Green Tax Reforms: What Happened to the Double Dividend?

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Overview

- Double Dividend literature suggested the opportunity for significant efficiency gains from Green Tax Reforms
- The promise of efficiency reform has not been realized in practice
- Why not?
- What are the opportunities moving forward?

Green Tax Reform

- Implement or increase an environmental levy
- Lower some other distortionary tax – on labor and/or capital
- Do this in a revenue neutral reform

- Intellectual roots in the Double Dividend Literature

Double Dividend Literature

- Gains from replacing CAC regulations with revenue-raising instruments (Tullock, 1967; Terkla, 1984)
  - Not a green tax reform per se
- Evolving shift to revenue neutral tax reforms (Lee and Misiolek, 1986; Pearce, 1991; Repetto et al., 1992)
- Very different fiscal/environmental experiment

Double Dividend Literature

Governments may then adopt a fiscally neutral stance on the carbon tax, using revenues to finance reductions in incentive-distorting taxes such as income tax, or corporation tax. This "**double-dividend**" feature of a pollution tax is of critical importance in the political debate about the means of securing a "carbon convention."

- Pearce (1991), p. 940

Double Dividend Hypothesis

- Implementing a Green Tax Reform can improve the efficiency of the overall tax system
- Strong Double Dividend – a GTR will improve efficiency for typical tax systems
- Intermediate Double Dividend – a GTR can be designed to improve efficiency
- Weak Double Dividend – Using environmental revenues to lower taxes is more efficient than returning the revenues in a lump-sum fashion.

Goulder (1995)

Challenges to the Strong Double Dividend View

- Environmental taxes have their own distortions that are of first-order importance in the presence of pre-existing distortions (Bovenberg and de Mooij, 1994; Parry, 1995)
  - a general equilibrium phenomenon
- Offsetting Effects (Goulder, 1995)
  - revenue recycling effect (+)
  - tax interaction effect (-)
- Intermediate DD recognizes the importance of the tax interaction effect

Weak Double Dividend

- Even the weak DD must be qualified (Babiker, Metcalf, and Reilly, 2003)
  - With sufficient distortions in the tax system, a lump-sum return of environmental revenues could be more efficient than specific tax rate reductions
  - Evidence to support this in the EU

Welfare losses with recycling (EV to Full Income)			
	Lump-Sum	Labor	Non-Energy Consumption
USA	0.65	0.49	0.57
JPN	0.62	0.56	0.54
GBR	1.05	0.97	0.91
DEU	0.77	0.69	0.55
DNK	3.82	3.54	3.23
SWE	3.46	3.27	3.03
FIN	1.86	1.67	1.45
FRA	**0.70**	0.64	**0.76**
ITA	1.26	1.08	1.22
NLD	**4.67**	4.45	**4.87**
ESP	**3.13**	3.01	**3.32**
REU	**1.27**	1.17	**1.44**
OOE	1.96	1.88	1.84
Average	1.94	1.80	1.83

Babiker, Metcalf, and Reilly (2003)

Understanding the DDH

- DDH cannot be established on an *a priori* basis
- Focus on revenue is misplaced
- DD connected to creation of scarcity rents
- CAC regulations can be distinguished by their ability to create scarcity rents.

Fullerton and Metcalf (1998)

DDH Cannot Be Established On An *A Priori* Basis

- Evaluating the gains from an environmental policy depends on the:
  - Policies currently in place
  - Nature of the reform
  - e.g. Babiker, Metcalf, and Reilly (2003)
- Legitimizes a Green Tax Reform research agenda

Focus On Revenue Is Misplaced

- Green revenue can be used to lower existing taxes
- Changes in real factor prices matter (Bovenberg and de Mooij, 1994)
  - reform raises the price index (denominator) and the nominal after-tax wage (numerator)
- Can achieve the same effect with subsidies (Fullerton and Metcalf, 2001)
  - subsidy lowers price index and lowers the after-tax wage

Scarcity Rents Matter

- CAC regulation creates entry barriers for incumbents
- So does cap and trade *if* allowances allocated on basis of historic emissions
- Analogous to implementing a carbon levy and handing out revenue to owners of carbon intensive industry
- Carbon levy ensures that the government captures the scarcity rents associated with environmental policy
- Auctioning permits does the same thing

Not All Regulatory Approaches Create Rents

- SO_2 trading program under Clean Air Act Amendments of 1990 create scarcity rents
- Low-carbon emission standards do not create scarcity rents
- A point long understood by industry (see Buchanan and Tullock, 1975)

Double Dividend Focus on Efficiency

- Double Dividend literature primarily focused on efficiency
- A parallel strand focusing on distributional neutrality
- Distinction between green taxes and green tax reforms (Metcalf, 1999)

10% Green Tax Shift: Metcalf (1999)

- Incidence analysis focuses on uses side
- In a partial equilibrium framework, full forward shifting
- Price impacts on intermediate goods flow through to final consumption goods using BEA Input-Output Tables and BEA Bridge Tables to link to Consumer Expenditure Survey

10% Green Tax Shift

Tax Increase	
Carbon Tax	$ 56.0
Gasoline Tax	$ 19.8
Air Pollution Taxes	$ 40.5
Virgin Materials Tax	$ 9.3
Total	$ 125.6
Tax Decrease	
Payroll Tax Reduction	$ 71.2
$150 Refundable Tax Credit	$ 34.9
4% Personal Income Tax Reduction	$ 19.3
Total	$ 125.4
Amounts in billions of dollars	

Metcalf (1999)

10% Green Tax Shift

Married, Age 40 - 50			
Decile	Increase	Decrease	Net
1	1,248	1,214	34
2	1,406	1,580	-174
3	1,382	1,681	-299
4	1,513	1,761	-248
5	1,861	1,903	-42
6	1,706	2,097	-391
7	1,761	2,163	-402
8	1,972	2,133	-161
9	1,998	2,107	-110
10	2,830	2,954	-124
Δ Suits	**-0.224**	**0.234**	**0.010**

