

# Is Broader Always Better?

## Preexisting Distortions, Emissions Elasticities, and the Scope of Emissions Pricing

Lawrence H. Goulder

Stanford University, Resources for the Future, and NBER

Marc A. C. Hafstead

Resources for the Future

Roberton C. Williams III

University of Maryland, Resources for the Future, and NBER

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# How Broad Should Emissions Pricing Be?

- Economists typically advocate for economy-wide carbon price
  - This equalizes incentive across all emissions sources, which minimizes abatement costs (in a model with no other distortions)
- But there are often political or distributional advantages to narrower carbon prices (exempting some sectors)
  - Sen. Wyden in 2021: carbon tax that would exempt gasoline
  - Some consideration of an electric-power-sector-only carbon tax
  - Other countries' carbon prices often exempt some sectors

# Key Questions

- Is broader emissions pricing always more cost-effective than narrow?
- How big are the cost differences?
- What factors determine the size (and direction?) of the cost differences
- How do the answers change as the policy becomes more stringent (i.e., for larger reductions in emissions)?

# This Paper

- Compares broad vs. narrow carbon pricing in models with pre-existing tax distortions
- Uses a relatively simple analytical model to develop intuition and identify key effects
- Uses the Goulder-Hafstead E3 model (multi-sector dynamic CGE) to model effects in US economy and evaluate magnitudes

# Preview of Results

- Narrow carbon tax can be more cost-effective than broad
  - Depends on characteristics of the sector excluded from the tax
- Why? Interactions with pre-existing distortions from broader tax system
- And even if narrow tax is less cost-effective, difference can be small
- But for sufficiently large reductions in emissions, broader tax is always more cost-effective
  - And cost advantage of broader tax rises as policy gets more stringent

# What Determines Cost Effect of Excluding a Sector?

- Revenue-recycling effect: efficiency gain from recycling carbon tax revenue to cut other taxes
- Tax-interaction effect: efficiency loss because carbon tax exacerbates pre-existing tax distortions
- Emissions elasticity: how responsive emissions are to the tax rate
  - For a given overall reduction in emissions:
    - Excluding a low-elasticity sector increases direct costs (costs ignoring TI and RR effects) by less
    - Excluding a low-elasticity sector reduces revenue (relevant because both TI and RR effects are roughly proportional to revenue)
- Elasticity and TI effect vary by sector. RR effect depends how tax revenue is used.

# Intuition for Results

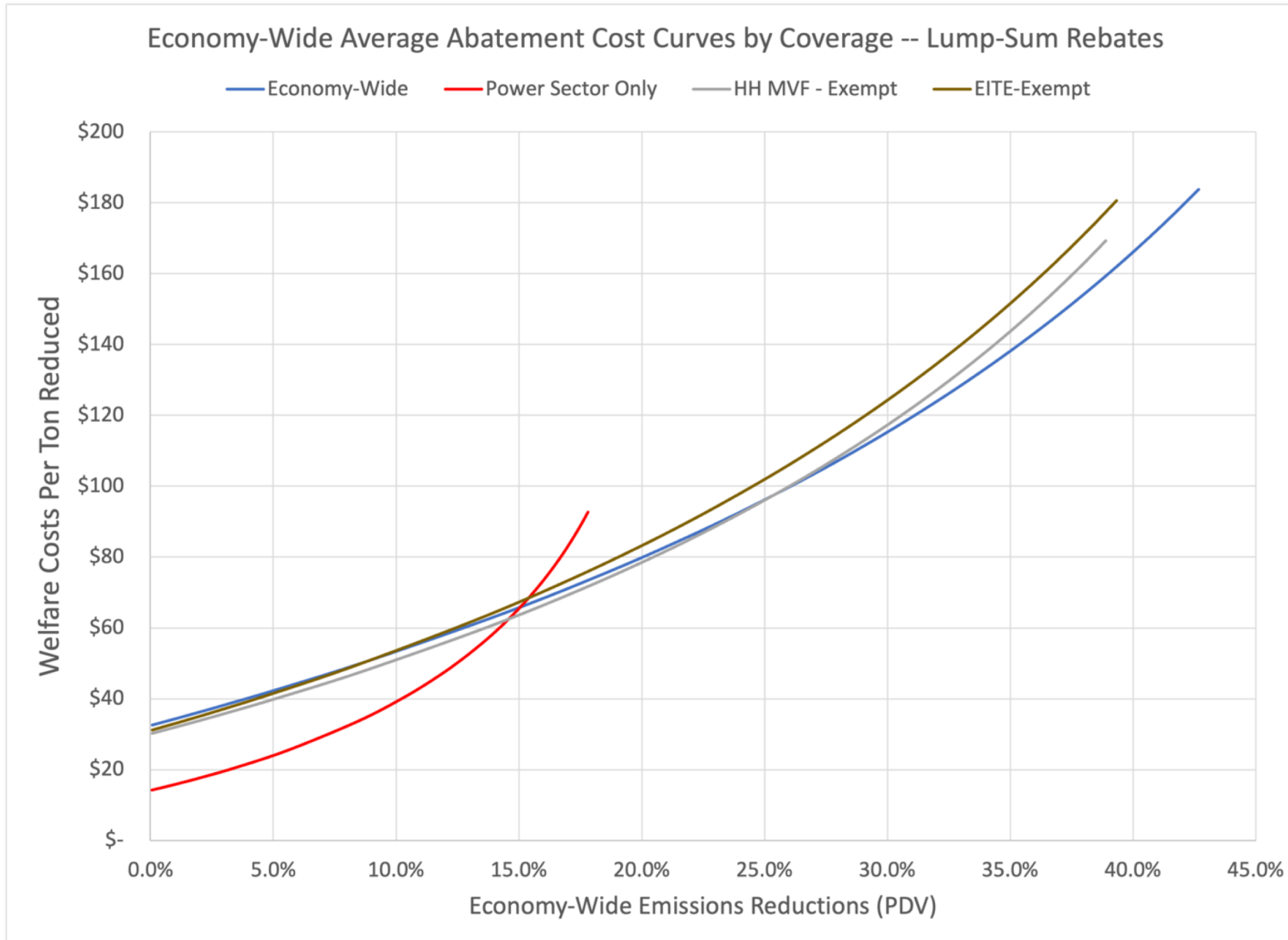
- Direct cost is always higher for narrower tax.
  - But cost increase is smaller when excluding less elastic sectors
- If TI effect is larger than RR effect, then net TI/RR increases cost
  - That cost increase (per ton) is larger for less elastic sectors (less elastic -> more revenue for given emissions reduction)
  - Reversed if RR larger than TI (lowers cost, larger drop if less elastic)
- TI/RR effects roughly proportional to tax rate. Direct cost roughly proportional to square of tax rate
  - Intercept of cost curve determined by TI/RR effects
  - Slope determined largely by direct cost
  - Implication: narrower can be better for small emissions reductions, but broader is better for sufficiently large reduction

