intensive. This implies that an ecological tax reform program using energy taxes to reduce labor taxes will benefit most firms. This would not imply any net benefit for Swiss trade if the many firms seeing modest declines in their output prices were counterbalanced by a small number of fuel-intensive firms with much larger price increases. But as shown in section 5, it is possible to fully offset the competitive burden on fuel intensive exports using BTAs, or to largely offset them through targeted tax relief. Consequently, the competitive benefits from the modest tax and price reductions to most industries are not countered by comparable price increases on the fuel-intensive sector.

8.2.2 Competitive Tax Structure.

Under the rules of the GATT/WTO, some taxes can be imposed on imports and rebated on exports (border adjusted), and others cannot. As a result, industries with tax burdens of comparable magnitude will face a higher competitive burden if that tax is not border adjustable than if it is. Nations are forbidden to impose BTAs on taxes on wages, income or profits.[135] On the other hand, section 6 above demonstrated that BTAs on energy taxes are allowed. Thus the shift from labor to energy as a tax base can reduce the overall competitive burden of the tax system.

8.2.3 Environmental Technology and Export Opportunities

Environmental markets around the world are growing much faster than other industries, a situation that creates major opportunities for export.[136] A U.S. Office of Technology Assessment report concluded that "[t]he strength and form of environmental regulations in the home market are the major determinant of environmental industry competitiveness."[137] Increasingly, nations worldwide face similar environmental challenges, ranging from local to

[135] *Working Party Report on Border Tax Adjustments*, id. at footnote 70, paragraph 13-14.

[136] Hoerner, et al., id. footnote 12, pp. 8-18.

[137] Office of Technology Assessment, U.S. Congress, *Industry, Technology and the Environment: Competitive Challenges and Business Opportunities*, Washington DC: U.S. Government Printing Office, 1994.

global problems. Moreover, technologies developed to solve an environmental problem in one country or region increasingly can be applied to problems elsewhere. For example, urban air pollution in Los Angeles, Tokyo, Mexico City, and Jakarta; acid precipitation in Europe, North America, and China; and global climate change share the same primary cause -- fossil fuel consumption. Technologies such as zero-emission vehicles, renewable energy power plants and energy-efficient appliances will find global markets wherever they are developed.

Harvard Business School professor Michael Porter, guru of international competitiveness studies, notes that when a nation's environmental policies lead environmental policy developments in other countries, domestic firms can gain important advantages as early movers. Once a technology has been developed which makes tougher environmental standards achievable at reasonable cost, other countries will adopt such standards, creating a market for the technology. This diffusion of environmental standards and technologies is driven by green consumerism and the growing effectiveness of the national and international environmental lobby in a world of increasingly democratic politics. In addition, economics alone will lead to expanding market share for new clean technologies which, as they mature, not only provide environmental benefits but also lower overall costs.

8.2.4 Tax Reform and Long-Term Growth

In the post-war era, less than half of economic growth can be explained by the increase in labor supply and capital investment. The "residual" growth, not caused by the increase in physical inputs, comes from making more efficient use of each unit of capital, labor and raw materials.[138] This increase in efficiency comes about through increased knowledge and technology, expressed in both the skills of the work force and quality improvements in the capital stock.

Unlike physical and human capital, which can be increased and improved without apparent limit, energy and raw materials are relatively fixed in their chemical and material form. Moreover, it is inevitable that ever-expanding exploitation of exhaustible and depletable resources will raise the environmental cost of consuming those resources. Conversely, the existing stock of technology, education and skills is the primary input to the creation of new technology, education and skills. As a result, increased investment in these areas may lead to a long-term positive growth feedback. Thus, environmental tax reform that encourages redirection of resources away from consumption of natural resources and toward human capital improves the long-term competitive prospects of nations that adopt it.

8.3 Policy Packages for Jobs and Growth

Recognizing that a major goal of energy taxes is to shift the economy toward sustainable growth, energy tax proposals should be advanced in tandem with targeted policies promoting low-emission technologies and infrastructure. Public discussion of energy tax proposals and other environmental policies has tended to focus on the economic activities that such policies aim to curb, rather than those they aim to encourage. Consequently, the employment benefits of environmental policies are not widely recognized. In 1994, for example, the environmental industry in the United States provided more than 1 million jobs, and the number was growing at twice the rate of employment overall.[139]

Combining energy tax proposals with other policies is necessary because taxes alone are insufficient to reduce emissions. Energy tax revenues, for example, might be used to modernize inter-city rail systems; or a revenue-

[138] Edward F. Dennison, *Trends in American Economic Growth*, 1929-1982, Washington DC: Brookings Institution, 1985; E.F. Dennison, *Why Growth Rates Differ*, Washington DC: Brookings Institution, 1985. For a survey of the literature, see Angus Madison, "Growth and Slowdown in Advanced Capitalist Economies," *Journal of Economic Literature*, 25 June 1987; and Michael Boskin & Lawrence Lau, "Contributions of R&D to Economic Growth," in Bruce Smith & Claude Barfield, ed., *Technology, T&D, and the Economy*, The Brookings Institution, Washington DC (1996).