Metcalf (1999)

Distributional Neutrality and Climate Policy

- Excise taxes and lifetime income: Poterba (1989, 1991); Bull, Hassett, and Metcalf (1994); Fullerton and Rogers (1993)
- Carbon Pricing: Dinan and Rogers (2002); Parry (2004); Metcalf (2007); Hassett, Mathur, and Metcalf (2009); Grainger and Kolstad (2009)
- Focus on uses side effects

Double Dividends in Practice: Early Promise

- Early Green Tax Reforms
  - Finland (1990)
  - Sweden, Norway (1991)
  - Netherlands (1992)
  - Denmark (1993)
- EU Carbon/Energy Tax (1992)
- Germany (1999)

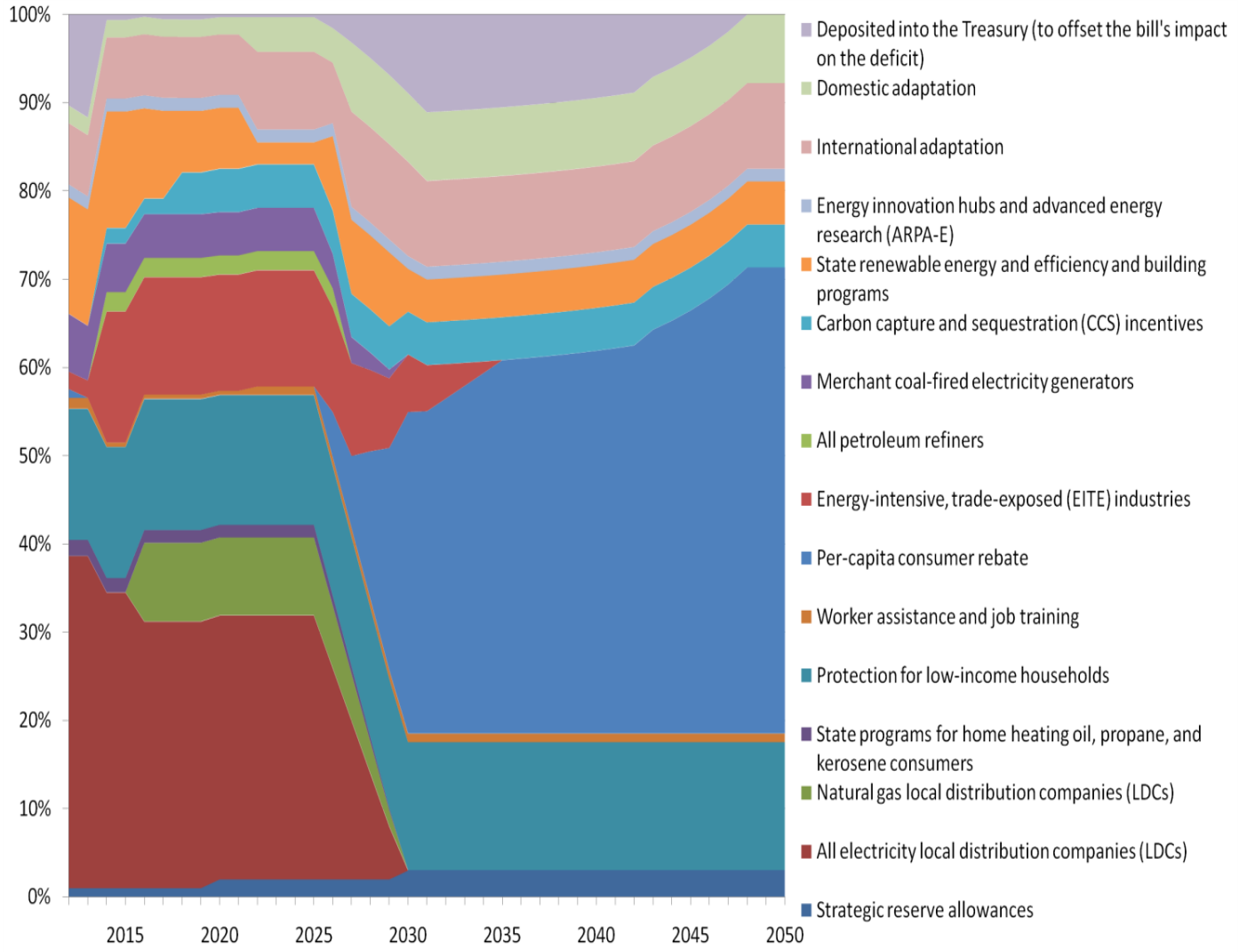
Double Dividends in Practice: Cap and Trade

- U.S. EPA Acid Rain Program
- EU Emissions Trading Scheme
- Regional Greenhouse Gas Initiative (RGGI)
- AB32 in California
- Western Climate Initiative

Double Dividends in Practice: U.S. National Policy

- American Clean Energy and Security Act (H. 2454) cleared House of Representatives
- Clean Energy Jobs and American Power Act (S. 1733) cleared Senate Environment Committee
- American Power Act Draft Bill
- Carbon Limits and Energy for America's Renewal (CLEAR) Act (S. 2877)
- EPA endangerment finding

Waxman Markey (H. 2454)



Rausch, Metcalf, Reilly, and Paltsev (2010)

Waxman Markey (H. 2454)

- Small portion of permits auctioned
  - 2012 – 2025: 18%
  - 2012 – 2050: 40%
- Smaller portion of permits used for tax rate reduction
  - Zero!
- Similar result for Senate bills

Cantwell Collins (S. 2877)

- All permits auctioned (with price band)
- Carbon Refund Trust Fund receives 75% of revenue to finance monthly per capita energy security dividends
- Clean Energy Reinvestment Trust Fund receives 25% of revenue to finance
  - "targeted and region-specific" transition, mitigation, and adaptation assistance
  - training and development funds for job transition
  - investments in clean technology, weatherization, and other projects
  - 16 categories listed in total
  - Tax rate reductions not included in this list

Summing Up

- Early tentative steps to implement Green Tax Reforms based on insights from the Double Dividend Literature
- No current interest in using carbon proceeds to enhance efficiency of tax system
- Why not?

