Reforming the federal tax code could advance economic growth as well as help the United States address a number of its environmental and energy challenges. A carbon tax, in particular, is an effective fiscal policy option that would simultaneously support federal tax reform initiatives, reduce carbon dioxide emissions, and promote sound energy policies.

A carbon tax is a consumption tax levied on the carbon content of oil, coal, and natural gas. Taxing the carbon content of these fossil fuels is an efficient means of assigning costs to the carbon dioxide emissions they release when burned for energy.

A carbon tax would be relatively easy to administer. It could be collected where fossil fuels enter the economy, such as ports, oil refineries, natural gas providers, and coal-processing plants. Applying the levy to as few as 2,000 entities could reach nearly all the fossil fuel consumed in the U.S. economy and would cover 82 percent of U.S. greenhouse gas emissions.

A carbon tax would generate significant revenue. According to the Congressional Budget Office, a tax of $12 per metric ton of carbon that gradually rises to $17 per metric ton of carbon would generate $208 billion in revenue over a ten year period.

Revenue from a carbon tax could be used to finance other tax reform initiatives. A carbon tax could be incorporated into a number of revenue-neutral tax reform packages, with the proceeds supporting reductions in inefficient existing taxes on productive labor and investment.

A carbon tax dovetails sound tax policy and sound climate change policy. Climate change policy in the United States would be most effective if it were federal, economy-wide, and market based. A carbon tax meets all these criteria. A tax that starts at a modest rate and increases gradually and predictably over time would establish incentives throughout the economy to reduce carbon dioxide emissions with minimal disruption. Moreover, by encouraging a less carbon-intensive economy, a carbon tax could help improve the nation’s long-term energy security.

Because the tax base for such a policy is quite large—all the carbon contained in fossil fuels sold in the United States—even a modest carbon tax would generate significant revenue. Economic literature is replete with evidence to support both the cost-effectiveness of a carbon tax as a climate change policy and the potential benefits of using carbon tax revenue to offset reductions in distortional taxes, such as those on labor and investment. Moreover, a carbon tax would serve other national policy goals, such as encouraging energy efficiency and conservation, reducing air pollution, and decreasing the nation’s dependence on foreign sources of energy.

II. What Is a Carbon Tax?
A carbon tax is an excise tax on the sale of fossil fuels—coal, petroleum products, and natural gas—based on their carbon content. Fossil fuels are used for electricity generation, transportation, residential and commercial space heating, industrial processes, and other activities. As Table 1 shows, different types of fossil fuel contain different amounts of carbon per unit. Accordingly, a levy on carbon would place a higher tax on coal than on oil and a higher tax on oil than on natural gas because coal has a higher carbon content per
A carbon tax as a sound climate change policy

Many people in the scientific community as well as in the private and public sectors are concerned that greenhouse gas emissions from human activities are influencing changes in the earth’s climate. Potential climatic changes could have significant economic and environmental implications for coastal communities, public health, agricultural productivity, and ecosystems. Carbon dioxide (CO₂) from fossil fuel combustion is the most prevalent of these greenhouse gases from human activities in the United States (see Figure 1). Consequently, to be successful, any climate change policy must address these emissions.

For several reasons, an initially modest but gradually increasing economy-wide carbon tax would be a cost-effective way of tackling CO₂ emissions and the challenge of climate change. First, a carbon tax is a market-based policy, enabling the market to determine the most cost-effective means of reducing CO₂ emissions. It would encourage reductions of CO₂ emissions wherever and however such reductions could be achieved at a cost lower than the tax. A tax based on carbon content thus would create over time a financial incentive for firms and households to select lower carbon-content fuels, conserve energy, improve energy efficiency, and take other cost-effective steps to reduce the consumption of fossil fuels, thereby reducing CO₂ emissions.

Second, a carbon tax would address CO₂ emissions throughout the entire economy, not just a few of the emitting sectors. This strategy would minimize the cost of reducing emissions by creating an incentive for cost-effective reductions in all sectors. It also would distribute the costs of the policy widely, avoiding concentrated financial impact on selected sectors.

Third, a carbon tax offers an administratively feasible means of reaching nearly all the economy’s carbon dioxide-emitting activities. Directly regulating all sources of CO₂ emissions would be administratively difficult given the millions of individual fuel users, most of which lack the systems or the capability for measuring and monitoring emissions. But because CO₂ emissions from fossil fuel combustion are proportional to each fuel’s carbon content, a carbon tax would be an indirect yet effective means of taxing them. Furthermore, the number of entities in the fossil fuel production and distribution chain is far smaller than the number of CO₂ emitters, and records of fuel sales are already being kept for commercial and other reasons.

