

Distributional Effects of Environmental Policy

Don Fullerton

University of Illinois and NBER

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Research in environmental economics is mostly about economic efficiency:

- How to measure the benefits of environmental protection?
- How to measure the costs?
- What is the optimal amount of protection?
- What policy will achieve that protection most efficiently?
- In contrast, relatively little research on distributional effects

Standard tax incidence definitions and methods can be applied to environmental policy (even if it is a mandate rather than a tax):

- *Statutory Incidence*: who writes the check
- *Economic Incidence*: who bears the burden
- These differ because of changes in equilibrium prices.
- *Proportional*: economic burden as a fraction of income is the same across all income groups
- *Progressive*: burden as a fraction of income is higher on those with more income
- *Regressive*: burden as a fraction of income is lower on those with more income

Standard tax incidence: Uses side and sources side.

#1 Costs to Consumers (depends on each group's fraction of income spent on the taxed good)

#2 Costs to Factors (depends on factor price changes and each group's fraction of income from each factor K, L)

Environmental policy can be interesting and challenging, as it likely involves those two pathways plus four more.

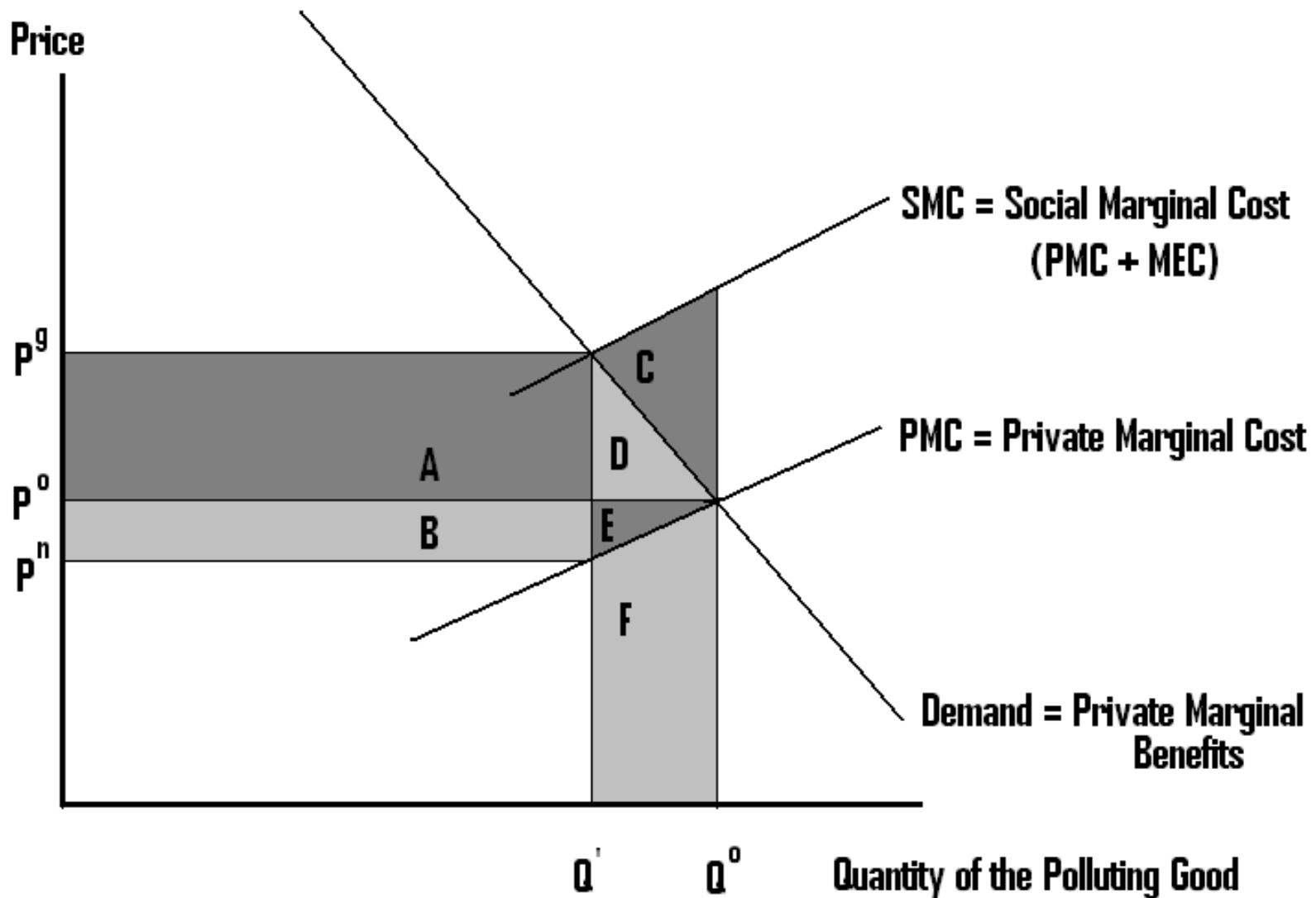
To give this presentation a “theme”, I will make the following over-statement as a hypothesis (not always true, but it certainly can hold under some circumstances):

These six distributional effects might **all** be regressive, so that environmental policy burdens the poor to help the rich (unless the policy reform package includes offsets).

