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REVIEW

A carbon tax by any other name: Public benefit funds in the American states

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Abstract

Although there is substantial opposition to carbon taxation in the United States, a form of carbon tax is already in place in many jurisdictions. Twenty-two American states plus Puerto Rico and the District of Columbia have implemented a policy called the "public benefit fund," in which utility companies add a charge per kilowatt-hour of energy consumed to the electricity bills of individuals and firms. Public benefit funds are monetary charges for energy usage, and are in several respects similar to carbon taxes. This paper gives an overview of the introduction of public benefit funds in the American states and their current extent, considers their similarities to and differences from carbon taxes, discusses several studies showing that they do have an impact on reduction of carbon emissions, and suggests that expansion or intensification of public benefit funds could be a path to lower emissions for the country.

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Introduction

Carbon taxes have been shown to reduce emissions without damaging economic growth [1, 2]. They have been implemented in many countries around the world [3] but there is substantial opposition to carbon taxation in the United States [4]. Nevertheless, 22 American states plus Puerto Rico and the District of Columbia have implemented a policy called the "public benefit fund." Public benefit funds are a state-level environmental policy in which utility companies add a charge per kilowatt-hour of energy consumed to the electricity bills of individuals and firms, under labels such as "system benefit charge" or "public benefit charge." These charges are found in conservative states as well as progressive ones. Public benefit funds are analytically close to a carbon tax, because the mechanism—a monetary charge scaled to energy usage—is the same (Table 1). The difference between public benefit funds and carbon taxes is that carbon taxes are levied on carbon emissions, whereas public benefit funds are applied at an earlier stage, to the consumption of electricity. This is an important difference. Because electricity usage rather than carbon emissions is being taxed, the incentive is not to reduce carbon emissions, but to reduce electricity consumption. As a practical matter this makes sense, particularly for households, who can monitor and adjust their electricity usage more precisely than they can their carbon emissions. As a policy matter this is an interesting difference, because it means that, as states begin the shift to renewable energy, the public benefit fund will not lose revenue as carbon taxes would under such a shift, as explained in more detail below. This

Table 1. Carbon tax vs. public benefit fund.

	carbon tax	public benefit fund
where implemented?	around the world, not in the U.S.	American states
mechanism	monetary charge levied by government, scaled to energy usage	monetary charge levied by government, scaled to energy usage
taxpayer	(generally) corporations who pass on the charge to end users	end users, or public utilities who pass on the charge to end users
levied on	carbon emissions	electricity usage
can households reduce their tax?	yes, but emissions also depend on carbon intensity of production	yes, by reducing electricity usage
what happens as renewable energy becomes more prominent?	tax declines	tax does not decline
currently prevalent rates	$.02 - $48.81 per ton of CO2	$.06 - $30 per ton of CO2
use of revenue	varies—rebated to consumers or producers, used to reduce other taxes, or earmarked for particular uses	(usually) dedicated to the development of renewable energy and energy efficiency

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paper gives an overview of the introduction of public benefit funds in the American states and their current extent, examines each state's public benefit fund and considers its similarities to and differences from carbon tax, discusses several studies showing that public benefit funds reduce carbon emissions, and suggests that expansion or intensification of public benefit funds could be a path to lower emissions for the country.

The origin and extent of public benefit funds

In the United States the oil crisis of the mid to late 1970s, and then the Gulf War of the early 1990s, spurred state and federal governments to experiment with energy conservation. Although the ultimate solution to the crisis was found not in conservation, but in military interventions to protect the oil supply [5], the conservation efforts did bear policy fruit. In the 1970s many states experimented with energy policies and Congress passed legislation to conserve energy and develop renewable energy sources. By the mid-1980s these experiments had developed into a movement toward resource conservation by utilities, as well as experiments with gas and wind turbines and solar cells. In 1992, after a spike in oil prices, Congress passed the Energy Policy Act, which required state utilities to consider environmental effects. In 1994, California began a movement of electricity restructuring, followed by dozens of other states. A period of creative experimentation with policy instruments followed. Public benefit funds emerged from this effort as charges, sometimes intended to be temporary, to finance energy efficiency and renewable energy programs [6–8]. Because the electricity sector accounts for a significant share of carbon emissions in the U.S., reductions in electricity usage or changes to renewable electricity could have substantial effects on carbon emissions [8, 9].