# Policies Modeled

- Economy-wide carbon tax
- Carbon tax only on the electric power sector
- Carbon tax with exemption for household use of motor vehicle fuel
  - Approximates an exemption for gasoline
- Carbon tax with exemption for energy-intensive trade-exposed sectors
- Inverses of these policies (e.g., exempt power sector, tax only motor fuel)
  - Not politically relevant, but useful as illustration
- Different uses for carbon tax revenue
  - Lump-sum rebates to households
  - Cuts to individual income tax rates



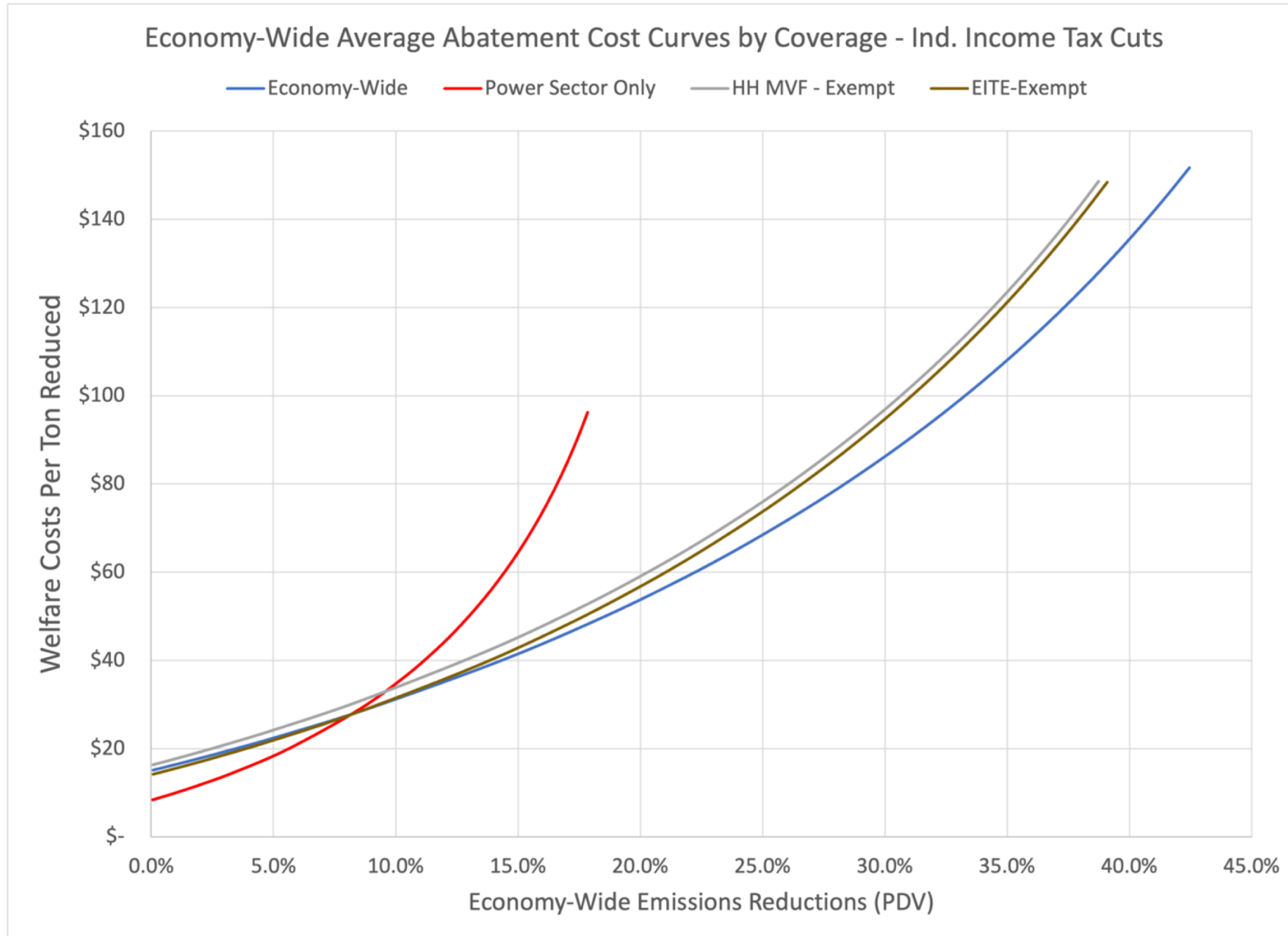
# Abatement Costs with Lump-Sum Recycling