Fourth, because a carbon tax sets a fixed cost per unit of CO₂ emissions, it provides certainty regarding the program’s costs. Affected businesses and consumers would know that they could calculate the maximum amount they would have to pay from the carbon tax rate and that their actual costs could be lower if emissions abatement or avoidance strategies were available at a cost lower than the tax.

A carbon tax as a sound tax policy

A carbon tax would generate revenue that could be recycled back into the economy to finance reductions of other taxes. Consequently, it would offer an opportunity to shift taxation away from activities that are good for society, such as labor and investment, toward those that pose potential risks to society, such as activities that emit CO₂ and other greenhouse gases.

Some taxes influence behavior in ways that lead to economic distortions. For example, increasing the cost of a good or activity through a tax typically results in lowering the consumption of the good or participation in the activity. For this reason, some economists have criticized the reliance of the U.S. federal tax system on payroll and income taxes as a drag on two fundamental elements of the U.S. economy: labor...
and investment. Reducing the cost of labor and investment by lowering taxes on them could stimulate economic growth.

A properly designed carbon tax could help correct this economic distortion. That is, revenues generated by such a tax could be used to reduce economically distortional taxes on labor and investment currently in the tax code.

Collecting a carbon tax
A tax on the carbon content of fossil fuels could be collected at any of several different points in the fuel chain for each type of fuel. Most studies of carbon tax implementation emphasize the importance of selecting points of collection that (1) send a price signal to the broadest possible range of fuel users and (2) minimize the administrative costs. These criteria are likely best met by levying the tax “upstream,” where fossil fuels are imported, produced, processed, or distributed by relatively few entities, rather than “downstream,” where fossil fuels are burned by many millions of end users.

The results of one study suggest that a carbon tax applied to as few as 2,000 entities could reach virtually all the fossil fuel consumed in the U.S. economy. Given this small number of collection points, an upstream tax would be relatively easy to administer and would cause fewer economic distortions than other approaches would.

III. USING CARBON TAX REVENUE TO FINANCE OTHER REFORM INITIATIVES
A carbon tax could raise significant revenue that could be used to finance other tax reform initiatives.

Revenue levels
A carbon tax could generate a significant amount of revenue because it would have a substantial tax base: all the carbon in fossil fuels in the U.S. economy. In 2004, for example, the fossil fuels burned to generate energy for industry, utilities, homes, and vehicles contained approximately 1.6 billion metric tons of carbon (MTC), which were released into the atmosphere in the form of CO₂. At current fossil fuel consumption levels, therefore, each $10 in tax per MTC would generate approximately $16 billion in revenue per year.

Many experts agree that a carbon tax should start at a modest rate and rise gradually over time. This approach would give businesses and households time to shift their investment and consumption patterns to more efficient technologies and lower carbon-content fuels, thereby reducing CO₂ emissions. It also would give policymakers flexibility over time to adjust the tax rate to balance economic and environmental impacts.

The Congressional Budget Office has outlined a carbon tax plan that would begin at approximately $12 per MTC and rise to $17 over a ten-year period. It calculated that such a tax plan could generate approximately $208 billion over its first ten years while reducing the United States’ CO₂ emissions from business-as-usual levels.

Another recent carbon tax proposal suggested a tax that would start at $5 per MTC and increase by $5 per MTC every other year. By the fifth year, the tax would be $15 per MTC and would generate approximately $26 billion, roughly equivalent to 1 percent of expected federal tax revenue. By
the fifteenth year, the levy would be $40 per MTC and would generate approximately $75 billion in annual revenue.

**Use of revenue**

Revenues from a carbon tax could finance reductions in the marginal rates of a variety of existing taxes by offsetting the revenue lost through these tax reductions. A number of recent economic analyses found that recycling revenues from a carbon tax to lower existing taxes on productive activities such as labor and investment could generate economic benefits that offset much of the cost of reducing greenhouse gas emissions.16 For instance, a carbon tax could finance a decrease in the payroll tax, which could encourage the creation of more jobs and incentives to work.17

Another possible tax reform package would use a carbon levy to finance eliminating the “double taxation” of corporate dividends. Double taxation refers to the fact that shareholder dividends are effectively taxed twice, first by the corporate income tax and then by the shareholder’s personal income tax. A carbon tax of approximately $13 per MTC18 would be sufficient to offset the revenue lost by eliminating the personal income tax on dividends—while retaining the corporate tax—and would leave consumer prices relatively unaffected for the majority of industry sectors.19

Alternatively, a carbon tax could finance revisions to the alternative minimum tax (AMT). The $208 billion raised over ten years by the Congressional Budget Office’s carbon tax plan could offset a third of the revenue that would be lost if the AMT were eliminated during the same time period. If the government instead opted to index AMT brackets and exemptions to inflation, the same carbon tax plan would offset nearly 55 percent of the forgone revenue.20

**IV. IMPLEMENTATION ISSUES**

Several issues are often raised regarding the implementation of a carbon tax: its economic impact, distributional effects, and relevance to those fossil fuels not used to generate energy. Policymakers could adopt a range of strategies to address these concerns.

