Does Environmental Protection Hurt Low-Income Families?

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Policies for environmental protection affect the lives of all US citizens by regulating pollution, imposing costs and influencing economic decisions. Common examples range from municipal trash disposal to federally mandated Corporate Average Fuel Economy (CAFE) standards for automobile fuel efficiency. Other notable environmental policies include the Environmental Protection Agency's Acid Rain Program to reduce sulfur dioxide (SO_2) emissions from domestic power plants, and the much-discussed but not-yet-enacted idea of a program to reduce greenhouse gas (GHG) emissions. While the United States is not a member of the Kyoto Protocol to reduce global GHG totals, adopted by the United Nations Framework Convention on Climate Change (UNFCC) in December 1997, President Obama promised to achieve substantial GHG reductions in the form of a cap-and-trade policy. The proposed policy has an ambitious reduction target, and if such a policy were to be passed by Congress it would have profound impacts on the entire country. Here, we look at various implications of a GHG regulatory regime for residents of the nation and the state of Illinois, including the possibility of different effects on each income group.

As pollution becomes an increasing concern at the municipal, state, national and international level, policy makers continue to enact environmental policies to manage environmental problems. Pollution is a negative "externality", to the extent that the costs of pollution are not included in the price of the goods produced and sold. Generally, an externality is defined as the impact of a market transaction on individuals not involved in that transaction. A firm that tries to maximize profits would not voluntarily incur costs to cut emissions. Similarly, consumers do not ration their use of goods that are produced in a polluting process, because they do not face the higher prices that would result if producers were required to pay for pollution. In such circumstances, it is incumbent upon the government to enact appropriate policies to deal with the negative externalities of pollution. However, the optimal level of pollution is not zero. Given current technology, some pollution is necessary to produce the vast majority of goods and services demanded by consumers.

Policy makers have a large menu of choices at their disposal to control pollution levels. Below are three categories of policy types:[1]

- *Command-and-control (CAC) policies* can include either a "performance standard" that merely restricts pollution of each firm or a "technology mandate" that may require particular choices. For instance, an electricity plant may be required to use a particular type of fuel or to install a scrubber. These requirements generally make goods more expensive.
- *Pollution taxes* set a tax per unit of pollution. This tax may induce the firm to reduce pollution per unit of output, and it may raise the price of output in a way that induces consumers to buy less output. A problem is that taxes are usually collected on receipts from market transactions, while many emissions are not so easily measured.
- *Permit trading schemes* are also known by the name cap-and-trade. Government creates a market for pollution by issuing a number of permits that matches the maximum target amount of pollution. In order to pollute legally, a firm would have to hold a number of permits equal to their own quantity of pollution. Firms can buy and sell these permits on the open market. Firms that can reduce pollution at a lower cost than the prevailing permit price can sell their permits, and firms with higher abatement costs can buy permits. A key policy choice in any permit trading scheme is the initial allocation of permits. In the case of a GHG cap-and-trade program, the US Congressional Research Service (CRS) estimates that the total

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[1] For a further discussion of policy options, see Fullerton (2001).

value of permits could be 100 billion US dollars per year by 2020 under proposed legislation.[2] If permits are given away (or grandfathered) to firms, then firms receive profits equal to the total value of the permits. Alternatively, the government could auction the permits and use the resulting revenue to reduce other taxes, to reduce the deficit, or for necessary spending.

Importantly, all three policy choices would be likely to raise product prices. Goods produced using the most pollution would tend to experience the largest increases in price on a percentage basis. Particularly hard hit would be items such as electricity and gasoline. However, consumers are not all identical, as some use more electricity or gasoline than others. In this regard, a key distinction is between absolute consumption levels and consumption as a percentage of each household's budget. To calculate the burden of such policies as a fraction of each household's budget, we need to know the household's expenditure on these goods as a fraction of total expenditures.

Government must balance various and often conflicting goals when selecting an environmental policy, including economic efficiency, administrative costs, distributional objectives and political feasibility. This note focuses on distributional effects of environmental policy, or the question of how to consider the impacts on different segments of society when formulating a policy. A particular concern is that low-income individuals might shoulder an undue burden from environmental policy.

