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HOW TO DESIGN CARBON DIVIDENDS

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ABSTRACT

A robust carbon tax would generate considerable revenue. Some carbon tax advocates have suggested returning those revenues to Americans through direct payments, often called carbon dividends. We examine how to design these dividends considering two, sometimes conflicting, principles. Carbon dividends can be viewed as shared income from a communal property right, much as Alaskans share in income from the state's oil resources. Dividends can also be viewed as rebating the carbon tax back to consumers. These views often have different implications for designing carbon dividends. Political and practical considerations are also important. With that in mind, we propose a carbon dividend design that combines beneficial features from both the communal property and tax rebate views.

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EXECUTIVE SUMMARY

Climate change poses a range of economic and environmental threats, including damage to ecosystems, more frequent and damaging storms, and risks to human health. Reducing emissions of carbon dioxide and other greenhouse gases is essential to limiting those threats. Implementing a robust carbon tax would be one way to substantially reduce future emissions.

A robust carbon tax would also generate considerable revenue. Analysts and policymakers have proposed numerous uses for that revenue, from cutting existing taxes to spending on new programs. In this paper, we explore in detail one particular approach: using carbon tax revenues to make direct payments, or carbon dividends, to American households. We consider how such dividends should be designed.

Two distinct views animate many carbon dividend proposals. One sees dividends as shared income from a communal property right. Just as Alaskans share in income from the state's oil resources, so could Americans share in income from use of atmospheric resources. The other sees dividends as a way to rebate carbon tax revenues back to the consumers who ultimately pay them. Regardless of which view drives the design of a dividend, if all net revenue from a tax were used for dividends, most households would come out financially ahead, a fact that could build political support for enacting and maintaining a robust carbon tax.

These views are sometimes complementary, but they have different implications for designing carbon dividends. We propose a hybrid design that combines elements of the communal property and tax rebate perspectives and integrates other political and practical considerations. The main features of this design are as follows:

- Revenues dedicated to carbon dividends will be deposited in a new Carbon Dividends Trust Fund. The trust fund will use those resources to pay dividends and to cover the operating costs of the dividend program.
- People will be eligible for carbon dividends if they have a Social Security number and bear a material burden from the carbon tax. People who have or can easily get a Social Security number include all citizens and legal permanent residents plus immigrants with temporary work authorizations. People who are unlikely to bear a material burden from a carbon tax imposed by the United States include those who live overseas for a prolonged period, in institutions that cover their living expenses without charging for them, or in US territories that are not subject to the carbon tax. Determining exact eligibility requirements is a matter for legislators and administrators.
- Dividend amounts will be the same for all qualifying adults. All qualifying children will receive half that amount. Dividends will often be combined and paid to a person identified as the head of the household, but individual adults can receive dividends separately.

- People will receive dividends quarterly, usually through direct deposit or electronic benefit transfer cards. To avoid temporary spikes in payments, the government will spread dividend payments throughout each quarter. To the extent practical, dividend eligibility will also be determined quarterly.
- Dividend payments will not be subject to federal, state, or local income tax, and they will not be counted as income for any means-tested benefits.
- The dividend program will be managed by the Treasury or the Social Security Administration.
- Policymakers will withhold some carbon tax revenues to cover all direct fiscal burdens (spending increases or revenue reductions) the carbon tax imposes on the federal government. The Treasury will estimate this offset each year. Under current law, it is expected to be between 22 and 25 percent of overall carbon tax receipts.
- Policymakers may also use some carbon tax revenues to cover any indirect fiscal effects of the carbon tax or for other policy purposes. Indirect effects include declines in federal excise taxes caused by reduced use of gasoline and other fuels and potential across-the-board revenue declines caused by reduced economic activity. If policymakers do not use carbon revenues to cover these indirect effects, they should identify other revenue increases or spending reductions.

The Climate Leadership Council has proposed a carbon tax starting at $43 per metric ton in 2021. The Council is considering a range of possible escalation rates for how the tax would increase over time. We focus on a scenario in which the tax rate increases at 5 percent above inflation each year.

We estimate this tax could fund a potential dividend of about $570 per adult in 2021, or $1,710 for a family of two adults and two children. These figures assume some carbon tax revenues cover the costs of operating the dividend program and the direct fiscal burden of the tax but do not cover any indirect fiscal burdens.

Potential dividends would increase as the carbon tax rises. If the carbon tax increases 5 percent more than inflation each year, the estimated dividend would reach about $680 per adult and about $2,040 for a family of four in 2026. Those figures would reach $850 and $2,550 in 2031.

Taxing dividends as income would allow larger gross dividends. In 2021, for example, the potential dividend would be about $640 per adult and $1,920 for a family of four. After taxes, net dividends would be the same, on average, as in our proposal, with more going to people in lower tax brackets and less to those in higher tax brackets.

Different choices for children would increase dividends for some families and reduce them for others. Limiting dividends to two children per household, for example, would increase dividends for individual adults and families with up to two children and reduce them for larger families. Giving children full dividends, rather

than half, would reduce dividends for adults and increase them for families with children. If both options were combined—children receive full dividends with a two-child limit—potential dividends would be about $550 per adult and $2,200 per family of four in 2021.

Other factors also affect potential dividend amounts. Relative to our base case, dividends would be larger if more revenue is dedicated to dividends, if the carbon tax rate grows more rapidly, if the carbon tax starts at a higher level, if fewer people are eligible, or if fewer eligible people participate in the dividend program. Similarly, dividends would be smaller if less revenue is dedicated to the dividend pool, if the carbon tax rate grows less rapidly, if the carbon tax starts at a lower level, if more people are eligible, or if more eligible people participate in the dividend program.

INTRODUCTION

When people burn fossil fuels, make cement, and clear land, they release carbon dioxide and other greenhouse gases. Those gases accumulate in the atmosphere and warm the globe, leading to higher sea levels, changing rainfall, more intense storms, and damage to marine and terrestrial ecosystems. Reducing those emissions is essential to limiting climate change and the economic and environmental threats that it poses (U.S. Global Change Research Program 2018).

Robust, broad-based carbon taxes can be a powerful tool for reducing the emissions driving climate change. Carbon taxes would encourage businesses to shift toward less polluting production methods and encourage consumers to shift toward less polluting goods and services.

Robust carbon taxes would also raise substantial revenue. That revenue could be used in numerous ways, including cuts in existing taxes, investment in green infrastructure, and deficit reduction, among other possibilities (Marron and Morris 2016). Over the past 15 years, many carbon tax proponents have suggested one particular use for the revenue: making direct payments, or dividends, to the American people.[1] These proposals are motivated by considerations such as the potential for dividends to expand political support for a robust carbon tax, to compensate people for use of a communal property right, and to offset some of the financial burdens of such a tax (especially for households with low and moderate incomes).

In this report, we consider how to design those dividends.[2] We do not take a position on whether carbon dividends are the best use for carbon tax revenue.[3] Instead, we explore how policymakers should design dividends if they choose to pursue them.

Carbon dividends raise a mix of philosophical, practical, and political considerations. What is the purpose of carbon dividends? Who should be eligible? How much should dividend payments be? Should children get the same dividends as adults? Should dividends be taxed? How should the government distribute dividends? And so on.

In exploring these questions, we consider two conceptual rationales for carbon dividends. The first conceives of carbon dividends as income from an ownership right in the atmosphere, which is considered a form of communal property. In this view, the carbon tax is essentially a fee polluters pay for using the atmosphere. Dividends distribute the resulting income to the community of owners.[4] This view is inspired, in part, by Alaska's Permanent Fund, which distributes annual dividends to Alaskans based on the state's income from its oil resources. Several Native American tribes do the same with income from gaming and other businesses (Jorgensen and Morris 2009).

The second rationale conceives of carbon dividends as tax rebates. In this view, the carbon tax should change behavior rather than raise revenue or redistribute income. A robust carbon tax encourages people, businesses, and governments to cut back on carbon emissions. The resulting revenue is a side effect and can be

returned to affected consumers in proportion to their carbon tax burden. By rebating that revenue, the government can offset the financial burden from the carbon tax while keeping price incentives to cut emissions.

Political considerations also influence dividend proposals. Carbon dividends may help build political support for taxing carbon because they soften the financial blow from the tax. In fact, if enough revenue is used for dividends, it ensures that a substantial fraction of Americans comes out ahead financially. If all net revenues are devoted to carbon dividends, for example, then the majority of households come out ahead, with dividends received exceeding their share of the carbon tax.[5] Dividends also soften concerns about carbon tax revenue being used to expand the scope of government, and they may make it more difficult to repeal carbon taxes in the future once people become accustomed to receiving them.

