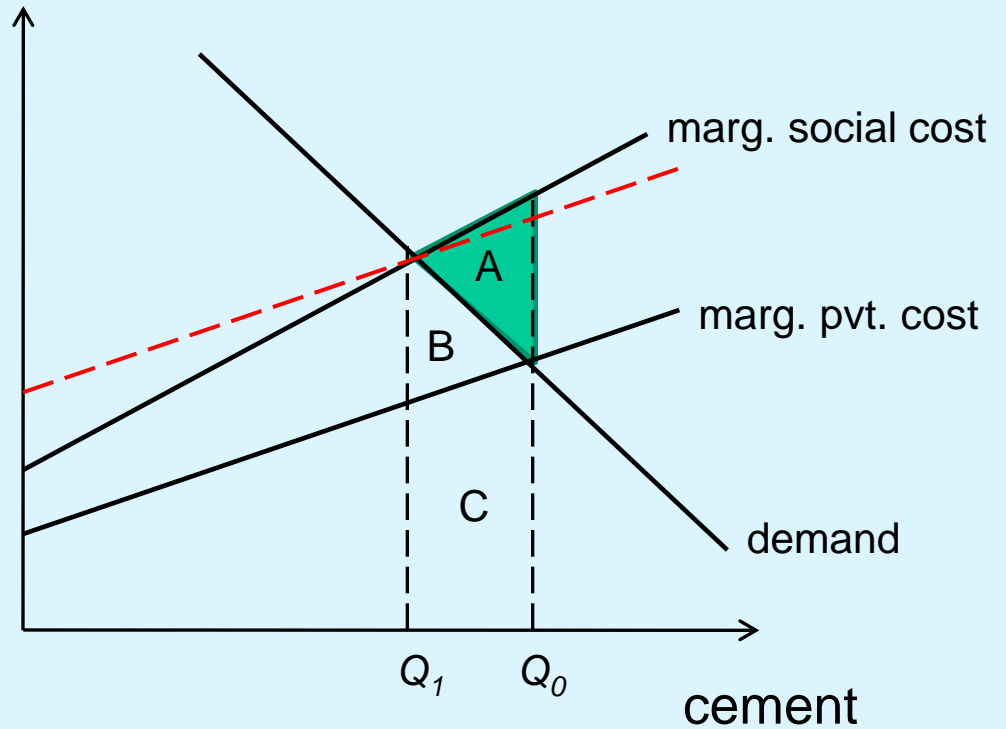


# Confronting Climate Change: Economics, Fairness, and Political Feasibility

Lawrence H. Goulder  
Stanford University

Department Economics Annual Distinguished Lecture Presentation  
University of Calgary, 14 March '14



## *Why limited adoption?*

- *Unfairness?*
- *Special interests?*
- *Environmental ineffectiveness?*
- *Harm to competitiveness?*
- *Lack of awareness/understanding by public?*