Six effects on the distribution of gains and losses

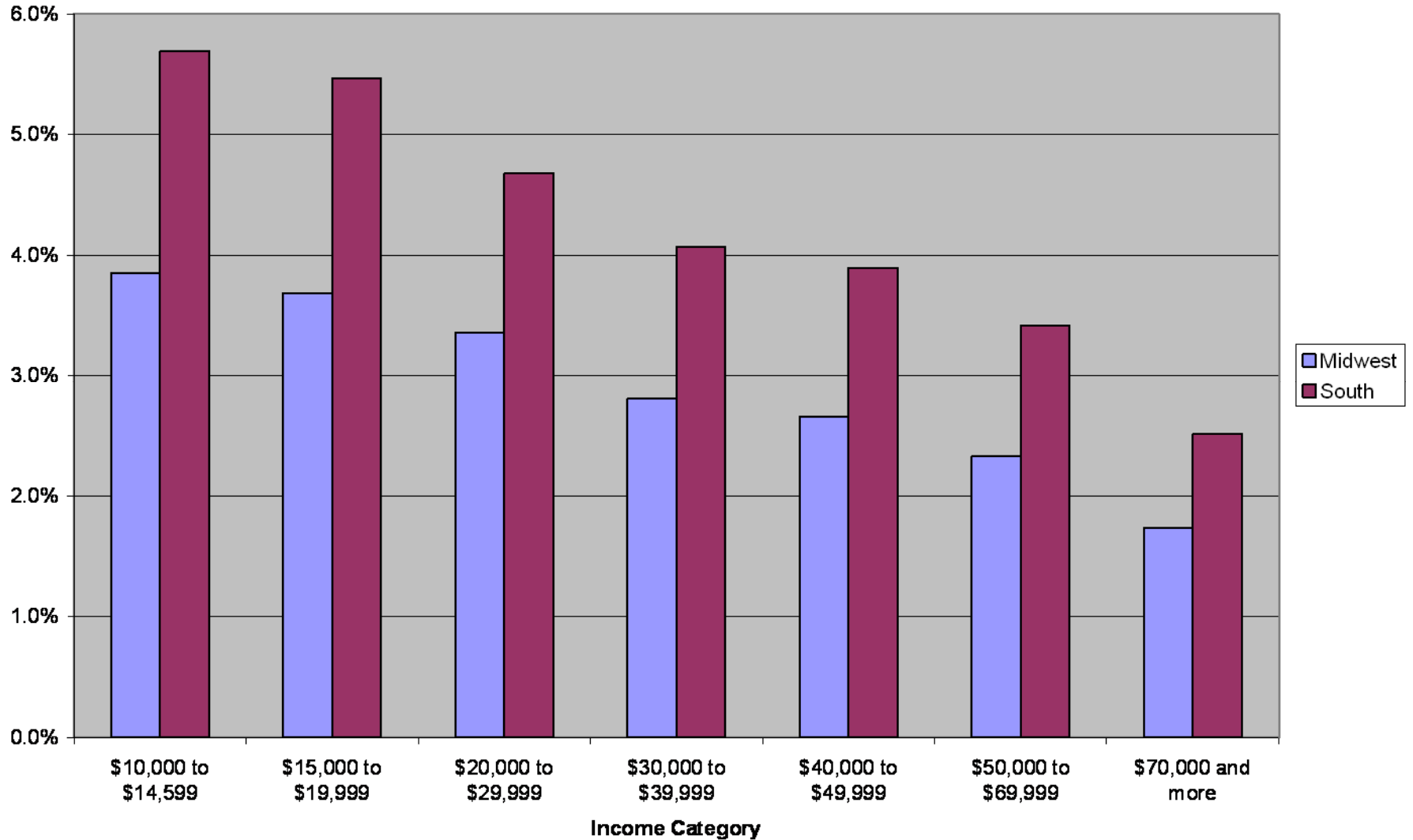
- #1 Costs to Consumers (low income households spend a high fraction of income on heating fuel and electricity)
- #2 Costs to Factors (firms invest in abatement technology, increasing the relative demand for capital, not labor)
- #3 Benefits from Scarcity Rents (cap and trade systems usually handout valuable permits to firms' shareholders)
- #4 Benefits from Environmental Protection (who is "willing to pay" to save endangered species, wildlife, ecology)
- #5 Costs of Transition (much study of capital adjustment costs, but costs on laid off workers as % of income)
- #6 Capitalization Effects (very complicated; some stock prices rise or fall, house prices rise or fall)

