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ARE THERE ANY COST-EFFECTIVE GREENHOUSE GAS CONTROL POLICIES THAT POLITICIANS MIGHT LIKE?

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EXECUTIVE SUMMARY

Economists who have studied climate change are nearly unanimous that increases in the price of energy according to the carbon content of different fuels are essential to cost-effective policies to control emissions of greenhouse gases. Yet a large majority of elected officials, both liberal and conservative, contend that policies that raise energy prices make little or no political sense. The conflict between economists' and politicians' views is troubling because changes in the earth's climate caused by human activity under business-as-usual forecasts are expected to have potentially significant environmental impacts that are hard to foresee or reverse. In addition, implementing carbon emission controls that can significantly delay, but not prevent, warming will be tremendously costly. Since adopting a significant new policy will require broad political support, it seems worthwhile to look again for cost-effective greenhouse gas control policies that politicians could endorse.

There is one set of cost-effective emission control policies that avoids the increases in energy prices that politicians shun. These policies would instead prevent future declines in energy prices from being as sharp as they might be. The distinction between a policy that increases prices and one that avoids a reduction in prices might appear small. But it could be significant if it defuses concerns that gas prices will rise.

Contingent incentives to reduce emissions (CIRE) share the key economic virtue of carbon taxes, or cap-and-trade approaches, raising the expected price of fuels according to their carbon content. CIRE would raise the expected prices of fuels containing carbon because in one possible state of the world -- low energy prices -- prices would be increased in a predictable way, although in the other state, high energy prices, they would be unaffected.

CIRE provide a way for politicians to commit to supporting only modest emission controls, as is now appropriate given the currently uncertain and distant nature of the threat posed by climate change. Conservatives sympathetic to concerns about global warming may not support a modest cap-and-trade program because they fear it will grow out of control. Yet they might support contingent incentives to reduce emissions that do not raise energy prices above current levels, knowing that such controls are intrinsically more limited, and that they would avoid unpopular increases in energy prices.

CIRE may offer an opportunity for larger emission reductions over an extended period of time that is relevant for climate change policy. Energy prices historically have fallen in real terms in the United States. Since 1967, a period that includes the huge energy price increases of the 1970s, the CPI rose at a rate of 5.3 percent per year while the CPI for energy rose at a rate of only 5.0 percent per year. This difference, while not huge, grows to about 2.4 percentage points after 10 years, or 6 percent over 25 years. Moreover, energy prices paid by consumers have sometimes fallen fairly sharply relative to all consumer prices. In principle, arranging emission controls to go into effect during periods when energy prices would otherwise be declining may reduce real adjustment costs as well as political dissent.

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INTRODUCTION

Economists who have studied climate change are nearly unanimous that increases in the price of energy according to the carbon content of different fuels are essential to cost-effective policies to control emissions of greenhouse gases. Yet a large majority of elected officials, both liberal and conservative, contend that policies that raise energy prices make little or no political sense. The conflict between economists' and politicians' views is troubling because changes in the earth's climate caused by human activity under business-as-usual forecasts are expected to have potentially significant environmental impacts that are hard to foresee or reverse. In addition, implementing carbon emission controls that can significantly delay, but not prevent, warming will be tremendously costly. Since adopting a significant new policy will require broad political support, it seems worthwhile to look again for cost-effective greenhouse gas control policies that politicians could endorse.

There is one set of cost-effective emission control policies that avoids the increases in energy prices that politicians shun. These policies would instead prevent future declines in energy prices from being as sharp as they might be. The distinction between a policy that increases prices and one that avoids a reduction in prices might appear small.[1] But it could be significant if it defuses concerns that gas prices will rise.

Some precedents exist for emission reduction policies contingent on economic conditions, which I call contingent incentives to reduce emissions (CIRE). Starting in 1998, the Clinton Administration sought to persuade developing countries to adopt national emissions caps indexed to measures of economic activity. Such indexed caps could reduce the risk that a cap is inadvertently either too stringent (and costly) or too lax.[2] Although Argentina adopted such an indexed emissions cap prior to its current economic crisis, policymakers have otherwise neglected indexed caps.[3] The emission control policies proposed here, however, are different because they address primarily a political, rather than an economic, problem.