[139] This includes jobs in solid waste management, recycling, water utilities, pollution control equipment and renewable energy. Hoerner, Miller and Muller, note 12 above.

neutral energy tax could be combined with a shift in spending from highway to rail development. An energy tax could also be introduced together with positive fiscal incentives for low-emission technologies. Such incentives played an important role in the development of a wind energy industry in California and Denmark that is now competitive with fossil fuels. Notably, while the U.S. Congress rejected the Btu tax in 1993, the previous year it did pass a tax credit for wind energy with an incentive five times greater than the disincentive for coal provided by the Btu tax.[140] When combined with such incentives, energy taxes can stimulate technological advances that not only provide environmental benefits but lead to net reductions in energy costs. By improving the technical efficiency of the economy such advances help sustain wage and job growth.[141]

Tax opponents have exploited fears that energy taxes will cause job losses; in the United States, for example, some advertisements proclaimed that Btu meant "Big Time Unemployment." Although job loss claims are exaggerated, environmental policymakers need to acknowledge that shifting to a sustainable pattern of energy use will dislocate communities centered on fossil fuel production, especially coal. The argument that coal mining jobs are already being lost because of technological change and industry restructuring will not suffice. At the very least, significant tax proposals should provide adjustment assistance for affected communities, including job retraining, income support, and regional economic development measures. This aid is warranted on social justice grounds and cannot be expected to neutralize opposition to energy taxes within these communities. To win the political battle over energy taxes, environmental policymakers will also have to address job concerns within the wider community by communicating a vision of a sustainable economy that provides secure employment.

Energy taxes can be introduced as part of broader tax restructuring designed to stimulate employment. The May 1995 EU carbon/energy tax proposal, for example, recommends that member countries use revenues to reduce other taxes, particularly those on labor. Statutory charges on labor, including taxes and social security contributions, account for more than 40 percent of overall labor costs, on average, within the EU, compared with 30 percent in the United States and 20 percent in Japan. In its 1993 white paper *Growth, Competitiveness, Employment,* the European Commission proposed using carbon/energy tax revenues to reduce such charges, especially for young, low-wage, and unskilled workers that experience the highest rates of unemployment. The paper estimates that a targeted reduction in employers' social security contributions of 1 percent of gross domestic product (approximately the amount of revenue raised by the full carbon/energy tax) could reduce the unemployment rate by 2.5 percentage points over four years.[142]

9. CONCLUSION

The adoption of carbon/energy taxes is essential to the success of the United Nations Framework Convention on Climate Change and to the global climate system which it protects. Although five nations have adopted modest carbon taxes, tax initiatives elsewhere have stalled or failed due to the opposition of fossil fuel producers and fuel-intensive industries. These industries have mobilized the larger business community and the public through campaigns claiming that the taxes would lead to loss of competitiveness and jobs.

The widespread adoption of meaningful carbon/energy taxes in developed countries is unlikely unless competitiveness concerns are addressed. Existing taxes and tax proposals have attempted to deal with these concerns through exemptions of energy-intensive industries. This approach erodes the environmental benefit of the tax, and can lead to a public perception that the tax is complex and unfair.

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[140] A production tax credit of 1.5 cents per kilowatt-hour for wind energy and closed-loop biomass was enacted in conjunction with the National Energy Policy Act of 1992. The full Btu tax would have increased the cost of electricity from a typical coal power plant by 0.3 cents per kilowatt-hour.

[141] Hoerner, et al., id. footnote 12.

[142] Commission of the European Communities, *Growth, Competitiveness, Employment: The Challenges and Ways Forward into the 21st Century*, supplement 6/93 of *Bulletin of the European Communities* (Luxembourg, 1993); and Directorate General for Economic and Financial Affairs, *Taxation, Employment and Environment: Fiscal Reform for Reducing Unemployment*, II/645/93-EN (Brussels, December, 1993).

Alternative approaches are available that better protect a nation's competitive position and preserve the environmental incentive of the tax. Nations can combine border tax adjustments on energy intensive goods or targeted tax relief with a package of policies to promote renewable energy and energy efficient technologies. This combination of policies can offset the competitive burden of the carbon tax on fuel-intensive industries while preserving the competitive benefit of the corresponding decrease in labor taxes.

By taking a leadership position in adopting carbon or energy taxes with such competitive offsets, a country can help promote global greenhouse emissions reductions which far exceeds its own reductions. Such taxes encourage the discovery, development and commercialization of energy-efficient processes and products and zero-emissions renewable energy technologies. Such high-efficiency process, products and alternatives can be exported, creating business opportunities and jobs at home while reducing greenhouse gas emissions in the purchasing nations. Such clean technology exports will become increasingly important as developing nations industrialize. In addition, a nation can lower the barriers to other nations adopting carbon/energy taxes by providing a model of effective, administrable competitive offsets that comply with international trade rules and preserve the environmental incentive.

Finally, environmental tax reform contributes to long-term competitiveness by shifting a country's economy toward an economically and environmentally sustainable growth path. Exploitation of exhaustible and depletable natural resources (including the capacity of the environment to absorb wastes such as carbon dioxide) will lead to increasing environmental costs. Conversely, investment in new cleaner technologies and human capital provide positive feedbacks that lead to further improvement in the quality of the workforce and capital stock, a process which historically has been the primary engine of economic growth. Thus, nations that use pollution or natural resource taxes, such as carbon taxes, to reduce the tax burden on labor and investment will reap long-term growth benefits. ⌘