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RETHINKING THE GREEN NEW DEAL: USING CLIMATE POLICY TO ADDRESS INEQUALITY

Aparna Mathur

The Green New Deal is best understood as an ambitious mobilization of the economic and environmental resources of the country to achieve the twin targets of net-zero greenhouse gas emissions and a more equal and fair society where workers have access to decent paying jobs with benefits, healthcare, housing, and economic security. The challenge with the Green New Deal is to address climate and inequality issues together and to finance solutions in a practical and effective manner. This paper presents tax reform solutions to address two of the central pillars of the Green New Deal — reducing greenhouse gas emissions and improving the economic situation of low-income households. Using a carbon tax as a central mechanism for achieving these goals, this paper presents a review of the existing literature on the impacts of a carbon tax. It then builds upon this idea by using a micro-simulation tax model to estimate the costs and distributional impacts of several other tax reforms. Ultimately, the paper presents two hypothetical reform proposals that implement a carbon tax, additional revenue raisers, and other targeted low-income tax reforms, such as changes to the earned income tax credit (EITC) and child tax credit (CTC), to create revenue-neutral solutions to reduce greenhouse gas emissions and raise the average after-tax income of the bottom quintile.

Keywords: Green New Deal, carbon tax, EITC, CTC

I. INTRODUCTION

The Green New Deal is best understood as an ambitious mobilization of the economic and environmental resources of the country to achieve, within a period of 10 years, the twin targets of net-zero greenhouse gas emissions and a more equal and fair society where workers have access to decent paying jobs with benefits, healthcare, housing, and economic security (H.Res.109, 116th Congress, 2019). Regarding specific climate policy, it calls upon the United States to repair and upgrade infrastructure and manufacturing facilities, guarantee universal and affordable access to clean water and electricity, invest in renewable power sources, upgrade to "smart" power grids, restore and protect threat-

Aparna Mathur: Economic Policy Studies, American Enterprise Institute, Washington, DC, USA (amathur@aei.org)

ened and weakened ecosystems, and, finally, invest in cleaner transportation systems. On the public policy goals of strengthening labor standards and boosting worker wages, it calls for providing people with affordable and high-quality healthcare, guaranteed federal jobs, housing, and benefits such as paid family leave and vacation and sick days; it also addresses the challenges of wage stagnation and growing income and wealth inequality across race and gender. While the list of goals proposed by proponents of the Green New Deal is long, a list of specific policies to achieve these goals is lacking. Perhaps because of this lack of specificity, there is no mention of costs and financing within the legislative text. This paper attempts to answer two key questions. One, what specific policies can meet the goals of the Green New Deal? Two, how are these policies financed? As a starting point, I use the main idea of the Green New Deal to connect climate policy targets with inequality reduction. I then show, using existing and new research, how a carbon tax could be a central legislative reform to solve this issue. The advantage of a carbon tax is the ability to raise a significant amount of revenue by expanding the tax base. However, existing research shows that a carbon tax can be regressive if revenues are not channeled back to the poorest households. Using a micro-simulation tax model, I model a variety of policy pathways in which the revenues from a carbon tax could be directed to strengthen existing safety net programs, such as expanding pro-work policies, including the earned income tax credit (EITC), and providing a boost to families struggling with rising childcare expenses through an expanded child tax credit (CTC). I also discuss other proposals such as universal basic income (UBI).

Existing research shows how these types of programs have helped reduce poverty and increase workforce attachment. The EITC and CTC, for instance, lifted over 8.9 million people out of poverty in 2017 by supplementing wages for low-income households and encouraging work (Beltran, 2019). Hence, an expansion of these programs is likely to help tackle the problem of inequality. The question then becomes how to raise revenues for such an expansion. One idea is a carbon tax. A carbon tax has the potential to meet emission reduction targets by discouraging the use of traditional fossil fuels and by encouraging investments in cleaner technologies. At the same time, the revenues from the carbon tax can help fund an expansion of programs such as the EITC and the CTC. While a carbon tax is clearly appealing because of its environmental impacts, I also consider other revenue raisers, such as increasing the threshold of wages subject to the Social Security tax and a 70 percent tax rate on top earners. In general, pairing a carbon tax (and other revenue raisers) with an expansion of anti-poverty programs has the potential to achieve the two primary aims of the Green New Deal.

This paper provides estimates of the static cost and distributional impacts of reforming programs such as the EITC and the CTC. While it does not present a model of the dynamic, long-run impacts of these proposals, or incorporate any behavioral responses of these particular reforms, a novel contribution of this paper is that it highlights how changing or expanding the design of existing policies can have very different impacts for low-income households. For instance, while there is much discussion of an expanded EITC, there is less discussion on what form this expansion could take. What is the impact on low-income households when we only expand the maximum credit associated with

the plateau region of the EITC, as opposed to changing the phase-in or phase-out rate of the EITC? What happens if we change the refundability of the CTC or remove its income requirement? What is the cost and net impact on low-income households if both the EITC and CTC are reformed in tandem? As this paper demonstrates, the particular design of the reform can have interesting implications for families at different points of the income distribution, as well as different cost impacts. The reform ideas discussed in this paper aim to reduce inequality (measured by changes in average after-tax incomes) by increasing wages and incomes for low-income households, while raising revenues through a broad-based carbon tax or more targeted tax rates on high-income earners.

Finally, while the paper provides a simplified and perhaps more practical approach to achieving certain objectives of the Green New Deal, there are aspects of the Green New Deal that are beyond the scope of the paper. For instance, I do not attempt to model or assess the costs of a federal jobs guarantee, the differential impacts on inequality for people across races and gender, or even certain environmental goals that a climate policy, such as a carbon tax, can fail to achieve. The focus of this paper is to shed some light on what roughly revenue-neutral combinations of policies that achieve some goals of the Green New Deal might look like.

This paper is organized as follows. Section II introduces the concept of a carbon tax as a means of achieving climate goals. Section III explains the data and methodologies used to produce the revenue and distributional impacts of the tax reforms modeled in this paper. Section IV considers other tax reforms that can be leveraged as additional revenue sources. Section V discusses various ways in which the revenues from a carbon tax and other reforms can achieve the larger social policy goal of improving the well-being of low-income households through targeted tax reform. Section VI combines these reforms and funding mechanisms to create hypothetical reform proposals, and Section VII concludes.

II. ADDRESSING CLIMATE POLICY: A CARBON TAX EXPLAINED

The Green New Deal makes climate policy a centerpiece of its platform. At a global level, carbon emissions from fossil fuels have increased significantly over the last several decades. Per the Intergovernmental Panel on Climate Change (IPCC), carbon dioxide emissions have increased 90 percent since 1970, with emissions from fossil fuel combustion and industrial processes contributing about 78 percent of the total greenhouse gas emissions increase from 1970 to 2011 (IPCC, 2014). This suggests that these emissions increases, as well as the rising concentrations of greenhouse gases in the atmosphere, are driving increases in the global average surface temperature. The long-term and central goal of the Green New Deal is to achieve "net-zero global emissions by 2050," which the IPCC states is necessary to prevent global temperatures from rising more than 1.5 degrees Celsius (IPCC, 2018).[1] This temperature target requires holding

[1] In model pathways that do not exceed this benchmark warming, global net anthropogenic carbon dioxide emissions would decrease 45 percent from 2010 to 2030, reaching net zero by 2050.

current atmospheric concentrations of carbon dioxide at 430 parts per million (ppm), which is less strict than the previous IPCC goal of limiting warming to 2 degrees Celsius (warming of 2 degrees Celsius necessitates not allowing emissions levels to exceed 450 ppm).[2] However, the means to which the United States can help limit global warming to 1.5 degrees Celsius through a net-zero emissions target by 2050 is not outlined in the text of the bill (H.Res. 109, 2019).