Very little research has been conducted on public benefit funds, with a paucity of both scholarly and journalistic coverage. Something called a public benefit fund is currently implemented in 22 states plus Puerto Rico and the District of Columbia (although, for reasons discussed below, not all of these can be considered equivalent to carbon taxes). The leaders were the states in the Pacific Northwest, California, and several northeastern states. Advocates of public benefit funds argued at the turn of the century that they would reduce energy use, particularly during peak times, and thus reduce the need for constant construction of new plants and system upgrades; that they would benefit the environment, particularly because reduction of energy usage would allow utility companies to take the dirtiest power plants offline; and that

they would even benefit local economic development, because residents' reduced energy bills would lead to more spending at local businesses [10, 11].

The revenue collected from these charges is used to support a wide variety of renewable energy and energy efficiency programs, as well as research and development and energy education. For example, New York's public benefit fund helps to finance 30 different programs, including successful efforts to promote more energy-efficient appliances and assist providers in developing energy-saving methods [10]. On electricity bills the charge appears as "SBC" for "System Benefits Charge." One observer noted that in 2008 it amounted to just over a dollar a month for New York City residents who lived in apartments, and yet it had already helped several small businesses, from an ice rink and an engineering firm to laundromats, as well as temples, churches, Manhattan office buildings that implemented recycled-steam power systems, individuals who wanted to install solar panels and wind turbines, and an entire city that wanted to change its traffic lights to a more energy saving version [11]. Overall, estimates were that the money had resulted in reducing electricity usage over a decade "by 650 megawatts, or about what a big power plant can produce. The agency [that manages the SBC] says that these programs have created 4,700 jobs over the past decade and that they helped utility customers save $570 million in 2007" [11]. Putting together all of the rebates, tax incentives, and subsidized interest rates financed by the systems benefit charge, one estimate was that it would cost a homeowner less than $20 a month over a period of 20 years to install solar panels worth $20,000 [12, 13]. Other programs included subsidizing the costs of energy assessments for large residential apartment buildings and the costs of whole-house audits for house owners [14, 15].

Given the politicization of taxation elsewhere in American politics, there is a surprising lack of controversy at the origin of many of these charges. California's "public goods charge" emerged as part of a very controversial bill, but the charge itself escaped much notice. The larger plan to restructure electricity in 1995 was extremely controversial, with consumer groups arguing that it was a giveaway to utility industries because it did not guarantee lower rates and made consumers rather than utilities pay for the costs of various failed investments. Amid all the rancor, the plan to add a small charge to finance energy-efficiency programs did not generate much comment [16].

The successful implementation of public benefit funds shows that carbon tax-like instruments are possible in America [17] (see also, relatedly, [2] on conservatives' strong support for severance taxes). Public benefit funds have been democratically selected and implemented in a variety of jurisdictions, including conservative states [17]. As Rabe and Borick note, their popularity is likely due to the public benefit funds' design. A particular feature of these policies is that the funds are slated to be used for concrete purposes, which generates more support from taxpayers. Rabe and Borick note that electricity costs are less visible to the average consumer, and that these programs seem to have "the intent of finding some word other than 'tax' to describe their cost-imposition strategy" [17]. Their stealthy nature is reinforced by the low rate at which they are levied.

Public benefit fund vs. carbon tax

Although all public benefit funds share the broad features of a charge on electricity that is used to finance renewable energy programs of various kinds, there is a wide variety of programs that fall under this label. The programs vary based on how much money they take in and how they relate to other programs in the state, such as renewable portfolio standards (RPS). As shown in Table 2, some programs are not technically taxes at all, because they are not scaled to usage, or they are not taxes on households because the utility rather than the end-user pays the

Table 2. Elements of public benefit funds in the American states.

Not equivalent to carbon tax*	Equivalent to carbon tax			
Virginia, Maine, Minnesota, Puerto Rico, Wisconsin	Funds not used for renewable energy or energy efficiency	Funds used for renewable energy or energy efficiency		
	Illinois	City-level	Paid by utilities	Classic public benefit fund**
		Colorado	Delaware	California, Connecticut, Hawaii, Massachusetts, Michigan, Montana, New Hampshire, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Vermont, Washington, D.C.