#1 Costs to Consumers (the "Uses Side"): Area A+D



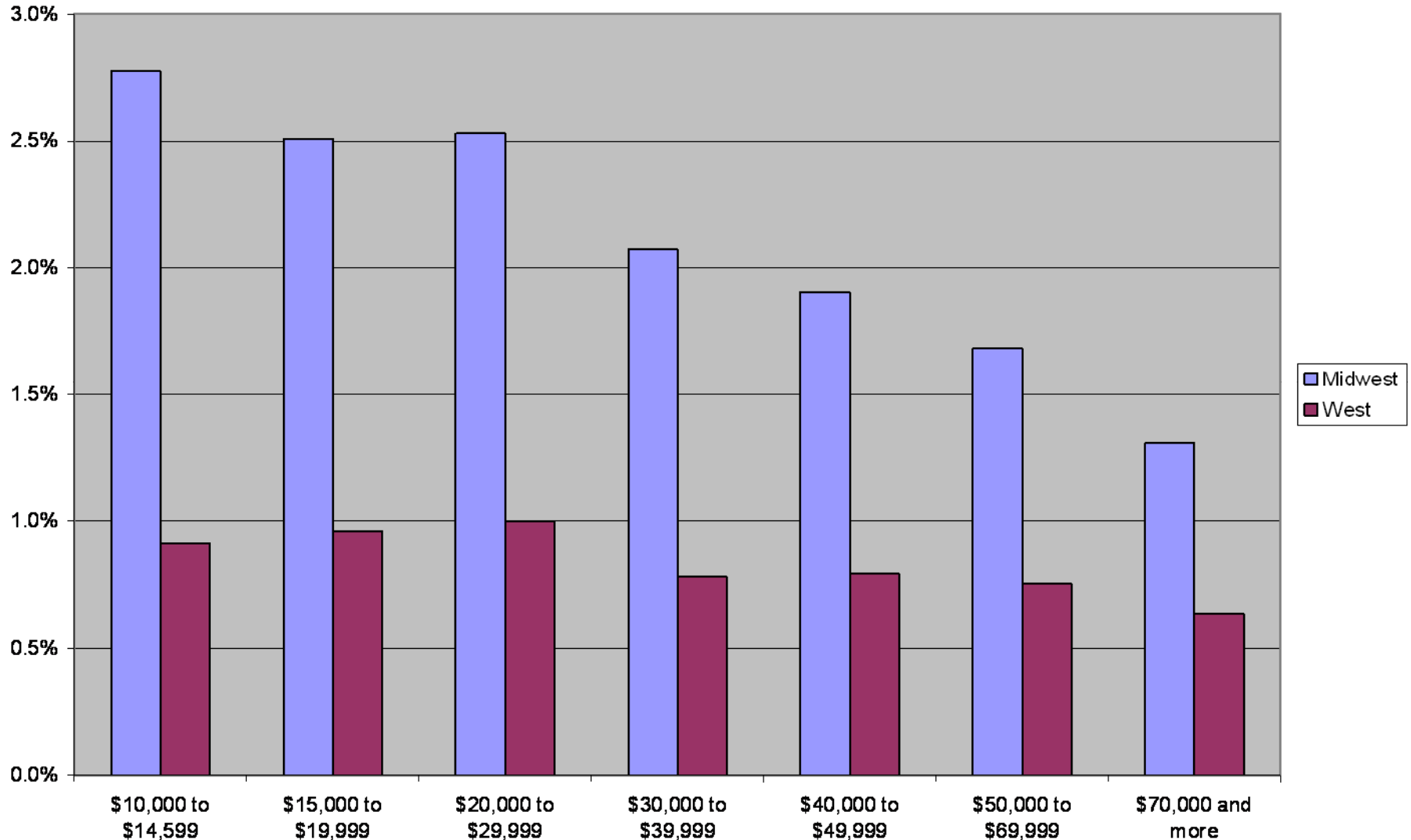
Electricity Consumption in the U.S.

Electricity as a percent of total consumption expenditures, by region and income group



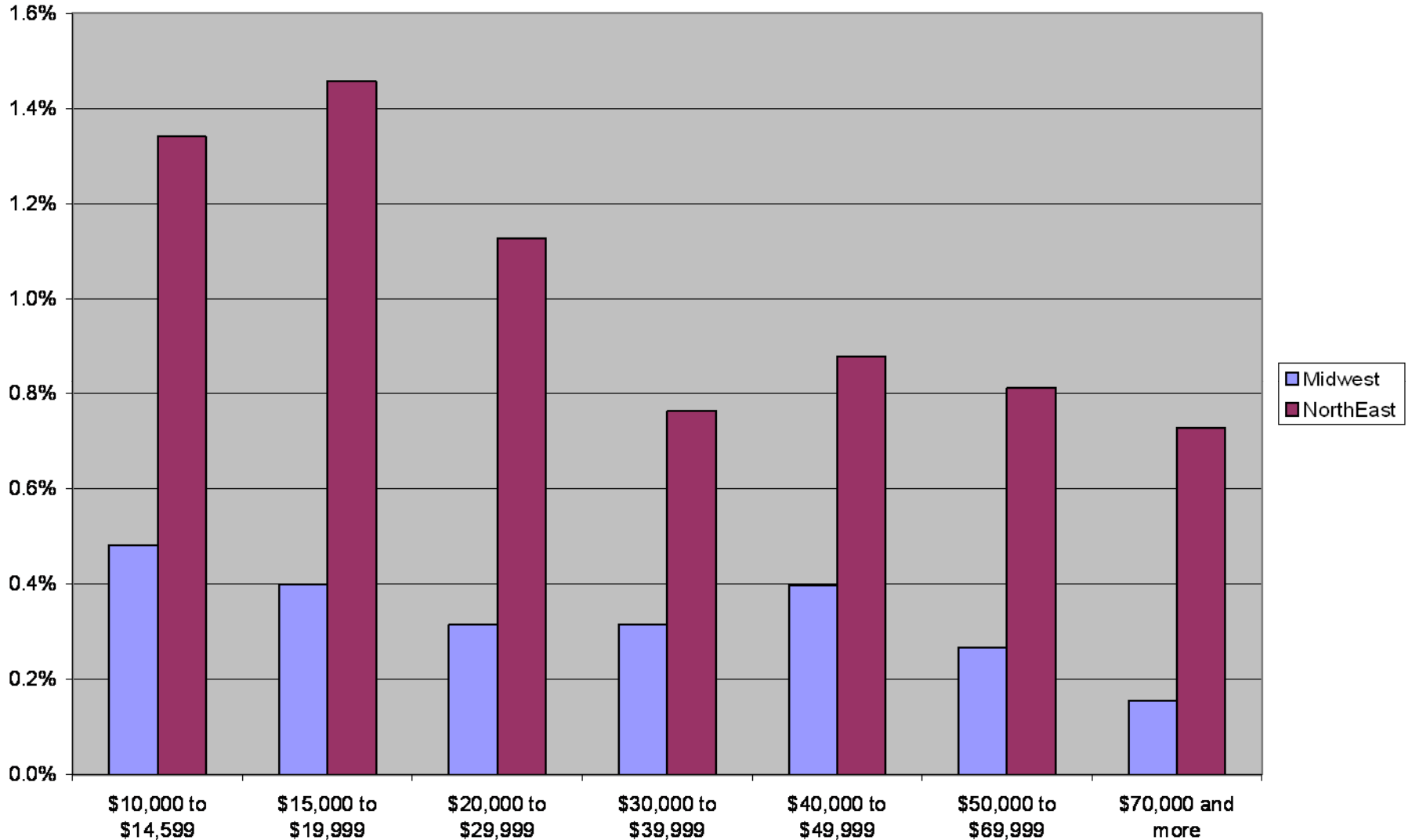
Natural Gas Consumption in the U.S.