A. Emissions Reductions Due to Carbon Pricing

Economists have advocated that market-based instruments are more efficient than regulations or mandates as a means of addressing the social damages arising from polluting activities (e.g., Knittel, 2019; Phillips and Reilly, 2019; Morris, McKibbin, and Wilcoxen, 2015). Market-based instruments refer to policies that force firms to internalize the cost of polluting activities. In the context of climate change, the polluting activity is the release of carbon dioxide and other greenhouse gases.[3] Carbon taxes and cap-and-trade systems are two examples of market-based instruments that create a cost to emissions. A carbon tax does this directly by taxing the carbon content of fuels, while a cap-and-trade system imposes a cost by requiring the surrender of valuable permits in proportion to the carbon content of fossil fuels.[4]

Evidence suggests that carbon pricing is, in fact, an effective mechanism to achieve emissions reduction targets. Palmer, Paul, and Woerman (2012) estimate a price of $10 per ton of CO_2 to have very slight emissions reduction effects, yet a tax of $25 would reduce emissions by over 25 percent.[5] Research using the MIT Emissions Prediction and Policy Analysis (EPPA) model applies a set of cap-and-trade proposals considered by the U.S. Congress in 2007 and finds that a price of $30–$50 per ton of CO_2 would be needed to achieve the proposal's goal of reducing emissions 50–80 percent below 1990 levels, which corresponds to global stabilization of atmospheric carbon dioxide concentration at or above 450 ppm (Paltsev et al., 2007). Metcalf (2008) uses the EPPA model to show that, in the short run, a price of $15 per ton of carbon in 2015 would reduce total greenhouse gas emissions by 14 percent. Metcalf and Weisbach (2008) argue that about 90 percent of U.S. greenhouse gasses could be brought into the tax base at a relatively low cost. Hence, as the literature shows, a significant reduction in emissions as envisaged by the Green New Deal may require a relatively high carbon tax, over $40–$50 per ton of carbon. However, politically, it may be unlikely that policymak-

[2] As of May of 2019, atmospheric carbon dioxide concentrations reached an average of 414.7 ppm (National Oceanic and Atmospheric Administration, 2019).

[3] The major greenhouse gases include carbon dioxide, methane, nitrous oxide, and various fluorocarbons and other gases.

[4] While this analysis focuses on energy-related carbon emissions only, a carbon tax or cap-and-trade system can incorporate all greenhouse gases, typically by using the 100-year global warming potential coefficient for the various gases to convert to a CO_2 equivalent (CO_2e).

[5] In this paper, carbon is used as a shorthand for CO_2 and other greenhouse gases. The terms are used interchangeably in this paper.

ers would begin carbon taxation at such a high level, given its burden on households. Therefore, as discussed later in this paper, I assume that the carbon tax is set at $28 per ton of carbon, which could make significant progress toward achieving the Green New Deal target of significant emissions reduction but still leaves the option of increasing the rate over time as households have more time to adjust to the tax.[6]

B. Impacts on Households Due to Carbon Pricing

A major concern with either a carbon tax or a cap and trade is that the policies have been shown to be regressive (e.g., Poterba, 1991; Wier et al., 2005; Metcalf, 2019; Williams et al., 2015). Mathur and Morris (2012), Hassett, Mathur, and Metcalf (2008), Marron and Toder (2014), and Dinan (2012) all demonstrate that carbon pricing is regressive when measured relative to current income.[7]

The impacts on households are typically estimated using the following methodology. Researchers assume that the tax is levied on coal at the mine mouth, natural gas at the wellhead, and petroleum products at the refinery. Imported fossil fuels are also subject to the tax. While some studies assume that the tax is passed forward completely to households in the form of higher prices of goods and services, others assume that some portion of the tax falls on factors of production in the form of lower wages and rents.[8]

For instance, in Mathur and Morris (2017), a $32 per ton carbon tax is applied and the authors trace the impact of this tax on industry goods' prices and subsequently the impact on households and their expenditures. The methodology begins with Input-Output matrices from the U.S. Bureau of Economic Analysis (BEA) called the Summary Make and Use matrices from 2014. The Make matrix shows how much each industry makes of each commodity, and the Use matrix shows how much each industry uses of each commodity. Using these two matrices, an industry-by-industry transactions matrix is derived, which traces the use of inputs by 1 of 66 industries to all the other industries. Making assumptions about production and trade, we can trace the impact of price changes from the carbon tax in one industry to the products of all other industries in the economy. Using the Personal Consumption Expenditure Bridge tables, also from the BEA, those industry input price increases are translated into corresponding price increases for consumer items. Then, household level expenditure data from the 2014 U.S. Bureau of Labor Statistics' Consumer Expenditure Survey (CEX) is used to compute the carbon taxes paid (via those higher prices) by each household in the survey across 33 categories of personal consumption items. The largest price increases are estimated

[6] Many carbon tax proposals suggest increasing the tax over time while starting from a low initial level of tax. A recent example is 2020 Democratic presidential candidate John Delaney's climate plan, which includes a price of $15 per metric ton of carbon, increasing $10 each year over the next decade. Delaney's "carbon fee" claims to reduce emissions by 90 percent by 2050 (https://www.johndelaney.com/issues/climate-change/).

[7] Studies generally find carbon taxes to be less regressive as a share of consumption, rather than income.

[8] For example, Bovenberg and Goulder (2001) and Metcalf (2008).

for direct energy items, such as electricity, home heating oil, and gasoline. However, price increases are also found for other household items, such as clothes, shoes, and transportation, since all of these items use fossil fuels in production. The increase in household expenditures as a result of the carbon tax is the carbon tax burden. Using this standardized methodology, Mathur and Morris (2017) find that the carbon tax burden on the lowest income decile is over five times the burden on the top decile when measured as a fraction of annual income.[9]

Table 1 compares results from existing research analyzing the carbon tax burden on households. All studies show distributional impacts, either by decile or by quintile, using microdata (first column). The second column shows the ratio of the carbon tax burden of households at the bottom of the income distribution to the households at the top of the income distribution, as estimated uniquely by each study. The third column shows the burden on households at the bottom of the income distribution. Therefore, while a carbon tax might help achieve the Green New Deal's goal of emissions reduction, its regressivity could potentially exacerbate inequality issues, which is counter-productive to the other goal of increasing the incomes of low-income households.[10]

C. Revenue Gains from Carbon Pricing

Per the Energy Information Administration, energy-related emissions of CO_2 were 5,268 million metric tons in 2018 (U.S. Energy Information Administration, 2019). Given a $25 tax per ton of carbon, ignoring short-run reductions in emissions and assuming, as is typical, 85 percent of these emissions are taxable, a carbon tax of this level is expected to raise $112 billion in 2018 dollars.[11] This is in line with the Congressional Budget Office's (CBO's) recent estimate of a $25 tax per ton of carbon yielding $103.4 billion in additional revenue (CBO, 2018a).[12] Other studies suggest that a carbon tax would raise roughly $125 billion annually, with variation occurring based upon the policy's design (Palmer, Paul, and Woerman, 2012). Recently, a joint study published by researchers at Columbia University's Center on Global Energy Policy and the Tax Policy Center (TPC) estimated that a tax per ton of carbon set at $14, $50, and $73 would increase government revenue by about $60 billion, $180 billion, and $250

[9] A recent analysis using Treasury data on 322,000 families suggests that, when measuring carbon tax burdens as a fraction of consumption, a carbon tax may, in fact, be marginally progressive (Cronin, Fullerton, and Sexton, 2017).

[10] Pursuant to this finding, several recent research papers show that the regressivity of pricing carbon through market-based means can be either partially or fully offset if revenues are recycled appropriately. Recent policy ideas include lump sum rebates, payroll tax cuts and corporate tax swaps, expansion of the EITC and other transfer payments, such as Supplemental Nutrition Assistance Program (SNAP) and Temporary Assistance for Needy Families (TANF), and an expansion of Social Security benefits (e.g., Grainger and Kolstad, 2010; Williams et al., 2015; Callan et al., 2009; Mathur and Morris, 2017).

[11] Eighty-five percent of the total million metric tons of carbon in 2018 is 4,477.8 million metric tons of energy-related emissions, which serves as the tax base. Multiplying this by a $25 tax results in $111.95 billion dollars. Assuming 85 percent of emissions to be taxable is standard and follows existing methodology.

[12] See CBO (2009), as well as the CBO's working paper on the topic Dinan, (2012).