Categorizations explained in more detail in text.

*These public benefit funds are either voluntary (Virginia and Maine), have payments connected to particular issues (Minnesota), come from general taxation (Puerto Rico), or are imposed as a mandate rather than a tax (Wisconsin). See text for more details.

**The classic public benefit fund is a state-level charge to consumers used to finance renewable energy, energy efficiency, and research and development.

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fee. In some states there are multiple public benefit funds, or even a patchwork of several. There are different degrees of vigilance over how the money is used, with some states taking the money from the funds and using it for other purposes, while other states codify in law that the money must be used for renewable energy or energy efficiency uses. The most egregious case is of Illinois, which for many years used half of the funds raised by the surcharge to extend the market for coal. Even within funds that genuinely aim at promoting energy efficiency and/or green energy, there are a variety of means through which this is accomplished. For example, in 2015 New York adopted a law that explicitly aimed at making the public benefit fund—which is already a market-oriented policy—even more market oriented: the new law aimed to diminish the role of top-down grants for renewable energy and energy efficiency projects and increase attempts to use the funds to attract private investment and lessen the burdens of the permit process.

Martin, Mehrotra, and Prasad define taxation as "the obligation to contribute money or goods to the state in exchange for nothing in particular" [18]. Under this definition a tax is an obligatory charge, not simply a contribution from citizen to state; and it is not received for a particular service to the taxpayer, unlike a fee. Using this definition we distill several criteria for meeting the definition of a carbon tax, and we can assess whether the various types of public benefit funds qualify as carbon taxes. The criteria for a carbon tax include the following:

- The charge must not be voluntary; it must be an obligation.
- The tax must not be a fee for a particular service, but rather, "in exchange for nothing in particular."
- The tax must be scaled to carbon usage.

Table 2 gives a schematic overview of differences in the different kinds of public benefit funds, and S1 Table gives a more detailed picture of each state's program.

Although the revenue from public benefit funds is generally used to finance environmental goals, the individual taxpayer is not guaranteed anything in return, meeting the criterion for a tax. But under this definition, voluntary contributions such as in Virginia and Maine do not constitute a tax. As shown in the table we also set aside the public benefit fund of Minnesota, where the money for the fund comes not from ratepayers but from utilities, is not scaled to energy usage, and is connected to the issue of nuclear waste disposal: these charges are better conceptualized not as a tax, but as a fee for a particular service. Puerto Rico's Green Energy

Fund, on the other hand, is financed through taxes, but not through *carbon* taxes per se—it is financed from general taxation. And although Wisconsin's mechanism serves many of the same functions as a public benefit fund, it is a mandate imposed on the utilities to invest in energy efficiency, rather than a tax. It is worth preserving mandates and taxes as separate categories, because they have distinct effects: most importantly, a firm can easily decide to pay a tax and not invest in renewables or efficiency, whereas Wisconsin requires that firms make investments into energy efficiency. The tax is a more market-oriented approach, in that it allows firms to decide whether paying the tax or making the investment is more cost-efficient for them.

Thus, only eighteen states plus D.C. qualify as having a public benefit fund that is equivalent to a carbon tax—a surcharge to end consumers that is scaled to usage. Illinois is included in this count, even though much of the fund is not used for purposes of energy efficiency or development of renewables, because what a tax is used for is a separate question from whether or not it is a tax. We also include Delaware's fund, which is difficult to define, because the utilities have opted out and created smaller funds; nevertheless, this opting out is only allowed under certain conditions, and if those conditions are not met then an obligatory charge would be levied on ratepayers. It is best to conceptualize this as a tax that can be avoided under certain circumstances (as is also the case, to a lesser extent, for some other states). We also include Pennsylvania's fund even though it has since stopped collecting revenue, as there is in general some flux around the stopping and starting of public benefit funds.