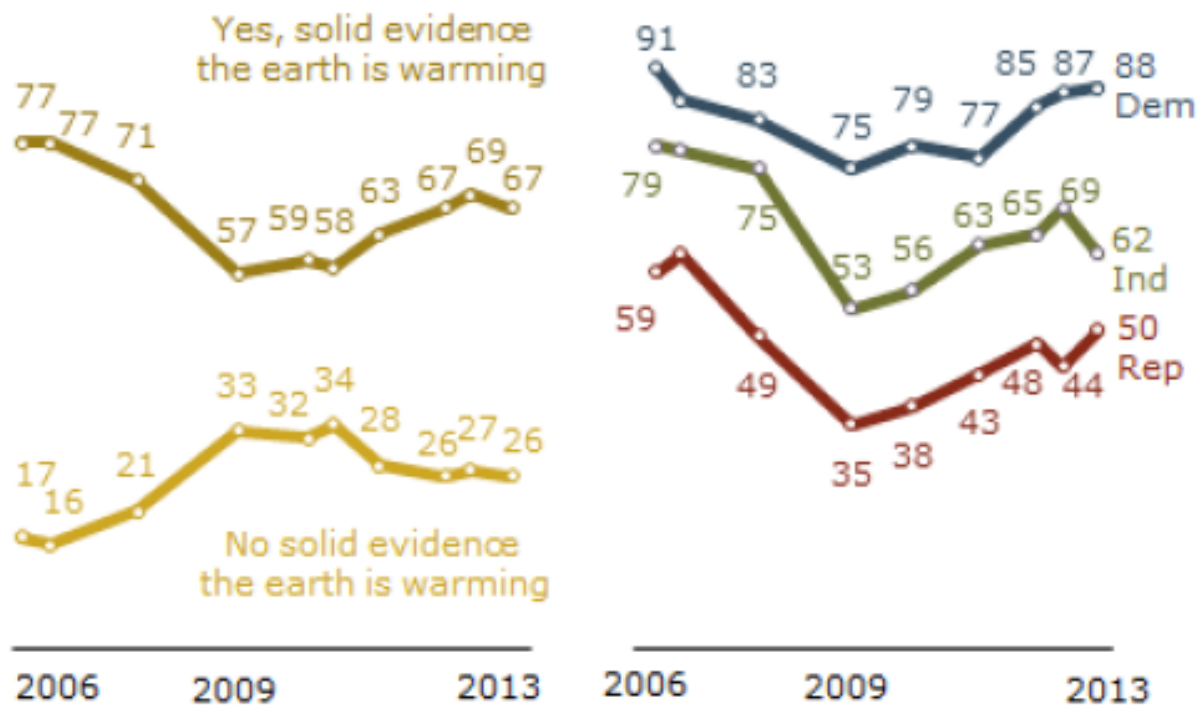
Sir Nicholas Stern:  
[Global climate  
change] “is the biggest  
market failure the  
world has ever seen”

James Inhofe (R-OK):  
“Global warming is the  
greatest hoax ever  
perpetrated on the  
American people”



## Trends in Views on Global Warming

### Is There Solid Evidence Earth is Warming?

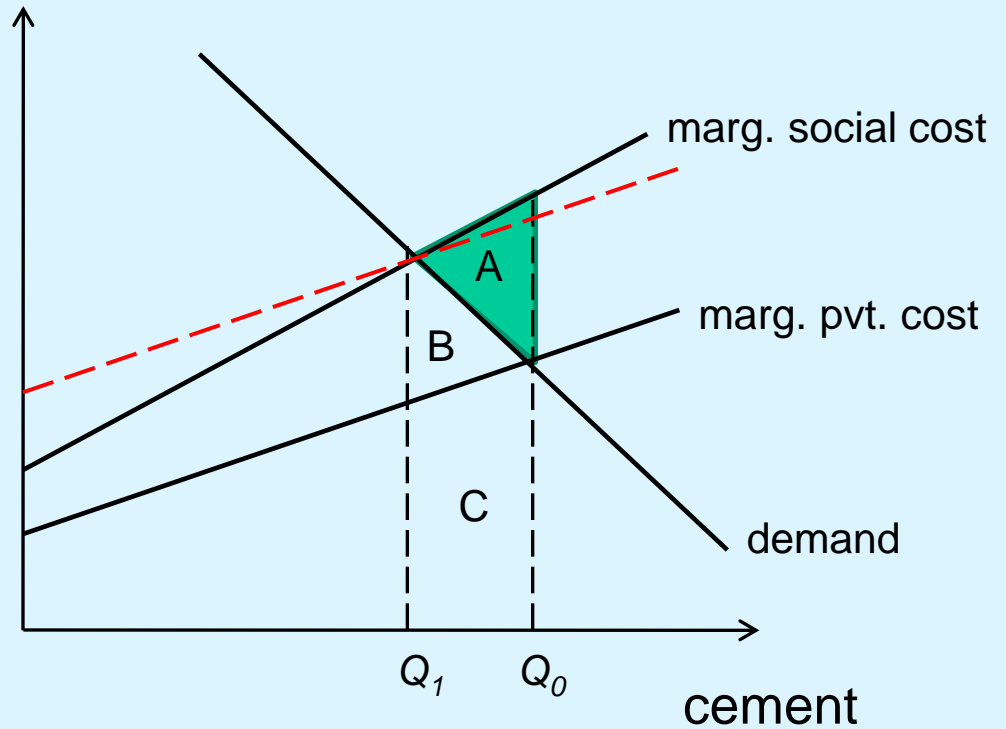


PEW RESEARCH CENTER Oct. 9-13, 2013.

