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Distributional Impacts in a Comprehensive Climate Policy Package

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1.1 Introduction

Distributional considerations figure importantly in the design of comprehensive climate policy legislation. The allowance allocation in the American Clean Energy and Security Act of 2009 (H.R. 2454), popularly known as the Waxman-Markey bill, that was passed by the House of Representatives in June 2009, suggests the care and attention paid to distributional considerations in crafting the bill. Both the Kerry-Boxer bill and the Cantwell-Collins proposals in the Senate also paid close attention to distributional considerations.

This chapter uses data from the 2003 Consumer Expenditure Survey to allocate the burden of carbon pricing from possible cap-and-trade legislation under different assumptions about the relative importance of uses- and sources-side heterogeneity as well as differing assumptions about relative factor price changes. It builds on previous research using the Consumer Expenditure Survey by generalizing the incidence assumptions beyond the assumption of full-forward shifting of the carbon price. It also improves on the measurement of capital income burden allocation by using capi-

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tal income distribution data from the 2004 Survey of Consumer Finances (SCF) to augment the data in the Consumer Expenditure Survey.

The approach detailed in this chapter provides a method for carrying out a back-of-the-envelope calculation of the distributional impact of carbon pricing using readily available data that allows for sensitivity analysis of assumptions on sources- and uses-side incidence of carbon pricing. We find that accounting for sources-side impacts of carbon pricing yields less regressive impacts on households looking across the income distribution.

1.2 Background

Households differ on a number of dimensions that policymakers may care about. When designing a climate policy bill, policymakers have made it clear that many of these dimensions are important and affect the allocation of allowances as well as the mechanisms of allowance use. Households differ by income, regional location, primary heating source, and predominant mode of electricity generation among other things. We focus in this chapter on measuring the impact of carbon-pricing policies on households looking across the income distribution.

In carrying out distributional analyses, a number of considerations come into play. First is the question of how best to sort households to distinguish them by some measure of relative well-being. Income is often used for this ranking and this analysis sorts households by annual income. This brings a potential bias to the analysis to the extent that annual income is a poor proxy for lifetime well-being. As discussed elsewhere (see, for example, Fullerton and Metcalf [2002]) many low-income households are not poor in a lifetime sense. They may have transitorily low income or may be at a low income-earning stage of their careers. In both these cases consumption-to-income ratios may be unusually high and may provide a misleading picture of the distributional impact of consumption-related taxes (like energy taxes) or carbon-pricing policies. As a check for the importance of our income measurement we also provide results where we use current consumption as a proxy for lifetime income under the assumption that households engage in consumption smoothing.

A second issue is that the economic impact of carbon pricing depends importantly on how prices adjust to the new equilibrium with carbon pricing. This is particularly important for a policy that creates and distributes financial assets in excess of $100 billion by the middle of this decade (see Congressional Budget Office 2009). A number of computable general equilibrium economic analyses have argued that carbon pricing will predominantly be passed forward to consumers in the form of higher energy prices. See, for example, Bovenberg and Goulder (2001) and Metcalf et al. (2008).

Based on analyses focusing on uses-side incidence impacts of carbon pricing, a number of economists have carried out distributional analyses of carbon pricing using the Consumer Expenditure Survey, including Bull, Hassett, and Metcalf (1994), Dinan and Rogers (2002), Metcalf (1999), Parry (2004), and Hassett, Mathur, and Metcalf (2009). The Consumer Expenditure Survey is particularly useful for this analysis given its high level of detailed disaggregation on household spending patterns. But these analyses are useful only to the degree that the assumption of full-forward shifting (e.g., impacts on uses side only) is correct.

In the following analysis we refer to forward shifting and backward shifting when we wish to analyze the distributional impacts of carbon pricing according to how households spend their income (uses side) or earn their income (sources side). The terminology of forward and backward shifting has a long-standing place in public economics, albeit an imprecise meaning. Whether a tax is shifted forward (leading to higher consumer prices) or shifted back (leading to lower factor returns) depends on the normalization employed in the general equilibrium framework. Since the normalization choice in a general equilibrium model has no real effects, forward or backward shifting cannot have real effects either (see Fullerton and Metcalf [2002] for more on this point). When we later refer to forward or backward shifting, we use this to refer to heterogeneous impacts of carbon pricing based on how different households spend or earn their income.