The states with public benefit funds that are similar to carbon taxes are California, Colorado, Connecticut, Delaware, Hawaii, Illinois, Massachusetts, Michigan, Montana, New Hampshire, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, Rhode Island, and Vermont, as well as Washington, D.C. Those that do not qualify as carbon tax are the programs of Maine, Minnesota, Virginia, Wisconsin, as well as Puerto Rico. Colorado has two programs, both of which are unusual: one gets its funding from other taxes so we do not consider it equivalent to a carbon tax; the other, more traditional program is a tax but it is unusual for being at city level. Delaware's charge is levied on utilities rather than end users—closer to a carbon tax, which are usually levied at the point of production, but unusual among other public benefit funds. In several cases, states have multiple public benefit funds, or several programs that jointly operate a public benefit fund (see details in S1 Table).

Even for the "classic" public benefit funds that collect surcharges from ratepayers, there are nevertheless differences between public benefit funds and carbon taxes. For one thing, most—although not all—public benefit funds are much lower than carbon taxes. Rabe and Borick estimate that public benefit funds and similar sub-national mechanisms in Canada range from around $2 per ton of carbon dioxide released to $4 per ton of carbon dioxide released, whereas explicit carbon taxes and carbon tax proposals have ranged from $2 to $35 per ton of carbon dioxide released [17]. My own calculations on public benefit funds in American states suggest a range from 6 cents to $30 (Fig 1, Public Benefit Fund as Carbon Tax, rate in $ per metric ton of CO2, Fig 2, Public Benefit Fund as Carbon Tax, revenue per metric ton of CO2 equivalent, $, and S1 Data). The figures show two different ways of calculating the carbon tax rate. In Fig 1 the calculation begins with the rate of the public benefit fund per kWh and uses a measure of rate of CO2 emissions per MWh in the state to calculate the equivalent rate on carbon. These figures are not weighted by the role of the electricity sector in total carbon emissions in the state; they should thus be understood as estimates for a general tax on carbon in the state, rather than a tax on carbon in the electricity sector alone (weighting by the role of the electricity sector would produce considerably higher rates and we choose to present the more conservative calculation). In Fig 2 annual revenue from the state's public benefit fund is divided by annual state carbon tax emissions, producing a measure of what the carbon tax rate would be

