HOW DO THE COSTS OF CLIMATE CAP AND TRADE AFFECT HOUSEHOLDS?

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INTRODUCTION

IN AN EFFORT TO COMBAT CLIMATE CHANGE, THE major climate policy proposals before the 111th Congress imposed caps on the amount of greenhouse gases (GHGs) released into the atmosphere. Capping greenhouse gas emissions introduces a price on GHGs and raises the cost of carbon-based fuels and the production of goods that use carbon-based inputs. Everything from gasoline to orange juice will increase in price depending on the amount of carbon that is associated with its production or use. Placing a price on carbon gives consumers and manufacturers an incentive to switch to lower carbon products and processes. This is the primary purpose of the policy.

One major element of the national dialog on climate policy has been to ensure that individual households are protected from sudden or disproportionate increases in the prices of energy or goods, especially economically vulnerable households. Previous research has focused on the income distributional and regional incidence of national climate policy. For example, Metcalf (2009), Blonz et al. (2010), Burtraw et al. (2009), and Rausch et al. (2010) analyze the incidence of various policies using a number of modeling approaches. In general, they do not find substantial regional differences and conclude that with a well-designed policy, particularly with respect to the distribution of allowance value, vulnerable low income populations can be protected. Government studies of the Waxman-Markey proposal (HR2454), the one bill to pass the House of Representatives, show relatively modest costs for average households (CBO, 2009; EIA, 2009; EPA, 2009).

One group that has not been addressed in the literature are older adults, who are of particular concern because many live on a fixed income and do not have the flexibility to withstand significant changes in their expenses. Low-income older adults may not be able to afford increases in utility prices and may be forced to make potentially dangerous cuts in their consumption of heat or air conditioning. On the other hand, they may receive a disproportionately larger share of the value of allowances in a cap-and-trade program, depending on how that value is redistributed back to households. This paper focuses on this older population by looking at the household burden by age group across a number of policy scenarios.

DATA AND METHODOLOGY

We base our analysis on U.S. Bureau of Labor Statistics Consumer Expenditure Survey (CE) data from 2004 through 2008. The population sampled in the CE includes 128,973 observations for 50,031 households; an observation equals one household in one quarter. We use these observations to construct five age groups: under 39, 40-49, 50-64, 65-74 and 75+ years.

The model we construct accounts for changes in household costs through direct energy expenditures and the indirect purchase of goods and services.[1] The analysis is focused on 2016, which is the first year that all components of the major legislative proposals would come into effect. We assume that the baseline (no carbon policy) distribution of consumption across regions and income groups in that year would be roughly the same as in our data period (2004–2008), but the level of consumption may change over time due to shifts in demand in response to price changes. Consumption data are combined with the average carbon contents of goods from Hassett et al. (2009) to estimate the carbon dioxide (CO_2) content of every household's consumption bundle. The average CO_2 content of household consumption based on the data period is scaled to reflect changes in production and consumption that are predicted by EIA's baseline forecast for 2016 outside the electricity sector (EIA, 2009). The baseline forecast for the electricity sector is based on Resources for the Future's Haiku electricity market model to enable more detailed analysis.

We use EIA's cost estimate of climate policy outside the electricity sector and Haiku's estimate within the electricity sector to calculate the total burden on households to achieve an emissions reduction target for 2016. These impacts are distributed across age groups according to the expenditure patterns revealed in the CE data and the Haiku model. Our measure of household burden captures the loss in well-being experienced by households due to higher energy prices as a result of climate policy, including any gain earned from the distribution of allowance value. It also captures the effects of changes in government programs and income and payroll taxes that are described below.[2] A more complete description of the model can be found in Blonz et al. (2010).

OPTIMISTIC VERSUS PESSIMISTIC OUTCOMES UNDER WAXMAN-MARKEY

The Waxman-Markey bill includes many provisions describing how the allowance value will be used – from increasing the Earned Income Tax Credit, to free distribution to local electricity and natural gas distribution companies, to programs to promote climate adaptation, and more. Estimating the effectiveness of these government uses of allowance value introduce a large degree of uncertainty to the analysis. We incorporate the potential range of outcomes by varying assumptions about the effectiveness of expenditures to accomplish these climate related goals and defining "optimistic" and "pessimistic" scenarios.