A recent study by Metcalf et al. (2008) found that for a given price normalization forward shifting of carbon pricing ranged widely depending on the fuel in question, the proposal under consideration, and the particular year of analysis. Carbon pricing on coal was nearly fully passed forward into higher prices, reflecting in large part the low Hotelling resource rents for coal. Shifting for natural gas ranged from a low of 14 percent to a high of over 200 percent. The latter occurs as demand rises for natural gas in the intermediate term as gas substitutes for coal in the production of electricity.[1] Finally, forward shifting for crude oil ranged from a low of 2 percent to a high of nearly 90 percent depending on the year and tax scenario.

If taxes are not passed forward to consumers in the form of higher product prices, then they are passed back to factors of production in the form of lower wages, returns to equity, and reduced resource rents. Changes in resource rents can also affect government revenues since much fossil fuel extraction in the United States occurs on publicly owned land (e.g., the Powder River Basin coal reserves in Wyoming and the Outer Continental Shelf oil and gas drilling). We ignore that complication in this analysis in part because the impact of taxes on government revenue from land-leasing activities is poorly understood.

This chapter uses burden-shifting insights from computable general equilibrium (CGE) models along with the Consumer Expenditure Survey to measure the burden of carbon pricing. A goal of the analysis is to demonstrate the ability to use the survey with a broader range of assumptions to

1. That natural gas prices may rise by over twice the tax rate indicates the complex price responses that can occur in general equilibrium.

obtain a rough-and-ready guide to the distributional impacts of carbon-pricing proposals without having to run full-blown CGE analyses.

1.3 Measuring Carbon Price Burdens

Our goal in this chapter is to provide a simple rough-and-ready measure of the burden impact of carbon pricing that builds on the insights of more complex economic analyses. This is in the tradition of a number of studies that use detailed data sets such as the Consumer Expenditure Survey (CEX) along with results and insights from sophisticated economic models to allocate the burden of government policies to different economic groups.

As noted earlier, previous studies using the CEX have assumed that carbon pricing is fully passed forward into higher consumer prices based on the carbon content of goods and services. Input-Output tables from the Bureau of Economic Analysis are used to trace through carbon content and thus carbon-pricing impacts. If carbon prices are passed back to factors of production, then we need to use income information in the CEX to distribute the carbon-pricing impacts. We distribute the burden of carbon pricing that falls on owners of capital in proportion to capital income shares as a proxy for capital ownership shares.[2]

Carbon-pricing burdens may also fall on owners of fossil fuel resources. To the extent these resources are privately owned, carbon pricing may lead to a reduction in returns to owning property with fossil fuel resources. Some of this property is held by sole proprietors and partnerships while other tracts are owned by corporations. Lacking detailed information on resource ownership, we assume that resource ownership is distributed across households in the same manner as capital.

Turning to allowances, we can allocate the value of allowances to households either according to consumption or income patterns depending on how allowances are distributed. The Waxman-Markey bill sets aside roughly 30 percent of allowances in the early years for distribution to customers of electricity and natural gas utilities to compensate them for higher electricity and gas prices. We allocate the value of those allowances to households based on their electricity and natural gas expenditures, respectively. Allocations to industry are assumed to benefit owners of capital. Allocations to households are distributed to households.

In general we follow the distribution approach of Rausch et al. (2010) for distributing the value of allowances. One place where we differ is in the allocation of allowances to the US government for deficit reduction. Under the assumption that reductions in the deficit reduce pressure to decrease government spending, we allocate the allowances for deficit reduction based

2. This follows from the result in Harberger (1962) that partial capital income taxes are borne by all owners of capital.

Table 1.1 **Incidence scenarios**

Scenario	Consumers (%)	Capital and resources (%)	Labor (%)
1	100	0	0
2	80	20	0
3	80	10	10
4	50	25	25

on government spending that would otherwise have to be cut. Our assumptions on the benefits of government spending across the income distribution are taken from the Tax Foundation (2007).