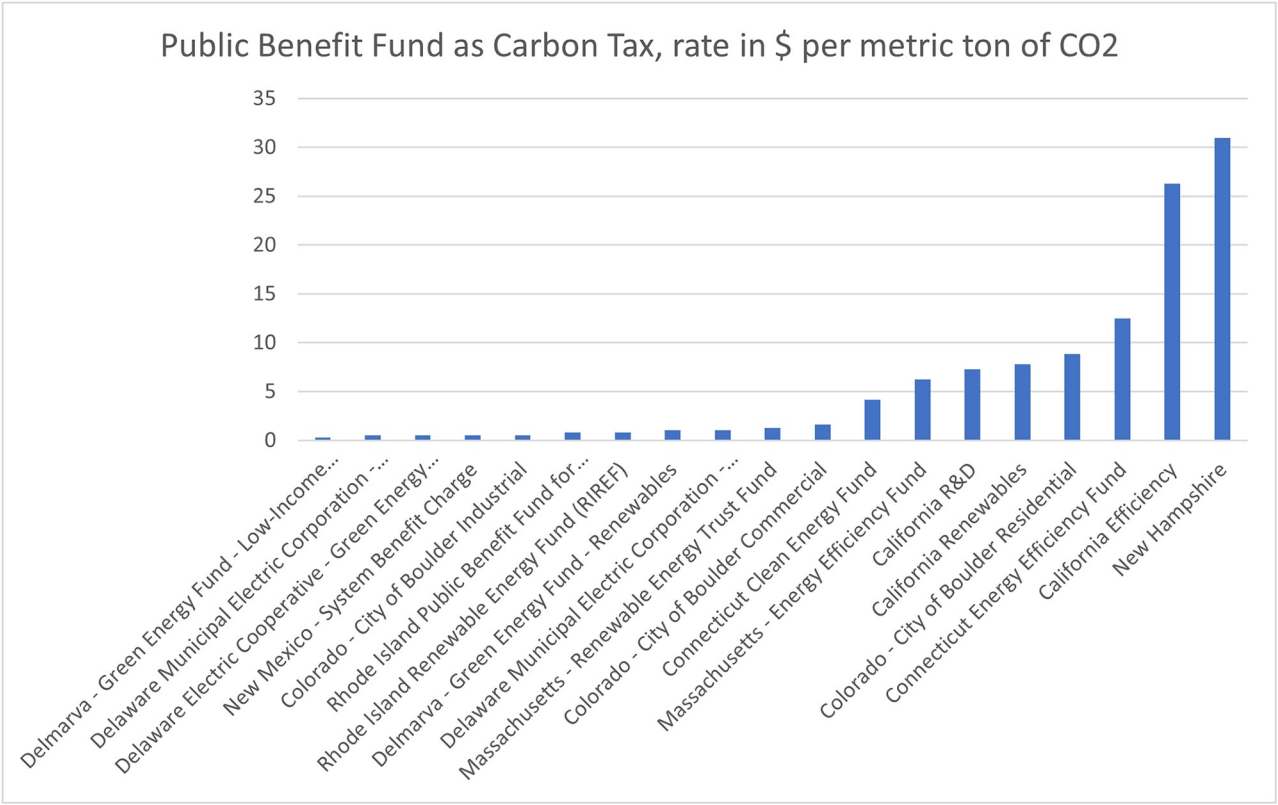

Fig 1. Public benefit fund as carbon tax, rate in $ per metric ton of CO2.

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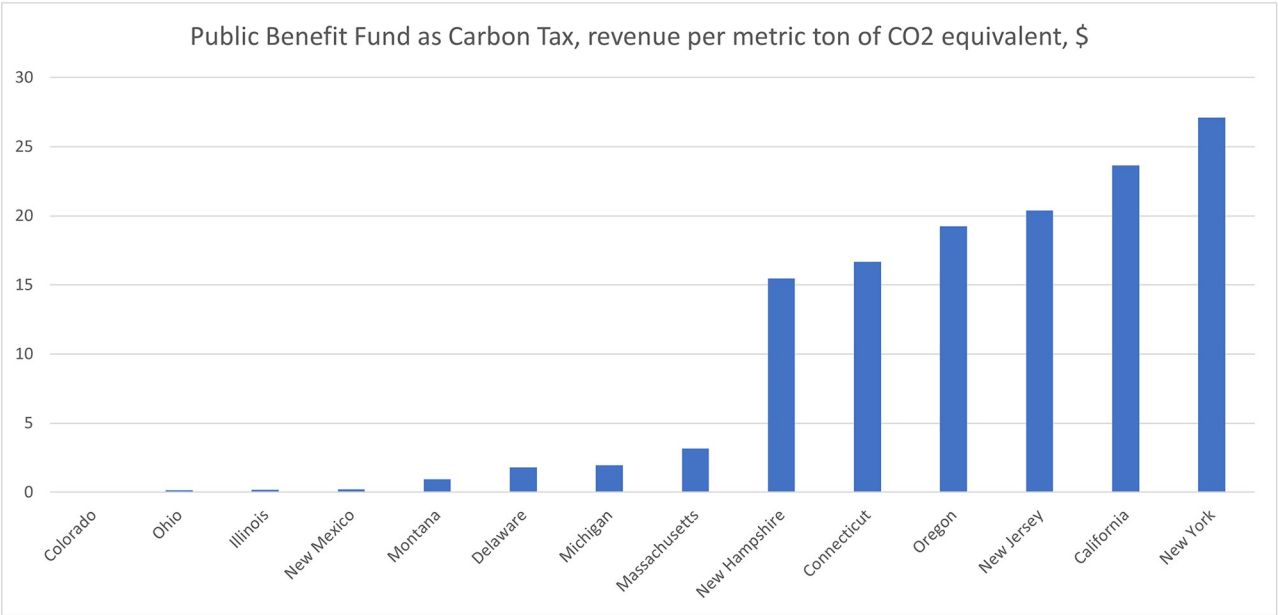

Fig 2. Public benefit fund as carbon tax, revenue per metric ton of CO2 equivalent, $.