The optimistic scenario assumes the expenditures funded with allowance value in programs like energy efficiency, carbon capture and storage technology, clean vehicle technology, renewable energy and other energy technologies successfully achieve their intended purposes, producing emissions reductions and resulting in household savings. The pessimistic scenario takes a worst case outlook with these expenditures providing no climate-related benefit. It is important to note that these scenarios do not represent outcomes that are expected to occur, and instead represent bookends drawn from the academic literature and political discourse.

These scenarios are compared to a "cap-and-dividend" scenario in which 75 percent of the allowance value is rebated directly to households in a lump-sum, per-capita fashion and not used for various climate related programs; the remaining 25 percent is assumed to cover allocations to trade exposed industries, and to natural gas LDCs, home heating, and energy efficiency programs. This is our characterization of the Cantwell-Collins proposal (S.2877), where we adjust the emissions targets and timing to be comparable with Waxman-Markey. This type of policy eliminates the uncertainty of the effectiveness of the numerous programs in Waxman-Markey. Cap-and-dividend scenarios, and carbon tax scenarios with lump-sum return of revenue, have been analyzed in previous studies such as Dinan and Rogers (2002) and Burtraw et al. (2009).

INDEXING TO INFLATION

The introduction of a price on CO_2 raises the cost of using energy as well as the prices of all goods and services, and various government programs that are indexed to inflation would be affected. To incorporate this, we use the EIA's estimate of growth in the Urban Consumer Price Index (CPI-U) due to climate policy and inflate the benefits received by households from three major programs: the Earned Income Tax Credit, veterans' benefits, and Social Security.[3] To account for the increased revenue that would be required for the first two programs we assume a proportional increase in income tax payments and an increase in the payroll tax rate for the third.[4]

Our modeling represents the effect of indexing as invariant to choice of policy scenario, thus the same benefit is earned in each scenario. In reality, with different allowance prices and different impacts on energy prices, the three scenarios may have different impacts on the CPI and thus on Social Security payments. We are unable to account for those impacts, as we take our CPI prediction from EIA analysis of Waxman-Markey. The basic message—that indexing makes a big difference to the net burden—still applies, but the effect would be bigger in the pessimistic case because it has a higher allowance price and thus presumably a bigger impact on the CPI.

Households would be affected through changes in employment opportunities, regional and national economic growth as well as the changes in prices under climate policy. This analysis looks only at the change in prices and the effect this would have on the overall household consumption.

LOW INCOME PROGRAMS IN WAXMAN-MARKEY

Additional protections beyond the automatic indexing of Social Security benefits have been built into the major climate proposals in an effort to further protect low income households. The Energy

Refund Program in Waxman-Markey is designed to assist all low income households including the low income elderly. The program is targeted at households at and below 150 percent of the federal poverty line. The legislation calls for households to be refunded their "loss in purchasing power" due to climate legislation, with the goal of completely protecting low income households from the price effects of a cap on carbon.[5]

Older households that fall under 150 percent of the poverty line benefit from the Energy Refund Program. The Energy Refund Program is at least as important as the Social Security adjustment for these households.

Results

The impacts on households from climate policy to achieve emissions reductions identified in the Waxman-Markey bill vary considerably across the legislative approaches and assumptions about implementation of those proposals. Table 1 shows the average household burdens by age group, in dollar terms and as a percent of annual income. Households under age 65 bear most of the burden of climate policy under the Waxman-Markey option, averaging about 0.26 percent of household income in the optimistic case and about 0.77 percent in the pessimistic case. All three age groups below age 65 experience larger-than-average household burdens. In the cap-and-dividend option, households in the 40–64 age range experience larger-than-average losses, while other age groups are below average. Households in the 75+ age group are net winners under the optimistic Waxman-Markey scenario.

Tables 2 and 3 break down the impacts on older households by showing average household burdens by income quintile for households in the three top age groups: 50–64, 65–74, and 75 and above.[6] Table 2 shows the results in dollar terms and table 3 as a percentage of income. The tables indicate that the low-income elderly do better than average elderly households, which in turn do better than average households over all age groups. In fact, households whose head is at least 65 years old in the lowest income quintile enjoy a net household gain in all three scenarios. The gain for low-income

Table 1
Household Burden (2006 Dollars) by Age Group per Household for Three Cap-and-Trade Scenarios