These rationales for carbon dividends complement each other, but they have different design implications (table 1). Under the communal property perspective, for example, all Americans should receive the same dividend. Under the tax rebate perspective, dividends should vary to reflect people's different carbon tax burdens. Political realities suggest that dividends should vary to maximize the chances of enacting and maintaining a robust, rising carbon tax. Similar differences arise along other dimensions of carbon dividend design.

Designing carbon dividends based exclusively on the communal property or the tax rebate perspectives provides conceptual elegance. To attract broad support, however, a realistic dividend design should include features of both approaches and should reflect the politics and practicalities of enacting, maintaining, and administering a successful carbon dividend. We propose a design that combines elements of these perspectives and considerations.

The remainder of this report explores design issues in detail. The second section examines dividend eligibility. The third section examines whether and how dividends should vary across people. The fourth section examines how dividends should be treated under the income tax and means-tested benefit programs. The fifth section examines how to determine the overall pool of money to distribute as dividends. Using a recent carbon tax proposal from the Climate Leadership Council (Baker et al. 2017), the sixth section examines how large dividend payments may be under our proposal. The seventh section examines how different design choices and assumptions affect potential dividends. The eighth section analyzes how those dividends should be delivered. The ninth section considers whether the government should use the dividend infrastructure to offer saving, borrowing, and charitable giving programs. The appendix examines how carbon taxes affect federal revenues from income, payroll, excise, and other taxes.

Table 1

Our Proposed Design Blends the Communal Property and Tax Rebate Views

	Communal property	Tax rebate	Proposed design
Name	Dividend	Rebate	Dividend
Eligible population	People recognized as in community	People bearing tax burden	People with Social Security numbers bearing tax burden
Recipients	Individuals	Households	Tax units and individuals
Amounts	Equal	Varies with tax burden	Equal
Children	Same as adult, paid to child	Less than adult, paid to household	Half of adult, paid to household
Income for tax purposes	Yes	No	No
Income for transfer programs	Yes	No	No
Distributing agency	Treasury or new agency	Internal Revenue Service	Treasury or Social Security Administration
Frequency	Annual, quarterly, monthly	Annual, quarterly, monthly	Quarterly, staggered
Potential dividend pool	Gross carbon tax receipts less operating costs	Gross carbon tax receipts less direct federal carbon tax burden	Gross carbon tax receipts less operating costs and direct federal carbon tax burden
Fiscal effects to offset through tax and spending changes	Revenue loss from direct and indirect federal carbon tax burden, revenue gain from taxing dividends, spending reduction from means testing	Revenue loss from indirect federal carbon tax burden, spending increase for operating costs	Revenue loss from indirect federal carbon tax burden

ELIGIBILITY

The first question policymakers must address is who should receive carbon dividends. The communal property and tax rebate perspectives provide different answers, but they overlap somewhat in who qualifies. We recommend that, at minimum, everyone in the overlapping portion be eligible for carbon dividends.

Under the communal property view, dividends should go to people who are part of the relevant community. Just as Alaska defines who counts as Alaskan for purposes of the Permanent Fund dividend and tribes define who counts as an eligible member for purposes of Indian Gaming Regulatory Act tribal payments, so should the federal government define who counts as an American for purposes of carbon dividends. Options include US citizens, citizens and legal permanent residents, everyone with a Social Security number (SSN),[6] or all residents.

Under the tax rebate view, dividends should go to people who bear the burden of the carbon tax. Most citizens and legal permanent residents fall in this category. People who may bear little or no tax are those who live abroad, who live in institutions that cover their living expenses (e.g., prisons and some long-term care facilities), or who live in any US territories outside the scope of the carbon tax.[7] On the other hand, some residents who are not citizens or legal permanent residents may bear as much tax as resident citizens. These include both unauthorized and some authorized immigrants, such as people living in the US temporarily for school or work.

Deciding who is eligible for dividends is perhaps the most political aspect of designing carbon dividends and will likely spark substantial debate. As a starting point, we recommend a two-part eligibility requirement that combines aspects of the communal property and tax rebate perspectives. To be eligible, people must first have an SSN. SSNs provide a broad and easily administered way to identify who qualifies. In addition, people must be likely to bear a material burden from the carbon tax. They should be residents of the 50 states, the District of Columbia, or any territories subject to the carbon tax, and they should not be persistently living in institutions that cover their living costs. This approach focuses the financial benefit of dividends on Americans who bear a financial cost from the carbon tax. To comport with recent legislative practice, we include overseas members of the military, just as they are included in the earned income tax credit and child tax credit without needing to live with a child for a sufficient amount of time during the year or reside in the United States, as would be the case if they were not members of the military serving overseas.

Whether to include additional people is a matter for legislators and administrators. Sensitive issues include people serving in the diplomatic service overseas and their accompanying family members, students attending schools overseas, people who are incarcerated or institutionalized, and some categories of immigrants and temporary residents. As one benchmark, Alaska makes dividends available to people who are temporarily out of the country because of military or other public service or higher education.[8]

To the extent practical, eligibility should be determined on the same schedule as dividend payments are made, with eligibility determined in the previous period.[9] With quarterly dividends, for example, we recommend assessing eligibility on a quarterly basis. Someone who is eligible by March 31 could start receiving dividends in the April to June period. Quarterly eligibility is fairly straightforward for the federal government to assess for events like birth, death, becoming an adult, qualifying for an SSN, and entry and release from prison. Residency is more difficult for the government to be knowledgeable about and to track.

VARIATION ACROSS RECIPIENTS

The second question policymakers must address is whether and how dividend amounts should vary across recipients. We recommend that all adults receive the same dividend and children receive half as much. This recommendation largely follows the communal property view, with the half amount for children being a step toward the economies of scale within a family under the tax rebate view.

Under the communal property view, dividends should be the same for everyone. Community members have equal standing, so everyone, children and adults, should receive the same dividend. Alaska takes this approach in sharing its oil income. So do some Native American tribes that distribute revenue from gaming and other activities (Jorgensen and Morris 2009).[10]

The tax rebate view, on the other hand, endorses variability. Households face different burdens from the carbon tax. Many factors such as location, household size, and income affect carbon usage (Jones and Kammen 2011). A household of five people will likely bear more tax than a person living alone, but not five times as much. A household that spends $100,000 each year will likely bear more tax than a family that spends $20,000. A household that drives long distances in a large truck will likely bear more tax than an otherwise identical family driving short distances in a compact car. A household that gets electricity from a utility that relies predominantly on fossil fuels will likely bear more tax than an otherwise identical family whose utility relies more heavily on hydroelectric power and other renewables.

In principle, the government could try to calibrate dividend amounts to reflect these differences. However, linking dividend payments too closely to fossil fuel use would undermine the incentives created by the carbon tax. It would also create an enormous administrative burden. Giving people who drive large trucks bigger dividends than those driving compact cars would be counterintuitive, given the policy's goal of reducing emissions. Dividends could be linked to factors such as income, state of residence, and family size, though each adds administrative complexity.

Scaling dividends up with income would tighten, on average, the relationship between carbon taxes paid and dividends received. It is difficult to believe, however, that this choice would be politically viable. A positive link between income and benefits works for Social Security because of a clear, well-established sense that benefits are in some sense earned. We do not believe that link would work for carbon dividends. Moreover, scaling up dividend amounts with income would completely reject the communal property notion that all Americans should share equally in shared property. For both reasons, we recommend that dividends not scale up with income,[11] and they should not vary based on where people live.[12]

Family size, however, provides an easy, politically acceptable way to integrate some tax rebate thinking into an otherwise uniform dividend. Children generate less carbon, on average, than do working-age adults (Zagheni

2011). Put another way, there are substantial economies of scale—from a carbon emissions perspective—from living in a household.

To reflect some of these economies, we recommend children receive dividends equal to half the adult amount. This amount recognizes children as members of the community (albeit not yet full members) and calibrates household dividend amounts to better match actual tax burdens. For administrative simplicity, those dividends should be combined with adult dividends in payments to the household,[13] just as child tax benefits are delivered already.[14] In cases where a child moves between parents sharing custody, parents would need to provide updated information to the administrative agency regarding a child's residency. The administrative agency could ask the adults who share custody to apply a test similar to the residency test for the income tax, which relies on where a child spends the majority of his or her nights. Parents could also agree to split dividend payments, as some divorced parents did by deciding in advance which parent claimed the dependent exemption before its repeal.

Some dividend proposals limit the number of children in a family eligible for a dividend. The Citizens' Climate Lobby (REMI and Synapse 2014), for example, caps the number of children at two. We prefer an uncapped approach. Capping the number of children would create administrative complexities, gaming opportunities, and marriage penalties. Program administrators would need to implement a more complex payment schedule, and divorced parents would have an incentive to optimize where they report their children's residency. Two single parents would face a financial hit if they married and together have at least three children. This marriage penalty arises because they could receive at least three child dividends when unmarried but only two once married. As Lerman (2018) notes, a relatively small fraction of families has more than two children.