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if this amount had been levied as a tax on carbon emissions. In several cases revenue from one or more state public funds is not available, so the figure should be understood as a lower bound. Washington, D.C. is an outlier with an unusually high rate and is not shown in the figure. See S1 Data for details. Discrepancies between the two calculations may be explained by (1) the existence of multiple funds in many states (in Fig 1 each rate is calculated as if it were the only fund in the state), (2) exemptions, which are not accounted for, and (3) inconsistent standards of reporting data, as public benefit funds have not attracted much attention and therefore data on them is incomplete and unsystematic.

Despite these cautions, if we think of public benefit funds as a "carbon tax equivalent," the rate at which they are levied overlaps with the rate at which carbon taxes are levied around the world, and in both figures in several states the public benefit funds compare favorably with carbon tax [19]. Particularly notable is that New Hampshire, a state known for its conservative or libertarian leanings, has one of the highest public benefit funds rates in both calculations, suggesting an intriguing topic for future research.

Although public benefit funds and carbon taxes are both monetary charges scaled to the usage of energy, some important behavioral and revenue consequences follow from the fact that a classic public benefit fund is levied on usage of electricity, not on emissions of carbon. First, individual end-users are more able to monitor and control their electricity usage than their carbon emissions, because an individual's carbon emissions from electricity depend on the source of the electricity, and sourcing decisions are made not by individuals, but by utilities, whereas end users do not always have a choice of utilities. Two end users who use the same amount of electricity will have very different effects on carbon emissions if the first user purchases from a utility that generates its electricity from coal while the second user purchases from a utility that generates its electricity from solar and wind. Indeed, an individual's concerted efforts to reduce electricity could be counteracted by her utility's decision to produce more electricity from high-carbon sources. Levying a charge on carbon emissions, then, puts a price on something that is only partly under the control of the end user. Levying the charge on electricity puts the price on something that is under the user's control to at least some extent. In practice, utilities have been moving toward lower-carbon alternatives, which means this distinction will not in the current environment have practical effects, but in analytical terms it is worth preserving the observation that the amount an individual pays of carbon taxes depends on behavior from the individual as well as the utility, whereas the amount the individual pays into a public benefit fund is in the hands of the end user.

Whether this will actually lead to less usage of electricity is, on the other hand, an open question. Currently in most states the public benefit fund charges are so low that users may not even notice them. Even if they become more visible, users may not realistically be able to reduce their electricity usage. And as renewables become less expensive, electricity will become less expensive, which may actually lead to increases in electricity usage, as discussed below.

If behavioral consequences are unclear, there is another interesting consequence of levying the charge on electricity usage rather than carbon emissions: the revenues that come from a charge levied on carbon emissions will decline as carbon emissions decline. But revenues from a charge levied on electricity consumption will not necessarily decline as carbon emissions decline; indeed, the charge would still be in place even if the electricity is being generated entirely from renewables and emitting zero emissions. And if electricity consumption increases as electricity becomes cheaper, the public benefit fund charge would actually bring in greater revenue. This means the public benefit fund is a longer-term measure than the carbon tax and can effectively underpin revenue to mitigate climate change even after the shift to renewables is complete.

Carbon taxes have been in place in several jurisdictions for several decades now, and in recent years a steadily increasing body of evidence has shown that these taxes do not damage economic growth and that they do reduce carbon emissions (see [3] for a review). Given the well-documented costs of carbon (see e.g. [20]), more recent scholarship is turning to the question of why, despite their clear benefits, carbon taxes remain so unpopular and difficult to implement [4, 21–23]. Carattini et al. [22] suggest several design features that may lessen carbon tax opposition, including phasing in carbon taxes over time so that citizens can assess for themselves their costs and benefits, and earmarking the revenues for environmental purposes, which voters prefer. Fairbrother's [4] suggestions include that the tax be called a "fee" or something other than a tax, that the tax be phased in over time, and earmarking the revenue for a particular purpose. Muhammad, Hasnu, and Ekins [23] review 29 studies on the effect of the use of carbon tax revenue on the popularity of the tax; 25 of these find that use of revenue affects popularity, and a handful of studies show that earmarking the tax revenue for environmental purposes increases support for the tax.