Another precedent is federal excise taxes that vary with the price of the item being taxed.[4] Manufacturers' taxes imposed on the sale of sport fishing equipment, electric outboard motors, sonar devices, bows, and arrows components are currently based on the sale price of the article. As another example, coal is taxed at a higher percentage rate if the price is low. The rate is 4.4 percent if the selling price is less than $25 per ton for underground mined coal and less than $12.50 per ton for surface-mined coal. If coal prices exceed these thresholds, taxes are capped at $1.10 per ton or $0.55 per ton depending on whether the coal is mined underground or on the surface. These rates

[1] Note also that Daniel Kahneman, the winner of the 2002 Nobel Prize in Economics, showed that people react differently to gains and avoided losses.
[2] See Lutter (2000).
[3] Note, however, that the emissions intensity target adopted by the Bush Administration in 2002 is similar, in that it focuses on emissions per unit of GDP, rather than on emissions *per se*. See the White House's Global Climate Change Factbook (2002), available at http://www.whitehouse.gov/news/releases/2002/02/climatechange.html.
[4] See Internal Revenue Service (2002).

imply that the existing tax on coal is higher (in percentage terms) for coal that is priced relatively low.

While emission control policies contingent on relatively low energy prices may be nearly as cost-effective as economists' favorite approaches, their implementation could pose novel political or policy challenges unrelated to increases in energy prices. For example, it is not yet clear they can be implemented in a simple and straightforward way. In addition, their complexity may pose new problems for the effort to facilitate international coordination of control measures to address global climate change, although policies must first be domestically sensible before they can be coordinated internationally.

This paper addresses the policy problem caused by the difference between economists' and politicians' views about greenhouse gas control policies, and then reviews politicians' recent experiences with energy tax proposals and recent emission control proposals. It then describes a proposal for cost-effective and politically viable emission controls, delves into the details of the design of such contingent controls, and discusses how OPEC's behavior affects the effectiveness of contingent controls. Finally, it describes how contingent control policies could facilitate -- or complicate -- a political consensus, before drawing conclusions.

THE POLICY PROBLEM

There is essentially unanimous agreement among economists specializing in climate change that carbon emission controls must use the incentives of higher fuel prices in order to be cost-effective. Since William Nordhaus of Yale University did his early work on the economics of controlling climate change,[5] neoclassical economists have come to accept the view that increases in energy prices according to the carbon content of different fuel sources are a necessary component of cost-effective emission control policies. All the authors of 14 articles published in 1999 in a special issue of the *Energy Journal* on "The Costs of The Kyoto Protocol: A Multi-Model Evaluation" implicitly make this assumption. This assumption also underlies economic studies of emission control policies conducted by the Clinton Administration and the U.S. Energy Information Administration.[6] Both carbon taxes and cap-and-trade policies that raise the price of fuels according to their carbon content would give all emissions sources the same incentives to reduce carbon emissions.[7] The equal incentives ensure that carbon emission reductions are undertaken in the sectors where they are least expensive.

There are two key caveats to this generalization. First, geoengineering -- the application of engineering techniques to limit greenhouse gas accumulations or their effects -- may be a more cost-effective means of controlling temperature increases than emission controls.[8] For example, some authors have suggested that fertilizing algae with

[5] See e.g., Nordhaus (1991).
[6] See Clinton Administration (1998) and EIA (1998).
[7] See, however, Lutter and Shogren (2002) for an argument that uniform national carbon prices are unlikely to be cost-effective because they ignore effects of carbon emission reductions on emissions that contribute to local air pollution.
[8] See Nordhaus and Boyer (2000).

iron in the eastern Pacific may sequester huge amounts of carbon in the deep ocean at very low cost. The uncertain ecological implications of geoengineering suggest, however, that further study is needed. Second, increased fuel prices are a cost-effective way to reduce emissions only to the extent that methods of removing carbon from flue gases are not economically viable. Though there are now no techniques for cost-effective removal and disposal of carbon from flue gases, new technology may be developed.

Economists' agreement about which emission control policies are cost-effective is important because of the need for any policy to be cost-effective. The United States rejected the Kyoto Protocol in part because politicians saw it as too costly.[9] Yet even with complete compliance, Kyoto would have averted only 7 percent of climate change projected to occur by 2100, if left in place that long.[10] Avoiding more than a small share of projected climate change will eventually require deep cuts below business-as-usual emission levels in both the industrialized countries and the developing countries that under Kyoto resisted any commitments to reduce their own emissions.[11] Cost-effective measures to achieve such cuts will cause significant increases in the price of fuels containing carbon. Trying to address global warming through inefficient policies will be too expensive to be effective.