Why No Double Dividend?

- Earmarking
- Congressional committee structure
- Political concern about distribution
  - transitional distribution concerns
  - income concerns

Earmarking

- Improve efficiency of voting process (Buchanan, 1963)
- Earmarking to compensate victims (Pirtilla, 1999)
- Earmarking to avoid future expropriation of revenues (Brett and Keen, 2000)

Congressional Committee Structure

- Cap-and-trade under jurisdiction of energy and environmental committees
  - Committee jurisdiction over spending programs
- Tax code overseen by different committees

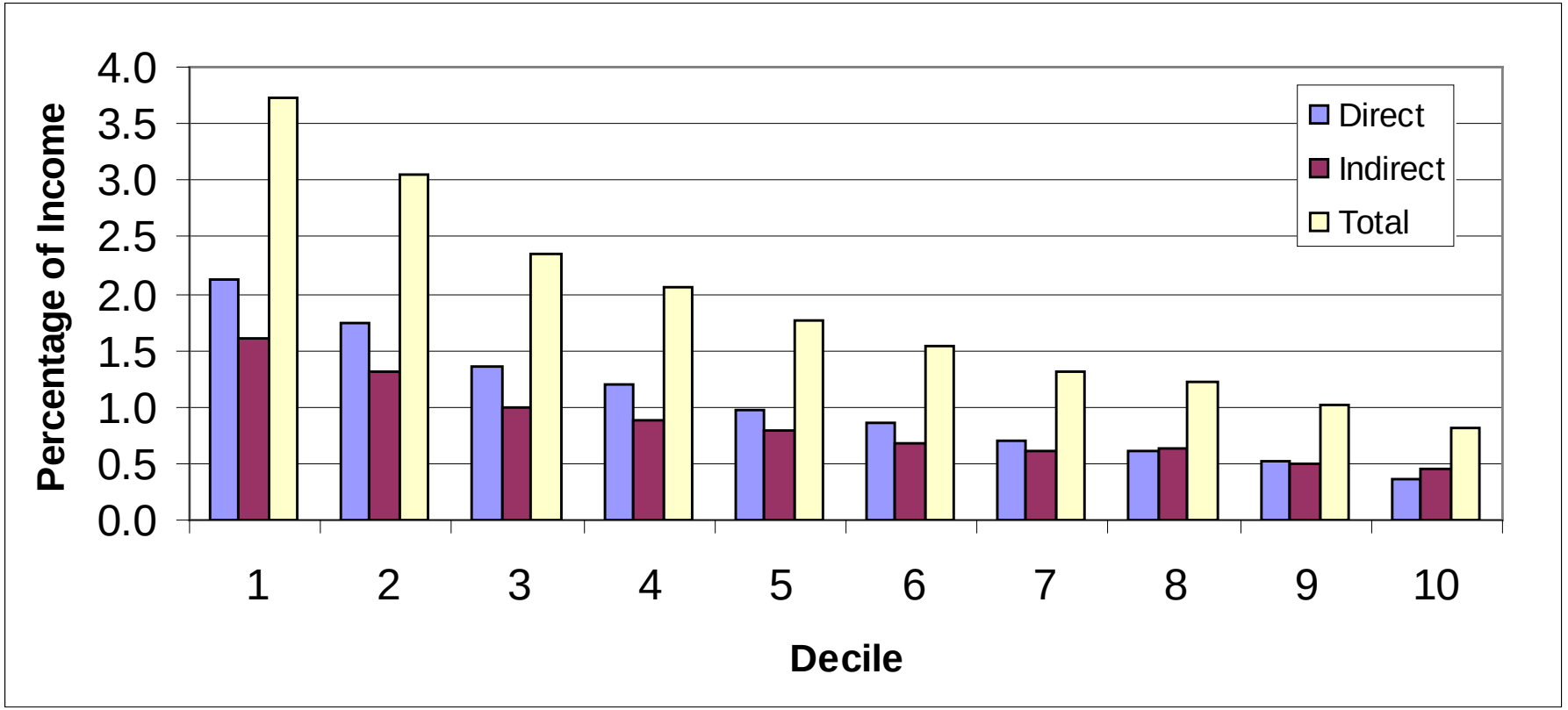
Distributional Concerns

- Received wisdom is that carbon pricing is regressive
- Need to offset regressivity through targeted rebates to low-income households
- Why not targeted rebates with efficiency provisions?
  - Congressional committee structure

Incidence

- Forward and backward shifting analyses
- Focus has been on forward shifting on assumption that carbon pricing is passed forward into higher product prices

Regressivity on the Uses Side



Hassett, Mathur, and Metcalf (2009)

Problems with This Analysis

- Green Tax versus Green Tax Reform
  - Metcalf (1999)
- Analysis with forward and backward shifting is a partial equilibrium construct
  - Forward and backward shifting meaningless in a general equilibrium context
  - Choice of numeraire determinate

The Importance of the Numeraire

$$\underbrace{X}_{Numeraire} + Y = wL$$

$$X + (1+t)Y = wL$$

$$\frac{X}{1+t} + \underbrace{Y}_{Numeraire} = \frac{w}{1+t}L$$

Sources and Uses Side Analysis

- Carbon pricing has differential impacts based on
  - uses side: how individuals spend their income
  - sources side: how individuals earn their income
- Increases in prices of energy intensive goods disproportionately impact those who spend disproportionately on those commodities
- Decreases in real factor prices disproportionately impact those who receive a disproportionate share of income from those sectors