Natural Gas as a percent of total consumption expenditures, by region and income group



Fuel Oil Consumption in the U.S.

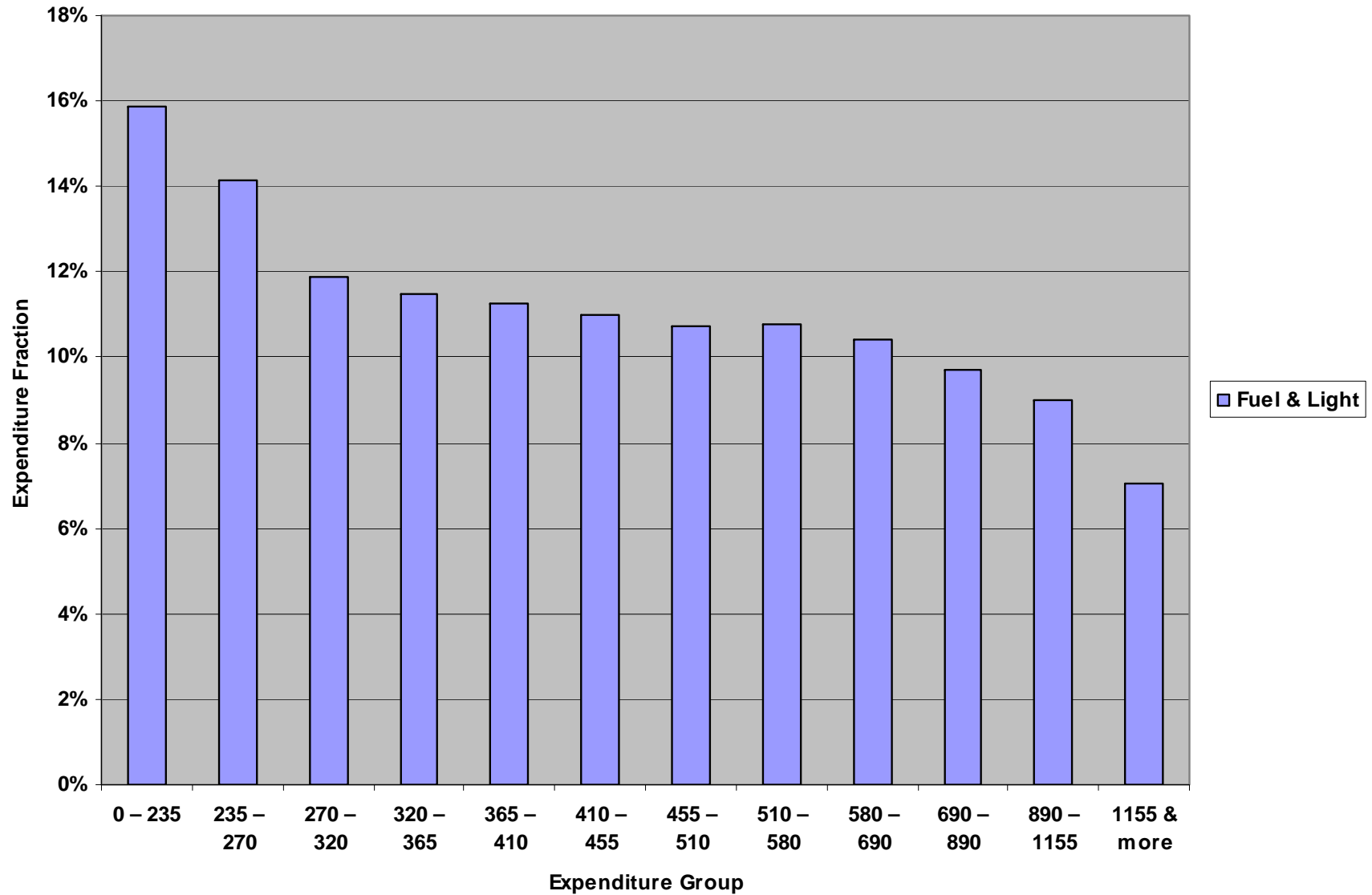
Fuel Oil as a percent of total consumption expenditures, by region and income group