Notwithstanding economists' love of policies that reduce emissions through the incentives of higher energy prices, nearly all politicians in Washington share a deep antipathy toward proposals that raise energy prices. The genesis of that antipathy is the public's dislike of gasoline taxes, as measured by various polls. From 1982 to 1993, the number of people opposed to higher taxes outweighed the number in favor by margins in excess of three to two in four of the six years for which this question was asked.[12] The lowest margin was nine percentage points.[13] Depending on the wording of the particular question, more recent polling data confirm this dislike.[14]

Most of these polls have a key limitation, however. The ones that show consistently anti-tax views asked about higher gasoline taxes as a way of reducing the federal deficit, and not as a substitute for other taxes.[15] Yet people tend to respond differently if revenues from higher gasoline taxes would be used for different purposes. For example, in November 2001, 58 percent of Americans supported an additional tax of 10 cents per gallon of gasoline "to help reduce energy use, and this country's dependence

[9] See Energy Information Administration (1998) and *Energy Journal* (1999) for cost estimates.
[10] See Wigley (1998).
[11] See Wigley (1998).
[12] See Farhar (1994).
[13] Ibid.
[14] An exception is a CBS News/New York Times Poll in November 1997, which asked "Which policy would you prefer the government follow to help stop global warming: 1. extra taxes on gasoline, coal, oil and natural gas, 2. tax breaks for other forms of energy, like solar and wind, or 3. regulations that force manufacturers to produce more efficient cars, home appliances and other equipment? " Only 3 percent of those respondents who had some familiarity with global warming preferred taxes.
[15] See Farhar (1994).

on oil as an energy source," provided it was used to "fund more research and development of alternative energy sources" and encourage people to use less gas.[16]

Independent of polling data, simple empirical observations support the idea that households are especially sensitive to gasoline prices. Consumers are likely to know the price of gas better than the price of, say, eggs or milk. Among consumer products bought on a weekly basis, only gasoline is advertised on big street signs. This practice has arisen because drivers can fill up at one gas station pretty much as easily as at another and because drivers choose gas stations largely on the basis of price. Gasoline is a homogeneous commodity sold by specialized retail outlets that do not bundle it with other goods. As a result, the returns to advertising are relatively large, and service stations post prices prominently.

For the average household, there are few practicable alternatives to gasoline and motor oil, despite the size of such spending. The average household spent $1,055 on gasoline and motor oil in 1999, when gasoline prices were relatively low.[17] This figure represents nearly 3 percent of total out-of-pocket expenditures ($37,027), an amount roughly comparable to total spending on meat, fish, poultry, eggs and dairy products, which was $1,071.[18] If the price of beef or turkey or salmon rises, consumers can switch to pork, chicken, catfish, or even beans to avoid bearing the full burden of the higher prices. On the other hand, to avoid higher gasoline prices, consumers must curtail car trips, use public transit, or join carpools, all of which are inconvenient or time-consuming options. Thus consumers can shift to less expensive alternatives to gasoline only with considerable difficulty.

Consumer demand for gasoline is much less responsive to price than demand for other household items. In the short run, consumers buy about 0.15 percent less gasoline in response to a price increase of one percent.[19] Thus a 10 percent increase in price provokes roughly a 1.5 percent decline in gasoline use and about an 8 percent increase in consumer spending. For pork, poultry, and dairy products, a one percent increase in price prompts larger declines in consumption, about 0.69 percent, 0.64 percent, and 0.79 percent, respectively.[20] These greater declines in consumption imply that a given price increase causes spending to rise by less for these items than for gasoline.

These estimates imply that a 10 percent increase in the price of gasoline increases the average household's out-of-pocket spending by some $90 per year per household. It is hard to think of another commodity for which a 10 percent price increase would burden families to the same degree.

Consumers' discomfort with higher energy prices provoked contentious debates about the government's responsibilities for the energy price spikes of 2000. One issue

[16] See Princeton Survey Research Associates/Newsweek Poll (2001). Note that this poll coincided with great public concern about Al Qaeda.
[17] See the Statistical Abstract of the United States (2001, No. 659).
[18] See the Statistical Abstract of the United States (2001, No. 659).
[19] See NRC (2001, p. 19).
[20] See Huang and Lin (2000, Table 8).

was the use of the federal Strategic Petroleum Reserve as a way of reducing home heating oil prices in the Northeast.[21] Another was the role of government regulations in raising Midwest gas prices during that summer, when they reached $2.10 per gallon in Chicago and $2.00 per gallon in Milwaukee.[22] These debates show how sensitive politicians are to higher fuel prices. Small wonder they are loath to make energy more expensive.