Rather than assume a particular burden-sharing outcome, we report results for four different scenarios to illustrate the importance of the burden-sharing assumption on distributional outcomes. The four scenarios we consider are reported in table 1.1.[3] The first scenario assumes full-forward shifting of carbon pricing to final consumers (i.e., burden is based on heterogeneity in household expenditure patterns). The next three scenarios allow for a greater role in sources-side effects with different assumptions about relative price changes between capital and labor. These approaches are based on a particular normalization (price of non-carbon-based consumption goods held fixed). As noted previously, forward and backward shifting is imprecise (and potentially misleading) terminology though long used in public finance. More precisely we focus on distributional impacts based on uses-side impacts and sources-side impacts. Scenario 1 focuses on uses-side heterogeneity only. The remaining three scenarios allow for greater amounts of sources-side heterogeneity and also allows for differential impacts on wage and capital (and resource) income.

1.4 Issues in Using the Consumer Expenditure Survey

The Consumer Expenditure Survey has been used by a number of researchers investigating the burden impacts of carbon pricing because of its rich detail on consumption patterns of US households. It also contains information on the demographic makeup of households as well as some income information. The CEX has a single capital income measure that researchers have used to allocate taxes to owners of capital in scenarios assuming some degree of backward shifting. The survey question for this data asks whether households received any regular income from dividends, trusts, estates, or royalties. A separate question asks about interest income from bank accounts, money market funds, CDs, or bonds. Researchers have used the dividend income amount (or dividends and interest) as a proxy for

3. This approach is in the spirit of the classic distributional analysis by Pechman (1985).

Table 1.2 **Distribution of capital income across households**

Annual income decile	Consumer expenditure survey	Survey of consumer finances
1	0.004	0.001
2	0.007	0.005
3	0.007	0.011
4	0.159	0.015
5	0.033	0.019
6	0.027	0.015
7	0.050	0.037
8	0.020	0.027
9	0.156	0.060
10	0.542	0.810

Source: Authors' calculations from 2003 CEX and 2004 SCF. Entries are capital income shares for each decile. Each column sums to one.

capital holdings under the assumption that capital income is proportional to capital holdings.

The problem with using CEX-reported capital income is that it may misrepresent capital holdings across income groups. There are two possible reasons. First, the CEX focuses primarily on spending and the income data quality may not be as high quality as the spending data. Second, if holdings of growth stocks are disproportionately held by higher income groups, then the CEX capital income measure will be biased toward more capital holdings in lower income groups. Table 1.2 suggests that the first problem is significant with the CEX showing more capital income in the lower income deciles than the SCF.[4]

Using data from the 2004 SCF, Wolfe (2010) estimates that 85 percent of net worth capital is held by households in the top quintile and 92 percent of nonhousehold wealth by this quintile. The CEX in contrast reports only 70 percent of capital income accruing to the top quintile. Using CEX capital income distributions will skew any carbon-pricing distribution toward greater progressivity to the extent that any of the burden is placed on owners of capital.

One advantage of using the SCF is that it disproportionately samples wealthy families. Each survey consists of a core representative sample combined with a high-income supplement, which is drawn from the Internal Revenue Service's Statistics of Income data file. Further, the survey questionnaire consists of detailed questions on different components of family wealth holdings. For these reasons, the SCF is widely acknowledged to be the best at capturing both the wealth at the top of the distribution and the complete wealth portfolio of households in the middle. Since the wealth dis-

4. Income cutoffs for the deciles are $10,304, 17,000, 24,000, 32,000, 40,200, 50,655, 65,032, 81,700, and 108,768.

Table 1.3 Distribution of labor income across households

Annual income decile	Consumer expenditure survey	Survey of consumer finances
1	0.003	0.003
2	0.012	0.011
3	0.025	0.023
4	0.042	0.039
5	0.063	0.054
6	0.083	0.073
7	0.114	0.088
8	0.143	0.126
9	0.185	0.178
10	0.331	0.403

Source: Authors' calculations from 2003 CEX and 2004 SCF. Entries are labor income shares for each decile. Each column sums to one.

tribution is highly skewed toward the top, most other surveys (like the CEX) that have poor data on high-income families tend to underreport measures of income and wealth.