INCOME TAXES AND MEANS-TESTED BENEFITS

The third question policymakers must address is how carbon dividends will interact with federal, state, and local policies involving income taxes and means-tested benefit programs. For this question, the communal property and tax rebate perspectives point in opposite directions.

Under the communal property view, dividends are a new source of income. Government policies should generally treat all forms of income the same. Carbon dividends should therefore be taxed as income and counted as income in means-tested programs.

Under the tax rebate view, dividends do not provide new income. Rather, they offset taxes paid from income that has already been taxed. Dividends should therefore not be taxed or treated as income in means-tested programs. Doing otherwise would be a form of double taxation.

Both perspectives have merit. On practical and political grounds, we favor the tax rebate approach. Dividends should not count as income for taxes or for transfer programs.

INCOME TAXES

Exempting carbon dividends from income taxes has five main benefits. It avoids concerns about double taxation that arise under the tax rebate view. It is consistent with many past proposals to recycle revenue through refundable tax credits that would not be taxed as income. It avoids the administrative hassle—for both government and recipients—of a new tax withholding system for dividends.[15] As a matter of political optics, it separates carbon dividends from the rest of the government, softening concerns that a carbon tax would expand government. And it is consistent with not treating dividends as income in means-tested programs.

On the other hand, exempting dividends from federal income taxes has one main drawback. It is less progressive than larger, taxed dividends.

On balance, we find the upsides of not taxing carbon dividends more compelling than the downsides. Untaxed carbon dividends are a very progressive policy: if all net revenue from a carbon tax is dedicated to dividends, the majority of households, especially those with low and moderate incomes, come out ahead financially.[16] There is no pressing need to make dividends even more progressive by subjecting them to income tax. We value consistency between the treatment of dividends in transfer programs and in the tax system. Avoiding the nuisance of a withholding system for dividends is a benefit. Not taxing dividends may also expand potential political support for a carbon tax proposal.

MEANS-TESTED BENEFITS

Exempting carbon dividends from countable income for means-tested transfer programs has four main benefits. It avoids potential unanticipated reductions in transfer program benefits, which could make carbon dividends a net negative for some families. It avoids burdening recipients of transfer programs with additional income reporting requirements and burdening administrators with additional tracking and allocating. To the extent the dividend serves as an offset to incurred price increases, it does not represent new income; as such, it should not be counted in determining eligibility for transfer programs. It is consistent with how tax refunds are already treated for transfer programs.

The treatment of dividends is important because, if counted as income, they could reduce transfer benefits or eliminate them entirely for some people. Eligibility for transfer programs such as Supplemental Nutritional Assistance Program (SNAP, formerly Food Stamps), housing vouchers, child care subsidies, and Medicaid is based (in part) on income. In some case, such as with SNAP and housing vouchers, additional income can reduce benefits, offsetting the benefit of a carbon dividend. Medicaid has a hard cutoff for eligibility, where the addition of any income can result in a total loss of benefits (Campbell 2017). In some states, this happens with child care as well.[17] If the dividend payment were counted as income for determining eligibility for these programs, people currently receiving transfer benefits could be made worse off by receiving the dividend.

Considering the dividends for purposes of transfer programs also increases complexity. The dividend would be an additional source of income that potential program recipients and program administrators must track. Beneficiaries of other programs must know if the amount of the dividend is large enough to trigger reporting requirements and potential adjustments to those benefits. If the dividend is not timed to the same period benefits are paid over, administrators must determine whether a quarterly or annual benefit should be smoothed over the course of the year or treated as lump-sum income on the date it is received. Not treating the dividend as income comports with the treatment of other tax credits, such as the child tax credit and earned income tax credit.

Our approach also parallels the path Alaska chose with its Permanent Fund dividends. The state excludes dividends from income when determining eligibility for state benefit programs. It adjusted its Medicaid eligibility thresholds to offset the effect of dividends. And it even makes "hold harmless" payments to Alaskans who lose federal benefits such as Temporary Assistance for Needy Families and SNAP because of the dividends (Center on Budget and Policy Priorities 2018a; Alaska Department of Health and Social Services 2014; Cole 2014).

THE DIVIDEND POOL

The fourth question policymakers must answer is how much money to devote to carbon dividends.[18] This question is surprisingly complicated. Using carbon tax revenues to pay dividends sounds straightforward. But translating that idea into an actual pool of dividends raises practical and political challenges. Important questions policymakers should ask include:

- Which revenue streams should fund carbon dividends?
- How much of the carbon tax revenue should the government use to offset any burden it bears from the tax?
- If dividends are treated as income, should the resulting income taxes and transfer payment savings be used for dividends?
- What operating costs should be charged against the dividend program?
- What budget goal is appropriate for the carbon dividend program?

We address each of these in turn.

REVENUE STREAMS

Carbon tax proposals include up to three distinct revenue streams: taxes on the carbon content of fossil fuels; taxes on other emissions sources (which include carbon dioxide from nonenergy sources as well as other greenhouse gases); and border carbon adjustments that impose taxes on imports from, and rebate taxes on exports to, countries that do not have sufficiently rigorous climate change policies. The United States is a net importer, so the border carbon adjustment would likely raise net revenues, at least in its initial years.

The first two revenue streams make sense as sources of revenue for carbon dividends. Those taxes increase consumer costs and reflect domestic use of our atmosphere. The communal property and tax rebate views thus both imply that those revenue streams be used for dividends.

Border carbon adjustments pose distinct diplomatic, legal, political, and administrative challenges. The resolution of those challenges may depend, in turn, on how the resulting revenue is used. For that reason, we do not include any net revenues from border carbon adjustment in our estimates of potential dividends.

FEDERAL BURDEN

Households are not the only parties that bear a burden from a carbon tax: the federal government does as well.[19] A carbon tax might increase prices and thus increase the amount that the federal government spends. It

might lead to lower wages and profits, reducing federal revenue from income and payroll taxes. It might also reduce consumption of gasoline, diesel, and other fuels subject to federal excise taxes. And a carbon tax might reduce overall economic activity and thus reduce federal revenues generally.

As discussed in detail in the appendix, the first two impacts are the same effect expressed in different ways. At one extreme, consider a world where prices rise in response to the carbon tax. A product that relies heavily on carbon either directly or through its supply chain would see its price rise substantially. A product that (hypothetically) relies on no carbon whatsoever would see its price stay the same. In that world, the federal government must spend more to deliver the same level of services.

At the other extreme, consider a world where the overall prices stay the same. Every price increase caused by the carbon tax requires a price decrease elsewhere. Prices for carbon-intensive products increase while those for non-carbon-intensive products decline. In that world, the amount the federal government spends stays more or less the same (assuming federal services are more or less average for the economy). But traditional federal revenues decline. If prices overall remain stable, people's income—from wages, profits, and other sources—must decline to make room for the carbon tax. As a result, the government collects less in income and payroll taxes. Either way, the carbon tax imposes a direct financial burden on the federal government.

The carbon tax may also impose an indirect financial burden. As noted, this comes through two channels: a reduction in fuel excise taxes as people use less fossil fuel and a drop in all revenue sources if the carbon tax reduces economic activity.

These indirect fiscal impacts differ from the direct burden on the federal government in three ways. First, these indirect effects were not a prominent part of the policy discussion during the debate over cap-and-trade legislation in 2009 and 2010. The direct effect was a well-known feature of Congressional Budget Office scoring of cap-and-trade proposals. As best as we can tell, the effect on fuel tax revenues was not estimated during that debate, and the potential macrodynamic effects of those proposals did not receive official scoring. Dynamic scoring has since become more accepted in official scoring and thus may be a part of budgeting landscape in future legislative debate over carbon taxes.[20]

Second, these effects cannot be measured over time. The agency administering the carbon dividends program can measure its operating costs each year. The Treasury has well-established principles for estimating the direct federal burden of excise taxes, as it already does with taxes on vaccines. Estimating the effect of carbon taxes on fuel tax receipts or the overall economy for any point in time, however, would require a counterfactual analysis: what happened versus what might have happened. Such analysis will become increasingly speculative as years pass.

Third, it is not obvious whether these effects should be charged against potential dividends or charged against other tax and spending policies more broadly. The decline in fuel tax revenues, for example, is driven in part by a decline in gasoline and diesel use (as intended by the carbon tax). One could argue policymakers

should address that head on (by reconsidering what level of highway spending is appropriate and how best to raise it) rather than getting a portion of carbon tax revenues. Similarly, the economy could slow under any robust climate policy. Again, it is unclear how much of that should be charged against dividends rather than grappled with as part of larger fiscal policy discussions.