EXPERIENCES WITH ENERGY TAX PROPOSALS

Experiences with proposed energy taxes or high fuel prices have tempered politicians' views towards raising energy prices. The most cost-effective approach to fighting global warming, a carbon tax, was first presented to Congress some 12 years ago. Representative Pete Stark, a California Democrat, introduced H.R. 4805 at the end of the first Bush Administration.[23] It would have taxed carbon at the rate of $25 per ton of carbon, or coal at $15 per ton, oil at $3.25 per barrel, and natural gas at $0.40 per million cubic feet. Needless to say, it failed to pass.

When President Clinton faced a large budget deficit in 1993, he proposed an energy tax intended to raise $22 billion in federal revenue, based on the energy content -- measured in British thermal units (Btu) -- of different fuels.[24] Although the proposed Btu tax would have raised gasoline prices by only 7.5¢ per gallon, according to the Administration,[25] a Democratic Congress rejected it. Some observers believe that the Administration's fight for the Btu tax contributed to the Republican takeover of the House of Representatives in 1994.

After the Clinton Administration agreed to the Kyoto Protocol in 1997, no group in Congress expressed support for a domestic implementation plan that would control carbon emissions through higher energy prices, even though such a plan was implicit in the Administration's testimony. The Chair of the President's Council of Economic Advisers, Dr. Janet Yellen, testified that the net effect of the Administration's climate policies on energy prices would be "modest," on the order of a nickel per gallon of gasoline.[26] Later, during the debate following President Bush's decision to abandon the Protocol, no politicians sympathetic to the Protocol expressed public support for policies that would raise energy prices.

RECENT EMISSION CONTROL PROPOSALS

More recent Congressional proposals to address greenhouse gas emissions look quite different from the proposals that economists think would be cost-effective. Popular

[21] See Kongshaug (2000).
[22] See FTC (2001) for a summary.
[23] See Poterba (1991, p. 74).
[24] See Noah (1993).
[25] Ibid.
[26] See Clinton Administration (1998) for the analysis supporting her testimony. While the analysis relied on conventional economic models, it made unusually optimistic assumptions about the willingness of other countries to sell emissions permits to the United States. These assumptions may have been essential to keep the estimated effects on energy prices as low as the politically-tolerable nickel per gallon. See, for example, Toman (2002) and EIA (1998).

in the Senate early in 2002 was an ultimately unsuccessful proposal to impose more stringent corporate average fuel efficiency (CAFE) standards for new cars and light-duty trucks. CAFE standards are much less efficient at reducing emissions than higher gasoline taxes because they exempt all vehicles already on the road.[27] In addition, they create incentives that worsen existing social problems. By lowering the incremental cost of driving, they increase driving and so contribute to more -- not less -- traffic accidents, highway congestion, and local air pollution. Some evidence suggests that these "external" effects of CAFE exceed the value of fuel savings by a factor of two to four.[28] Taking all the economic effects of CAFE into account strengthens this conclusion. Professor Andrew Kleit of Pennsylvania State University recently estimated that a 3.0 mile per gallon increase in the fuel efficiency standard would in the long run impose social welfare losses of $5.6 billion per year and save 5.1 billion gallons of gasoline per year.[29] He concludes, "the 3.0 MPG increase is thus 20 times more expensive than a gas tax increase that would save as much gasoline. In addition, the marginal welfare costs of long-term increases in the CAFE standard amount to $1.26 per gallon and exceed by a factor of five recent estimates of the marginal social benefits from avoided externalities."[30] The National Highway Transportation and Safety Administration recently issued more stringent CAFE standards for light trucks, such as sport utility vehicles and minivans.[31]

Also at odds with most economists' notions of efficiency is a proposal by Senator James Jeffords to cap carbon emissions from power plants[32] -- an idea opposed by the Bush Administration and generally lacking support in the West or Midwest. Power plants are only one of many sources of carbon, which is only one of six significant greenhouse gases. No policy that singles out one source of emissions without considering others is likely to be cost-effective. More broadly, an industry-by-industry approach to the regulation of greenhouse gas emissions is likely to be inefficient because it would almost certainly prevent the incremental cost of emission controls from being equal among the different sectors.

These proposals avoid using the incentives of higher energy prices preferred by most economists. Many believe a more efficient approach would restrict the carbon content of fossil fuels that can be brought into the market at an "upstream" point in the distribution process, such as the wellhead or the mine mouth.[33] This approach is equivalent to capping all carbon emissions, but it is much simpler to administer than requiring permits of all motor vehicle operators.