Table 1
Overview of Literature on the Distributional Impacts of Carbon Pricing

Paper	Definition of Household Income Level	Ratio of Carbon Tax Burden on Low-Income Households to High-Income Households	Burden on Low-Income Households as a Fraction of Income (%)
Mathur and Morris (2012)	Deciles by annual income from CEX	5.62	3.54
Hassett, Mathur, and Metcalf (2009)	Deciles by annual income from CEX	4.62	3.74
CBO (2009)	Quintiles by a measure of after-tax income, constructed from IRS SOI, CPS, and CEX data	3.57	2.5
Rosenberg et al. (2018)	Quintiles by expanded cash income, as constructed by the TPC's Tax Model	1.91	2.1

Notes:
1. Column 1 notes how each study classifies low- and high-income households.
2. Column 2 presents the author's calculations of each study's ratio of the carbon tax burden on low-income households to high-income households.
3. Column 3 presents the burden on low-income households due to a carbon tax.
4. After-tax income, as defined by the CBO (2009), accounts for cash and non-cash income and adjusts for household size. After-tax household income reflects the impact of federal income, payroll, and excise taxes.
5. Expanded cash income equals cash income plus (a) tax-exempt employee and employer contributions to health insurance and other fringe benefits, (b) employer contributions to tax-preferred retirement accounts, (c) income earned within retirement accounts, and (d) food stamps. For a more detailed description, see https://www.taxpolicycenter.org/resources/income-measure-used-distributional-analyses-tax-policy-center.
6. The Tax Model uses data from the 2006 PUF produced by the SOI division of the IRS, the 2012 March CPS, the Survey of Consumer Finances, the CEX, and several other data sources. For a more detailed description of the data and methodologies used by the TPC model, see https://www.taxpolicycenter.org/resources/brief-description-tax-model.

billion, respectively, per year in the 2020s (Kaufman and Gordon, 2018; Rosenberg et al., 2018). Researchers at the U.S. Treasury Department estimate that a tax of $49 per metric ton of carbon in 2019 would generate $194 billion in its first year, which is equivalent to nearly 50 percent of projected corporate income tax payments, or 20 percent of the Old Age, Survivors and Disability Insurance portion of the payroll tax (Horowitz et al., 2017). All these estimates suggest that a carbon tax has the potential to raise a significant amount of revenue, dependent on the level of the price on carbon.

Furthermore, a carbon tax could allow a reduction in tax expenditures, as well as spur new investments in clean research and development (R&D) technologies. Currently, the United States spends about $4 billion annually in oil and gas production tax breaks. These can be removed along with the $18.3 billion in tax preferences for renewables and energy-related projects, which would no longer be needed since the tax on carbon is an implicit subsidy to renewable fuels (Congressional Research Service, 2019).[13] Finally, a tax on carbon will encourage producers to shift away from polluting fuels and toward cleaner technologies due to increased energy prices.[14] In a recent paper, Fried (2018) uses a dynamic, general equilibrium model and finds that a carbon tax induces large changes in green innovation, which increases the effectiveness of the tax in reducing emissions.

D. Underlying Carbon Pricing Estimate

While one can use any of the distributional analyses highlighted in Table 1 to capture the burden of the carbon tax on households, for purposes of this paper, I present results using the revenue and distributional estimates of a $28 per ton carbon tax. This level is chosen for several reasons. One, it is a relatively central estimate in terms of the estimated social costs of carbon. In a survey of 75 studies, Tol (2013) found 588 estimates of the social cost of carbon based on varying assessment models, policy assumptions, and discount rates. At a real discount rate of 3 percent, the mean social cost of carbon was placed at $25 per ton with a standard deviation of $22; the CBO estimate of $28 is only $3 above the average social price. The CBO consistently cites this $28 per ton of carbon estimate and provides both a revenue estimation and distributional analysis by quintile for this tax price, which is key to the analysis presented in this paper. This distributional analysis allows the quintile changes in after-tax income due to a carbon tax to be compared to and put in context with the quintile changes in after-tax income due to the other tax reforms modeled by the micro-simulation model in this paper. Finally, the CBO estimates are in line with other studies cited above, with the estimated carbon tax burden varying within a percentage point of other studies. This suggests that the estimated impacts shown in this paper should be generally similar, irrespective of the study chosen.

One limitation of using an existing distributional analysis of a carbon tax is that the interaction of the carbon tax with existing programs, such as the EITC and the CTC, is not explicitly modeled. For instance, Mathur and Morris (2014) show that a carbon tax could affect receipt of EITC benefits if it reduces the wage income of low-income households. However, as the results from their paper show, these effects are negligible.

[13] These ideas are discussed in "Paying for Pollution: Why a Carbon Tax is Good for America" (Metcalf, 2019).

[14] In *Fiscal Therapy*, Gale (2019) argues for a carbon tax as a revenue raiser while suggesting financial assistance for affected workers as jobs transition away from traditional fossil fuel industries to newer, cleaner industries.

In addition, analyzing carbon tax interactions with other benefit programs is complicated because of the lack of household level surveys that provide information both on consumption patterns of households and benefit receipt. Therefore, for purposes of this paper, I rely on the CBO estimates of the tax, as discussed, and treat the revenue and distributional consequences of a carbon tax as being independent of any interaction with other programs such as the EITC and the CTC.

III. DATA AND METHODOLOGY

In order to estimate the revenue and distributional impacts of other revenue raising and income redistribution policy reforms modeled in this paper, I use Tax-Calculator release 2.2.0, developed by AEI's Open Source Policy Center and housed by the Policy Simulation Library.[15] Tax-Calculator uses the 2011 Internal Revenue Service–Statistics of Income (IRS-SOI) Public Use File (PUF) and a recent Census Current Population Survey (CPS) to compute federal income taxes and Federal Insurance Contribution Act (FICA) taxes for a sample of filing units, beginning in 2013. The model then creates a micro dataset that closely reproduces the multivariate distribution of income, deduction, and credit items in 2009, and extrapolates to 2015–2029 levels in accordance with CBO forecasts released in the spring of 2016. Additional information on non-filers is taken from the March 2013 CPS. All estimates in this paper use 2018 dollars and a baseline of 2018 law. All results exclude filers with negative after-tax income and those claimed as dependents in the baseline sample.[16] After-tax income, as defined by Tax-Calculator and used in all analyses in this paper, is the sum of wage and salary income net of certain items[17] minus all federal tax liability (individual and payroll). The additional revenue generated by any particular reform is calculated by subtracting the total tax revenue under the reform scenario from the current estimated total tax revenue in 2018. In general, behavioral responses are not modeled in Tax-Calculator. Therefore, all distributional changes in after-tax income are static estimations. I do not model the long-run, dynamic impacts of these proposals or any behavioral responses (such as higher labor force participation rates or changes in family structures) that could arise as a result of these reforms.

[15] See the open source model at https://github.com/PSLmodels/Tax-Calculator.

[16] Those with large business losses make up a significant part of this non-positive income population. These individuals often have other means of wealth and are likely not welfare recipients because of investment income thresholds and asset testing qualifications of the social safety net. As such, I find it misleading to include them in the sample and analyze them among the poorest households, thus justifying the exclusion of non-positive incomes.

[17] Items netted out of wage and salary income include the following: defined contribution pension contributions, tax-advantaged defined contribution pension contributions for taxpayer and spouse, taxable and non-taxable interest income, dividends, state and local income tax refunds, alimony received, Sch. C business net income/loss, capital gain distributions not reported on Sch. D, Form 4797 other net gain/loss, taxable Individual Retirement Account distributions, total pension and annuity income (including defined benefit-plan benefits), Sch. E total rental, partnership, S-Corporation income/loss, Sch. F farm net income/loss, Sch. D net short-term capital gain/loss, Sch. D net long-term capital gain/loss, other Additional Marginal Tax taxable income items from Form 6251, and half of the employer share of FICA taxes on wages/salaries.

The only point at which I incorporate any behavioral responses in this paper is when analyzing the revenue impacts of the 70 percent tax rate on incomes above $10 million. In deriving this estimate, I manually apply estimates of the elasticity of taxable income (ETI) of high earners from the literature to obtain the projected revenue yields. This is discussed more fully in Section IV.