# Decomposing Intercepts (Lump-Sum Recycling)

Coverage	Net tax-interaction/ revenue-recycling effect per dollar of tax revenue	Leakage- Adjusted Semi- Elasticity	Marginal Cost Per Ton Reduced (at Intercept)		
			Analytical Model	Numerical Model	Difference
<b>Economy-Wide</b>	\$ 0.26	1.1%	\$ 23.76	\$ 23.74	0.1%
<b>Power Sector Only</b>	\$ 0.31	2.6%	\$ 11.89	\$ 11.88	0.1%
<b>Power Sector Exempt Motor Vehicle Fuel Exemption</b>	\$ 0.23	0.4%	\$ 60.28	\$ 60.27	0.0%
<b>Motor Vehicle Fuel Only</b>	\$ 0.28	1.3%	\$ 22.22	\$ 22.20	0.1%
<b>EITE Industry Exemption</b>	\$ 0.13	0.1%	\$ 105.30	\$ 105.29	0.0%
<b>EITE Industry Only</b>	\$ 0.25	1.1%	\$ 22.84	\$ 22.82	0.1%
	\$ 0.36	0.8%	\$ 44.98	\$ 44.96	0.0%

# Abatement Costs with Indiv. Income Tax Recycling



# Decomposing Intercepts (Indiv. Income Tax Recycling)

Coverage	Net tax-interaction/ revenue-recycling effect per dollar of tax revenue	Leakage- Adjusted Semi- Elasticity	Marginal Cost Per Ton Reduced (at Intercept)		
			Analytical Model	Numerical Model	Difference
<b>Economy-Wide</b>	\$ 0.08	1.1%	\$ 7.17	\$ 7.17	0.1%
<b>Power Sector Only</b>	\$ 0.13	2.6%	\$ 5.08	\$ 5.07	0.1%
<b>Power Sector Exempt Motor Vehicle Fuel Exemption</b>	\$ 0.05	0.4%	\$ 13.58	\$ 13.58	0.0%
<b>Motor Vehicle Fuel Only</b>	\$ -0.12	0.1%	\$ -97.48	\$ -97.48	0.0%
<b>EITE Industry Exemption</b>	\$ 0.07	1.1%	\$ 6.48	\$ 6.47	0.1%
<b>EITE Industry Only</b>	\$ 0.18	0.8%	\$ 22.93	\$ 22.92	0.0%

# Conclusions/Implications

- Narrow carbon tax can be more cost-effective than broad
  - Depends on emissions elasticities and tax interactions
- Even when broader tax is more cost-effective, cost difference can be small
- But for sufficiently large reductions in emissions, broader tax is always more cost-effective (and difference grows as policy gets more stringent)
- Narrow tax could be attractive for political or distributional reasons, and could have a cost advantage (or only small disadvantage)
- If policy is going to tighten over time, could make sense to start with narrow tax and broaden over time
- Results should generalize to other policies and other distortions