[27] See Lutter (2002), Kleit (2002a) and Kleit (200b).
[28] See Lutter (2002).
[29] See Kleit (2002a).
[30] See Kleit (2002a).
[31] See NHTSA (2003).
[32] See *Clean Power Act of 2001*, S. 556, Section 132(b).
[33] See e.g., Keeler (2002).

A PROPOSAL FOR COST-EFFECTIVE AND POLITICALLY VIABLE EMISSION CONTROLS

The darling of neoclassical economists interested in a cost-effective government emission control policy is currently a proposal by researchers at Resources for the Future (RFF), a centrist think tank specializing in environmental policy in Washington, D.C.[34] This proposal has the language of a politically palatable cap-and-trade program but the salient economic characteristics of a carbon tax. Unlike a regular cap-and-trade approach, it would allow a government agency to sell an unlimited quantity of emissions permits at a fixed price, e.g., $20 per ton, thereby capping the price of carbon permits, and hence the incremental effects on all and any fuel prices.[35] Economist Billy Pizer, of RFF and recently the President's Council of Economic Advisers, showed that fixed greenhouse gas emission caps are less efficient than fixed price incentives (e.g., taxes).[36] The RFF proposal, sometimes called cap-and-trade plus a safety valve, offers protection from the risks of very large increases in energy prices, as might occur if low-carbon energy sources turn out to be more costly than expected. In effect, the cap on the price of carbon permits limits the economic costs of the program.

The basic RFF proposal may be more politically acceptable if it avoided easily identifiable price increases. In particular, it could be modified to allow stringency to increase as energy prices fall, or decline as energy prices rise. For example, it could be made to "bite" only when energy prices are below a specified level. A carbon price ceiling of, say, $20 per ton would kick in only if, for example, the energy component of the consumer price index were x percent below current values.

Would contingent incentives to reduce emissions (CIRE) be as cost-effective as a simple carbon tax or the cap-and-trade-plus-safety-valve proposal associated with RFF? CIRE share the key economic virtue of carbon taxes, or cap-and-trade approaches, raising the expected price of fuels according to their carbon content. CIRE would raise the expected prices of fuels containing carbon because in one possible state of the world -- low energy prices -- prices would be increased in a predictable way, although in the other state, high energy prices, they would be unaffected.

CIRE would complicate firms' and households' investment decisions, but the key features of these decisions would be essentially the same under contingent incentives as under a simple carbon tax. For example, a firm considering a water heater powered either by natural gas or the sun would have to evaluate the cost and performance difference of the two heaters, given assumptions about the future prices of natural gas and the cost and reliability of solar technology. If the stringency of the emission control policy is contingent on energy prices, then the distribution of natural gas prices is changed, but in a predictable way. Given an expected price of natural gas, the firm can choose heaters to minimize the expected cost of heating water. Thus CIRE would provide the same

[34] See Kopp, Morgenstern and Pizer (1997).
[35] See, also, AEI-Brookings Joint Center for Regulatory Studies (2001).
[36] See Pizer (1997).

incentives to reduce carbon emissions as simpler carbon taxes or a program of cap-and-trade-plus-safety-valve.[37]

One key difference, however, is that as a practical matter, most of the volatility in energy prices is driven by oil, so that carbon taxes that kicked in when energy prices were low would likely be triggered by low oil prices. As a result, CIRE may introduce a bias in favor of oil and against coal that does not exist with a simple carbon tax: coal -- the most carbon-intensive fuel -- is taxed when oil is relatively cheap. But opportunities to substitute oil for coal are relatively limited. Only natural gas and home heating oil are real substitutes and only for new furnaces, so that biases of this type are likely to be limited.

Contingent incentives reduce the stringency of any given carbon price, because they would not be in place all the time. To see this, consider a world where next year's energy prices, calculated to take inflation into account, could be either last year's level, 95 percent of last year's level, or 105 percent of last year's level, each with probability 1/3. Contingent incentives to reduce greenhouse gas emissions might price carbon at the rate of, say, $30 per ton in the low price scenario and not at all in the other two scenarios. But since the low-price scenario is projected to occur with only probability 1/3, the expected price for carbon is only 1/3 x $30/ton, or $10 per ton. Contingent incentives intended to impose a zero carbon price if realized energy prices are at their expected level may be limited in their ultimate stringency because they would only occasionally be in effect.