‘From what you’ve read and heard, is there solid evidence that the average temperature on earth has been getting warmer over the past four decades?’

	<b>Canada (2011)</b>	<b>Canada (2013)</b>	<b>US (2013)</b>
<b>Yes</b>	80%	81%	61%
<b>No</b>	14%	12%	25%
<b>Not sure</b>	6%	8%	14%

The Canada 2020 / University of Montreal National Survey of Canadian and American Public  
Opinion on Climate Change | [canada2020.ca/climatepoll](http://canada2020.ca/climatepoll)



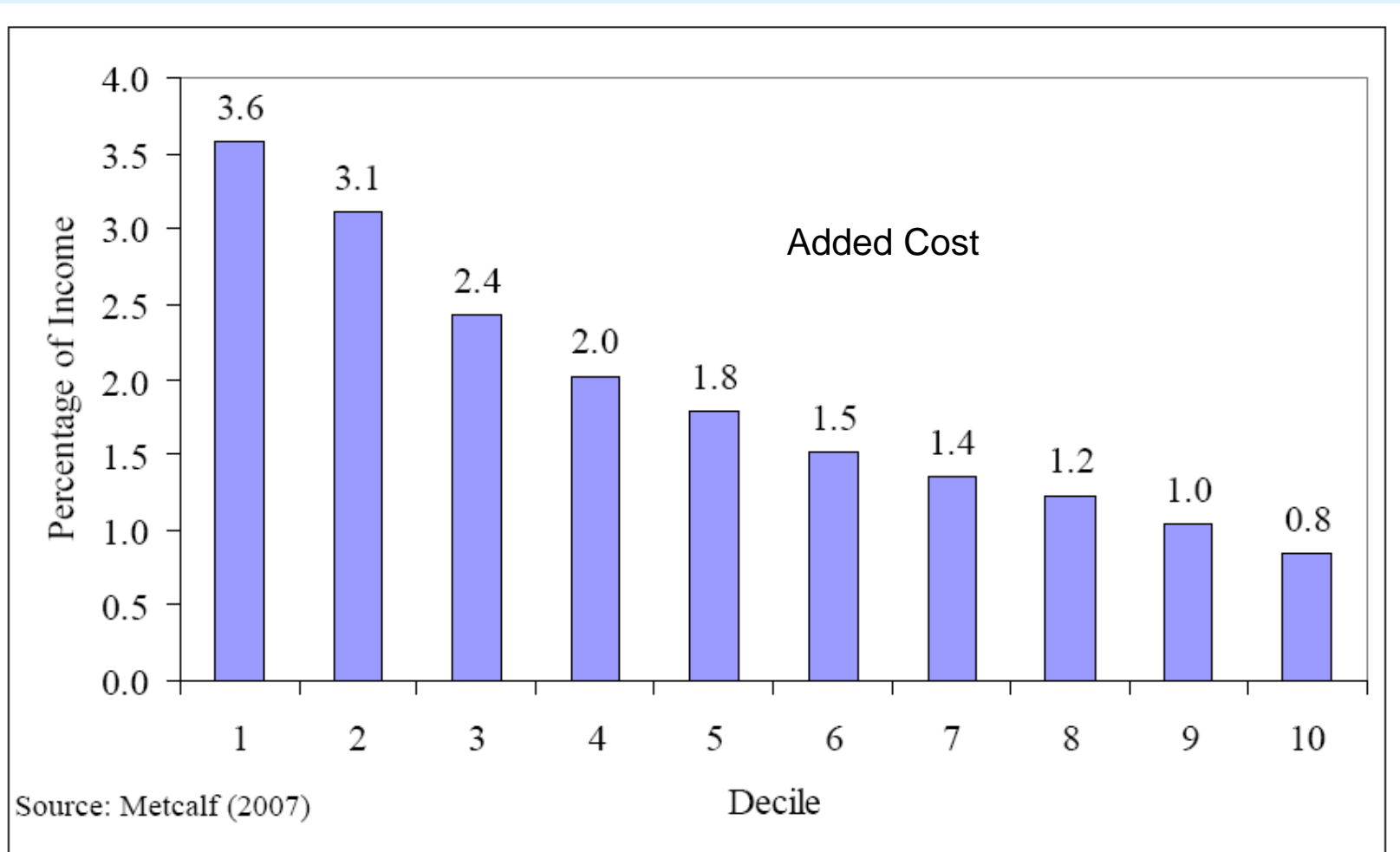
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# Addressing Potential Unfairness of Emissions Pricing