For these reasons, we focus on a scenario in which a portion of carbon tax revenues offsets the direct burdens the tax imposes on the federal government. Any indirect fiscal effects are covered by other changes in fiscal policy.[21] A carbon tax package overall should not increase the deficit, so these other policy changes would have to be part of a larger package. If such changes are not possible, policymakers should direct a suitable portion of carbon revenues to covering those costs, thus reducing the pool available for carbon dividends, even though that decision might reduce public support for the carbon tax.[22]

TREATING DIVIDENDS AS INCOME

We recommend dividends not be treated as income for purposes of the federal income tax or federal transfer payments. This approach does not exempt them from burden, however. Instead, it implies taking that burden out of the carbon dividend pool before dividends are paid. In effect, everyone pays a flat tax rate equal to whatever portion of carbon tax revenue is kept by the federal government rather than paying an individual effective tax rate that reflects their income tax and transfer payment status.

If policymakers decide to treat dividends as income, we recommend that the resulting revenues and reductions in transfer payments be added to the dividend pool. Just as income taxes on Social Security benefits of people with high incomes go back to the Social Security trust fund from which the benefits were paid, so should taxes and transfer savings from carbon dividends go back to the Carbon Dividend Trust Fund.

OPERATING COSTS

The carbon dividend program will have two types of operating costs: the administrative costs of establishing and operating the program and working capital needs because of a timing mismatch between dividend payments and tax receipts. Energy and environmental excise taxes generally are collected one month after the end of each quarter. We anticipate the same will be true for carbon taxes. Dividend payments will be distributed during the quarter that tax liabilities arise but before receipts are collected. Consequently, the Carbon Dividend Trust Fund will incur interest costs borrowing from the Treasury.[23]

BUDGET GOAL

Several leading dividend proposals are based on the principle of budget neutrality. The Climate Leadership Council (Baker et al. 2017) and the Citizens' Climate Lobby (REMI and Synapse 2014), for example, both

endorse dividend programs that would neither increase nor decrease resources available to the rest of the federal government. Dividend payments should thus equal carbon tax receipts less any new fiscal burdens imposed on the government plus revenues, if any, from treating dividends as income.

Budget neutrality is politically attractive because it addresses concerns among some observers that carbon tax revenues would fund an expanding government. It allays concerns among other observers that dividend payments may expand America's already large budget deficits. And it is consistent with a budgetary requirement known as Pay As You Go, or PAYGO. Among other conditions, PAYGO requires new legislation not increase the deficit over 5- and 10-year budget windows. To comply with PAYGO requirements, dividend payments, operating costs, and any indirect fiscal costs cannot exceed net tax receipts over the budget window.

But budget neutrality is not the only way to think about the dividend pool. If carbon dividends are income from communal property, for example, the government should pay out all gross carbon tax receipts less any operating costs for managing the dividend program. This approach would not cover any other fiscal costs borne by the government and thus would not be budget neutral. Under the communal property view, those impacts should be covered by a combination of taxing dividends and changing tax and spending policies generally, not by reducing the size of dividends.

If carbon dividends are tax rebates, the government should pay dividends that offset (on average) households' financial burden from the carbon tax. To do so, the government should keep enough of the receipts to cover its own burden from the tax and then distribute the rest to households to cover their portion of the burden. Again, this approach would not be budget neutral. The costs of operating the program would be viewed as a general government expense, not something to be charged specifically against the dividend pool.

Finally, from a political perspective, the dividend pool should be sized to build support for enacting a carbon tax and maintaining it once in effect. This view might require dividends to be as large as possible, or it might require some revenues to be used for other uses, whether cutting taxes, increasing spending, or reducing deficits.

Sizing the dividend pool is thus a political choice as much as it is a technical decision of which revenues and costs to consider. Given broad interest in budget neutrality, we focus on a case in which the dividend pool equals the gross receipts from the carbon tax, less the costs of operating the dividend program, less any other direct burdens placed on the federal government. This approach yields a carbon tax and dividend program that is budget neutral when considering direct fiscal effects.

This approach provides an upper bound on the potential dividend pool. The actual dividend pool will be lower if policymakers decide to use some carbon tax revenue to cover indirect impacts from lower fuel excise taxes or revenue losses from slower economic activity. The pool will also be lower if policymakers decide to use some carbon tax revenue for other purposes.

POTENTIAL DIVIDEND AMOUNTS

We now have enough structure to examine the potential size of carbon dividends under our proposal. To illustrate, we use the Baker-Shultz Carbon Dividends Plan proposed by the Climate Leadership Council (Baker et al. 2017, Bailey and Bertelsen 2018).

REVENUES

The Climate Leadership Council proposes a carbon tax starting at $43 per metric ton in 2021. Hafstead (2018) estimates that energy-related carbon dioxide emissions under this tax would be 4.2 billion metric tons in 2021. Revenues would thus be about $180 billion. Under an assumption that the tax rate increases 5 percentage points faster than inflation each year, he estimates that emissions would be 3.8 billion metric tons in 2026. Assuming inflation of 2 percent annually, revenues would then be about $230 billion, reaching about $295 billion in 2031.

These figures apply only to carbon dioxide emitted by the energy sector. The Climate Leadership Council proposal would also tax carbon dioxide emissions outside the energy sector. We have not seen a rigorous analysis of the potential revenue from doing so. As a first approximation, we assume revenues from taxing nonenergy sources of carbon dioxide would raise revenue equal to 9 percent of the revenue from energy sources.[24] As noted, we neither include any potential revenues from a carbon border adjustment in the dividend pool nor include any revenue from taxing dividends.

FEDERAL BURDEN

The official scoring agencies (the Joint Committee on Taxation, the Congressional Budget Office, and Treasury's Office of Tax Analysis) have often estimated that the direct federal burden from an excise tax is 25 percent of its gross revenues.[25] Indeed, the Treasury uses exactly that figure to determine how much money can be spent from the Vaccine Injury Compensation Trust Fund, which is financed by an excise tax on vaccines. Each year, the Treasury estimates how much money should be withheld (25 percent) and deposits the remainder in the trust fund (JCT 2015).

We adopt the same approach here, except we use the Joint Committee on Taxation's latest estimates of the offset. With the passage of the Tax Cuts and Jobs Act of 2017, the Joint Committee on Taxation has lowered its offset estimate to about 22 percent, which then rises to about 24 percent in 2026 after certain provisions expire (JCT 2018). For congressional scoring, each dollar of carbon tax receipts will thus lead to a direct federal burden of 22 to 24 cents, which is subtracted in computing net revenues.

We do not include any offset for the indirect fiscal burdens of the carbon tax. We assume the government uses other revenue increases or spending reductions to cover them.

ADMINISTRATIVE COSTS

In a comprehensive examination of administering a carbon dividends program, Lerman (2018) estimates that annual operating costs might total $6 billion. This figure includes the costs of a withholding system for taxing dividends. He also notes this estimate may be high. For both reasons, we assume that administrative costs will be $5 billion annually.

WORKING CAPITAL

Dividends will be distributed during each quarter, but tax receipts arrive one month after the end of the quarter. This working capital need creates some small financing effects and potentially a PAYGO issue.

To make dividend payments before tax receipts arrive, the trust fund will borrow from Treasury. If future Treasury rates are 3 percent, the resulting interest costs will be about 0.6 percent of the annual dividend amount. This cost reflects a two and half month gap, on average, between dividend payments and tax receipts.

These interest costs compensate the Treasury for providing working capital to the dividend program. In so doing, they satisfy the policy spirit of budget neutrality. However, they do not fully satisfy the specifics of how budget neutrality is typically measured. Under PAYGO, for example, the trust fund cannot engage in any net borrowing over the first five years of the budget window. To meet that requirement, dividends must be reduced not only to pay interest to Treasury, but also to eliminate any timing imbalance between dividend payments and tax receipts. Suppose a carbon dividend plan is enacted in mid-2019 with tax and dividend payments starting in January 2021. The five-year PAYGO window would cover fiscal years 2020 through 2024. Over that period, there would be 15 quarterly dividends, but only 14 quarterly tax collections. To amortize that gap over the first 15 dividend payments requires reducing dividends by about 1/15, or 6.7 percent. With those reductions, the trust fund will build a modest balance by the end of the five-year budget window (about one and half months of dividend payments, on average) and will earn modest interest.

This working capital adjustment is an artifact of the budget window. We do not include it in our base estimates, but we do consider an alternative scenario in which this PAYGO requirement leads to lower initial dividends.

ELIGIBLE POPULATION

Using data from the Social Security Administration Office of the Chief Actuary, we estimate there will be 342 million people in the Social Security Area in 2021.[26] From that figure we subtract residents of US territories,

children and adults living in institutions whose care is paid for by Medicaid, people who are incarcerated, undocumented residents, and citizens living abroad.[27] This brings our estimate of the eligible population to almost 320 million. Of those, 250 million are adults.