The problem of distributional bias is not as significant for labor income as for capital income. Table 1.3 reports labor income shares across deciles from the CEX and SCF. The distributions are more closely aligned than those for capital income.

In this analysis we distribute the burden of carbon pricing that is shifted to owners of capital based on the distribution of capital income from the SCF (table 1.2).

1.5 Results

For purposes of our analysis, we consider the effect of a carbon tax set at a rate of fifteen dollars per metric ton of carbon dioxide. We trace the effect of this carbon tax on the prices of consumer goods produced by the industries through the use of Input-Output matrices available from the Bureau of Economic Analysis. Once we obtained the effect of the tax on prices of consumer goods, we used data from the Consumer Expenditure Survey (CEX) to compute carbon taxes paid by each household in the survey. For a detailed discussion of this methodology as well as the computed price increases, see Metcalf (1999) and more recently, Hassett, Mathur, and Metcalf (2009).

We extend the analysis in this chapter by considering the incidence on the sources-side as well. Using capital and labor income shares from the Survey of Consumer Finances (SCF), we are able to compute the carbon tax burdens on capital and labor income for households in the CEX. Hence the total burden on any household is computed as the sum of the burden on the consumption side, as well as on the income side.

The final step in the calculations shown in tables 1.4, 1.5, 1.6, and 1.7 is the allocation of the allowance revenues under the three proposals. Every proposal allows some level of rebates to households that are based on their energy use, their labor and capital income shares, or whether they are low income. The final burden is lowered by the level of rebates allowed under the three proposals.

As noted earlier, the distributional tables are based on a carbon-pricing policy that yields a carbon price of fifteen dollars per ton CO_2. This is consistent with permit price estimates in the 2015 to 2020 period for either H.R. 2454 (Waxman-Markey) or the Kerry-Boxer bill in the Senate. In the analyses in which allowance revenues are returned to households, we assume full return of revenue to households allocating permit value using the assumptions in Rausch et al. (2010).

Table 1.4 shows results for a cap-and-trade program in which we ignore the rebate of permit revenue to households. This scenario focuses on carbon pricing itself without the confounding effects of allowance allocations. The left panel of the table sorts households by annual income while the right panel sorts households by annual consumption, a proxy for lifetime income under the assumption that households engage in consumption smoothing.

We first discuss the results in which we sort households by annual income. The first scenario assumes carbon pricing is fully reflected in higher consumer prices. Carbon pricing is regressive in this scenario with the burden of higher consumer prices falling from 3.7 percent of household income in the lowest income decile to 0.8 percent of household income for the top decile.[5] The ratio of burdens between the top and bottom deciles is 4.6. If 20 percent of the burden of carbon pricing is shifted back to owners of capital and resources, the regressivity of carbon pricing is blunted somewhat with the ratio of burdens between the top and bottom deciles falling to 2.3. Shifting part of the burden from capital to labor (scenario 3) increases the regressivity slightly relative to scenario 2. Scenario 4 shows that the regressivity of carbon pricing is blunted as more of the burden is shifted back to factors of production—with the burden shifting to capital the most important. In this case the burden share in the lowest decile is only 20 percent higher than the burden in the top decile.

As discussed earlier, using annual income to rank households may overstate the regressivity of carbon pricing and so we also report results where we rank households by current consumption in the right-hand panel of table 1.4. Regressivity is significantly blunted when households are ranked by consumption.[6] Now when sources-side heterogeneity is sufficiently im-

5. The incidence numbers look marginally different from those in Hassett, Mathur, and Metcalf (2009), since we are not accounting for the differential impact on electricity prices across regions in this study.