Income quintile	*Household average income*	*Waxman-Markey optimistic case*	*Waxman-Markey pessimistic case*	*Cap with 75 percent dividend*
			2006 dollars/year	
1	11,610	-24	-15	-86
2	26,842	77	239	-35
3	44,074	186	442	106
4	68,620	296	641	307
5	140,280	138	820	840
All	59,569	138	436	235
			Percentage of income	
1	11,610	-0.21%	-0.13%	-0.74%
2	26,842	0.29%	0.89%	-0.13%
3	44,074	0.42%	1.00%	0.24%
4	68,620	0.43%	0.93%	0.45%
5	140,280	0.10%	0.58%	0.60%
All	59,569	0.23%	0.73%	0.39%
Allowance price		(\$12.82 mt/CO_2)	(\$23.32 mt/CO_2)	(\$18.57 mt/CO_2)

Note: mt/CO_2=metric ton of carbon dioxide.

Table 2

Household Burden (2006 Dollars) for Older Households by Income Quintile for Three Cap-and-Trade Scenarios

Income quintile	*Household average income*	*Waxman-Markey optimistic case*	*Waxman-Markey pessimistic case*	*Cap with 75 percent dividend*
			Age group	
		50–64	*50–64*	*50–64*
1	11,611	6	19	-22
2	27,006	131	297	76
3	44,445	221	467	223
4	68,729	321	648	423
5	145,373	158	840	984
			Age group	
		65–74	*65–74*	*65–74*
1	12,415	-44	-38	-41
2	26,385	32	203	7
3	43,657	110	358	146
4	68,338	149	468	286
5	136,980	57	711	898
			Age group	
		75+	*75+*	*75+*
1	12,646	-73	-75	-61
2	25,861	-20	138	-52
3	42,893	17	237	26
4	66,689	105	416	238
5	127,897	2	592	716

elderly households is larger than the gain for all households in the lowest income quintile (table 1) under Waxman-Markey. However, this pattern does not hold for a cap-and-dividend approach, where the low-income elderly do not benefit as much as low-income households on average. This is primarily a result of the per-capita nature of the rebate in that policy option; older households receive a smaller rebate because they are smaller on average.

Households in the 50–64 age range, on the other hand, bear a much larger portion of the burden. Across all three policy scenarios, these households have burdens that are higher than average for their quintile, regardless of the specific quintile. For example, a household in the 50–64 age group in quintile 3 incurs an average loss of $223, or 0.5 percent of income, under the cap-and-dividend policy, compared with only $26, or 0.06 percent of income, for a household age 75 or older, and $106, or 0.24 percent of income, for an average household in the third quintile. The sharp contrast with elderly households is partially due to fewer households in this range receiving Social Security (and its corresponding indexed benefits), and various other consumption behaviors.

The cap-and-dividend policy is strongly progressive for older households. The average household burden as a percentage of income rises from -0.48 percent for the lowest income quintile in the 75+ age group to 0.56 percent for the highest income quintile. For the 65–74 age group, the loss rises from -0.33 percent of income up to 0.66 percent. The 50–64 age group also has a progressive distribution ranging from -0.19 percent to 0.68 percent, with a higher average burden throughout. The Waxman-Markey progressivity results for older households are similar to those in table 1 for all households. For both Waxman-Markey scenarios, the burden as a percentage of annual household income peaks in the third or fourth quintile.

Table 3
Household Burden (2006 Dollars) as a Percentage of Income for Older Households by Income Quintile for Three Cap-and-Trade Scenarios

Income quintile	*Household average income*	*Waxman-Markey optimistic case*	*Waxman-Markey pessimistic case*	*Cap with 75 percent dividend*
		Age group		
		50–64	*50–64*	*50–64*
1	11,611	0.05%	0.17%	-0.19%
2	27,006	0.49%	1.10%	0.28%
3	44,445	0.50%	1.05%	0.50%
4	68,729	0.47%	0.94%	0.62%
5	145,373	0.11%	0.58%	0.68%
		Age group		
		65–74	*65–74*	*65–74*
1	12,415	-0.36%	-0.30%	-0.33%
2	26,385	0.12%	0.77%	0.03%
3	43,657	0.25%	0.82%	0.33%
4	68,338	0.22%	0.68%	0.42%
5	136,980	0.04%	0.52%	0.66%
		Age group		
		75+	*75+*	*75+*
1	12,646	-0.58%	-0.59%	-0.48%
2	25,861	-0.08%	0.53%	-0.20%
3	42,893	0.04%	0.55%	0.06%
4	66,689	0.16%	0.62%	0.36%
5	127,897	0.00%	0.46%	0.56%