Problems with This Analysis

- Green Tax versus Green Tax Reform
  - Metcalf (1999)
- Analysis with forward and backward shifting is a partial equilibrium construct
  - Forward and backward shifting meaningless in a general equilibrium context
  - Choice of numeraire determinate
- *Ceterus Paribus* important

The Incidence Experiment

- Determining the incidence of a tax reform requires specifying what is held constant
- Treatment of government spending over the time horizon of the experiment crucial
- Held constant in
  - real or nominal terms?
  - absolute or relative terms?
- Rausch, Metcalf, Reilly, and Paltsev (2010) explore this issue

Modeling U.S. Carbon Policy

- General equilibrium analysis of U.S. carbon policy with emphasis on allowance allocation
- Two broad allocation approaches
  - Targeted Allowance Allocation Scheme (TAAS)
  - Per Capita Dividend Scheme (PCDS)

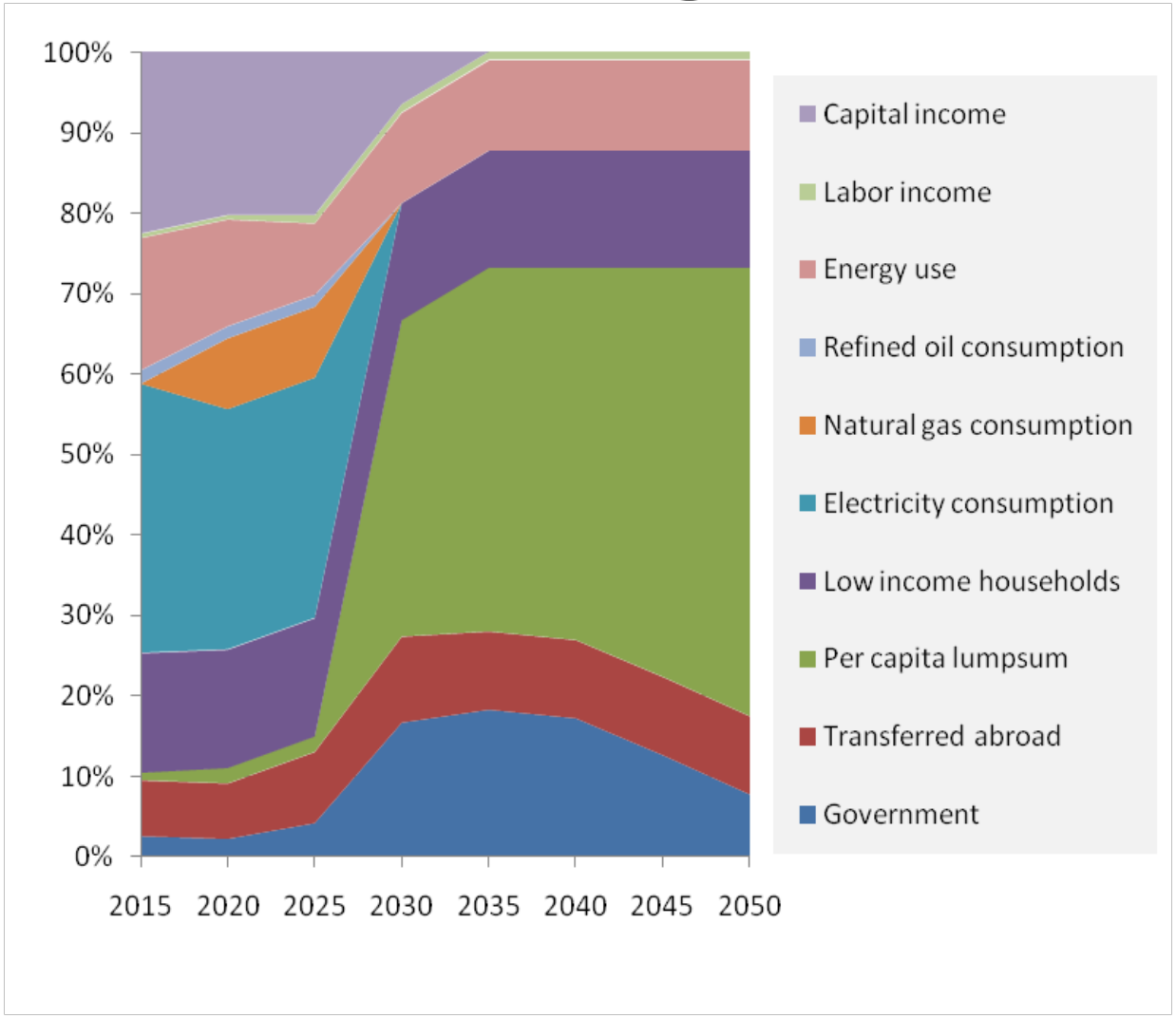
Rausch, Metcalf, Reilly, and Paltsev (2010)

Policy Modeling Details

- Target an overall reduction of GHG emissions in the US to ~80% below 2005 levels by 2050 with intervening targets
- Assume the national goals are met with a cap and trade system that covers all US emissions except for land use CO_2 sources (or sinks)
- Banking and limited borrowing provisions