IV. ALTERNATIVE PROPOSALS FOR RAISING REVENUES

In this section, I consider two other commonly discussed proposals for raising revenue. The first is a significantly higher marginal tax rate on top income earners. The second involves raising the Social Security payroll tax cap.

A. A 70 Tax Rate on Top Incomes

Rep. Ocasio-Cortez, who co-sponsored H. Res. 109 (the Green New Deal Resolution), proposed a 70 percent tax rate on income above $10 million.

There is a large literature in public finance that has studied how taxpayers respond to high-income tax rates (Feldstein, 1999; Chetty, 2009). In general, while real responses, such as changes in the labor supply, have been estimated to be low, other responses, such as shifting taxable income to different taxable bases, shifting taxation forward to a different time period, or even shielding income from taxation through use of deductions, credits and tax shelters, tend to be high. The ETI captures all of these responses, measured as the percentage change in reported taxable income in response to a percentage change in the (net-of) tax rate.

In a recent review of the research, Saez, Slemrod, and Giertz (2012) conclude that the findings from most empirical studies suggest that the behavioral response to changes in marginal tax rates is likely to be concentrated at the top of the income distribution, with less evidence of any response for middle- and upper-middle-income individuals. For instance, Goolsbee (2000) calculate very high short-term elasticities (greater than one) of executives, attributed to the exercise of compensation options in anticipation of tax rate increases. Auten, Splinter, and Nelson (2016) find that high-income taxpayers show significant responses to changes in tax rates in order to limit their tax liability.

I model the revenue implications of a 70 percent tax on income above $10 million, using various elasticities for these high-income taxpayers. I apply a 70 percent rate tax to ordinary income above $10 million. Ordinary income includes wages, salaries, interest, and business income. This 70 percent tax rate decreases the net-of-tax rate on the portion of income above $10 million by 52.38 percent. To see how the revenue estimates can change when accounting for behavioral responses, I present results with an ETI of 0.25 and 0.6. Saez, Slemrod, and Giertz (2012) point to an ETI of 0.25 as a central estimate from the ETI literature, which largely focuses on low- and middle-income households and, hence, is a conservative estimate of the behavioral response. However, to account for stronger behavioral responses that are more likely to apply to higher income households, I present results with an ETI of 0.6 as well. Assuming the ETI to be 0.25, this implies that ordinary income would fall by 13.10 percent, while an ETI of 0.6 implies that ordinary income would fall by 31.43 percent.

Table 2
Revenue Generated from Various Tax Reforms

70% Tax Rate on Income above $10 Million	Additional Tax Revenue Generated ($Billions)
ETI = 0	14.9
ETI = 0.25	10.8
ETI = 0.6	5.0
Increase the Cap on Earnings Subject to the Social Security Payroll Tax to ($)	
135,000	9.2
150,000	26.7
175,000	48.2

Note: Ordinary income includes only wage, salary, interest, and business income.
Source: Author's calculations using Tax-Calculator release 2.2.0.

Table 2 presents the revenue impacts of this income tax reform under the two different ETI assumptions. As the results highlight, applying a 70 percent tax rate to ordinary income over $10 million generates nearly 89 percent more tax revenue from this portion of income than under current law. Yet, accounting for behavioral responses decreases this revenue gain by 27.8 percent when calculated using an ETI of 0.25, and by 66.7 percent with an ETI of 0.6.

It is important to note that capital gains and dividends are taxed at different rates and only upon realization, which allows individuals to defer taxation in high tax years and implies that this income has a different elasticity. The elasticity associated with that income has, in some cases, been estimated to be higher than 0.25 (Bogart and Gentry, 1995). Therefore, I apply the rate increase only to ordinary income and not to all taxable income. Increasing the tax rate on capital gains and dividends should be analyzed separately and increasing the tax on that form of income is not discussed here.[18]

The above suggests that accounting for behavioral responses is critical to accurate revenue projection. This is an important point for policymakers to understand as the projected revenue from these policies is often discussed as the source of funding for social programs.

B. Raise the Social Security Payroll Tax Cap

Another proposal to raise revenue is to broaden the tax base by expanding the amount of income subject to the Social Security payroll tax. Currently, Social Security is financed by a 12.4 percent payroll tax on wages until the taxable maximum cap, with half paid

[18] Along the same lines, modeling by the Tax Foundation shows that, when accounting for both the elasticity of taxable income and the capital gains elasticity, the proposal would lose approximately $63.5 billion between 2019 and 2028 (Pomerleau and Li, 2019).

by workers and half paid by employers. Since the tax applies only on households earning less than $128,400, the tax is regressive.[19] So what happens if we raise the taxable maximum cap and bring a larger share of high incomes into the tax base? This could potentially further help attain the goals of the Green New Deal by taxing high-income earners and using the revenues to expand programs aimed at low-income households. Table 2 presents the additional revenue generated by increasing this threshold at different levels.

The modest proposal of increasing the cap to $135,000 or $150,000 reduces the average after-tax income of the top 10 percent by less than 0.23 percent, while generating between $9.2 billion and $26.7 billion in revenues. Increasing the cap to $175,000 still only reduces the average after-tax income of the top decile by 0.43 percent, while generating an additional $48.16 billion in revenue. As discussed later, these estimates assume no behavioral responses.

Policymakers, such as Senators Moynihan and Kerrey and Presidents Clinton and Bush, have discussed similar proposals, though in the context of bolstering Social Security funds rather than recycling revenue to fund other social policy goals. More recently, Diamond and Orszag (2005) have argued for doing away with the cap on taxable earnings, while projections from the CBO have estimated revenue increases from increasing the amount of earnings subject to the Social Security payroll tax to a $250,000 threshold (CBO, 2016). Several others (Friedberg, 2000; Wilson, 2001) also worry about the deadweight loss of raising taxes on high-income earners. However, there is still considerable uncertainty about what the elasticity would be for this type of a tax hike. Liebman and Saez (2006) find little evidence to support a large behavioral response, and estimates from the Congressional Research Service find net positive revenue outlays from increasing the maximum taxable earnings subject to the Social Security payroll tax (Congressional Research Service, 2018).

In the next section, I show how the revenues from the proposals highlighted above could be redirected toward low-income households, with the aim of reducing inequality.[20]

V. HELPING THE POOR AND REDUCING INEQUALITY THROUGH TARGETED REFORMS

The second broad goal of the Green New Deal is inequality reduction and expanding wages and benefits of poor households. Recent data from the CBO (2018b) show that post-tax and transfer income grew by 103 percent between 1979 and 2015 for the top

[19] This is the 2018 threshold, the year of analysis used in this paper. In 2019, this threshold is $132,900.

[20] In recent years, there have been several other proposals to raise revenues (and, subsequently, direct funds toward low-income households). Many of these broaden the base and move away from income taxation and toward consumption taxation. In a recent paper, Burman (2019) proposes a Universal EITC funded by a value-added tax. Carroll and Viard (2012) proposed an X Tax, which is a two-part tax with separate components for households and businesses. Tax Foundation (2016) proposes eliminating stepped-up basis and taxing carried interest as ordinary. This paper focuses on and models only three potential tax reforms, though there exist a wide variety of ways to raise revenue.

quintile, relative to 79 percent for the lowest quintile and 46 percent for the middle three quintiles.[21] In this section, I focus on a few reforms that could directly increase after-tax incomes and benefits for low-income families.

A. EITC Reform

The Green New Deal aims to expand wages and incomes for workers. One possible policy that could help achieve that goal is the EITC program. The EITC is an anti-poverty program that aims to supplement earned incomes for low-income families through a refundable tax credit. The credit's refundability means that it not only provides tax savings to households, but also directly transfers the remaining credit amount, beyond eliminating their tax liability, to the qualifying filers as cash. This cash transfer to families directly reduces poverty (Neumark and Wascher, 2001). At the same time, the EITC has been shown to encourage work among recipient families (Eissa and Liebman, 1996; Meyer and Rosenbaum, 2001). Several recent proposals offer ideas for reforming the EITC by expanding the credit for families without children, making the credit available monthly, and expanding the amount of the credit (Burman, 2019; Maag, Werner, and Wheaton, 2019). Previous work, such as Mathur and Morris (2017), puts forth a policy simulation in which Congress expands the EITC program for childless workers. Building upon this work, I use Tax-Calculator to estimate the costs and distributional impacts of expanding the EITC in other ways. I model five different reforms to the EITC, all in terms of a baseline 2018 law. I focus on after-tax income since the EITC not only provides tax savings, but also adds to the cash income of families directly.