PARTICIPATION RATES

No government program achieves 100 percent participation. Factors such as program complexity and difficulties in claiming benefits (Bertrand, Mullainathan, and Shafir 2006) can contribute to eligible individuals not participating in a program. As a result, whether and how people are notified of eligibility for the carbon dividend could influence participation greatly. To ensure maximum participation, program administrators should make an effort to notify people of eligibility, to limit signup burdens, and to find as many eligible individuals as possible. The dividend could be designed so that people who fail to claim the dividend initially can claim it in subsequent years, for a limited period.

Most experience with take-up rates comes from programs that can be complex and tend to be limited to people with low and moderate incomes. People eligible for higher benefits appear more likely to participate in the programs than people eligible for lower benefits, and the differences can be stark. In fiscal year 2015, 98 percent of people in households eligible for at least half of the maximum SNAP benefit participated, compared with just 48 percent of people eligible for a lower benefit (Gray and Cunnyngham 2017). Overall, that amounted to a participation rate of 83 percent. Similarly, about 79 percent of eligible tax units claim the earned income tax credit, following a similar pattern. People eligible for higher benefits, typically families with children, are more likely to claim the credit (IRS 2018).

A broad dividend proposal that is not means-tested might avoid some of the complexity associated with means-tested programs that likely dampens participation. However, for some high-income individuals, a dividend may represent a small enough share of their total income that costs associated with claiming the benefit may make it unattractive. A review of non-means-tested programs in the US found take-up rates of up to 83 percent for unemployment insurance and 96 percent for Medicare part B (Currie 2004). Estimates of a universal child benefit in the United Kingdom, where mothers receive information on the benefit in the hospital, approached 100 percent (Brewer and Gregg 2001). Other benefits in the United Kingdom had substantially lower participation rates, on par with US means-tested programs.

We use a participation rate of 90 percent in our estimates, assuming program administrators would contact everyone already paying taxes or receiving Social Security and leaving a small share of the population that would need to learn about the program through other means. The actual participation rate could be higher or lower depending on ease of enrollment and the size of dividends. Another important factor is how long people have to claim dividends. We recommend that beneficiaries have several years to claim their dividends, much as taxpayers have up to three years to claim refunds by filing amended returns. Allowing this time will boost participation.

POTENTIAL DIVIDENDS

We combine these factors in table 2. If carbon tax legislation is passed in 2019, we assume the tax and associated dividends begin in January 2021. We thus look at potential dividends in 2021, the first year of the program; in 2026, after five years; and in 2031.

In 2021, the potential annual dividend for an adult would be about $570. For a family of two adults and two children, it would be $1,710. These figures would increase to $680 and $2,040 in 2026 and to $850 and $2,550 in 2031.[28] Potential dividends increase because carbon tax receipts grow faster than the eligible population. Those gains are partly offset by the increase in the federal burden.

Table 2

Base Case Calculation of Potential Dividends 2021, 2026, and 2031

	2021	2026	2031
Revenues ($ billions)			
Taxes on carbon in energy	181	229	296
Taxes on other carbon & other GHG	16	21	27
Carbon border adjustment	0	0	0
Income taxes on dividends	0	0	0
Total	197	250	323
Federal Burden ($ billions)			
Direct federal burden	43	60	77
Indirect federal burden	0	0	0
Total	43	60	77
Operating Costs ($ billions)			
Administrative costs	5	5	5
Financing costs	1	1	1
Total	6	6	6
Potential Dividend Pool ($ billions)	148	184	239
Eligible Population (millions)			
Adults	251	263	275
Children	70	72	75
Total Adult Equivalents	286	299	312
Participating Adult Equivalents (millions)	258	269	281
Potential Dividends ($, rounded)			
Individual Adult	570	680	850
Family of Four (Two Adults, Two Children)	1,710	2,040	2,550

HOW DESIGN CHOICES AND ASSUMPTIONS AFFECT DIVIDEND AMOUNTS

Changes to the dividend design, the carbon tax, and program participation would change potential dividend amounts. We consider six categories of changes in table 3.

We propose that dividends not be taxed as income. Taxing dividends as income and depositing the resulting revenue in the trust fund would allow a 12 to 19 percent increase in gross dividends.[29] In 2021, for example, a family of four would receive $1,920 rather than $1,710. On average, that gain would be offset by higher income taxes. As a result, after-tax dividends remain the same, on average. Households in higher income tax brackets would come out behind, and those in lower tax brackets would come out ahead.

As mentioned, our base case considers a scenario in which the carbon tax rises 5 percent more than inflation each year. Hafstead (2018) considered scenarios with real escalation rates as low as 3 percent and as high as 6 percent. Carbon emissions are projected to be relatively inelastic in this range, so faster growth in the tax rate increases dividends, and slower growth in the tax rate reduces them.

Blending the rebate and communal property views led us to propose that citizens and most legal residents qualify for dividends. However, recent congressional debates on the eligibility of the refundable portion of the child tax credit stressed disallowing a portion of the credit for legal residents who were not also citizens. Further limiting eligibility to citizens would reduce the number of eligible people and thus increase potential dividend amounts about 4 percent.

We propose the government distribute unclaimed dividends rather than retain them. If participation is higher than our 90 percent base case assumption, dividends will be somewhat lower. If participation is lower, dividends will be somewhat higher.

The dividend program incurs working capital costs because dividends are paid in advance of tax receipts. Our base case deducts from the dividend pool the interest costs the trust fund will pay Treasury to finance that working capital need. This reflects the spirit of budget neutrality. But it does not capture the letter of how PAYGO is typically enforced. Strict adherence to PAYGO would require that all borrowing from Treasury be eliminated by the end of five years. That could be accomplished by reducing dividends during the first several years of the program. This would reduce dividends in 2021, but increase them in 2026 and 2031, once interest costs are eliminated.

Table 3

Potential Dividends in Alternative Scenarios 2021, 2026, and 2031 ($)

	One Adult			Two Adults, Two Children		
	2021	2026	2031	2021	2026	2031
Base case	**570**	**680**	**850**	**1,710**	**2,040**	**2,550**
Income tax on dividends	640	790	1,010	1,920	2,370	3,030
Average after-tax dividend	*570*	*680*	*850*	*1,710*	*2,040*	*2,550*
Carbon tax real escalation						
3 percent	570	640	740	1,710	1,920	2,220
6 percent	570	720	910	1,710	2,160	2,730
Dividends limited to resident citizens	600	710	890	1,800	2,130	2,670
Participation rate						
95 percent	540	650	810	1,620	1,950	2,430
85 percent	610	720	900	1,830	2,160	2,700
No working capital after five years	540	690	860	1,620	2,070	2,580
Children						
Up to two children	600	710	890	1,800	2,130	2,670
Children get full dividend	510	610	760	2,040	2,440	3,040
Full dividend, up to two	550	660	820	2,200	2,640	3,280
¼ dividend for 3rd+	590	700	870	1,770	2,100	2,610

We propose that children receive half the adult dividend. The Citizens' Climate Lobby (REMI and Synapse 2014) has proposed capping dividends at two children per household. That cap would increase dividends for smaller families and reduce them for larger ones (tables 3 and 4). In 2021, for example, the family of four dividend would be $1,800, rather than $1,710 under our proposal. A family of two adults and four children, however, would receive $1,800 with the cap in place rather than $2,280.

Under the community property view, children should receive a full dividend. That change would lead to larger dividends for households with children and smaller dividends for households without children. Other options are to provide full dividends to children but cap them at two per household or to provide half a dividend to the first two children and a one-quarter dividend for a third child and subsequent children.

Table 4

Potential Dividends and Treatment of Childen By Family Size, 2021 ($)

	One Adult			Two Adults		
Number of children	0	2	4	0	2	4
Base case	570	1,140	1,710	1,140	1,710	2,280
Up to two children	600	1,200	1,200	1,200	1,800	1,800
Children get full dividend	510	1,530	2,550	1,020	2,040	3,060
Full dividend, up to two	550	1,650	1,650	1,100	2,200	2,200
¼ dividend for 3rd+	590	1,180	1,475	1,180	1,770	2,065

DIVIDEND DELIVERY

So far, we have discussed who should receive carbon dividends and how big they should be. Policymakers must also decide how to deliver dividends. Distributing more than $100 billion to almost 300 million Americans is not a simple task, and careful administration is essential. Lerman (2018) provides an excellent, detailed account of many of the administrative issues that arise. These include how to gather the information necessary to identify dividend recipients, how to distribute the money to them, and how to address the inevitable discrepancies that arise between what people are due and what they actually receive. There is no need to replicate his work here. Instead, we examine several high-level issues.