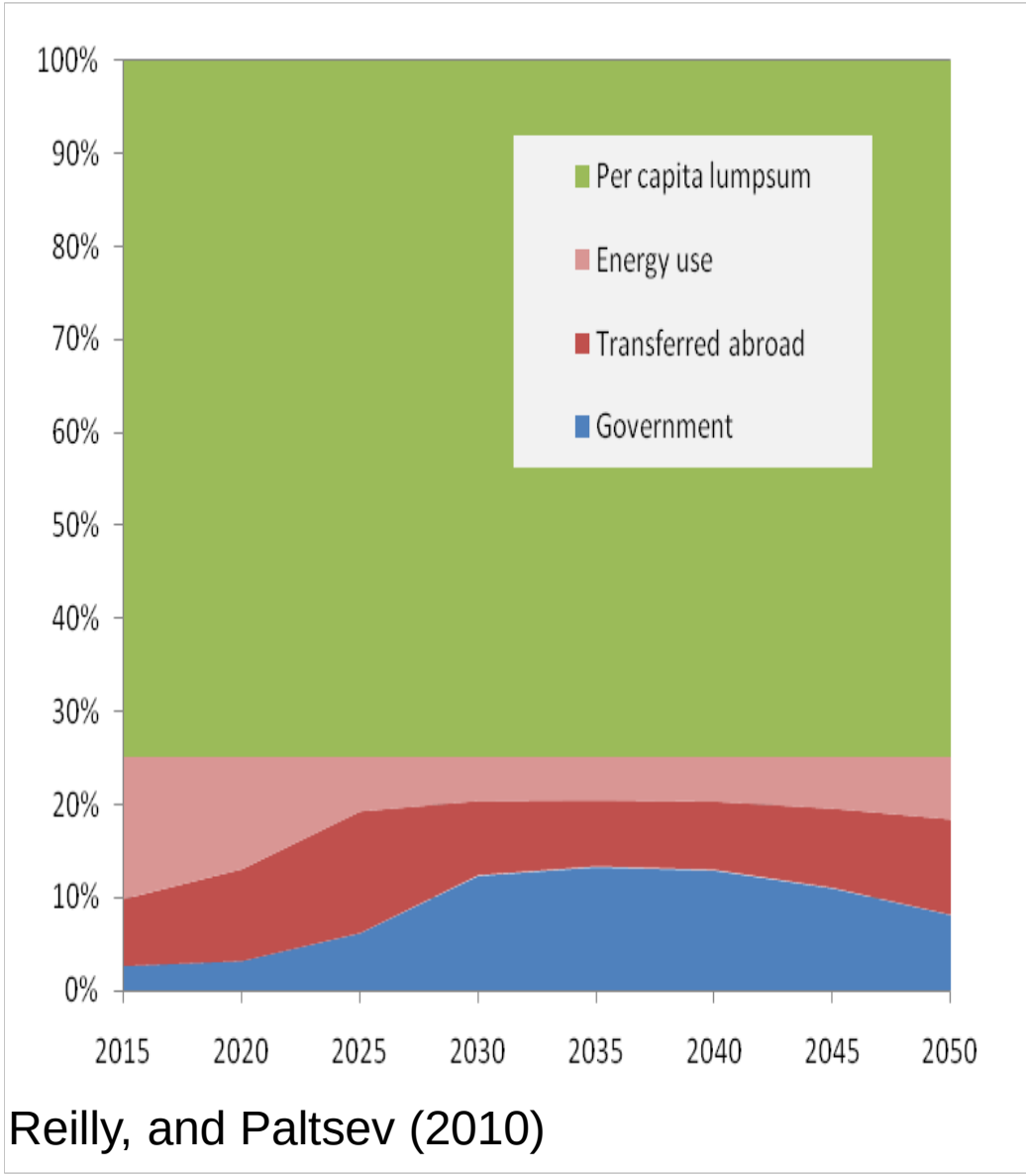
Rausch, Metcalf, Reilly, and Paltsev (2010)

TAAS



Rausch, Metcalf, Reilly, and Paltsev (2010)

PCDS



Rausch, Metcalf, Reilly, and Paltsev (2010)

MIT USREP Model

- MIT US Regional Energy Policy (USREP) model
  - Recursive dynamic model of U.S. economy
  - Similar to MIT Emissions Prediction and Policy Analysis (EPPA) Model
- Designed to analyze US energy and greenhouse gas policies
- Captures heterogeneity across regions and income groups in the United States

Regional Heterogeneity

Rausch, Metcalf, Reilly, and Paltsev (2010)

Household Heterogeneity

Income class	Annual Income (2006$)	Cumulative Population for whole US (in %)
hhl	Less than $10,000	7.3
hh10	$10,000 to $15,000	11.7
hh15	$15,000 to $25,000	21.2
hh25	$25,000 to $ $30,000	31.0
hh30	$30,000 to $50,000	45.3
hh50	$50,000 to $75,000	65.2
hh75	$75,000 to $100,000	78.7
hh100	$100,000 to $150,000	91.5
hh150	$150,000 plus	100.0

Rausch, Metcalf, Reilly, and Paltsev (2010)

Sectors and Inputs

Region	Sectors	Primary Input Factors
Alaska (AK)	**Non-Energy**	Capital
California (CA)	Agriculture (AGRIC)	Labor
Florida (FL)	Services (SERV)	Land
New York (NY)	Energy-Intensive (EINT)	Crude Oil
New England (NENGL)	Other Industries (OTHR)	Shale Oil
South East (SEAST)	Transportation (TRAN)	Natural Gas
North East (NEAST)	**Energy**	Coal
South Central (SCENT)	Coal (COAL)	Nuclear
North Central (NCENT)	Conventional Crude Oil (OIL)	Hydro
Mountain (MOUNT)	Oil from Shale (OIL)	Wind
Pacific (PACIF)	Refined Oil (ROIL)	
	Natural Gas (GAS)	
	Electric: Fossil (ELEC)	
	Electric: Nuclear (NUC)	
	Electric: Hydro (HYD)	
	Advanced Technologies	