It is interesting to note that CIRE would provide incentives to control carbon emissions even when they do not "bite." To see this, note that they are effective because they raise the expected price of coal relative to the expected prices of low-carbon energy sources such as natural gas or wind power. Yet these effects on expected relative prices exist even if the relative prices in fact do not change. The probability of a carbon tax, by creating a significant likelihood that energy prices will rise according to the carbon content of fuels, will affect resource allocation even if the conditions for it to go into effect are never satisfied.

One can understand better the possible effects of contingent incentives by pretending they had been put in place in the past. Table 1 shows how selected energy prices might have varied in the late 1990s if a $10 per ton carbon tax were imposed contingent on a decline in energy prices as occurred between 1997 and 1998, when the Consumer Price Index for energy fell by more than 10 percent. I calculate the increase in various prices assuming that they increase by the product of the carbon tax times the carbon content of the fuel. This approach ignores any changes in demand induced by taxes -- demand for natural gas does not increase as heating oil becomes more expensive

[37] There is an exception to this general claim. The incentives may be distorted if the controls are contingent on a measure of the price of carbon-intensive fuels relative to the price of carbon lean fuels. For example, if the controls were in place only when the price of oil were less than $15 per barrel, then the incentive to substitute carbon-lean oil for carbon-rich coal would be distorted relative to a simple carbon tax. In particular, the carbon premium would be in place only when oil was relatively cheap (and coal relatively dear).

-- and is therefore only an approximation. In this example, a $10 per ton carbon tax imposed during 1998 would have raised energy prices higher than they otherwise would have been, but still left them lower than in 1997, with the exception of natural gas prices.

Table 1: Energy Prices With a Contingent Carbon Tax

	1997	1998	
Energy	Actual	Actual	With $10/ton Carbon Tax
Heating oil (No. 2 Diesel Fuel, dollars per gallon)	0.606	0.444	0.472
Natural gas- residential (dollars per tcf)	6.94	6.82	6.97
Gas at pump (dollars per gallon)	1.29	1.12	1.14
Electricity- all sectors (dollars per kwh)	0.0685	0.0674	0.069
Electricity- residential (dollars per kwh)	0.0843	0.0826	0.0842
Energy CPI	115.5	102.9	Not Available

Sources: Bureau of Labor Statistics for the Consumer Price Index Data (http://www.bls.gov/data/home.htm), and the Energy Information Administration for other price data and information about carbon intensities.

DESIGN DETAILS

The details of CIRE are worth exploring because the devil may hide there.[38] The most important detail is the choice of the economic variable on which the policy would be contingent. Call this variable the index for the controls.

To ensure cost-effective emissions reductions, the index should reflect energy prices broadly, and not the price of a specific type of high-carbon or low-carbon energy. If the index were instead the price of a particular fuel, e.g., oil or coal, it would create incentives to reduce carbon emissions that are biased for or against that fuel. For example, if a carbon tax were contingent on the price of coal being sufficiently low, then the net effect of the tax on reducing coal use would be less than if it were indexed to energy prices broadly, because it would kick in only when relative prices already favored coal.

To focus on the political problem posed by higher energy prices, emission controls should be contingent on a retail price or a price far downstream in the process of

[38] Of course, some devilish details may occur in any given government policy. For example, contingent emission controls, like any emission control policy, are fraught with opportunities for private interests of various persuasions to expend substantial real resources to get the government to use its power to promote their private gain. While the potential for such mischief may be great, it is not obviously greater with this proposal than with others.

distributing fuels to end-users. Thus proposals for contingent incentives should focus at the retail level in order to link them most directly to consumer prices.

The likely effectiveness of price signals suggests that contingent incentives should work via government control over carbon prices, e.g., carbon taxes or caps on the price of tradable emission permits. An alternative approach would be to make the emissions authorized by a permit contingent on energy prices. For example, a permit to emit one ton of carbon might be granted providing that the permit would authorize the emission of only 0.9 tons if energy prices are below a given level. One difference between these approaches is that with the RFF cap-and-trade-plus-safety-valve proposal, the price cap may not be in effect if it is set too high relative to the incremental costs of controlling emissions. In this case, making the price cap contingent on energy prices would have no effect on the incentives to control emissions. A second difference is that participants in permit markets may find that changes in the emissions authorized by an emission permit constitute an unnecessary complication to an otherwise straightforward transaction. In particular, firms would have to trade emission permits not knowing future permit prices, or the amount of emissions they might be authorized to release, because this depends on future energy prices. The effectiveness of price signals in allocating resources suggests that the additional complication of varying the emissions authorized by a permit is unlikely to be worthwhile.[39]