6. This result is consistent with previous findings on the relative progressivity of energy and environmental taxes when comparing consumption to income-based household rankings. See Poterba (1989, 1991), Bull, Hassett, and Metcalf (1994), Lyon and Schwab (1995), Metcalf

Table 1.4 **Distribution of carbon pricing across households: No rebate**

	Annual income deciles incidence assumptions				Annual consumption deciles incidence assumptions			
Decile	1	2	3	4	1	2	3	4
1	3.70	2.99	3.02	2.01	1.45	1.18	1.25	0.96
2	3.05	2.48	2.51	1.71	1.41	1.21	1.26	1.03
3	2.31	1.93	1.97	1.46	1.31	1.15	1.19	1.01
4	2.03	1.71	1.76	1.36	1.29	1.04	1.14	0.92
5	1.75	1.47	1.54	1.23	1.24	1.12	1.16	1.04
6	1.51	1.26	1.35	1.09	1.17	1.03	1.09	0.97
7	1.30	1.13	1.20	1.03	1.16	1.03	1.10	1.02
8	1.24	1.04	1.14	0.98	1.07	0.91	0.99	0.89
9	1.02	0.91	0.99	0.96	1.01	1.10	1.07	1.17
10	0.82	1.29	1.15	1.64	0.90	1.12	1.03	1.23
Low/High ratio	4.51	2.32	2.63	1.23	1.61	1.05	1.21	0.78

Source: Authors' calculations. Table reports burden as a percentage of household income in annual income decile columns and as a percentage of current consumption in annual consumption decile columns. Last row reports ratio of burden for first decile relative to burden for top decile.

portant (scenario 4), carbon pricing looks proportional to modestly progressive. This finding is consistent with the finding of Rausch et al. (2010) who find that sources-side impacts lead to carbon pricing being progressive in their CGE analysis.

Table 1.4 considers the burden of carbon pricing with no consideration as to the distribution of carbon revenues. Considerable effort has been taken in the various cap-and-trade proposals in the House and Senate to allocate allowances (or allowance value) to offset the price impacts of carbon pricing. We now turn to a comparison of distributional results for the various burden-shifting scenarios identified in table 1.1. The allocation of allowances is based on the analysis of proposed cap-and-trade legislation carried out by Rausch et al. (2010). As these authors stress, the analysis only focuses on the allowance allocations in the bill and ignores all other aspects of the legislation. Thus, one should not view these distributions as representative of the actual distributions that will result from enactment of any of these bills.[7] To emphasize that we refer to the scenarios as Targeted Allowance

(1999), and Hassett, Mathur, and Metcalf (2009) among others. Fullerton and Heutel (2010), in contrast, find that uses-side impacts are more regressive when a consumption-based ranking of households is used instead of annual income. This appears to arise from their specification of incidence in which households are classified using annual income deciles, but the burden is reported relative to annual consumption.

7. Rausch et al. (2010) note other differences—in particular, the ability to use domestic and international offsets in the various proposals. Those considerations are not relevant for our analysis.

Allocation (TAA) scenarios TAA-1 for the Waxman-Markey approach, and TAA-2 for the Kerry-Boxer approach. We refer to a Household Dividend (HD) scenario for the Cantwell-Collins approach.

Table 1.5 reports results for the TAA-1 allocation approach. The bill has a complex allocation schedule for each of the years between 2012 and 2050. For this and the other two proposals we analyze, we consider the distributions in 2020.

Focusing first on the annual income analysis, the carbon-pricing reform (taking into account the burden of carbon pricing and the distribution of allowance value) is progressive regardless of the assumptions made about burden sharing between consumers and factors of production. Assuming full-forward shifting of the carbon price (incidence assumption 1) the burden of carbon pricing with allowance allocation in 2020 falls from –2.4 percent of household income for the lowest decile to –0.02 percent for the top decile. The bottom 40 percent of the income distribution get back more in allowance revenue (either directly or indirectly through allocations that reduce product prices for them) than they pay in higher prices of goods and services because of carbon pricing.