Table 4
Increase in Average Social Security Payments for Elderly Households by Income Quintile as a Result of Indexing Social Security Benefits to Inflation

Income quintile	*Household average income*	*Annual dollars*	*Percentage of income*	*Household average income*	*Annual dollars*	*Percentage of income*
		65–74			*75+*	
1	12,415	$88	0.71%	12,646	$98	0.79%
2	26,385	$138	0.52%	25,861	$150	0.57%
3	43,657	$139	0.32%	42,893	$155	0.36%
4	68,338	$130	0.19%	66,689	$152	0.22%
5	136,980	$97	0.07%	127,897	$145	0.11%
All	44,983	$120	0.27%	30,791	$128	0.29%

Indexed Social Security payments play a large role in easing the burden of climate policy on older households. As energy prices rise, the CPI increases, and Social Security payments rise along with it. These payments accrue to households age 65 and older that are receiving those benefits, while the costs are mostly borne by younger, working households through the payroll tax. These transfers are included in the household burden reported above. Table 4 breaks out the increase in Social Security payments for the two older age groups by income quintile. As the bottom row shows, the average household in the 65–74 age group earns $120 in extra Social Security income as a result of climate policy. Compared with the average household burdens shown in table 1, we can see that this extra payment is important in offsetting the costs of climate policy. The average loss for these households would have been $170 per year rather than $50 in the Waxman-Markey optimistic case, $391 rather than $271 in the pessimistic case, and $284 rather than $164 in the cap-and-dividend scenario. Similar effects are shown for the age 75+ households.

For lower-income older households, indexed Social Security matters even more. As table 4 shows, the extra payment amounts to 0.71 percent of income for the average age 65–74 household and 0.79 percent of income for the average age 75+ household. The payment has a strongly progressive effect for these older groups: the payment as a percentage of income decreases as income rises.

CONCLUSION

Understanding the multifaceted effects of climate change legislation can be a difficult task as there is still large uncertainty about the costs of climate policy and how households will be affected. Moreover, climate policy has the potential to impact various populations in different manners. In this paper we examine the effects of climate policy across age groups, using optimistic and pessimistic scenarios of one particular bill in congress to characterize the potential range of outcomes.

One difficult aspect to climate policy is that the costs start to accrue in the short term, which is very salient in the political process. This is particularly relevant when discussing older households, many of which have relatively little flexibility to adjust their behavior in response to increases in energy prices.

The findings in our research, however, show that older households fare better as a percent of income than younger households. In both the Waxman-Markey and cap-and-dividend scenarios, older households receive increases in Social Security benefits. The low income programs in the Waxman-Markey scenarios also help vulnerable older adults. In one case, the two programs in conjunction help to create welfare gains for the average household in the 75 and older age group.

This analysis illustrates the variation in the household burden of climate policy under different proposals and the potential vulnerability of older adults and other groups. As demonstrated, these groups can be protected with a combination of automatic adjustments in existing programs and effective policy design. As climate policy continues to evolve, it remains important to focus on this issue and to ensure that the elderly and other vulnerable populations are not unfairly affected.

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Notes

1 In the data period, direct energy consumption accounts for 48 percent of carbon dioxide emissions associated with household expenditures (i.e., excluding government emissions).

2 Our household burden is an estimate of the loss in consumer surplus due to higher energy prices, net of the distribution of allowance value.

3 We use EIA's (2009) estimate of the Urban CPI from their Waxman-Markey Core Scenario. The magnitude of inflation does not change across our scenarios. Inflation would affect other programs, including food stamps and Supplemental Security Income, but we

exclude them because the magnitude of the benefit is small or its distribution cannot be extracted from the CE data. An increase in military pensions could be more important, but we also exclude this effect because of insufficient data.

[4] The wage base that determines the upper limit on wage income eligible for the payroll tax is indexed to average national wages, which we assume do not change.

[5] Many of the details of the program are left up to the Energy Information Administration and the Department of Health and Human Services, so the ultimate effects of the rebate are unknown. Our modeling provides our best guess as to how the program might function.

[6] For a fair comparison across the tables, quintiles are defined nationally for the entire population, as table 1 shows. Note that the average incomes listed in tables 2 and 3 for each quintile are the averages for older households, not the national average across all households reported in table 1.

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