Although there is still much that is unclear about popular opposition to carbon taxation, if public benefit funds are similar to carbon taxes then they may have benefited from the fact that they are not called "taxes," that they are in most cases used to fund renewable energy programs and other environmental goals, and that they were initially implemented at fairly low levels, allowing the public to become used to them.

Effects of public benefit funds on carbon emissions

If public benefit funds can be analogized to carbon taxes, are they successful in reducing carbon emissions? A public benefit fund, like any carbon tax, does not guarantee either lower carbon emissions, or increases in renewable energy. Unlike renewable portfolio standards, which require that a proportion of energy be generated from renewable sources, the public benefit fund only invests in options that might—or might not—boost the production of renewables. Public benefit funds do not mandate a cap on carbon emissions, or even an absolute increase in renewable energy, focusing only on funding *input* efforts (energy efficiency improvements, renewable energy research) rather than on measuring or ensuring output. In fact, such measures could lead to higher total consumption of electricity: a well-known phenomenon, the "rebound effect," documents that environmental innovations can result in higher consumption of electricity if they lower electricity prices [24]. Moreover, because wind power and solar power, the two most extensive sources of alternative energy, are both intermittent and unreliable, because electricity storage is not well developed, and because coal plants cannot adjust output on short notice as easily as natural gas plants can, it will likely be cleaner natural gas plants rather than coal plants that are displaced by alternative energy, which means the potential reduction of carbon emissions may be less than we might expect [25] (see also [26]).

Nevertheless, to date three separate scholarly studies have found systematic evidence that public benefit funds are associated with reductions in carbon emissions. (There is also some anecdotal evidence for the effectiveness of public benefit funds [8, 10, 27].) Prasad and Munch [28] studied whether any of six different types of state-level environmental policy (net metering, retail choice, fuel generation disclosure, mandatory green power options, public benefit funds, and renewable portfolio standards) was associated with declining carbon emissions in the 39 states with the greatest potential for the development of renewable energy, from 1997 to 2008. They found that public benefit funds are associated with a decrease in carbon emissions and are the only policy to have this effect (240).

Grant, Bergstrand, and Running [29] took the analysis one level down, examining the effects of these policies on over 1129 power plants across the United States. Because some

facilities are much more polluting than others, they argue that state-level measures are inadequate for understanding the effects of policies, and they take advantage of recent releases of plant-level measures. They also examine a different and wider range of policies: emission caps, greenhouse gas targets, climate action plans, greenhouse gas registries, efficiency targets, renewable portfolio standards, public benefit funds, and electric decoupling. They find that public benefit funds—along with some other policies, although not renewable portfolio standards—are "significant determinants" of emissions. They suggest this is because RPS does not address the problem that renewable energy is intermittent, whereas public benefit funds "can be used to stimulate utility investments in clean energy activities". They note, however (as do Prasad and Munch) that other policies should not be dismissed, because they may not have been in place long enough to begin showing effects. Moreover, as the authors themselves note, analysis at the plant level can hide effects that occur from the opening or closing of plants: a policy could be so successful that it forces the closing of a plant, which could lead all the other plants in that state to increase their emissions even if total state emissions are going down. Thus, plant-level analysis is a supplement, not an alternative, to state-level analysis.

Martin and Saikawa [30] update the Prasad and Munch study and analyze both a wider set of policies (including voluntary policies) and a larger number of states: they argue that since the early 2000s, developments in solar power have rendered the assumption that only states with wind power potential could be expected to reduce carbon emissions untenable. They therefore analyze all 50 states from 1990 to 2014, and study 17 different types of policies. They also study the effects of various policy combinations. Their overarching finding is that mandatory policies are effective and voluntary policies are not: "In particular, electric decoupling and mandatory GHG registry/reporting are associated with the largest reduction in emissions. Furthermore, our results indicate that mandatory GHG registry/reporting and PBF [public benefit funds] are effective in reducing both emissions and emissions intensity from the power sector". Despite differences in scope and time period, this study also finds public benefit funds to be successful at reducing carbon emissions.