We recommend dividends be distributed separately from other government payments, using standard distribution methods (primarily direct deposit and electronic benefit transfer cards), on a quarterly basis, with either the Treasury or the Social Security Administration taking the lead in coordinating the program.

SEPARATE PAYMENT

One rationale for carbon dividends is that recipients will oppose future efforts to roll back a robust carbon tax. That support will be most effective if dividends are highly salient to recipients. Carbon dividends will be most salient if they are delivered separately rather than combined with other payments (e.g., Social Security benefits or tax refunds) or netted against amounts withheld as taxes.

Recent experience with federal payments supports this view. In 2008, households received separate economic stimulus payments that averaged $950. A majority of people could identify when the payment came; others remembered the payments coming but with timing that differed from the actual payment (Broda and Parker 2008). In contrast, the Making Work Pay tax credit (about $400 per adult) went largely unnoticed as it was delivered through reduced tax withholding. A poll from the *New York Times* showed just 10 percent of people noticed the credit (Gleckman 2010).

DISTRIBUTION

The administering agency will aim to distribute the vast majority of dividends by direct deposit or loading on electronic benefits transfer cards, working to get this rate as high as possible. In circumstances where a paper check is needed, dividends will be distributed by check. These three distribution methods are well established for distributing Social Security benefits, tax refunds, SNAP benefits, and other cash payments. The carbon dividends program should take advantage of these reliable, established systems.[30]

FREQUENCY

We recommend people receive dividends quarterly. Quarterly payments strike a balance among salience, administrative burdens, and impacts on dividend recipients. Payments that come frequently can serve as regular reminders of the dividend. But if the amount is too small, the payments may be a nuisance to some recipients. The more frequently the payment is made, the smaller it will be.

If paid monthly, carbon dividends would likely be significantly smaller than typical benefits from major benefit programs. The average monthly benefit for retired workers under Social Security, for example, is $1,404 (SSA 2018). Benefits for a family of four participating in SNAP average $456 (Center on Budget and Policy Priorities 2018b). In contrast, potential monthly benefits from carbon dividends would be about $145 for a family of four in 2021 and $170 in 2026. Quarterly benefits (about $430 and $510, respectively) would be more salient to many recipients.[31]

A second consideration is the sheer number of transactions required to distribute dividends. Each dividend will require more than 150 million payments. With monthly payments, that would total more than 1.8 billion a year. Paid quarterly, it would be "only" 600 million. To put those figures in context, the Bureau of Fiscal Service (which handles the vast majority of federal payments) currently makes about 1.2 billion payments each year (Bureau of Fiscal Service 2017). Monthly dividends would more than double that number. The government could certainly scale up transactions to that level over time, but we believe it more prudent to increase the number of Bureau payments by only half at the start of the program.

A third consideration is the benefit of regular income and the challenges of managing liquidity needs. People with low incomes and little liquidity may benefit from regular dividend payments rather than occasional ones. Many life expenses follow a monthly pattern, so distributing dividends on that schedule can be helpful. Almost two-thirds of low-income families experience at least one month where income spikes above or dips below 25 percent of average monthly income. Nearly 40 percent of low-income households have incomes that spike or dip in at least six months of the year (Maag et. al, 2017).

Carbon dividends can help families already subject to this volatility. A recent experiment in Chicago that delivered the earned income tax credit throughout the year found that quarterly (as opposed to annual) payments can lower borrowing, stabilize finances, and reduce financial stress for low- and middle-income taxpayers.[32]

We suspect many higher-income people who are not constrained in their spending might prefer to deal with fewer payments during the course of the year, reducing hassle associated with record keeping.

Different groups of people may systematically prefer different payment frequencies. At some point, the administering agency could consider a hybrid approach for dividend payment, but in the interest of keeping things simple, we recommend quarterly payments to start. The payments would, we believe, be large enough

for people to notice. Although not as responsive to price increases as more frequent payments, they also are less likely to exacerbate large changes in income. They also provide a relatively stable and frequent source of income without unduly burdening either the payer or the financial institutions tasked with dealing with the payments.

STAGGERING

We recommend spreading dividend payments through the quarter to avoid peaks and valleys for the agency sending them out, the private financial system receiving them, and the retail system into which they may be spent. For example, the agency might stagger dividends so that one-twelfth of recipients receive them each week. That pattern would give a week off each quarter for maintenance, updates, holidays, and so forth. Social Security does something similar with its monthly payments, spreading retirement benefits across three weeks of each month based on the last three digits of a recipient's Social Security Number.

Staggered payments would spread out the customer service demands of the dividend program, which peak when payments are made. They will also reduce unnecessary private sector responses to dividends. For example, staggering would avoid the potential for retailers to increase prices to coincide with dividend payments.[33]

AGENCY IN CHARGE

A final question is who should be in charge. This is primarily a practical issue. Administration should be carried out by an agency or combination of agencies with the best access to relevant data and capabilities. However, popular and political perception may also matter. We recommend an office inside the Department of Treasury take the lead, with the Internal Revenue Service, or IRS (an agency inside Treasury); the Social Security Administration; the Department of Agriculture; and other agencies sharing information and providing assistance. The Social Security Administration, as recommended by the Climate Leadership Council (Baker et al. 2017) would also be a reasonable leader, but it would require more assistance from other agencies. We do not recommend the IRS be placed in charge of the program, that a new independent agency be created, or that the program be outsourced to private contractors.

We base this recommendation on several considerations. First, managing an effective carbon dividends program will require extensive collaboration across government agencies. The IRS has information about people and payment preferences for people who file income taxes and receive refunds. The Social Security Administration has similar information about people who receive Social Security benefits. The Department of Agriculture has similar information about people who receive Supplemental Nutrition Assistance Program benefits. The carbon dividend program should build on that information rather than recreating it. As one of the most powerful departments, Treasury is well-positioned to coordinate information flows from across the

government. The Treasury Secretary will be held accountable for operating a successful dividend program. And the Treasury already houses the IRS, which collects much of the relevant data for operating a dividend program, and the Bureau of Fiscal Services, which processes the vast majority of direct federal payments including Social Security benefits and tax refunds.

Second, placing the office inside the Social Security Administration is a good second choice because the agency is popular with the public and has decades of experience managing regular payments to tens of millions of Americans. If policymakers choose this approach, however, they will need to take care that it creates no confusion about the relationships between carbon taxes and Social Security benefits.

Third, placing responsibility for dividends inside the Treasury or the Social Security Administration avoids the political downside of creating a new, independent agency. A new agency might make sense organizationally—it would focus exclusively on administering a successful carbon dividend program, and its head would be publicly accountable. But some observers would view the creation of a new agency as expanding government bureaucracy. Placing management of the program inside an existing agency softens that concern.

Fourth, placing the IRS in the lead would make sense if carbon dividends were distributed as annual credits through the income tax. It also makes sense under the tax rebate view of dividends. But the agency has little experience making quarterly or monthly payments: its primary mission is collecting revenue rather than sending it out. It already has a full plate of issues to address. And its unpopularity (deserved or not) might not be helpful for establishing and maintaining the carbon dividends program.

Private contractors might be an effective way to manage dividend payments, but using them could raise privacy concerns. Private contractors currently handle about 1.2 billion Medicare payments each year; they clearly have the capacity to handle many transactions.

SERVICES BASED ON DIVIDENDS

The infrastructure for paying dividends could facilitate various financial services, including saving, borrowing, and charitable giving. All three of these services are likely to develop organically without government support. Financial institutions will encourage people to deposit their dividends. Lenders will consider dividends when judging credit worthiness.[34] Charities will suggest people contribute their dividends.

The government could, however, make additional efforts to facilitate these uses of carbon dividends. Alaska, for example, added a charitable giving option to its permanent fund dividend program in 2008 and made it permanent after a three-year pilot. About 4 percent of Alaskans participated in 2017. Alaska also offers a college saving plan through its dividend program.

We do not recommend the government offer any such services in the initial years of the dividend program. The government should instead focus on establishing a capable, efficient, trusted operation for distributing carbon dividends. Once the program is fully established, the head of the program (either the Treasury Secretary or the Social Security Commissioner) could be given limited discretion to evaluate and pilot service extensions as long as they do not materially reduce the overall dividend pool.[35] Permanent program extensions should require congressional approval. To avoid reductions in dividend payments, fees could cover administrative costs of any extensions. Alaska's charitable giving program, for example, collects a fee from donations to cover some operating costs.

Allowing or preventing various service extensions could also be part of the legislative dealmaking necessary to enact a carbon dividends programs. Add-on services might attract support from legislators who are particularly interested in retirement saving, child saving accounts, short-term lines of credit, and charitable giving. Avoiding such services, on the other hand, may be necessary to attract support from those concerned about the scope of government.