Assuming 20 percent of the burden is shifted from consumers to owners of capital and resources, the progressivity increases in 2020. The highest degree of progressivity occurs under incidence assumption 4 where half the burden is shifted back to factors of production with labor and capital equally sharing the burden. To draw parallels, it is interesting to note that the carbon-pricing burden with the rebate is marginally less than half the value of the Earned Income Tax Credit subsidy for the bottom decile. The

Table 1.5 **Distribution for targeted allowance allocation 1**

	Annual income deciles incidence assumptions				Annual consumption deciles incidence assumptions			
Decile	1	2	3	4	1	2	3	4
1	–2.38	–3.09	–3.06	–4.07	–1.12	–1.39	–1.31	–1.60
2	–1.27	–1.84	–1.80	–2.60	–0.74	–0.94	–0.89	–1.12
3	–0.62	–1.00	–0.96	–1.47	–0.44	–0.59	–0.56	–0.74
4	–0.98	–1.31	–1.26	–1.66	0.07	–0.18	–0.08	–0.30
5	0.56	0.29	0.35	0.04	0.14	0.02	0.06	–0.07
6	0.54	0.29	0.37	0.12	0.22	0.08	0.14	0.02
7	0.43	0.26	0.32	0.16	0.29	0.17	0.24	0.16
8	0.56	0.36	0.46	0.30	0.37	0.22	0.30	0.19
9	0.23	0.11	0.20	0.16	0.28	0.37	0.35	0.44
10	–0.02	0.46	0.31	0.81	0.03	0.24	0.16	0.36

Source: Authors' calculations for 2020 assuming permit distribution as described in text. Table reports burden as a percentage of household income in annual income decile columns and as a percentage of current consumption in annual consumption decile columns.

Table 1.6 Distribution for targeted allowance allocation 2

	Annual income deciles incidence assumptions				Annual consumption deciles incidence assumptions			
Decile	1	2	3	4	1	2	3	4
1	–2.86	–3.58	–3.54	–4.56	–1.32	–1.59	–1.52	–1.80
2	–1.50	–2.07	–2.04	–2.84	–0.84	–1.05	–1.00	–1.22
3	–0.67	–1.05	–1.01	–1.52	–0.50	–0.65	–0.62	–0.80
4	–0.92	–1.25	–1.19	–1.60	0.01	–0.24	–0.14	–0.36
5	0.49	0.21	0.28	–0.03	0.10	–0.01	0.02	–0.10
6	0.49	0.23	0.32	0.07	0.19	0.05	0.11	–0.01
7	0.41	0.24	0.30	0.14	0.28	0.16	0.22	0.14
8	0.54	0.34	0.44	0.28	0.35	0.20	0.28	0.17
9	0.23	0.12	0.20	0.17	0.29	0.38	0.35	0.45
10	0.03	0.50	0.36	0.85	0.08	0.30	0.21	0.41

Source: Authors' calculations for 2020 assuming permit distribution as described in text. Table reports burden as a percentage of household income in annual income decile columns and as a percentage of current consumption in annual consumption decile columns.

share of the EITC in total adjusted gross income for the bottom decile was approximately 18 percent in 2007.[8]

The analysis based on consumption as a proxy for lifetime income mutes but does not overturn the progressive result. As with annual income rankings, the more important sources-side heterogeneity, the more progressive the reform.

Table 1.6 presents results for the TAA-2 scheme. Results are very similar to those for TAA-1. Results for the HD scheme are quite different from either TAA-1 or TAA-2 due to a very different approach to allocation taken by this proposal (table 1.7). Whereas the former two proposals have a complex allocation scheme distributing allowances to industry and to gas and electricity local distribution companies, HD rebates three-quarters of the allowance revenue to households on an equal per capita basis. The remaining allowance revenue is used for various clean energy investments and regional programs.

The Household Dividend distribution approach is markedly more progressive than the previous programs. This follows primarily from the largely lump-sum nature of rebate approach taken in this bill. Assuming some of the tax is passed back to owners of capital and energy resources increases the progressivity of the program relative to the assumption of full-forward shifting. This holds true whether we rank households by annual income or consumption.