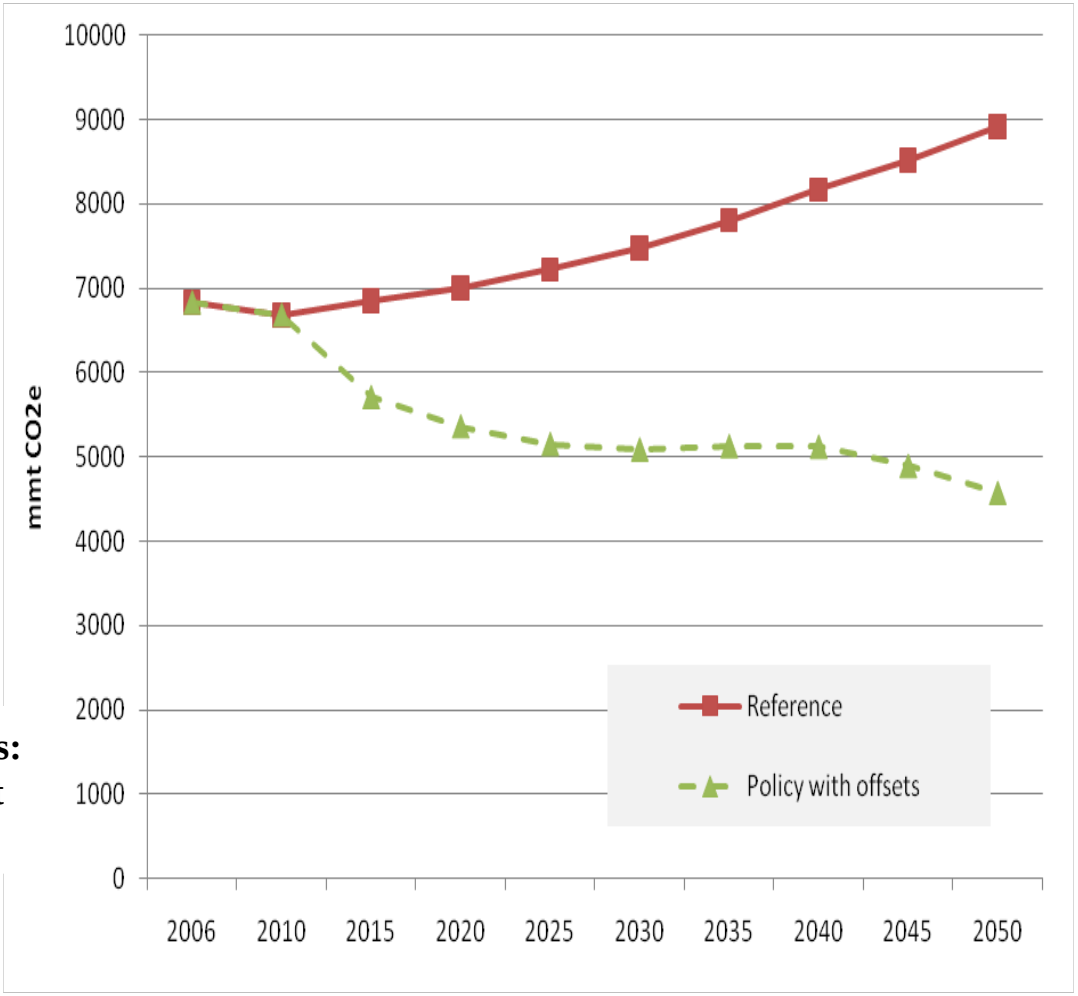
Rausch, Metcalf, Reilly, and Paltsev (2010)

Advanced Technologies

- Coal Gasification
- Biomass Liquids
- Biomass Electricity
- Intermittent Wind
- Wind With Gas Backup
- Wind With Biomass Backup
- Advanced Gas (Natural Gas Combined Cycle)
- Advanced Gas With Carbon Capture And Sequestration
- Advanced Coal With Carbon Capture And Sequestration
- Advanced Nuclear

Rausch, Metcalf, Reilly, and Paltsev (2010)