CONCLUSION

Dividend payments are one way to allocate money from a carbon tax. We outline a method of payment that builds on two distinct perspectives. One views dividends as compensation for shared ownership of the atmosphere, held as a form of communal property. The other views a carbon tax as a tool to encourage people to cut carbon emissions by substituting towards cleaner energy sources. Under this view, the point of the tax is to address climate change rather than to raise revenue; that revenue should thus be rebated back to the people subject to the tax. Our carbon dividend design combines these perspectives along with accommodating many political and practical considerations.

APPENDIX: DIRECT AND INDIRECT FEDERAL BURDENS OF A CARBON TAX

A carbon tax can place a fiscal burden on the federal government in three ways: a direct increase in federal spending or reduction in revenues, reduced economic activity, and lower fuel tax revenues.

THE DIRECT FEDERAL BURDEN

The federal burden from a carbon tax is easiest to understand if it happens through price increases. If the carbon tax results in higher prices, federal revenue will not go as far. The government will either have to cut back on the services it provides, increase revenues, or increase borrowing.

Budget analysts often approach this issue from a different perspective. Under conventional budget scoring conventions, analysts consider a world in which the size of the US economy and the overall US price level does not change. In that world, the carbon tax still has its intended effects. Carbon-intensive products become more expensive relative to less-carbon-intensive products. But the price increases for the carbon-intensive products are offset by price decreases for the less-carbon-intensive products.

In that world, the federal burden shows up through lower income and payroll taxes. In effect, the carbon tax absorbs some of the pretax income that would otherwise have gone to workers, businesses, and investors. They receive less income, so they pay less in taxes. This offset reflects an inescapable accounting relationship, not the potential effects of a carbon tax on macroeconomic activity. There is only so much national income to go around. If the government collects some of that income directly, such as through a carbon tax, there is less income available to the taxpaying private sector.[36]

We illustrate this conventional revenue offset with some simple accounting. Start with national income, NI, which measures all pretax income in the economy. National income is effectively the income version of gross domestic product except we subtract depreciation of the capital stock.[37] National income adds together the compensation paid to workers, earnings of the self-employed, profits of businesses, interest, dividends, royalties, rents, and the like. All are measured before the government collects income taxes and most payroll taxes.[38] Together, we call these factor incomes, FI. National income also includes any taxes that the government collects before they have an opportunity to become someone's income. Those taxes, including excise taxes and sales taxes, are income that goes straight to the government. For simplicity, we focus on excise taxes, E. We have:

$$(1) \qquad NI = FI + E.$$

The government collects revenue in two ways. It taxes factor incomes and collects excise taxes. For simplicity, consider a case in which a single tax rate, t, applies to all factor incomes. Then we have that revenues REV are

$$(2) \qquad REV = t\,FI + E.$$

This way of representing revenues makes it appear excise taxes add to overall revenues dollar for dollar. But that's misleading. Excise taxes also reduce factor incomes. To measure net revenues, we need to account for that relationship. To do so, we replace factor incomes using the relationship between national income and factor incomes:

(3) $REV = t\,(NI - E) + E = t\,NI + (1 - t)\,E.$

This identity makes the revenue offset clear. As long as excise taxes have no effect on national income, each dollar of excise taxes generates only (1 – t) dollars in federal revenue. Each dollar gained is offset by t dollars of lower income and payroll taxes.

The offset also arises if we consider a world in which prices rise to accommodate a new carbon tax. In that world, factor incomes remain unchanged in nominal terms. As a result, there is no nominal offset. Carbon tax revenues are purely additive to existing income and payroll taxes because factor incomes are unchanged:

(2') $REV = t\,FI + E.$

This is the same as above except that FI is now fixed and E is purely additive. Revenue rises by the amount of the new carbon tax. Because of price increases, however, that revenue no longer has the same purchasing power. Revenues don't go as far. To measure the change in real (i.e., inflation-adjusted) revenues, we multiply the new revenue level by the ratio of old prices to new ones:

(4) $REV_{real} = REV \times FI / (FI + E).$

This simplifies to a relationship very similar to the conventional offset:

(5) $REV_{real} = t\,FI + (1 - t)\,E \times FI / (FI + E).$

The conventional revenue offset thus reappears when we adjust for inflation. The gross revenue from a new carbon tax is reduced by a decline in the real value of income and payroll tax revenues.

REVENUE LOSSES FROM LESS ECONOMIC ACTIVITY

A robust carbon tax could slow economic activity and thus reduce other federal revenues. The size of that effect depends on three main factors: the macroeconomic effects of a carbon tax, the macroeconomic effects of how the revenue is used, and the regulatory and policy baseline.

Analysts typically find that a carbon tax, by itself, will reduce economic activity, as least in the near term.[39] Deploying carbon tax revenue, on the other hand, can increase economic activity. The net effect is usually a modest reduction in economic activity. How much depends on the revenue use. One common—but not universal—finding is that reducing marginal tax rates on capital income would provide the most macroeconomic boost in the long run, providing dividends or other lump-sum transfers would provide the least, and that cuts in other taxes or reducing deficits would fall in between (Barron et al. 2018). Dividends and other lump-sum transfers might provide significant stimulus in the short run, depending on the state of the economy, but that effect would wear off after a few years.

Most analyses compare carbon tax policies to a baseline in which nothing is done to reduce carbon emissions and there are no costs for failing to do so. In reality, a suite of regulatory policies already limit some carbon emissions. The potential economic drag from carbon taxes is lower compared to a baseline in which there is significant regulatory action to restrain emissions or in which there are potential sanctions from other countries for failing to take action. Indeed, a carbon tax might increase economic activity if it allowed the elimination of an inefficient regulatory policy achieving the same emissions reductions or forestalled dramatic trade actions by other nations.

The potential revenue offset from dynamic effects could vary widely depending on these factors as well as differences in modeling approaches. It is beyond the scope of this effort to specifically model them. We can, however, get a sense of the magnitudes involved with some rough calculations. Federal revenues will average about $4 trillion annually over the next decade. If a carbon tax and dividend policy reduced economic activity 0.5 percent relative to baseline, revenues would be about $20 billion lower each year. Using carbon tax revenues to offset the dynamic reduction in revenues tax would thus require a material reduction in carbon dividends.

REVENUES LOSSES FROM LOWER FUEL USE

A carbon tax will reduce revenues from excise taxes on gasoline and other transportation fuels. The carbon tax raises fuel prices, so people and businesses buy less. A rough estimate is that a $40 per ton carbon tax would increase the price of gasoline about 36 cents per gallon. Gasoline prices today are about $3.00 per gallon. Assuming complete pass through, the carbon tax would increase gasoline prices about 12 percent. Over the medium term, -0.2 is a reasonable estimate of the elasticity of gasoline demand. Purchases fall about 2 percent for every 10 percent increase in price.[40] As a result, the carbon tax would reduce gasoline consumption about 2.5 percent. With fuel tax revenues currently about $40 billion annually, this effect would cause about a $1 billion reduction in fuel tax revenues. Overall federal revenues would decline about $780 million after accounting for the direct federal burden of fuel taxes. The fuel tax offset would increase as the carbon tax increases and as people and businesses have more opportunity to adjust their behavior. An $80 per ton carbon tax with a -0.4 long-term elasticity implies about a 10 percent reduction in fuel tax revenues, or roughly $3 billion in net revenue losses from current levels after accounting for the direct federal burden. Using carbon tax revenues to offset the decline in fuel tax revenues would thus require a modest reduction in carbon dividends.

NOTES

[1] Examples include the Climate Leadership Council (Baker et al. 2017), Citizens Climate Lobby (REMI and Synapse 2014), Barnes (2003), Boyce (2018), and Hansen (2015) as well as two bills introduced in 2018: the Healthy Climate and Family Security Act and the Energy Innovation and Carbon Dividend Act.

[2] Lerman (2018) also examines many of these design issues; he also provides a detailed analysis of how to implement a dividend program.

[3] Baker et al. (2017) offer a leading endorsement of carbon dividends. Zycher (2017) offers a sharp critique.

[4] The atmosphere is shared by all the world's inhabitants. For purposes of this analysis, we focus on the portion of the atmosphere affected by the actions of the United States.

[5] See, for example, Horowitz et al. (2017) and Rosenberg, Toder, and Lu (2018).

[6] SSNs are issued to citizens, legal permanent residents, people lawfully admitted to the US on a temporary basis with authorization to work from the Department of Homeland Security, and people from other countries living in the US who have a valid, non-work reason for needing a number. SSNs are often used to determine benefit eligibility. In some cases, (e.g., the child tax credit), eligibility depends on whether an individual, such as a child, has an SSN. In other cases, (e.g., the earned income tax credit), every member of the tax unit must have an SSN eligible for work.