The design of the EITC is a plateau-shaped credit contingent upon filers' earned income. There is a phase-in rate that applies to those earning less than an inflation-adjusted threshold, a plateau region where filers receive the maximum EITC, and a phase-out rate for those earning above an income-adjusted threshold.[22] All rates, income thresholds, and maximum credit amounts differ based upon the number of child dependents of a filer. Therefore, reforming the EITC could have very different implications for filers, contingent upon not only which piece of the EITC design is undergoing change, but also the family composition of those at the bottom of the income distribution. I consider the following sample of reforms, all of which are focused on expanding the size of the credit for low-income families by either allowing them to access the maximum level of credit faster, expanding the size of the maximum credit, or allowing them to receive a larger share of the benefit in the phase-out region of the EITC. The proposed reforms are as follows: (1) doubling the maximum credit amounts, (2) doubling the phase-in rates, (3) eliminating the phase in (i.e., everyone below the phase-out threshold receives

[21] The extent of the growth in income inequality has been debated. In a recent paper, Auten and Splinter (2018) show that the share of post-tax income for the top 1 percent grew by much less than had been reported in Piketty and Saez (2003), with the use of revised methodologies.

[22] Those making above $49,194, $45,802, $40,320, and $15,270 in 2018 with three, two, one, or no child dependents, respectively, were ineligible to receive the EITC. These amounts are adjusted for inflation yearly.

the maximum credit), (4) cutting the phase-out rate in half, and (5) equalizing the EITC such that all filers have the same maximum credit amount, phase-in rate, and phase-out rate, irrespective of the number of children. I show the impact of these reforms on the after-tax income of households, since the EITC does not directly change wages for households but does affect their household incomes through either a reduction in their tax liability or through a direct cash transfer. Increasing filers' after-tax incomes gives them more resources to spend on themselves and their families. Chetty, Friedman, and Rockoff (2011) show that raising income through an increase in the EITC by $1,000 resulted in improved test scores for children, which in turn increased their probability of attending college, raised their earnings, and reduced teenage birth rates.

Table 3 shows that doubling the maximum credit would cost $62.2 billion and would increase the average after-tax income by $2,404 for filers with non-zero income changes (i.e., filers who are directly affected by this policy reform). The least costly reform is doubling the phase-in rate, with an average increase in after-tax income of $735 per affected filer. In order to address the concern of helping poor households and reducing inequality, distributional changes of each reform are crucial. The percentage

Table 3

Costs and Changes in After-Tax Income of Reforming the EITC

Reform Policy	Cost of Reform ($Billions)	Average Change in After-Tax Income per Filer, across Filers with Non-Zero Income Change ($)
Double maximum credit amount	62.2	2,404
Double phase-in rate	4.6	735
All receive maximum credit until phase out (eliminate phase in)	11.6	802
Cut phase-out rate in half	15.2	775
Equal credit and rates across number of children	84.0	2,160

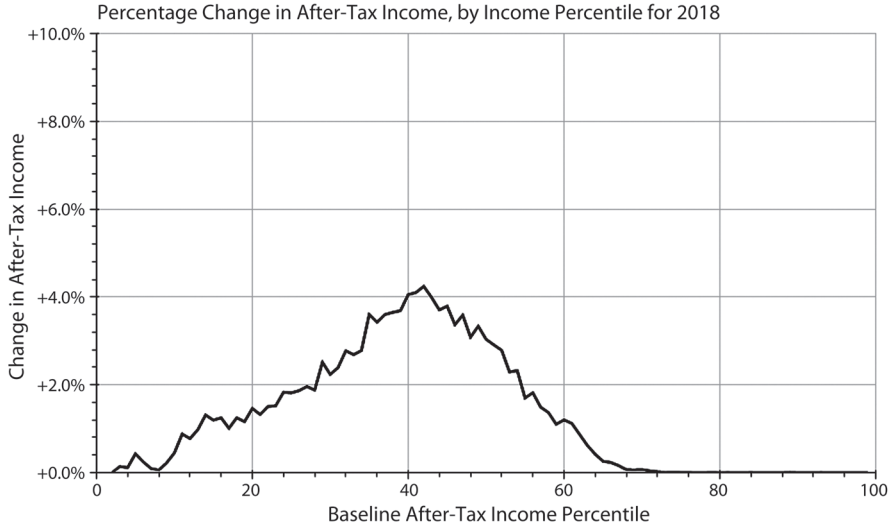
Notes:
1. Baseline is 2018 current law values of the EITC: $519 for filers without children, $3,461 for one child, $5,716 for two children, and $6,431 for three or more children. The phase-in rate is 7.65% for no children, 34% for one child, 40% for two children, and 45% for three or more children. The phase-out rate is 7.65% for no children, 15.98% for one child, and 21.06% for two or more children.
2. The reform creating equal credit maximums across children increases all filers' maximum credit potentials to $6,431, their phase-in rate to 45%, and their phase-out rate to 21.06%, irrespective of number of qualifying child dependents.
Source: Author's calculations using Tax-Calculator release 2.2.0.

change in after-tax income across the income distribution, together with the cost of each policy, is critical information to policymakers in understanding how to most effectively improve the standards of living of low-income households in a revenue-neutral way. As evidenced here, some policies are highly targeted at the bottom, whereas others have broader impacts across low- and middle-income households. With this information, policymakers can make evidence-based and informed policy decisions, balancing the effects of income increases with the costs of taking such action.

Precisely which percentiles are impacted by these proposed changes? As illustrated in Figure 1A, while doubling the maximum EITC amount is targeted in the sense that it does not benefit those in the top 25 percent of the income distribution, the poorest filers feel little impact from this reform because they are largely in the phase-in region of the EITC. Doubling the maximum credit leads to the largest average tax change, but a large portion of this tax reduction is concentrated at the 30th–50th income percentiles. Conversely, Figure 1B highlights that a reform that enables all filers to receive the maximum EITC credit until their income hits the phase-out threshold is far more concentrated at the very bottom of the income distribution. Although the average tax reduction is only $802 (less than 34 percent of the income increase due to doubling the maximum EITC), it is the bottom 20 percent receiving this benefit. As shown in Figure 1B, this policy increases the lowest-end after-tax incomes (bottom 5 percent of filers) by more than 50 percent.

Figure 1A

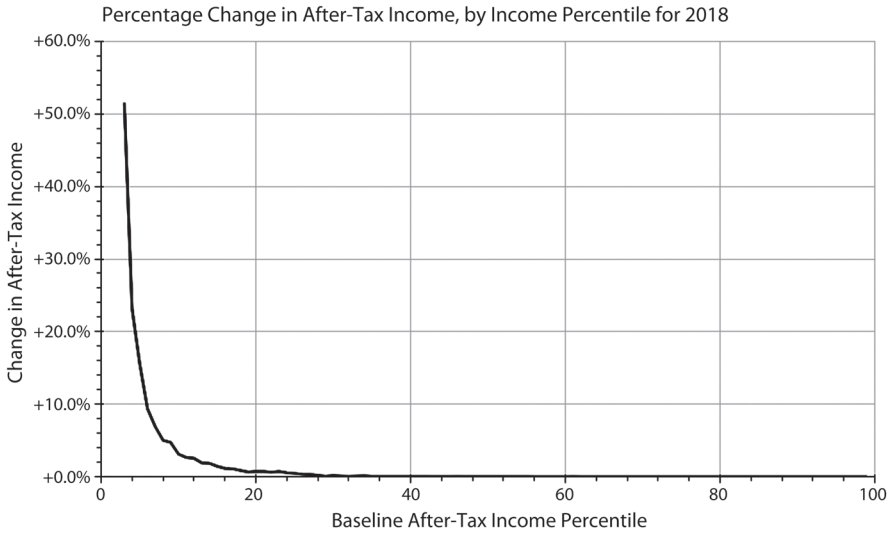
Distributional Impact of Doubling the EITC Maximum Credit



Source: Author's calculations using Tax-Calculator release 2.2.0.