Distribution of burdens

The federal income tax system is designed to be a "progressive" policy, since the tax is a low fraction of income for low-income workers and a higher fraction of income for those with more income. Conversely, a regressive policy is one with burdens that are a high fraction of income for low-income families and a lower fraction of income for a high-income family. Concerns regarding environmental policy impacts across the income distribution are an important part of policy making, but are not well studied or understood. A particular concern is that environmental policies might generally be regressive. We now discuss six pathways that might contribute to environmental policies being regressive, and how these pathways apply to some or all of the types of policies listed above.[3]

(1) Increased product prices: Environmental policy is likely to raise the price of goods and services that are produced or used in a pollution intensive manner. Under the tradable permit requirements of the Acid Rain Program, for example, electricity producers incur additional costs to buy low-sulfur coal, to buy scrubbers, or to buy SO_2 pollution permits. These extra costs raise electricity prices. Similar effects on automobile prices arise from CAFE standards that raise fuel efficiency, or from pollution surcharges such as garbage collection fees. In the case of a GHG reduction program, the products most affected would be those produced using a lot of fossil-fuels, whether manufactured goods, electricity, gasoline, or heating fuel. However, expenditures on goods such as electricity and gasoline generally constitute a high fraction of budgets for low-income households (Metcalf 1999). As a result, low-income households may be disproportionately harmed by the resulting price increases (West 2004).

(2) Decreased real net wages: Pollution abatement technologies might be capital-intensive, and thus environmental policies can raise the capital-to-labor ratio used in production. If so, in equilibrium, the wage rate paid to labor may fall relative to the return on capital. This effect may also have a regressive impact if low-income households derive the majority of income from wages, while high-income households earn higher returns from the increased demand for capital. That is, in real terms, the budgets of low-income households shrink relative to the budgets of high-income households.

(3) Scarcity rents: As discussed above, the handout of initial permits can create profits for firms, and high-income households may have relatively high levels of wealth held in the form of corporate stocks. If so, then this environmental policy may create corporate profits that are received by rich shareholders (Parry 2004).

(4) Differential valuation: Low-income households may not derive the same benefits as high-income households from decreases in pollution. Low-income households do benefit from a decrease in pollution, but those benefits may be low if those households

[2] The proposed legislation cited is S. 2191 (Lieberman-Warner). The CRS states, "using the lower allowance prices in the EPA/ADAGE-TECH case, total auction revenues start in the tens of billions of dollars (2005$) and increase to over $100 billion before 2030. Using higher allowance prices, such as the MIT/EPPA case, total auction revenues exceed $100 billion before 2020" (Parker and Yacobucci 2008, 40).

[3] For a complete discussion, see Fullerton (2008).

would rather spend the same resources on the basic necessities of adequate food, clothing and shelter. In contrast, high-income households can better enjoy the luxury of environmental benefits if they already have all the required necessities. If environmental protection provides greater value to high-income households, then, in this way also, environmental policies can be regressive.

(5) Capitalization effects: When environmental policy cleans up the air in a particular area, property prices usually increase, because, all else equal, people are willing to pay more for a house in a cleaner area. Often the property is already owned by high-income households, while low-income households rent. Thus, the capitalization effect increases the wealth of landlords and the costs to renters. It thus constitutes an additional regressive pathway of environmental policy. If so, it may represent a redistribution of wealth from the poor to the rich.

(6) Transitional effects: Environmental policies to reduce pollution almost surely decrease production by affected firms and may cause layoffs. However, individuals with higher levels of education often have better outcomes in the labor market when looking for a job. To the extent that low-income individuals have lower education levels, these individuals may bear a disproportionate cost from employment transition periods between jobs.

Despite these pathways, which can make environmental policy regressive, an overall policy package can be designed to offset these effects. For example, if permits in a cap-and-trade policy are auctioned, then the resulting government revenue can be used to provide assistance to low-income families who must pay more for electricity and heating fuel. While the policy would encourage conservation of pollution-intensive goods by raising these product prices for everyone, the assistance to low-income families could help offset the effects of those price increases on their overall welfare.

Empirical evidence

Next we turn to some numbers to illustrate the first regressive pathway; that is, the increased price of pollution-intensive goods. Again, any serious environmental policy must raise prices, affecting all consumers in some manner. President Obama has promised a GHG emission reduction policy to be instituted at the federal level that results in at least an 80 percent decrease from 1990 GHG levels by 2050. Importantly, he supports the auctioning of initial permit allocations to industry instead of giving away the initial permits to industry. Under such a policy, does the first regressive pathway affect all regions of the country identically? In terms of regressive effects, would Illinois be harmed to a greater extent compared to other states?