8. Available at http://www.irs.gov/taxstats/indtaxstats/article/0,,id=133414,00.html.

Table 1.7 **Distribution for household dividend**

	Annual income deciles incidence assumptions				Annual consumption deciles incidence assumptions			
Decile	1	2	3	4	1	2	3	4
1	–3.36	–4.07	–4.04	–5.05	–1.77	–2.04	–1.97	–2.26
2	–1.42	–1.99	–1.96	–2.76	–1.01	–1.21	–1.16	–1.38
3	–0.68	–1.05	–1.02	–1.52	–0.56	–0.72	–0.69	–0.87
4	–0.21	–0.54	–0.48	–0.88	–0.25	–0.50	–0.40	–0.62
5	0.01	–0.26	–0.19	–0.51	–0.05	–0.17	–0.13	–0.25
6	0.12	–0.14	–0.05	–0.30	0.06	–0.08	–0.01	–0.13
7	0.20	0.03	0.10	–0.07	0.20	0.08	0.15	0.06
8	0.36	0.16	0.25	0.09	0.26	0.11	0.19	0.08
9	0.31	0.20	0.28	0.25	0.36	0.45	0.42	0.52
10	0.36	0.83	0.69	1.18	0.46	0.67	0.59	0.79

Source: Authors' calculations for 2020 assuming permit distribution as described in text. Table reports burden as a percentage of household income in annual income decile columns and as a percentage of current consumption in annual consumption decile columns.

1.6 Conclusion

A perennial concern with proposals to put a price on carbon emissions either through a carbon tax or a cap-and-trade program is the perceived regressivity of the policy. We find that carbon pricing is indeed regressive when annual income is used to sort households, though the extent of the regressivity depends on the degree of backward shifting of the carbon price. The story changes, however, if households are ranked by a proxy for lifetime income. Now carbon pricing is at most mildly regressive, and may in fact be progressive depending on the relative importance of uses-side versus sources-side heterogeneity.

Once one allows for a distribution of some or all of the value of the allowances back to households—either directly or indirectly through grants to industry—the policy now looks progressive however one ranks households.[9] This is true for allocation schemes that are similar to the three leading cap-and-trade proposals currently under consideration by Congress.

This chapter provides a simple analytic approach for measuring the burden of carbon pricing that does not require sophisticated and numerically intensive economic models, but is not limited to restrictive assumptions that only uses-side heterogeneity can be taken into account when measuring the tax burden. We also show how to adjust for the capital income bias contained in the Consumer Expenditure Survey, a bias toward regressivity in carbon

9. This highlights the distinction between a green tax and a green tax reform made by Metcalf (1999).

pricing due to underreporting of capital income in higher income deciles in the CEX.

Once one allows for sources-side heterogeneity, carbon policies look more progressive than when attention is only on how households spend their income. Perhaps more important than the findings from any one scenario, our results on the progressivity of the leading cap-and-trade proposals are robust to the assumptions made on the relative importance of sources and uses-side effects for the burden of carbon pricing.

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Comment Hilary Sigman

Metcalf, Mathur, and Hassett's chapter (henceforth, MMH) significantly improves understanding of the effects of climate policy on households. Two advances relative to the previous literature stand out. First, MMH do not assume all carbon price effects are borne by consumers. In some of their scenarios, carbon prices may be partly shifted to capital in the form of lower returns or to labor in the form of lower wages. Second, they consider the distribution of the value of allowances in prominent policy proposals.

The MMH chapter has several key findings. First, relative to the standard assumption of full-forward shifting, all other distributions of the burden make a carbon price less regressive. Since full-forward shifting is unlikely, this result suggests a more positive picture of the progressivity of climate policy. Second, all the specific proposals considered (Waxman-Markey, Kerry-Boxer, and Cantwell-Collins) allocate allowances in ways that increase progressivity. Finally, lower income groups may gain quite a lot under these policies. The households in the lowest income decile may gain 3 to 4 percent of their income (or even 5 percent for some policies and scenarios). Gains often extend to the middle of the income distribution. Thus, gains are not restricted to households reporting very low income, who may have poor-quality income data, or be socioeconomically idiosyncratic. Instead, the policies seem to confer gains systematically to lower income households.

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