Taken together, these studies suggest optimistic evidence on public benefit funds, as all the studies that have examined public benefit funds at state level have found that they are associated with reductions in carbon emissions. The two more recent studies come to different conclusions about greenhouse gas registry and reporting. Both do find electric decoupling (subsidizing electricity plants) to be effective, but the advantage of public benefit funds is that they come with a funding mechanism, whereas electric decoupling requires revenue from somewhere else to subsidize the plants. This may not always be politically feasible, as it can be seen as a giveaway to the utility industry. The aim of this paper is not to dismiss other policies, however, as much as to bring attention to public benefit funds. The research on state-level environmental policies suggests public benefit funds are worth a more careful look.

However, this research tradition has been unable to explain the reasons for the success of public benefit funds. In particular, the public benefit fund is two separate mechanisms: a charge for the use of electricity, and expenditure on various environmental measures. It is not clear whether the charge or the expenditure is having the effect. Given the low nature of the charge, and the suspicion that most ratepayers neither notice them nor change their behavior because of them, it is likely the type of expenditure having the effect, but analysts have not attempted to disentangle successful from less successful types of expenditure.

Moreover, as the tour of different kinds of public benefit funds above has taught us, not all of these funds are the same, and yet all three of these studies treat them as if they are the same. For example, in these studies Illinois's fund, half of which went to increase the market for coal,

is treated exactly the same as the lively New York and Massachusetts funds, which are busily promoting energy efficiency and renewable energy. We may find different types of funds having different effects on carbon emissions.

Policy implications

The evidence on public benefit funds can be summarized as cautiously optimistic: cautious because so few studies have examined them, but optimistic because the studies that have examined them find them to be effective. There is evidence that public benefit funds have reduced carbon emissions and given their popularity they do seem to be politically feasible in some American states, including some states traditionally seen as conservative.

These promising signs have led some to wonder if a federal program could be the way forward. Nadel and Kushler [10] estimate that a federal public benefit fund matching program could produce significant savings for consumers as well as dramatic effects on carbon emissions. A federal program seems unlikely because it has been difficult to generate widespread political support for any federal environmental policy, but if carbon pricing is to be promoted at the national level, this discussion suggests the public benefit fund, with its link to electricity usage and its clearly targeted uses for revenues, could be a more successful model than the traditional carbon tax.

Another way forward is for other states that do not yet have public benefit funds to adopt them, but there may be political limitations to this. Public benefit funds are low-hanging fruit—a policy that no one objects to, and that seems to have substantial benefits. This suggests that states that have not already adopted them are resisting them for political and ideological reasons. For example, studying the adoption of renewable portfolio standards, Vasseur [31] concludes that a "[s]tate's energy economy, the presence of Democratic politicians, and environmental movement organizations are found to be important for determining the kind of policy a state ultimately enacts". If these factors also explain resistance to public benefit funds in states that do not have them, then the only way forward in such states would be if environmental concerns become more widespread or the political or economic context changes. If and when that happens, policymakers looking for an effective environmental policy tool can turn to the public benefit fund.

Meanwhile, another path is for states that already have public benefit funds in place to incrementally increase their rates. States that have public benefit funds, such as California, may have the political will to adopt more aggressive approaches toward safeguarding the environment, but experimentation will be required to identify the rates that both maintain ratepayer support and maximize available revenue for renewable energy and energy efficiency.

The agenda for research on public benefit funds is also clear. First, the existing research has examined the effects of this policy as if all public benefit funds are the same, but this review suggests that some are more likely to lead to reductions in carbon emissions than others. Research is necessary that takes these differences into account. Second, research is necessary on what level of the tax leads to or is correlated with lower electricity usage, greater renewable energy development, and reduced carbon emissions. This question is not straightforward, as some of these dynamics operate in opposite directions—for example, higher electricity usage could lead to greater funds for renewable energy development, which could lead to lower carbon emissions. Finally, research is necessary that takes apart the two mechanisms of the public benefit fund, the tax and the expenditure, and asks whether some uses of the revenues have more beneficial effects than other uses.

Supporting information

S1 Table. Public benefit funds in the American states.
(DOCX)

S1 Data. Calculation of carbon tax equivalents for public benefit funds in the American states.
(XLSX)

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