India: Fuel and Light -- Rural

Fuel and Light Fraction of Monthly Per Capita Expenditure (Rs), Rural Households

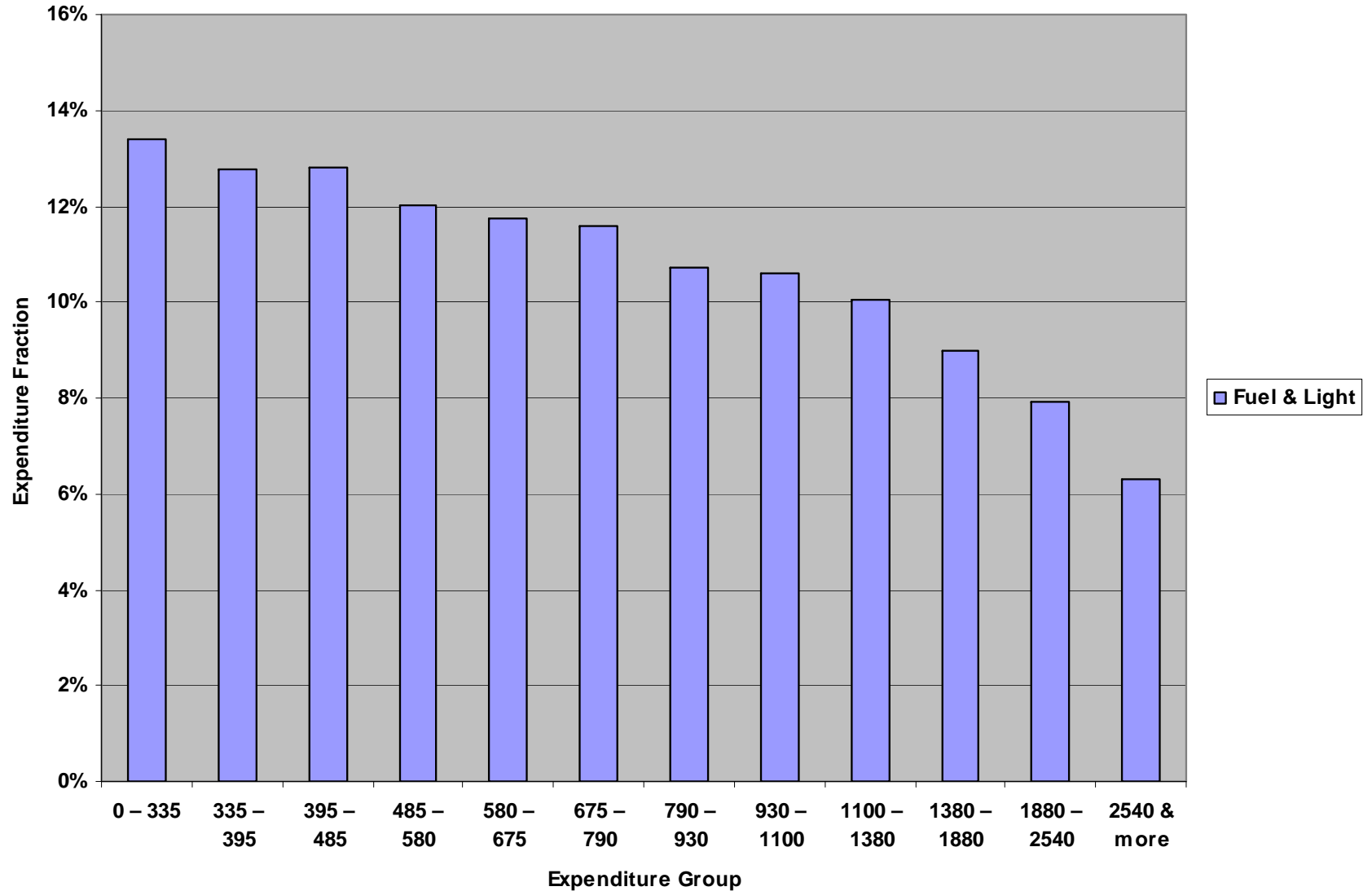
Source: NSS Report #527, Table 5R



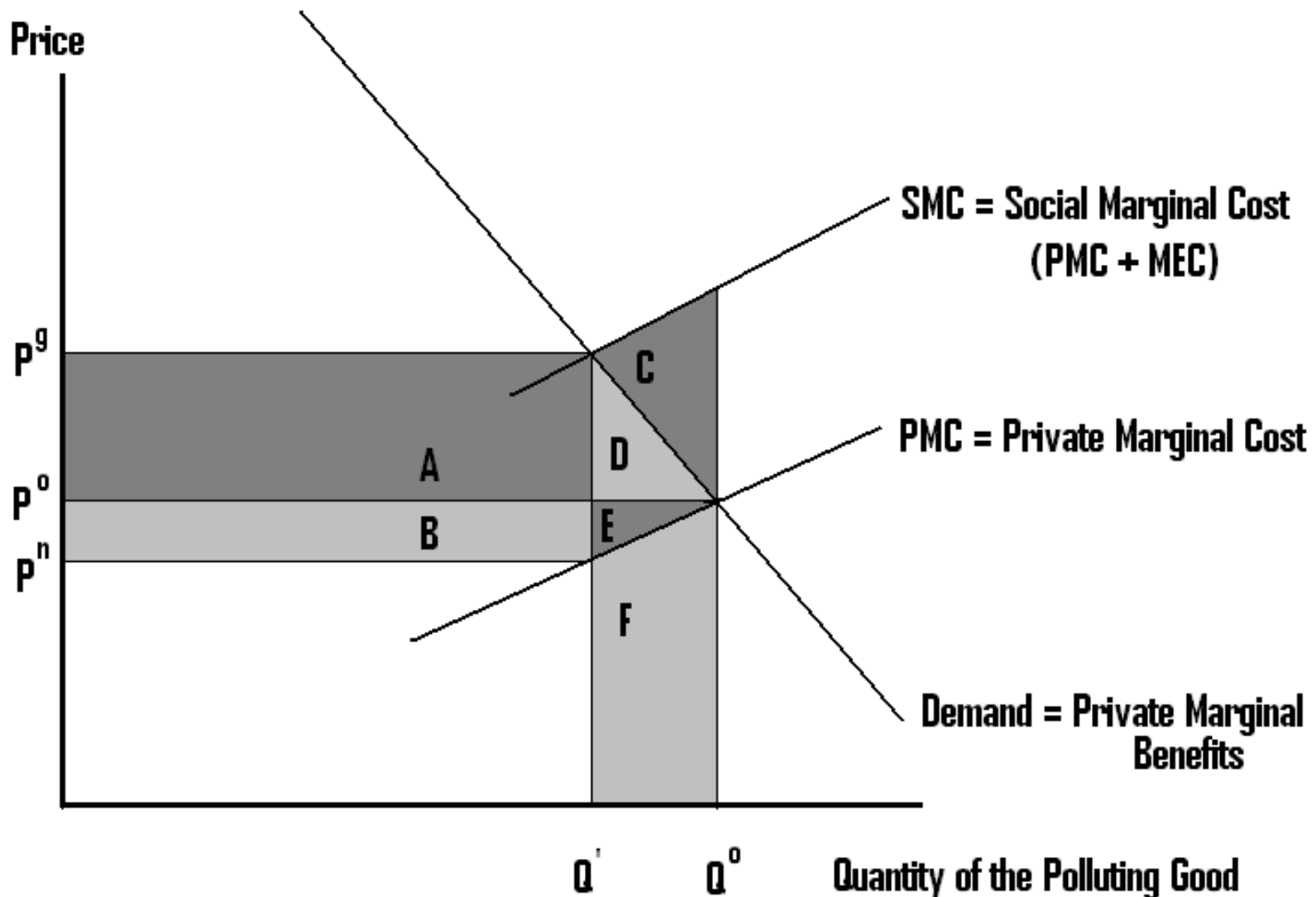
India: Fuel and Light -- Urban

Fuel and Light Fraction of Monthly Per Capita Expenditure (Rs), Urban Households

Source: NSS Report #527, Table 5U



#2 Costs to Producers and Factors (the “Sources Side”): Area B+E



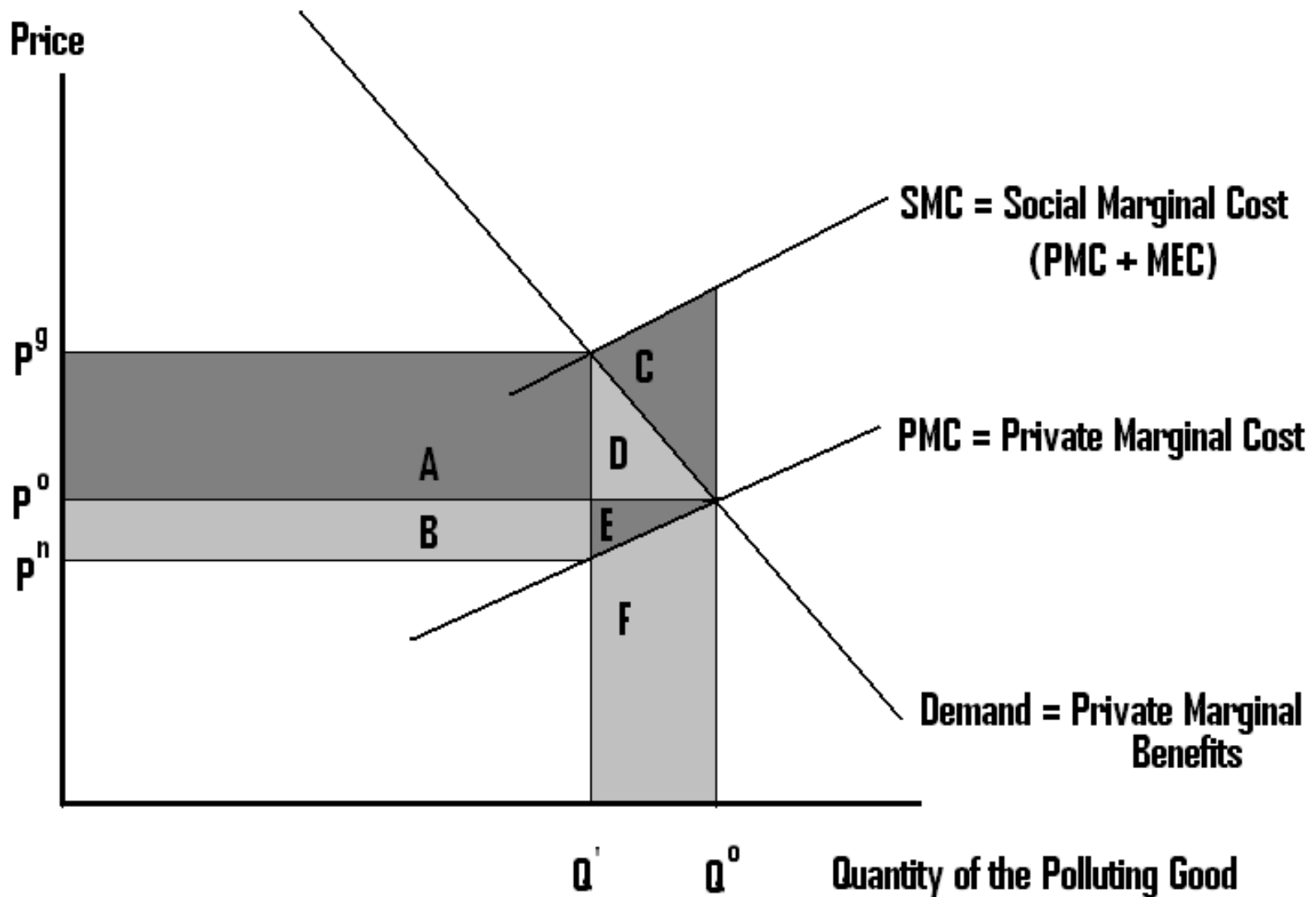
Fullerton and Heutel, “The General Equilibrium Incidence of Environmental Taxes,” *Journal of Public Economics* (April, 2007)

- Clean sector uses labor and capital; dirty sector uses labor, capital, and pollution.
- Initial equilibrium, and raise the tax on pollution.
- “Substitution effect”: helps whichever factor is a better substitute for pollution (burdens the relative complement)
- “Output effect”: raises price of the dirty good, reduces output, and hurts whichever factor is intensively used.