**Economic impact**

Some observers have expressed concern about the impact that a carbon tax or any mandatory regulation of greenhouse gas emissions might have on the nation’s economic growth. Policymakers could soften the impact of a carbon tax on the U.S. economy by introducing the tax gradually, an approach recommended by many economic experts.21 In 2004 the National Commission on Energy Policy (NCEP) conducted an economic analysis of a climate change policy that effectively would set a price on carbon emissions from fossil fuel combustion at an initially modest but gradually rising rate. The NCEP concluded that this policy would cut the annual growth of the U.S. gross domestic product (GDP) by only one one-hundredth of 1 percent (0.01%) from 2010 through 2020.22

The U.S. Department of Energy’s Energy Information Administration evaluated the NCEP’s proposal and agreed that under the proposed policy, the economy’s annual growth rate between 2003 and 2025 in terms of real GDP would not be materially affected.23 Furthermore, the impact on fuel prices of an initially modest carbon tax would not be significant in the near term. For instance, a levy of $10 per MTC would have only a small effect on oil and natural gas prices and a modest effect on the price of coal (see Table 2).24 In regard to its impact on typical consumer energy expenditures, such a levy would raise the average retail price of gasoline by only two cents—less than the typical monthly fluctuation of market prices—and would increase the average price of electricity and home heating oil by only 2 percent in the program’s initial years.

Using a carbon tax as a policy to reduce U.S. greenhouse gas emissions offers an opportunity to recycle revenues in order to lower inefficient taxes, thereby generating economic benefits that can offset much of the cost to the economy of reducing emissions.

**Distributional impacts**

Another issue regarding a carbon tax or any climate change policy that mandates reductions in greenhouse gas emissions is that the distribution of its effects would likely be uneven across industries and individuals, with some experiencing a greater impact than others. To be sure, an initially modest carbon tax would have minimal impacts in the near term. However, a carbon policy would have a relatively greater effect on individuals and families that rely on carbon-intensive industries for their livelihoods, such as coal miners and coal-mining communities. In addition, a carbon tax may be
regressive in that it would affect lower-income households proportionally more than higher-income households because the former spend a greater portion of their income on energy.\(^{25}\)

A number of policy tools are available, however, to address such distributional impacts.\(^{26}\) For instance, some of the revenue of a carbon tax could be used to compensate those industries or employees most affected by the tax. Compensation perhaps could take the form of tax adjustments for the most vulnerable sectors\(^{27}\) or transitional unemployment assistance for workers in the most affected industries.\(^{28}\)

To address regressive effects, some carbon tax revenue could finance an income tax credit equal to the first 1 or 2 percent of income devoted to purchasing energy. This policy could alleviate some of the initial impact of higher energy costs yet still preserve the incentive effect of the tax.\(^{29}\)

Alternatively, carbon tax revenues could be used to directly assist low-income households that might be adversely affected by a climate policy. For example, increasing the eligibility threshold for the Earned Income Tax Credit by 10 percent would cost approximately $46 billion over a ten-year period,\(^{30}\) which is just under a quarter of the $205 billion raised by the Congressional Budget Office’s carbon tax plan over the same time period.

### Adjustments for nonfuel uses and carbon capture and storage

Another issue is that a carbon tax could unfairly penalize those uses of fossil fuels that do not emit CO\(_2\) into the atmosphere. In some industries, fossil fuels are not combusted but are used as material inputs. For example, natural gas is often a feedstock for plastics and other chemicals. In addition, some energy companies are currently exploring methods to capture CO\(_2\) emissions at power plants and sequester them underground. Such technologies would make it possible to use fossil fuels for electricity generation and still prevent emissions of CO\(_2\) from entering the atmosphere.

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**Table 2** Impact on Energy Prices by Carbon Tax of $10 per Metric Ton of Carbon

<table>
<thead>
<tr>
<th>Unit of fuel</th>
<th>Direct Impacta</th>
<th>Indirect Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oil</td>
<td>Natural Gas</td>
</tr>
<tr>
<td></td>
<td>barrel</td>
<td>thousand cubic feet (mcf)</td>
</tr>
<tr>
<td>Metric tons of carbon/unit of fuelb</td>
<td>0.1177 / barrel</td>
<td>0.0149 / mcf</td>
</tr>
<tr>
<td>Average U.S. pricec (2004)</td>
<td>$36.77 / barrel</td>
<td>$10.74 / mcf</td>
</tr>
<tr>
<td>$10/metric ton carbon levy:</td>
<td>$1.18 / barrel</td>
<td>$0.15 / mcf</td>
</tr>
</tbody>
</table>

a. Assumes that the carbon levy is directly applied to oil, natural gas, and coal used to generate energy. Tax credits could be given to fossil fuels used as feedstocks for products such as plastics. Electricity, gasoline, and heating oil would not be directly taxed; the price impacts on these would be a result of the upstream tax on primary fossil fuels.