Data for this analysis are provided by the Consumer Expenditure Survey (CEX) administered annually by the Bureau of Labor Statistics (BLS). For a sample of about 119,000 households in the 2006 edition, the CEX provides information on their income, all expenditures, and their demographic characteristics. The survey provides reliable household representation at the regional level, and states are aggregated into four regions: East, West, South and Midwest.[4] Since the states in the Midwest have similar economies, and all make relatively high use of natural gas rather than other fossil fuels, the data for the Midwest region provide an appropriate picture for residents of Illinois.

Additionally, the CEX reports aggregate data by region for the seven household income classes arrayed across the bottom of each figure below. For example, the fifth group has pre-tax reported income between 40,000 and 49,999 US dollars. The 2006 edition of the CEX sampled 2,607 households in this group in the Midwest region, with an average household size of 2.4 people, an average annual consumption expenditure of 37,906 US dollars, and average yearly expenditure on electricity of 1,006 US dollars. We apply "equivalence factors" to household aggregate statistics to help account for differences in average household size and composition, and to allow for more accurate comparisons of welfare across household groups.[5]

Any one year's income may fluctuate and thus may not provide a meaningful measure of that family's long-run well being. Instead, we use total consumption expenditure as a measure of income that is relatively constant, since households make consumption choices based on past income and expected future

[4] In the CEX definition, the Midwest region includes: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.
[5] Equivalence factors adjust for increasing or decreasing returns to scale for households of different size and composition. The equivalence factor formula applied to this study is from Citro and Michael (1995).

Figure 1

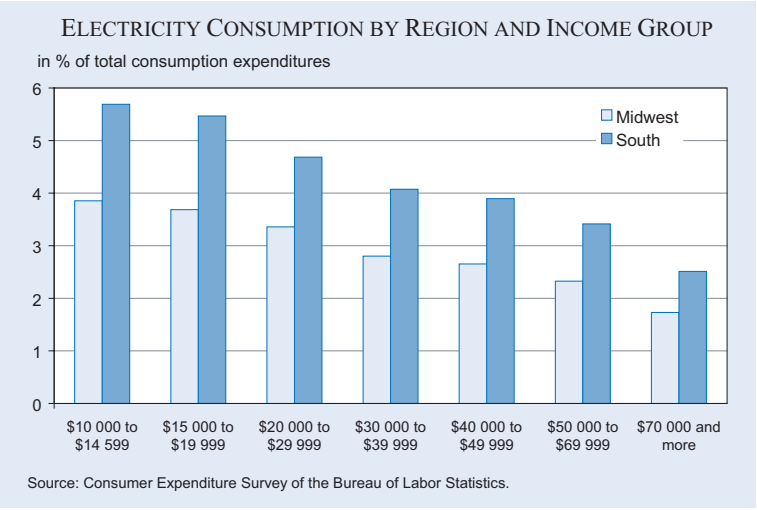
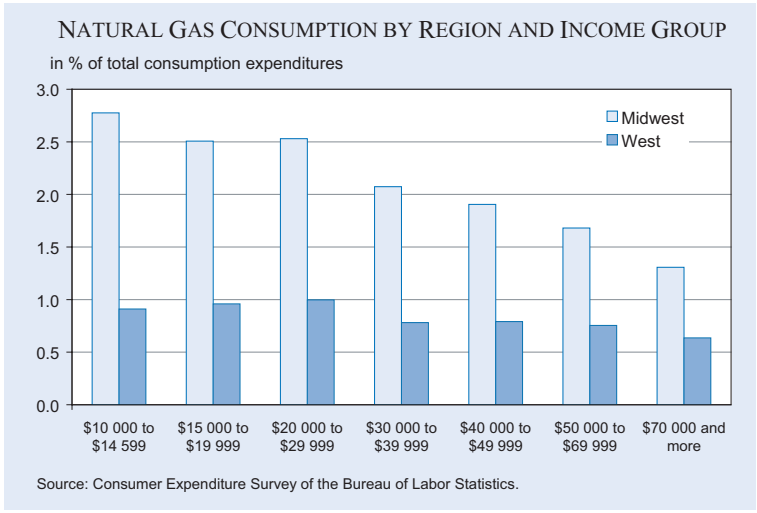