Figure 1B

Distributional Impact of Eliminating the EITC Phase-In Rate



Source: Author's calculations using Tax-Calculator release 2.2.0.

Under current law, the EITC is dependent upon the number of children a filer has. For instance, the 2018 maximum credit amount for a filer with no children is only 8 percent of that of a filer with three or more children. Reforming the EITC such that the maximum credit amounts, phase-in rates, and phase-out rates are equal irrespective of a filers' number of children could also align with the policy goal of helping low-wage workers. In other results not shown here, I set the schedule for all filers equal to that of filers with three or more children. In this case, the bottom 60 percent is largely impacted by this reform. The 20th–25th percentile of workers sees the largest change in after-tax income, with over a 10 percent increase. The level of after-tax income increase phases out over the income distribution, with all tax changes concentrated in the bottom 60 percent.

B. CTC Expansion

The second income redistribution policy expands the CTC. The CTC aims to help low- to middle-income families account for the expenses of childcare by reducing their tax burden. At the same time, access to affordable childcare has been shown to enable greater engagement in the workforce, leading to higher earnings and family incomes (Ansel, 2016; Blau and Kahn, 2013). Therefore, CTC reform has the potential to expand after-tax incomes directly, but also potentially through higher wages and access to jobs, which furthers the aims of the Green New Deal. While I can model the changes in after-tax incomes, I do not model the impact on labor force participation and access to jobs, which are beyond the scope of this paper. Under current law, the CTC reduces filers'

tax liabilities by up to $2,000 per qualifying child dependent. Of this credit, $1,400 is refundable, while the remaining $600 is non-refundable. This refundable portion of the CTC is known as the Additional Child Tax Credit, and it is limited to 15 percent of earnings above $2,500 (thus, those with incomes below $2,500 cannot claim this refundable $1,400 credit).[23] Dependents who do not qualify for the CTC may be eligible for a non-refundable credit of $500 per dependent under the Credit for Other Dependents.[24]

Table 4 describes a list of potential reforms to the CTC that would expand the credit with the goals of the Green New Deal in mind — reducing inequality and increasing incomes for lower-income working individuals. Again, there are numerous possible ways to reform the CTC design, which all have very different implications for families

Table 4

Aggregate Costs and Changes in After-Tax Income of Reforms to the CTC

Reform Policy	Cost of Reform ($Billions)	Average Change in After-Tax Income per Filer, across Filers with Non-Zero Income Change ($)
Double non-refundable value per child	63.7	2,565
$1,000 bonus credit for qualifying children under five	10.0	1,123
All $2,000 of credit is refundable	3.4	433
All $2,000 of credit is refundable and eliminate $2,500 income requirement	7.1	444
Increase the credit to $2,750 and make it entirely refundable	37.5	1,148
Double credit to $4,000 and make it entirely refundable	87.2	2,661

Source: Author's calculations using Tax-Calculator release 2.2.0.

[23] The Tax Cuts and Jobs Act (TCJA) reduced the earnings limitation from $3,000 to its current level of $2,500. This provision is set to expire and return to pre-TCJA levels at the end of 2025.

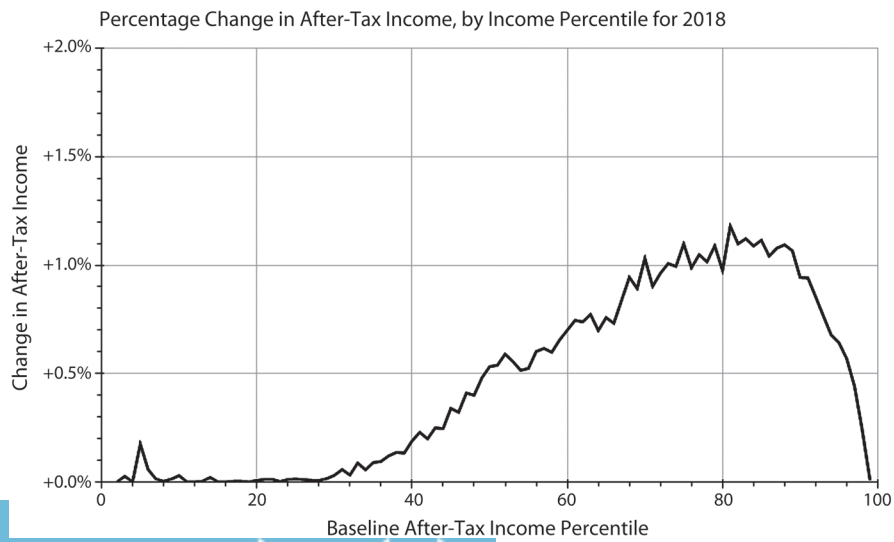
[24] Another potential reform is to the Child and Dependent Care Credit (CDCC). The CDCC is a credit of up to $3,000 for one qualifying dependent and $6,000 for two or more qualifying dependents. The credit can be claimed for expenses related to the care of a qualifying individual that enabled the filer or a spouse to work. However, this is not refundable, which means that the benefits are concentrated among relatively middle- and higher-income earners and not among those who have no tax liability. Tax-Calculator does not currently have information on childcare expenses beyond the existing data (which are capped at $3,000 of expenses per filer under current law), so I am unable to precisely estimate how expanding or making the credit refundable would help low-income workers.

at different income levels. For instance, I consider doubling the non-refundable portion of the CTC, making the credit fully refundable, and expanding the size of the credit. The costliest reform to the CTC is doubling the credit to $4,000 and making it entirely refundable, which has average tax savings per affected filer of $2,619. This produces a significant change in after-tax incomes for low- to moderate-income households. The least costly reform is making the current $2,000 entirely refundable, which produces an average after-tax increase of $433 per affected filer.

Because the CTC phase-out threshold affects filers at the top of the income distribution (the phase-out threshold for married filers is $400,000), analysis across the income distribution is even more important than for the EITC, which is inherently a more targeted program. Figure 2A illustrates the effects of doubling the non-refundable portion of the CTC. Under this reform, the 80th percentile would see a nearly 1 percent increase in after-tax income, while the bottom half would see little to, at most, a 0.2 percent increase in after-tax income. Instead, if we make CTC's current total value of $2,000 per child entirely refundable and eliminate the $2,500 minimum income requirement, as shown in Figure 2B, this would increase incomes at the very bottom by nearly 1 percent, while the bottom 20th–40th percentiles would see an increase in after-tax income by somewhere between 0.3 and 0.7 percent. The effects phase out from the 40th to 60th percentiles, and no effects reach above the 65th percentile. Hence, if the purpose of the Green New Deal is to increase incomes and earnings for those at the bottom, a better reform would be to make the CTC entirely refundable and eliminate the minimum earnings requirement, rather than to expand the non-refundable portion of the CTC.

Figure 2A

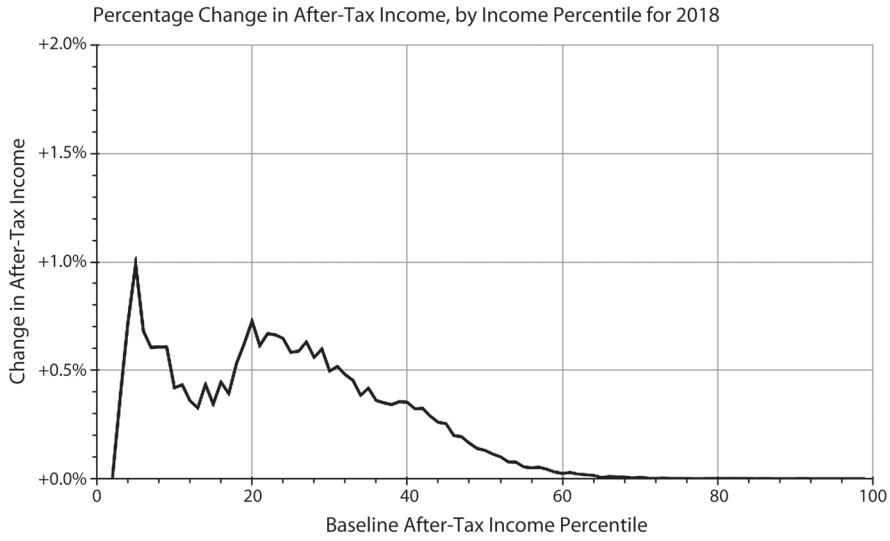
Distributional Impact of Doubling the Non-Refundable Portion of the CTC



Source: Author's calculations using Tax-Calculator release 2.2.0.