Fullerton and Heutel, “The General Equilibrium Incidence of Environmental Mandates,” NBER wp#13645, Cambridge, MA (2007)

- Actual policy does not use a tax on pollution!
- Cap-and-trade is a quantity restriction (quota).
- Most existing regulations restrict pollution per unit output.
- Mandate to reduce pollution/output can be satisfied two ways: cut pollution, or raise output
- The implicit subsidy to output *helps* the factor used intensively in the dirty sector.

#3 Benefits from Scarcity Rents: Area A+B



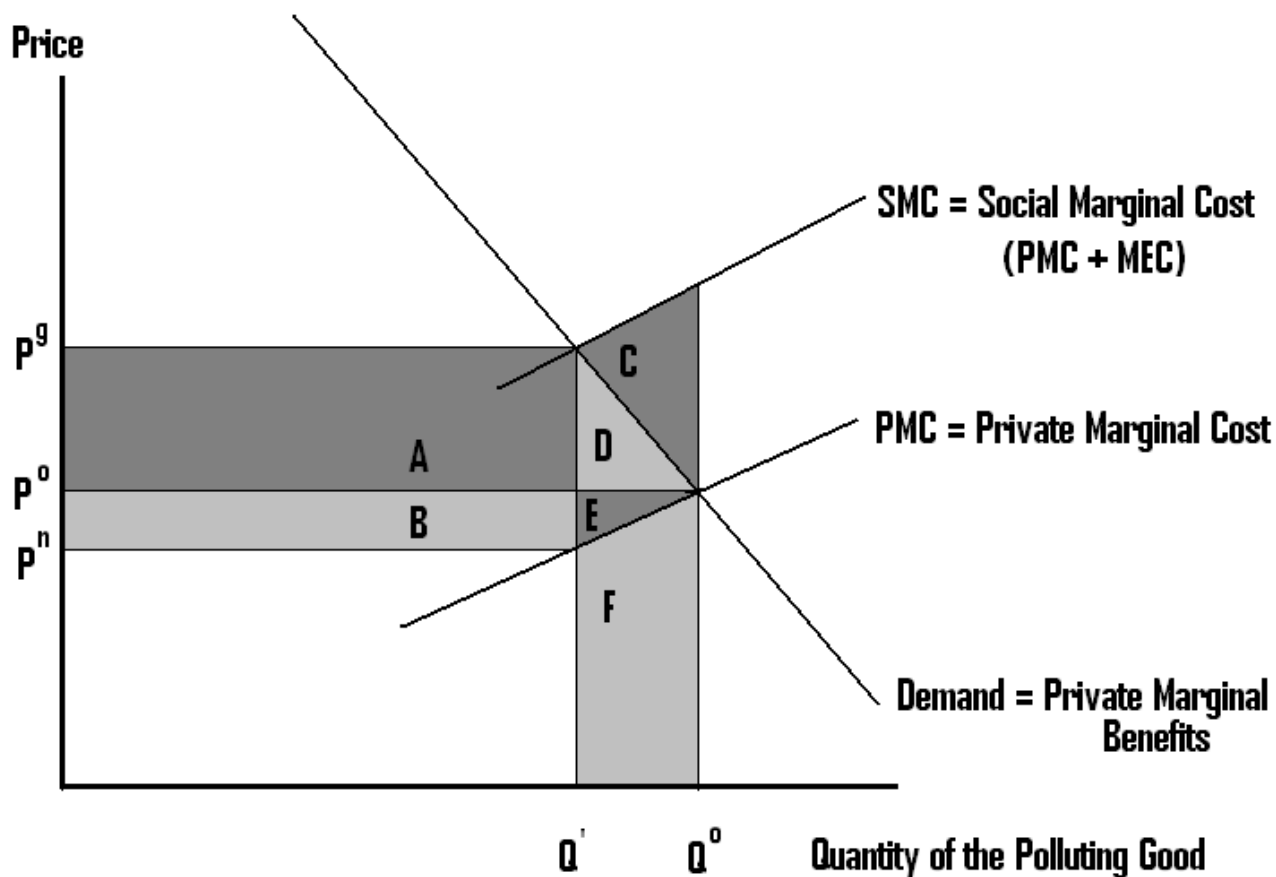
Parry, Ian, "Are Emissions Permits Regressive?",
Journal of Environmental Economics and Management 47(2), March 2004, 364-87.