Perhaps the most worrisome aspect of contingent incentives is that they would require firms to pay taxes based on variables that are observable only weeks after the relevant transactions are completed. In particular, the Consumer Price Index is available only monthly and with a delay. For example, the one for November 2002 was last modified on December 17th.[40] As a result, firms would have to make business decisions based on projected or anticipated taxes. Only after monthly CPI reports became available could firms know for sure their tax liability, if indeed the carbon tax for different fuels was imposed at different levels depending on the level of the CPI for energy. This delay and the associated uncertainty will impose additional costs that are avoided by a simpler approach. On the other hand, consumers and firms already pay a collection of taxes without knowing in advance their exact tax liabilities. Income taxes, for example, vary with annual income, which is typically not known until the end of the year.

THE ROLE OF OPEC

The behavior of the Organization of Petroleum Exporting Countries (OPEC) and Saudi Arabia in particular may affect the cost-effectiveness of different types of contingent incentives. OPEC and Saudi Arabia continue to play a major role in determining the price of petroleum, which accounts for about 40 percent of all energy consumed in the United States.[41]

[39] Some aspects of the design probably require pure policy judgments. For example, should controls kick in when retail energy prices fall from one year to another or only when they are down in two successive years? In addition, should controls be lifted if energy prices rise for unrelated reasons? Economic analysis will offer little help answering these questions.

[40] See http://www.bls.gov/news.release/cpi.t03.htm.

[41] See Department of Commerce (2001, Table 891).

In general, OPEC's decision-making calculus involves setting output levels for member countries, anticipating how the market determines prices and affects exploration, production and conservation. To the extent that OPEC manages the cartel's instability -- the incentives that individual countries have to cheat on their production quotas -- it is because the Saudis, with their tremendous proven reserves and their low incremental production costs, can adjust production to keep prices close to the level that they deem appropriate.

A U.S. emission reduction policy contingent on lower energy prices in the United States would affect demand for Saudi oil. In particular, as the Saudis increase their production, they would find that U.S. consumption doesn't increase by as much as without the new emissions policy. The additional stringency of the emissions policy makes prices paid by consumers fall less than they otherwise would.

To understand how the Saudis might react, consider an extreme variant of CIRE. Suppose the United States adopted a policy of taxing energy in order to prevent retail energy prices from ever falling below current levels. If the United States were the only importer of oil, then the Saudis would recognize that current energy prices represent a floor. Any increases in their exports would remain unsold because U.S. consumers wouldn't buy more without prices lower than is attainable given the extreme control policy. Furthermore, the price floor would invite price increases that would be disadvantageous to the United States as an oil-importing country. Therefore, CIRE must allow some price declines in response to changes in market conditions.

Thus OPEC's potential response to CIRE suggests a limit to them; prices will have to decline somewhat in response to market conditions. The limit may not, however, be very stringent because U.S. net imports of oil only amount to about 23 percent of global net imports.[42] In addition, as already mentioned, oil represents about 40 percent of U.S. energy consumption. Nonetheless, OPEC and Saudi behavior generally serves to limit the extent that contingent incentives can be used to prevent energy price declines.

CAN CONTINGENT INCENTIVES TO REDUCE EMISSIONS FACILITATE A CONSENSUS?

Contingent incentives to reduce emissions may be helpful in constructing a new consensus about the appropriate stringency of controls. Contingent incentives may offer a focal point that can facilitate negotiations about controls of limited stringency. While the disagreement between economists and politicians is the key focus of this paper, contingent incentives also speak to the better known dispute between environmentalists and conservatives.

The United States has to date adopted only voluntary carbon emission controls partly because conservatives object to any carbon emission controls, believing that current technology has made unfettered fossil fuel use essential to economic prosperity. Conservatives fear that emission controls effective at forestalling climate change will be so widespread as to constitute wasteful large-scale central planning of important parts of

[42] See Helio International (2002)

the economy. Quite a few extant environmental programs throw lots of money at relatively small problems.[43] Moreover, for decades, recessions have tended to follow increases in energy prices. Since the threat posed by climate change to Americans is uncertain, distant, and arguably small, how can it justify reductions in the use of the energy sources that are so critical to economic prosperity?

Thoughtful environmentalists respond that the slowly accumulating scientific evidence suggesting that anthropogenic climate change is affecting ecosystems merits *some* response. Anthropogenic climate change affects our planet in an unpredictable, potentially adverse and significant way that may not be reversible for many decades or centuries. Doesn't the risk of adverse irreversible effects merit some policy response now?