Figure 2B

Distributional Impact of Making the Entire CTC Refundable and Eliminating the $2,500 Income Requirement



Source: Author's calculations using Tax-Calculator release 2.2.0.

C. Basic Income Programs

Finally, another possible policy solution to reduce income inequality and provide economic opportunity to those at the bottom of the income distribution is a basic income program. UBI is a policy in which everyone receives a defined government transfer each year, often discussed by policymakers as a system to replace existing benefit programs and to provide direct cash help, particularly to those who are most vulnerable. In this paper, I model both a UBI policy (aimed at everyone above the age of 21) and a modified version of this policy idea — conditioning the transfer on tax filers' age, rather than making it universal. One advantage of the latter program is that a basic income for those 18–20 years old targets younger workers who are likely transitioning between school and their first job. Any income support at this time would enable them not only to be able to invest better in their education or vocational training, but to potentially secure a decent paying job, which could lead to a lifetime of better incomes (Mincer, 1994; Anderson et al., 2016). A recent report also links initial underemployment of young workers in their first jobs with long-term negative consequences for career advancement and income, further emphasizing the need to invest in the human capital of young workers (Burning Glass Technologies, 2018). In addition, since the policy is targeted, the costs are not as high as for a UBI policy that gives everyone a transfer.

The basic income program available to those 21 and older is more similar to the traditionally conceived UBI. I model a basic income of both $5,000 and $10,000 per year, for both 18- to 20-year-olds and those 21 and older. In this framework, the basic

income transfer is assumed to be taxable (administratively, the transfer is added to a filer's adjusted gross income). Again, using Tax-Calculator, I develop a set of cost estimates for these different basic income policies. I estimate the total amount of basic income transfer payments made under each program and then subtract the estimated amount of additional tax revenue generated from the increased AGIs. This produces a projected cost for each policy, presented in Table 5. As is clear, these reforms have immense costs, with the most expansive UBI program — a $10,000 taxable transfer to all filers 21 years and older — projected to cost more than $2 trillion. Similarly, Hoynes and Rothstein (2019) estimate a UBI program of $12,000 for all filers age 18 and older to cost about $3 trillion. Many policy conversations present basic income solutions in tandem with entitlement cuts, and such a reform would inevitably lower these costs.[25]

A basic income program that does not phase out over income is progressive, since an increase in household income of $5,000 or $10,000 is a larger share of disposable income for lower-income households than for high-income households. While a basic income program where all filers age 21 and older receive a taxable $10,000 transfer costs over $2 trillion, this comes with the benefit of immense progressivity. Under this policy, the bottom 20 percent see a 50.4 percent increase in their after-tax income. Even the top quintile has a measurable income increase of 6.4 percent. While the necessity of expanding the incomes of the top 20 percent is up for debate and seen by some as an inherent unnecessary cost in the design of a UBI program, the full scope of the program's impact is worth noting. Under the least expansive basic income program modeled in this paper, an additional $5,000 in taxable income to filers age 18–20, the after-tax income of the bottom 20 percent increases 5.21 percent and the next quintile still sees an increase in after-tax income of 1.5 percent. The average after-tax income of the top decile sees little impact, with an average increase in after-tax income of 0.12 percent.

Table 5

Costs of Basic Income Policies

Reform Policy	Total Cost ($Billions)
$5,000 fully taxable, 18–20 years old	67.6
$10,000 fully taxable, 18–20 years old	134.1
$5,000, fully taxable, 21 years and older	1,013.1
$10,000 fully taxable, 21 years and older	2,009.2

Source: Author's calculations using Tax-Calculator release 2.2.0.

[25] I consider a preliminary estimation of one such policy idea, subtracting the reported annual costs of SNAP, TANF, and unemployment insurance (UI) benefits. Recent data of SNAP, TANF, and UI benefits indicate that benefit payments for these three assistance programs totaled approximately $123.95 billion. Data on benefit programs is for the most recently available fiscal year, as provided by the Office of Family Assistance, the Food and Nutrition Service, and the U.S. Department of Labor. Curbing entitlements while instituting a basic income program shows a net revenue surplus for both programs applied to 18- to 20-year-olds. However, when extending this to all filers age 21 and older, the costs for a $10,000 basic income, with benefit repeals, are still over $1.9 trillion.

D. Other Policies

Other items in the Green New Deal agenda include a federal jobs guarantee and improving access to paid family and medical leave. The Green New Deal aims to provide all individuals seeking work with a job that pays a minimum wage of $15 and provides benefits such as sick days, paid family and medical leave, and childcare. The costs of a federal job guarantee are hard to model, since such a guarantee may not only induce the unemployed to seek these positions, but also encourage people who are paid less than $15 to change jobs. Similarly, research shows that paid leave policies can yield longer-term economic benefits but come at a cost. For instance, access to leave allows women to stay engaged in the workforce, have higher earnings when they return to work, and have stable careers with the same employer (Byker, 2016; Berger and Waldfogel, 2004; Rossin-Slater, Ruhm, and Waldfogel, 2013). While an extensive discussion of the costs and benefits of paid family leave programs is beyond the scope of this paper, existing models show that the costs of such policies depend upon not only the parameters of the policy, such as the extent of wage replacement, the duration of leave, and the inclusiveness of the policy, but also the response of private sector employers to a federal program and employee take-up responses.[26]

VI. COMPARING AND COMBINING REFORMS

This paper ultimately provides two hypothetical reform proposals that each combine a carbon tax and various additional tax reforms in order to produce a revenue-neutral solution to climate, poverty, and inequality issues. To estimate the net effects of these reform proposals, all tax reforms, except for a carbon tax, are modeled simultaneously using Tax-Calculator. The impacts of these reforms are modeled in two steps. In the first step (Step A), I calculate the change in after-tax income of the bottom quintile and net revenue estimate due to all combined policies, except a carbon tax. Next, in Step B, I combine these estimates with the CBO estimates from a carbon tax. As mentioned, the CBO (2009) has estimated that a $28 per ton of carbon tax will generate $103 billion in additional revenue and reduce the after-tax income of the bottom quintile by 2.5 percent. Aggregating the effects in Steps A and B produces net revenue impacts and changes in after-tax income of the bottom quintile for each reform proposal. While this methodology is imperfect since not all of the interaction between a carbon tax and the other reforms is measured, the existing and well-researched carbon tax impacts in combination with the impacts of tax reforms, as modeled by Tax-Calculator, do capture a large portion of the complexity of the tax code. These projections provide preliminary answers to the broad questions regarding overall neutrality and effects on households from the presented reform proposals. Furthermore, this combination of existing and new research pushes the policymaking dialogue toward integrating reforms that encompass both greenhouse gas reduction and poverty alleviation, as outlined in the Green New Deal.

The process of determining a revenue-neutral reform proposal is complex, and the costs of tax reforms cannot simply be determined by aggregating the individual costs of each piece of the reform proposal. Due to the complexity of the tax code, particularly at the

[26] See the cost model developed by Ben Gitis, http://www.aei.org/spotlight/paid-family-and-medical-leave-cost-model/.

bottom of the income distribution where various tax credits phase in and out at certain thresholds, it is imperative to model tax credit reforms simultaneously. For instance, consider the total cost of implementing two reforms: doubling the EITC maximum credit allowance and eliminating the EITC phase-in rate. The sum of the costs of each of these policies (as seen in Table 3) is nearly $74 billion. However, each reform alters the trapezoidal shape of the EITC credit amount in an inter-dependent way. In reality, these two reforms of the EITC would cost approximately $120.9 billion. Therefore, while the prior tables are useful in seeing which aspects of particular credits are, in fact, helping the poor the most and at what cost, the reform proposals are more precisely modeled as net changes to the tax code. I model all tax reforms of each reform proposal, except for a carbon tax, simultaneously using Tax-Calculator, thus capturing the interactions and dependencies between all credits, rates, and tax law provisions. This same level of complexity and methodology applies to the distributional analysis of these reform proposals.[27]

Next, I use the estimates of the carbon tax burden to calculate the net impact on households of the policy combinations. In particular, the 2.5 percent decrease in after-tax income of the bottom quintile estimated by the CBO can be subtracted from the estimated net increase in after-tax income on the bottom quintile from the other tax reforms, producing a net change in after-tax income of each reform proposal.