Policymakers could design the carbon levy to avoid taxing such nonemitting uses of fossil fuel. For instance, the program could grant tax exemptions or offsetting credits for nonfuel uses of coal, oil, and natural gas. Similarly, authorities could provide tax credits for every ton of CO₂ sequestered through capture-and-storage techniques with adequate measurement and monitoring systems. It is important to note, however, that any exemptions or credits may reduce the amount of revenue available for recycling.

V. CONCLUSIONS

An initially modest and gradually increasing economy-wide carbon tax could be an effective fiscal policy that simultaneously supports revenue-neutral federal tax reform initiatives, reduces CO₂ emissions over the long term, and promotes sound energy policies. A carbon tax would be relatively simple to administer and could generate very significant revenues. According to the Congressional Budget Office, a tax of $12 per MTC that gradually rises to $17 per MTC would generate $208 billion in revenue over a ten-year period. Such revenues could finance reductions in inefficient taxes on labor and investment. Furthermore, a carbon tax would dovetail sound tax policy with sound climate change policy. It would establish long term incentives throughout the United States to reduce carbon dioxide emissions with minimal disruption to the economy and could help improve the nation’s long-term energy security.

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NOTES


5. For a primer on carbon taxes, see T. D. Dinan and R. Shackleton, Limiting Carbon Dioxide Emissions: Prices vs Caps (Washington, DC: Congressional Budget Office, 2005); B. Repetto et al., Green Fees: How a Tax Shift Can Work for the Environment and the Economy (Washington, DC: World Resources Institute, 1992). A carbon tax is different from a Btu tax, which was proposed by the Clinton Administration in 1993. The 1993 Btu tax would have applied to nearly all forms of energy (including nuclear and hydroelectric) based on the fuel’s heat content, without regard to each energy source’s different level of carbon and therefore without regard to its contribution, if any, to global climate change. In addition, the Btu tax was not designed to be revenue neutral, rather, it was intended to generate new revenues for deficit reduction.


7. In 1997, 2,500 economists, including eight Nobel laureates, signed a statement calling for the application of market-based, mandatory broad-based policies to address global climate change. The statement reads in part: “The United States and other nations can most efficiently implement their climate
policies through market mechanisms, such as carbon taxes or the auction of emissions permits. The revenues generated from such policies can be effectively used to reduce the deficit or to lower existing taxes.” See http://www.rprogress.org/publications/econ-statement.html.


10. Tim Hargrave, U.S. Carbon Emissions Trading: Description of an Upstream Approach (Washington, DC: Center for Clean Air Policy, 1998). Although this study examined a cap-and-trade program, its findings are generally applicable to a carbon tax. The study found that the regulation of 550 coal preparation plants plus 100 coal mines that do not use coal preparation plants would cover virtually all the coal used in the United States. The study also found that the regulation of 175 oil refineries and 200 refined product importers would cover virtually all the petroleum consumed in the United States. Finally, it found that the regulation of 150 natural gas pipelines and 725 processing plants (natural gas liquids) would cover virtually all the natural gas consumed in the United States.


12. References to particular proposed tax rates are offered for purposes of illustration only. Neither Duke Energy nor the World Resources Institute has taken a position on the most appropriate tax rates. Establishing appropriate carbon tax rate structures will require more policy dialogue with federal officials, analysts, and others.

13. This figure does not factor in possible reductions in fossil fuel consumption in response to the tax (i.e., the price elasticity of demand).


17. Hammond et al., Tax Waste Not Work; Repetto et al., Green Fees.


20. The CBO estimates that eliminating the AMT would result in $582.5 billion of forgone revenue between 2006 and 2015 and that indexing AMT exemptions to inflation would cost $376 billion over the same time period. See Congressional Budget Office, Budget Options (Washington, DC: Congressional Budget Office, 2005).

21. For example, see Burtraw and Portney, “A Carbon Tax to Reduce the Deficit.”


24. The table is adapted from C. Hanson and D. Sandalow, Greening the Tax Code (Washington, DC: Brookings Institution and World Resources Institute, forthcoming).


29. Poterba, “Tax Policy to Combat Global Warming.” This approach also is discussed in Goulder, “Confronting the Adverse Industry Impacts of Carbon Dioxide Abatement Policies.”


31. The tax system also could credit agricultural and forestry activities that sequester carbon dioxide.


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