Figure 2



earnings. In this way, consumption expenditure is a reliable measure of "permanent" income.[6]

Conveniently, the CEX tracks energy expenditures including purchases of electricity, natural gas and heating oil. Expenditure proportions by income class on these three energy sources help demonstrate this regressive pathway, because the burning of carbon-based fossil fuel releases carbon dioxide (CO_2) emissions that constitute a vast majority of domestic GHG emissions. By calculating the household budget expenditure fractions on these three energy expenditure categories for different income groups, we show the possible regressive impact of environmental policy from the potential increase in prices.

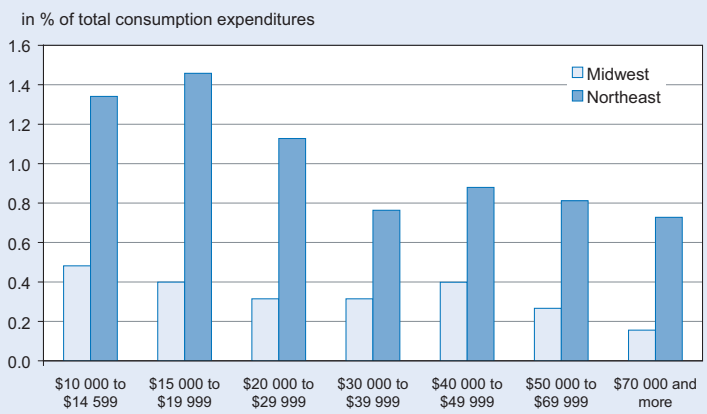
Figure 1 compares the percentage of consumption expenditures on electricity for the Midwest and South regions by income class. The clear downward sloping trend for both regions demonstrates the first regressive pathway of environmental policy. That is, the percentage of consumption expenditures on electricity falls as income increases. Among all regions, Southern states have the highest fractions of budget expenditures on electricity, due to air-conditioning use. If the GHG emissions from electricity generation are similar in the Midwest and South, then the impact of a GHG reduction regime through electricity prices would be greater in the South. Thus, comparing environmental regulation only on electricity generation, Illinois would have a smaller regressive distributional impact than in the typical southern state.

Figure 2 compares the percentage of consumption expenditures on natural gas for the Midwest and West regions by income class. Here, the downward sloping trend is more pronounced for the Midwest region, but still applies to the West region. In the Midwest, natural gas is widely used for home heating, but the West has mild weather. However, natural gas has a low carbon content per unit of energy, compared to other fossil fuels, which mitigates the effects of a GHG reduction regime on Illinois consumers.

By contrast, Figure 3 compares the percentage of consumption expenditures on fuel oil for the Midwest and Northeast regions, by income class. In many ways, Figure 3 is the opposite of Figure 2. Many homes in the Northeast region are heated using fuel oil, while Figure 2 showed that the Midwest region uses more natural gas for home heating. Unfortunately, the carbon content per unit of energy for fuel oil is much higher than for natural gas. Thus a GHG reduction policy would tend to have a heavier welfare burden on the

[6] After applying the equivalence factor formula and using total consumption as a proxy for income in the budget, electricity accounts for 2.65 percent of a standardized household budget with reported income between 40,000 and 49,999 US dollars. We use total consumption for the denominator of these spending percentages, but the CEX still defines income categories by annual income. Ideally, the household aggregate groups would also be sorted by consumption.

Figure 3



Northeastern states relative to a Midwestern state like Illinois.

Conclusion

Environmental policies increasingly affect every aspect of society, and it seems inevitable that more stringent pollution control regulations are soon to be enacted. However, politicians and citizens need to be aware of the potentially regressive effects of environmental policy. Environmental policy is not necessarily regressive, however, if the distributional impacts are understood and taken into account. The data analysis provided here demonstrates one possible regressive pathway of environmental policy via increased product prices. It also therefore demonstrates the magnitude of assistance to low-income families that would be needed to offset the effect of higher energy prices. Revenue to provide the assistance could come from the auctioning of initial permits, a policy position supported by President Obama. Five other possible regressive pathways are also discussed. If these pathways are not considered carefully, well-meaning environmental policies can inadvertently hurt the poorest members of our communities.

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