[7] Lerman (2018) discusses some of the issues that arise with US territories (Puerto Rico, Guam, the US Virgin Islands, the Northern Marianas islands, and American Samoa). Whether a territory is outside the scope of the tax depends on whether the tax is levied in the territory and whether its "imports" from the rest of the United States receive border adjustment rebates.

[8] Alaska's dividend guidelines provide a useful starting point in identifying categories of people who may or may not qualify for dividends (Alaska Department of Revenue 2018). Lerman (2018) also explores this issue.

[9] Eligibility could either be determined based on a person's status at the end of the quarter preceding when the payment will be made or on the status at the beginning of the quarter preceding the quarter payment will be made. If eligibility were determined at the end of the quarter, a person who died during the quarter would not be eligible for benefits for that quarter. If eligibility were determined at the beginning of the quarter, a person who died during the quarter would be eligible for a full payment. Determining eligibility based on status at the beginning of the quarter preceding payment would allow the administering agency the largest window to collect and verify data before payments would be made, but would be slightly less responsive to changing situations.

[10] Indeed, in some approaches to communal property children should receive their dividends directly rather than have it paid to a parent or other guardian. This is the approach that some tribes take with their Indian Gaming Regulation Act tribal payments. In several cases, Native American tribes have created minors' accounts held in trusts for eligible children until a specified age, often age 18 (Jorgensen and Morris 2009).

[11] Several analysts have proposed that tax credits or other assistance go down with income. For example, Stone (2015) discusses how to protect Americans with low incomes from the burden of a carbon tax. These approaches deserve close attention if policymakers decide to pursue a carbon tax without a universal dividend.

[12] There is one situation, beyond the scope of this paper, that might justify place-based variation in dividends: state and regional policies limiting carbon emissions. Suppose one state already has carbon policies equivalent to a $15 per ton tax on carbon. And suppose the federal government then enacts a $40 per ton carbon tax. In that scenario, it might make sense for the state to repeal its policies and accept the national carbon price. But the state would lose revenue in doing so. Political negotiations over a carbon dividend might earmark some dividend money for the state. If so, residents of that state might receive lower dividends, but only because a portion of those dividends was, in effect, going to their state.

[13] For administrative convenience, we consider each tax unit to be equivalent to a "household." In fact, some households have more than one tax unit, including multigenerational households and households with unmarried partners (who tend to form two tax units). Analysis by Maag, Peters, and Edelstein (2016) shows that, though complex households are

increasing, they remain a relatively small fraction of all households. For purposes of a carbon dividend, this distinction primarily affects who will receive the payment.

[14] An important administrative detail is deciding how to distinguish children from adults. We recommend a simple definition: children are people under age 19 who are not the head of a tax unit. This definition adopts the main (and simplest) criteria for defining a child for purposes of the EITC and head of household filing status. Also allowed for the earned income tax credit and defining head-of-household filing status are children ages 19 to 24 and in school full time for at least six months of the year. The latter criterion is difficult to administer, and many students live away from home, suggesting they bear a full share of the carbon tax rather than a partial share. Eligibility for the full child tax credit is reserved for children under age 17. Older dependents are eligible for lower benefits. Like other aspects of dividend eligibility, what household a child is considered part of can change on a quarterly basis.

[15] Lerman (2018) provides a detailed discussion of the administrative structure necessary for withholding from dividend payments.

[16] See, for example, Horowitz et al. (2017) and Rosenberg, Toder, and Lu (2018).

[17] Karen Weese, "Beware the Child Care Cliff," *Slate*, August 8, 2018.

[18] These monies will be collected in a Carbon Dividend Trust Fund. Like other trust funds, the fund will invest any positive balances in interest-bearing Treasury securities, and it will pay interest to Treasury on any negative balances.

[19] State and local governments and nonprofits also bear some burden from a carbon tax. Rather than track these separately, we take the approach of attributing those burdens to households. In effect, householders bear all burden from the carbon tax except that borne by the federal government. The household burden thus reflects not only their role as consumers but also their roles as business owners, state and local taxpayers, and contributors to non-profits. In principle, one could imagine a rebate program that also distributed money to state and local governments and nonprofits that face higher prices because of the carbon tax but cannot pass them onto customers. It is much more practical, however, to focus solely on households.

[20] A challenging issue in any dynamic score is specifying the baseline against which a tax and dividend proposal would be measured. Most macroeconomic studies of carbon taxes compare them to a world in which there is no other carbon policy. In reality, however, a robust carbon tax would render moot—and thus potentially allow the rollback of—many existing regulatory policies. A dynamic score of a carbon tax should focus on the net effect of these changes, which will likely reveal smaller macroeconomic effects than existing studies that compare to a no policy baseline.

[21] These changes could include reductions in tax and spending programs that currently encourage clean energy but are less relevant if a substantial carbon tax goes into effect.

[22] Relatedly, policymakers should also consider whether any changes are necessary for transfer programs whose benefits are indexed to inflation. If a carbon tax significantly increases overall prices, the combination of a carbon dividend and an automatic benefit increase might "over" compensate some recipients.

[23] These interest costs could be avoided—to be replaced with modest interest gains—if policymakers pay dividends after collecting the tax. In the first year of the program, there would be only three dividend payments. This would also avoid the PAYGO issue discussed below.

[24] Larsen et al. (2018) report baseline projections in which a category designated "other" accounts for 9 to 11 percent of carbon dioxide emissions. This category includes non-fossil emissions and a small amount of fossil emissions.

[25] See CBO (2009). Using a different approach, Boyce and Riddle (2008) estimate how much revenue would be need to be withheld to hold federal, state, and local governments whole.

[26] This includes residents of the 50 states, the District of Columbia, and armed forces overseas; civilian residents of the US territories; federal civilian employees overseas; dependents of the armed forces and federal civilian employees oversees; and crew members of merchant vessels.

NOTES

[27] Urban Institute DYNASIM validation analyses based on unpublished projections from the Social Security Trustees Report (intermediate assumptions) provided by Office of the Actuary, plus data from American Community Survey, Census Bureau, Bureau of Justice Statistics, and Eiken (2017).

[28] To maximize the salience of the dividends, policymakers should consider rounding the amounts. Here, we have rounded to the nearest $10.

[29] We estimate that the average marginal effective income tax rate on dividends would be about 11 percent in 2021, 14 percent in 2026, and 16 percent in 2031.

[30] Payments technology is advancing rapidly including new innovations based on distributed ledgers and blockchain technology. Carbon dividends may provide an opportunity for the Bureau of Fiscal Services to run pilot tests on these new approaches.

[31] Annual payments would likely be even more salient (Schenk 2011). If policymakers decide to distribute dividends annually, we recommend they be paid in September or October. That's how Alaska handles its Permanent Fund dividend. Paying in the early fall provides financial resources to people at a time of year when they may need them. Roughly 80 percent of Americans receive tax refunds from February through April. Paying a carbon dividend in September or October would smooth financial resources across the year and make the dividend more salient.

[32] Craig Chamberlain, "Year-Round Distribution of Earned Income Tax Credit has Significant Benefits, Says Study," *Illinois News Bureau* (University of Illinois), January 7, 2016.

[33] Strategic pricing is a concern with SNAP benefits, with mixed evidence reported so far (Hastings and Washington 2010; Goldin, Homonoff, and Meckel 2017).

[34] Lenders might even accept future dividends as collateral, if the government permits beneficiaries to assign them for that purpose.

[35] One possibility would be to allow lenders to execute liens against upcoming dividends. That could expand borrowing options for people with limited resources. It is unclear, however, whether states would go along.

[36] It does not matter that the government spends or invests this money. That spending creates income for the recipients. But workers, business owners, and investors would have spent or invested the money as well and would have created the same amount of income. The issue here is that the government is collecting excise tax revenue before it has a chance to appear as taxable income.

[37] Gross domestic product is gross precisely because it does not subtract depreciation. To keep things simple, this discussion excludes other factors that cause national income to differ from GDP. These include subsidies (which are effectively the reverse of excise taxes) and income flows to and from other nations.

[38] Employers can deduct the payroll taxes they pay. As a result, a fraction of their payroll taxes operates like excise taxes. This complication does not change the basic story here and is accounted for in official estimates of the offset.

[39] Potential climate benefits may boost the economy in the future, but not within the next decade. More immediate benefits, such as reducing other air pollution, do not appear in conventional economic analyses.

[40] For a brief discussion of elasticities, see "TPC's Methodology for 'Off-Model' Revenue estimates, accessed October 26, 2018,https://www.taxpolicycenter.org/resources/tpcs-methodology-model-revenue-estimates

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