Environmental groups may not be interested in such a proposal because it offers too little of value to them. In particular, it avoids any commitment to reduce emissions by a certain amount. A brief look at the Web sites of national environmental groups suggests that quantitative emission caps and estimates of emission reductions are a key way that they communicate their effectiveness to their members. For example, the Natural Resources Defense Council discusses emission caps and projected reductions in tons and in percent, but does not use the words "incentive" or "economic market mechanism."[44] The Sierra Club Web site, in its discussion of clean air policy, also focuses on tons of emissions rather than economic incentives.[45] Winning a policy debate focused first on economic incentives and only indirectly on emission reductions may be of little interest to environmental groups.

CIRE might help to reconcile these disparate views. They provide a way for politicians to commit to supporting only modest emission controls, as is now appropriate given the currently uncertain and distant nature of the threat posed by climate change. Conservatives sympathetic to concerns about global warming may not support a modest cap-and-trade program because they fear it will grow out of control to an expensive boondoggle. Yet they might support contingent incentives to reduce emissions that do not raise energy prices above current levels, knowing that such controls are intrinsically more limited, and that they would avoid unpopular increases in energy prices.

In addition, CIRE offer focal points about the stringency of emission control policies that are modest enough to be politically viable. Policymakers could state that energy prices should not rise above current levels, or that a given percent of any declines should be prevented in order to preserve incentives to reduce emissions.

Finally, CIRE may offer an opportunity for larger emission reductions over an extended period of time that is relevant for climate change policy. Energy prices historically have fallen in real terms in the United States. Since 1967, a period that

[43] See e.g., Viscusi and Hamilton (1999) and Lutter (1999).
[44] See NRDC (2002). The Web site does use the word incentive in the sense of tax incentives, but this is a euphemism for subsidies, a different topic altogether.
[45] See Sierra Club (2002).

includes the huge energy price increases of the 1970s, the CPI rose at a rate of 5.3 percent per year while the CPI for energy rose at a rate of only 5.0 percent per year. This difference, while not huge, grows to about 2.4 percentage points after 10 years, or 6 percent over 25 years. Moreover, energy prices paid by consumers have sometimes fallen fairly sharply relative to all consumer prices. In principle, arranging emission controls to go into effect during periods when energy prices would otherwise be declining may reduce real adjustment costs as well as political dissent.

Of course, CIRE would be no panacea. If triggered by lower consumer prices, they may go into effect when coal prices are unusually low. Carbon taxes imposed during such periods would be particularly problematic for coal companies and workers because they would lower prices received by coal producers. In addition, CIRE are quite difficult to coordinate internationally, and international cooperation is important for global climate policy to be effective. Finally, CIRE cannot be made very stringent, because, by their nature, they are more stringent if energy prices are relatively low.

CONCLUSIONS

Contingent incentives to reduce emissions have a lot to offer proponents of cost-effective climate controls and politicians generally. Politicians as a group have preferred policies with economic effects that are less visible than carbon taxes or the equivalent. Carbon taxes and the equivalent raise energy prices perceptibly and are therefore less attractive than more costly policies like CAFE that impose requirements on vehicle manufacturers in a way that is hard for consumers to discern. CIRE may provide a way for politicians to take a serious second look at cost-effective measures that use energy prices to create incentives to reduce carbon emissions.

Contingent incentives could help reconcile differences between environmentalists and conservatives. Environmentalists have acted as if their sole goal is to reduce carbon emissions. Despite the focus of these groups on areas where they hope to win tactical success, such as CAFE standards and the four-pollutant bills, they have not recently enacted any new legislation likely to achieve significant cuts in greenhouse gas emissions. Conservatives have criticized most climate change control proposals, fearing that they invite large, costly, and inefficient government programs to be built to protect against uncertain and arguably small future risks. Thus conservatives pondering a modest $10 per ton carbon tax proposal just say no, believing that once they agree to negotiate a tax (or cap-and-trade program), they will end up with one much bigger than they originally were willing to accept. Contingent incentives may help to bridge this difference because they offer a focal point -- no increases in energy prices above current levels -- that reflects a commitment to modest controls.

Whether contingent incentives ever get implemented depends in large part on whether one can find an organized constituency that they might benefit. Most environmental initiatives get support from parties that profit from stringent control programs and parties that are ideologically committed to support them. Contingent incentives may never be implemented without the support of key groups that would benefit economically from such an approach.

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