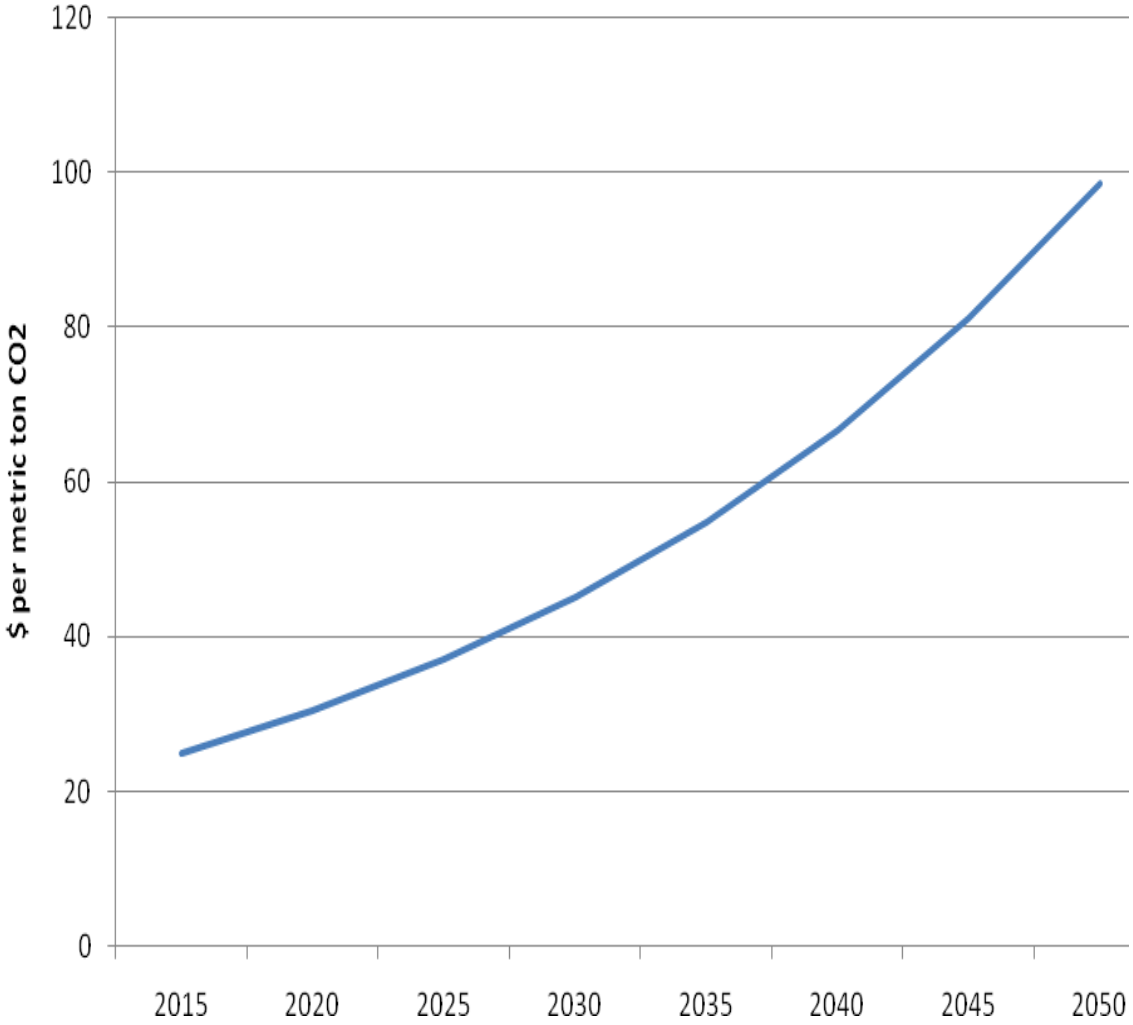
Emissions



Aggregate Emissions:
Reference: 298 bmt
Policy: 203 bmt

Rausch, Metcalf, Reilly, and Paltsev (2010)

Carbon Price



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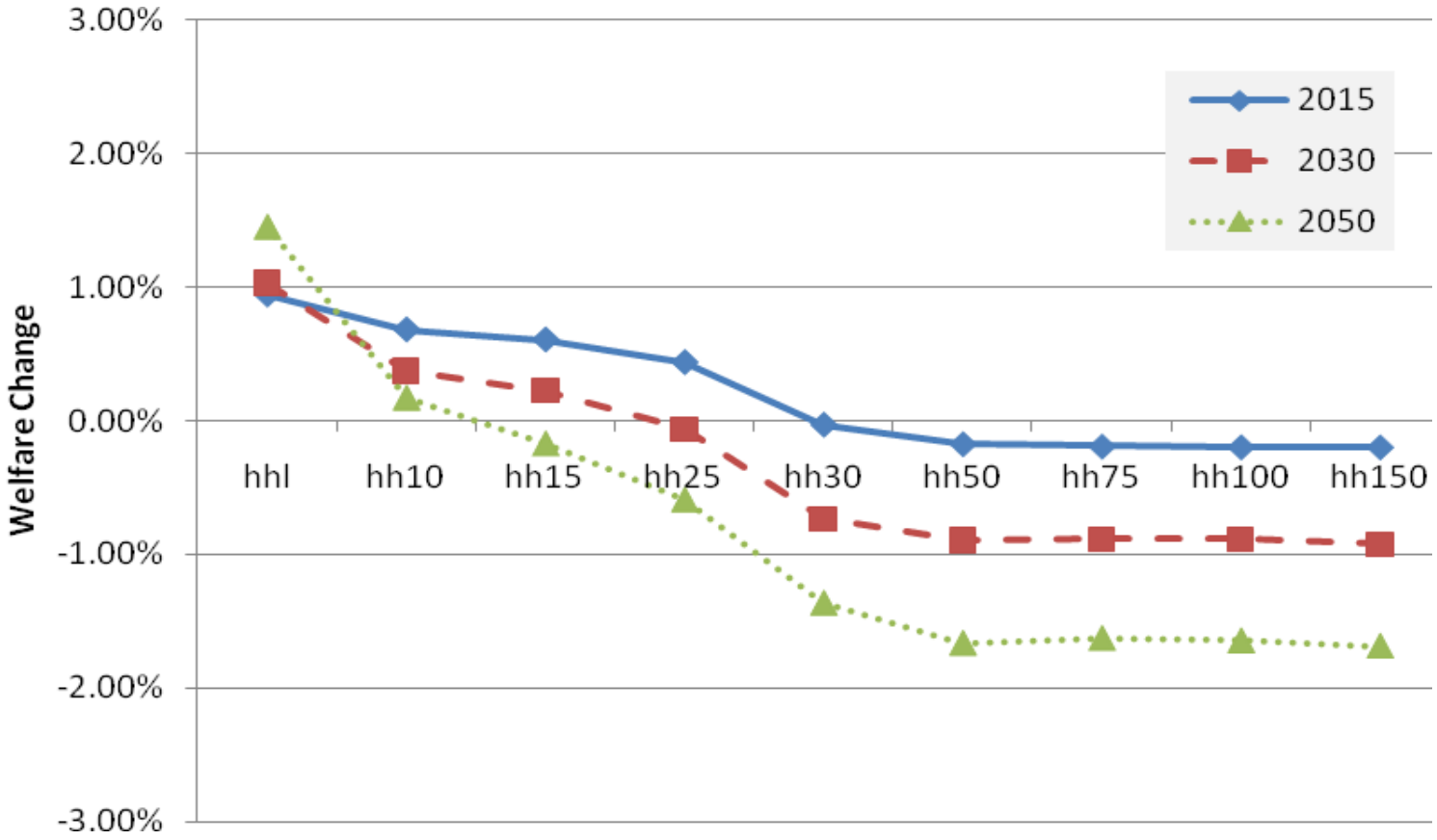
Distributional Impacts: TAAS



Rausch, Metcalf, Reilly, and Paltsev (2010)

Allowance Allocation and Distribution

- Allowance allocations overcompensate lower income households
- Actual proposals have additional features that will affect the overall progressivity of reform
- Distributional “hotspots” remain
  - workers in particular industries
  - households in particular regions