Each of the two presented reform proposals incorporates the carbon tax as a means to achieve the primary climate targets of the Green New Deal. I then choose policies that significantly raise the after-tax incomes of the bottom quintile. Furthermore, I consider the cost of these policies and choose a combination that is revenue neutral. Therefore, the presented reform proposals are neither the most progressive nor the least costly; rather, they fall somewhere in between, balancing this trade-off. These reform proposals are based on the two dimensions of costs and impact on the lowest quintile, but it is important to note that they should not be taken as optimal or preferred to other possible combinations that are neutral and equally or more progressive. The purpose of this section is to move the policy discussion toward analyzing tax reform in a progressive, climate-minded, and revenue-neutral way.

The first hypothetical reform proposal (Proposal A) reforms the tax code as follows: (a) equalizes the EITC such that the maximum credit amount and phase-out rate are equal to the parameters for households with three children ($6,431 and 21.06 percent, respectively), (b) raises the EITC phase-in rate to 0.9 for all filers,[28] and (c) makes the CTC entirely refundable and eliminates the $2,500 income minimum. This could almost entirely be financed through a $28 per ton carbon price. In order to make Proposal A close to revenue neutral, we could, in addition, institute a 70 percent tax on income above $10 million. Accounting for the ETI, this additional tax would bring the net cost of Proposal A to $0.38 billion.[29] Even further, funding the proposal

[27] I do not account for any behavioral responses for these reforms, except for those associated with high-income individuals in the 70 percent tax changes. As the literature cited in this paper explains, the behavioral responses of low- and middle-income households are far smaller than those of high-income individuals.

[28] Note that this is double the 2018 law phase-in rate for filers with three children (45 percent).

[29] This calculation uses the revenue estimate determined by applying a 70 percent tax on income above $10 million under the assumptions that the elasticity of taxable income is 0.6. In addition, such increases in tax rates could have longer-term consequences for savings and investment decisions.

through a carbon tax and increasing the cap on earnings subject to the Social Security payroll tax to $135,000 would enable Proposal A to generate a revenue surplus of $3.8 billion.

The second reform proposal (Proposal B) modifies the tax code in the following ways: (a) makes the CTC fully refundable, (b) doubles the maximum EITC for all filers and eliminates the phase-in rate, and (c) creates a basic income of $10,000 for filers 18–20 years of age. Again, a carbon price of $28 per ton of carbon would substantially cover the cost. Including a reform to increase the Social Security payroll cap to $135,000 would make Proposal B produce a similar slight net revenue gain. Table 6 presents the total and net costs of each reform proposal, as well as the net effects on the bottom and top income quintiles.

Proposal A increases the after-tax income of the bottom quintile by over 8 percent. Evidently, not only does this reform proposal offset the 2.5 percent decrease in after-tax income due to the regressive carbon tax, but it also makes the reform, on the whole,

Table 6

Costs and Impacts on Inequality of Reform Proposals

Proposal	Funding Mechanism	Net Cost ($Billions)	Net Effect on Bottom Quintile (% Change in After-Tax Income)	Benefit to Top Quintile? (Yes/No)
A	Carbon tax	5.4	8.53	No
A	Carbon tax and 70% tax	0.4	8.53	No
A	Carbon tax and Social Security cap increase	–3.8	8.53	No
B	Carbon tax	5.5	13.56	No
B	Carbon tax and 70% tax	0.6	13.56	No
B	Carbon tax and Social Security cap increase	–3.7	13.56	No

Notes:
1. Proposal A consists of the following tax reforms: (a) equalize the EITC such that the maximum credit amount and phase-out rate are equal to the parameters for households with three children ($6,431 and 21.06%, respectively), (b) raise the EITC phase-in rate to 0.9 for all filers, and (c) make the CTC entirely refundable and eliminate the $2,500 income minimum.
2. Proposal B consists of the following tax reforms: (a) make the CTC fully refundable, (b) double the maximum EITC for all filers and eliminate the phase-in rate, and (c) create a basic income of $10,000 for filers 18–20 years of age.
3. All tax reforms, except for a carbon tax, are estimated using Tax-Calculator release 2.2.0. The revenue and quintile impacts of the reforms produced by Tax-Calculator are combined with the carbon tax impacts from CBO (2009) to produce the above net estimates.
4. All reforms assume no behavioral response except for the 70% tax rate, which assumes the ETI to be 0.6.
Source: Author's calculations using Tax-Calculator release 2.2.0 and CBO (2009).

quite progressive. Similarly, Proposal B is largely progressive without implementing a carbon tax — increasing the bottom quintile's average after-tax income by more than 13.6 percent. Accounting for a carbon tax burden makes Proposal B, on net, still more progressive than Proposal A, with an increase in the average after-tax income of the bottom quintile of 11.06 percent.

It is important to note that these reform proposals do not benefit high-income households; therefore, they should result in reduced inequality. Proposal B has more modest reductions in after-tax income of the top quintile, yet neither proposal places an unreasonable burden on the upper quintile. A carbon tax alone decreases the after-tax income of the top quintile by only 0.7 percent (CBO, 2009). Increasing the Social Security cap in Proposal A burdens the top 20 percent, but only increases their total burden to 0.77 percent. Proposal B, in fact, reduces the burden on top filers, relative to implementing a carbon tax alone, because of the bump in incomes from the basic income transfer. On net, for the top quintile, the decrease in average after-tax income is about 0.5 percent for Proposal B. While the 70 percent tax is inherently the most burdensome on high earners, even assuming an elasticity of zero — which, as discussed, is likely not the case — only reduces the after-tax income of the top quintile by an average of 1.03 percent. With an ETI greater than zero, the effect on after-tax income is even lower.

Similar analysis can be done and policy reforms proposed if the carbon tax burden is higher or lower than that estimated by the CBO study (2009). These reform proposals do not merely offset the burden on lower-income households from a regressive carbon tax, as some of the other mentioned policy ideas do, they go a step further and, on net, are largely progressive. In addition, the benefits to the climate, which are not modeled here, are critically important and should follow as a result of a carbon tax.

VII. CONCLUSION

The Green New Deal aims to achieve many socioeconomic and environmental goals. The centerpiece is a substantive shift toward clean energy and net-zero greenhouse gas emissions. A second key component is a major reduction in economic inequality and improvement in standards of living through higher wages, jobs, and benefits for workers. There are multiple means by which these twin goals can be attained. For instance, climate goals can be attained through enhanced subsidies for renewable energy sources, more regulations on polluting entities, and greater federal investments in R&D. At the same time, reducing inequality can occur through a mix of direct and indirect programs aimed at transferring resources to poorer households, while taxing richer households. In this paper, I show that a realistic solution to these twin issues can be the adoption of a carbon tax, in combination with other tax and transfer program changes. The advantage of a carbon tax is that it can push us toward attaining climate goals, while, at the same time, raise enough tax dollars to finance expansions in targeted programs, such as the EITC, the CTC, and versions of a basic income program. Building upon existing estimates of revenue and distributional impacts of carbon taxes, I use a micro-

simulation tax model to estimate the revenue impacts of other tax reforms and then combine these estimates with the existing measurements from studies on carbon taxes to present two hypothetical, revenue-neutral reform proposals. In addition, I show how specific changes to the design of existing benefit programs can have differential effects on the recipients of those benefits. In sum, this paper contributes policymaking ideas for revenue-neutral sets of reforms that would help achieve the Green New Deal's goals of reducing greenhouse gas emissions and improving the standards of living for low-income households.

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