Table 2. Distributional Burden per Household from Emissions Controls

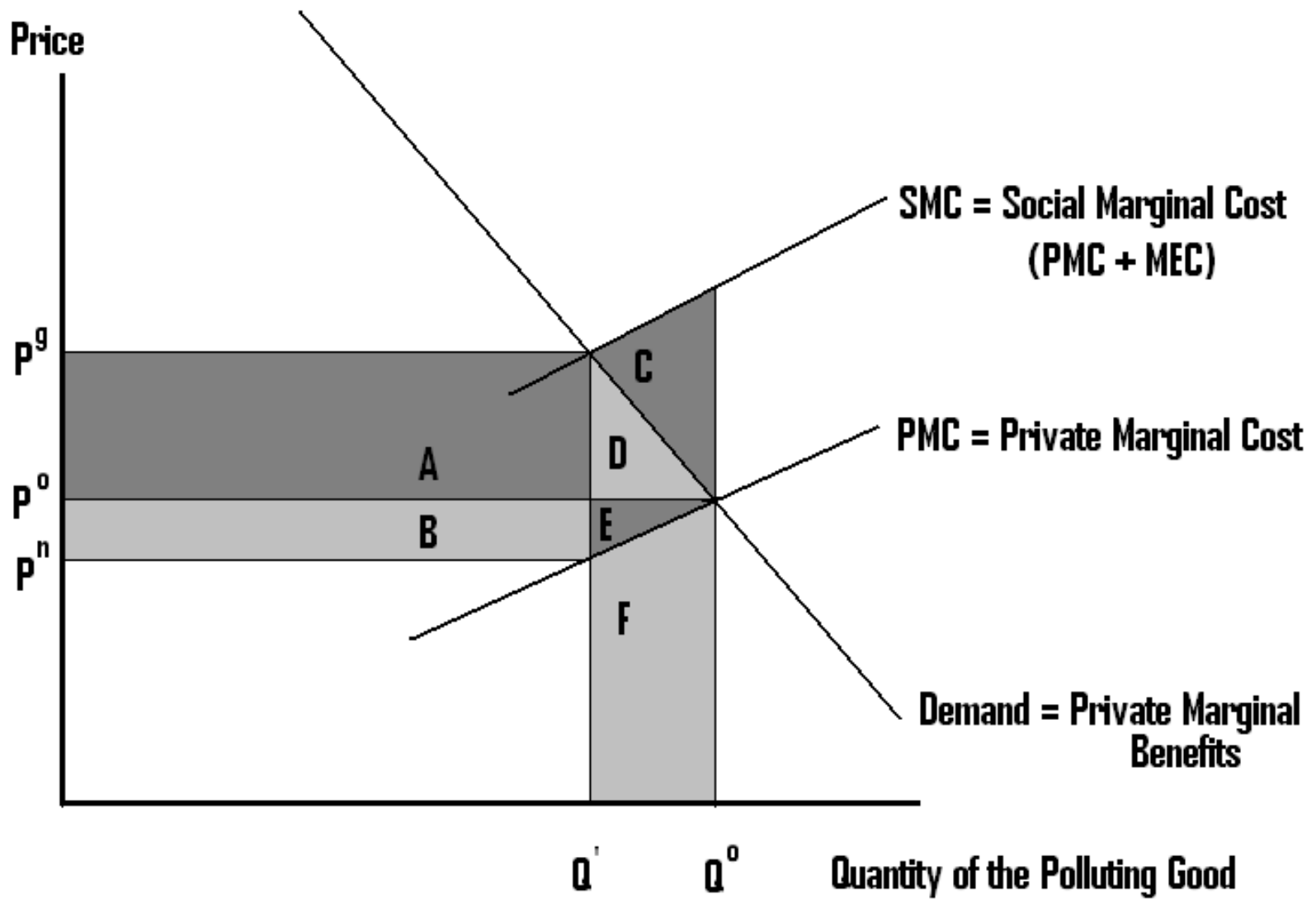
	Income quintile				
	1	2	3	4	5
SO₂ (44% reduction)					
Initial burden, \$	16.3	24.7	30.1	39.4	60.3
Profit income, \$	2.8	8.9	7.3	18.7	42.2
Net burden, \$ proportional recycling	10.7	10.6	15.6	10.6	0.6
% of income	0.104	0.058	0.060	0.029	0.001
Lump-sum recycling	5.0	7.2	14.2	12.2	9.5
% of income	0.048	0.039	0.055	0.033	0.015
Carbon (10% reduction)					
Initial burden, \$	106.0	159.8	199.9	265.5	405.9
Profit income, \$	24.5	77.6	63.6	163.5	369.7
Net burden, \$ proportional recycling	56.3	37.1	72.9	12.6	-117.0
% of income	0.546	0.202	0.282	0.035	-0.187
Lump-sum recycling	6.2	7.0	61.0	26.7	-39.1
% of income	0.06	0.04	0.24	0.07	-0.06

#4 Benefits from Environmental Protection: C+D+E

What income groups benefit from environmental protection?
Reduced global warming? Whose beachfront property gets saved?
Whose land more productive, whose less?



#5 Costs of Transition: Area E+F



#5 Costs of Transition: Area E+F

- Lots of models assume adjustment costs that rise with the amount of investment
- Certainly costs of disinvestment, with capital fixed in place
- Not enough research on labor adjustment costs
- Certainly depend on the time allowed
- Delayed enactment of optimal stringency? Immediate enactment of partial stringency? Phase in stricter regulations?
- The policy package could include assistance, retraining, relocation costs, etc.

#6 Capitalization Effects (not shown on diagram)

- Old toxic spill discovered seeping into the groundwater
- Neighboring homeowners sell their house at a loss
- Others buy cheap, suffer damages, and sue
- Damage awards may not go to those who lose!
- “Polluter pays”, but not those who benefited
- Stockholders are “responsible”, but sold out earlier
- New stockholders have to pay damages, but they aren’t the ones who did the damage
- Prior *consumers* benefited, bought for less than SMC
- Conclusion: impossible to compensate those who lose