Focusing on Carbon Pricing

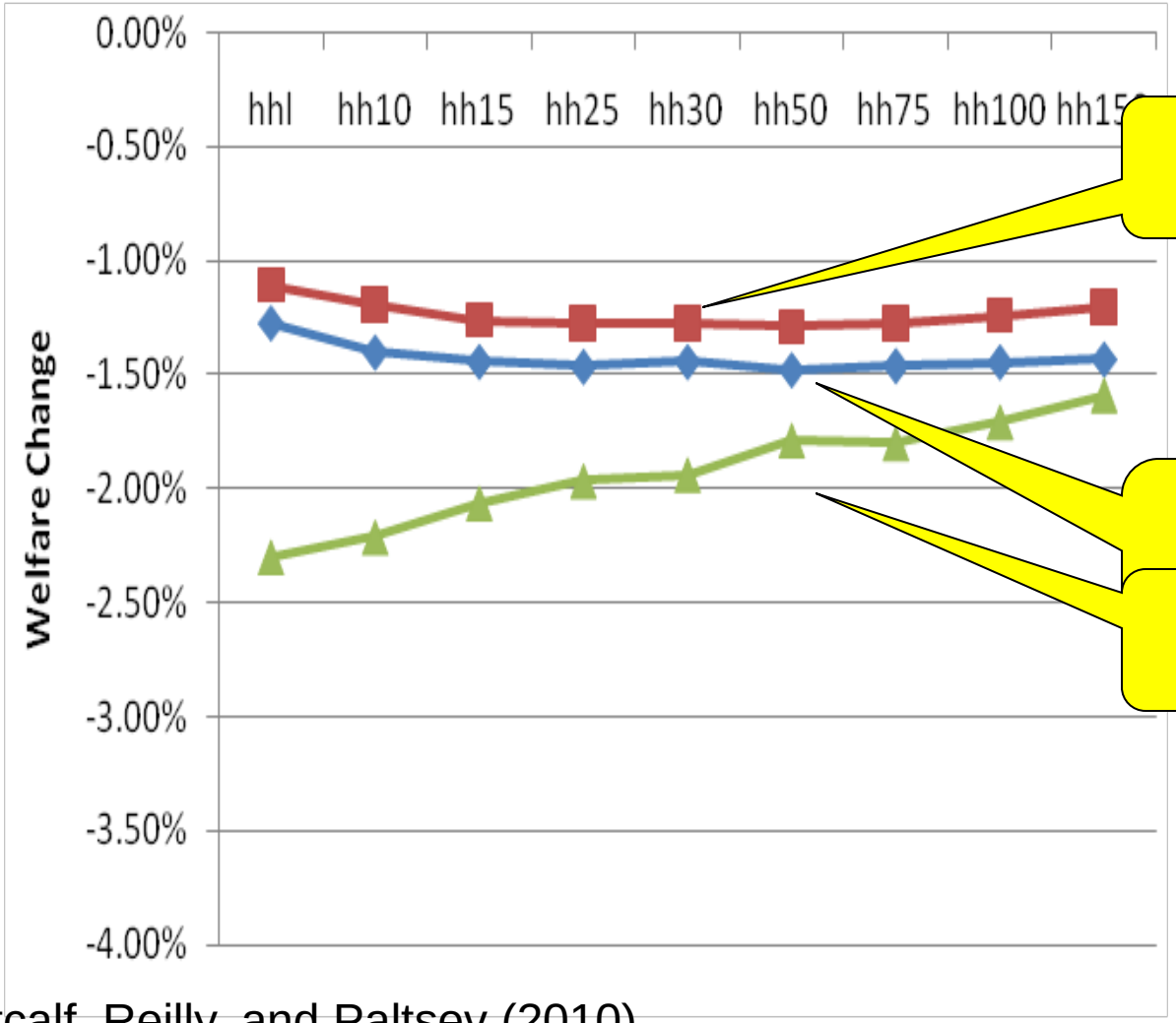
- Previous distributional analyses focused on uses side effects only
- Ignored counterfactual assumptions on government spending
- Much government spending is on transfers
- We hold transfers constant in real terms
  - Browning and Johnson (1979)

Sources of Income

	Fraction of Income from Labor	Fraction of Income from Capital	Fraction of Income from Transfers	K/L ratio	Transfer / (Capital+Labor) ratio
hhl	12.8%	6.5%	80.8%	0.5	4.2
hh10	28.6%	9.8%	61.6%	0.3	1.6
hh15	43.0%	18.2%	38.8%	0.4	0.6
hh25	48.3%	22.3%	29.5%	0.5	0.4
hh30	55.3%	24.7%	20.0%	0.4	0.3
hh50	60.4%	35.4%	4.2%	0.6	0.0
hh75	62.0%	37.5%	0.5%	0.6	0.0
hh100	59.4%	42.3%	-1.7%	0.7	0.0
hh150	57.6%	45.7%	-3.3%	0.8	0.0

Rausch, Metcalf, Reilly, and Paltsev (2010)

Carbon Pricing Without Allowance Distribution: 2030



Rausch, Metcalf, Reilly, and Paltsev (2010)

Green Tax Reform Implications

- Distributional concerns with carbon pricing may contribute to failure to take advantage of opportunities for efficiency improvements
- Distributional outcomes depend on subtle policy decisions
- Accounting for transfer and other sources side impacts may enhance progressivity of pricing
- Opens up possibilities for efficiency enhancements

Summing Up

- Policy makers have embraced (to some extent) the prescriptions of environmental economists
  - Movement to market based instruments
- Less movement towards efficiency enhancing reforms
- Concern with distribution may be overstated
- A better understanding of sources side impacts warranted
- Opportunities for double dividends still exist
  - Greater need as G20 nations commit to reducing deficits