# Impact of \$15/tonCO<sub>2</sub> Carbon Tax in U.S.

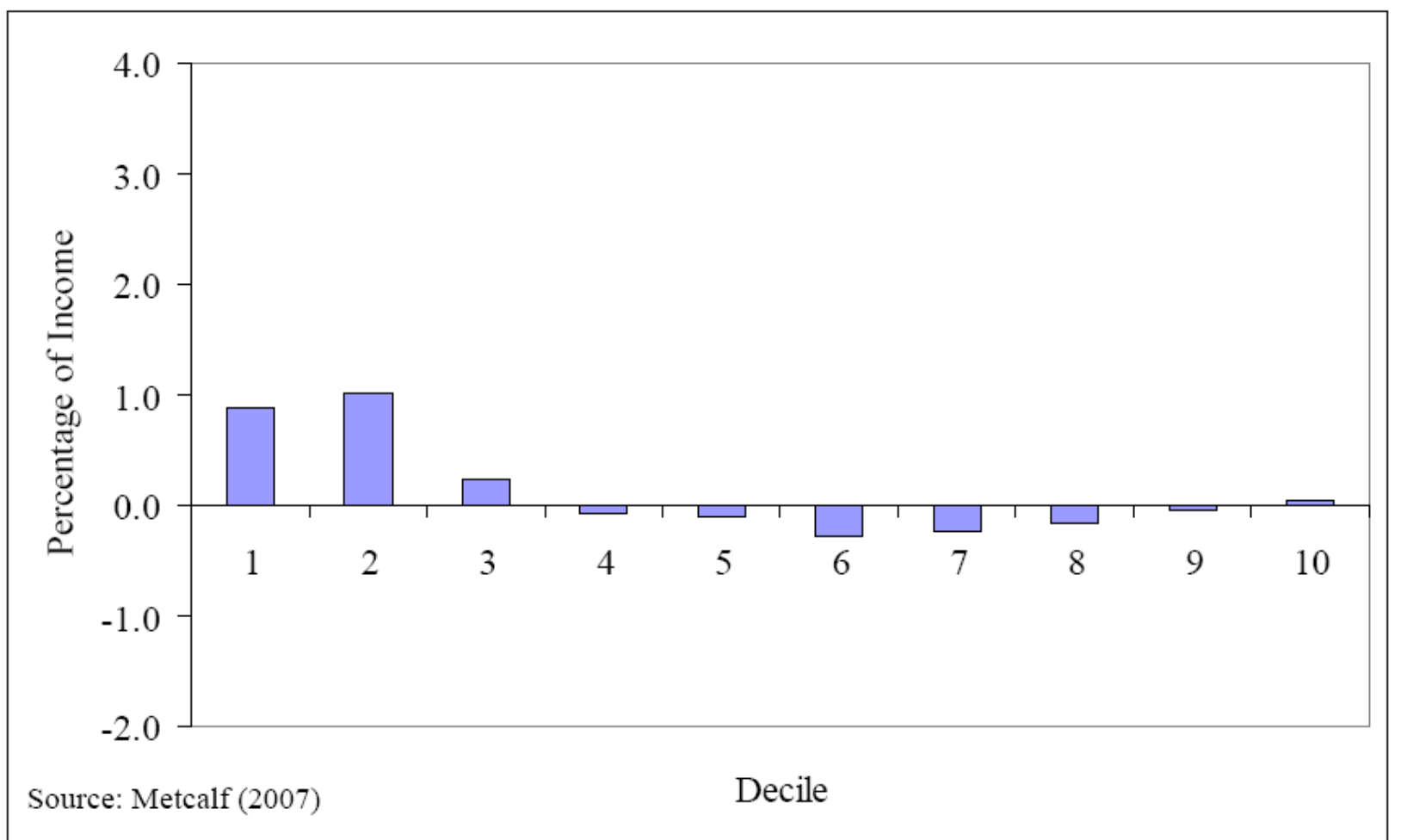
-- No Recycling





# Impact of \$15/tonCO<sub>2</sub> Carbon Tax in U.S.

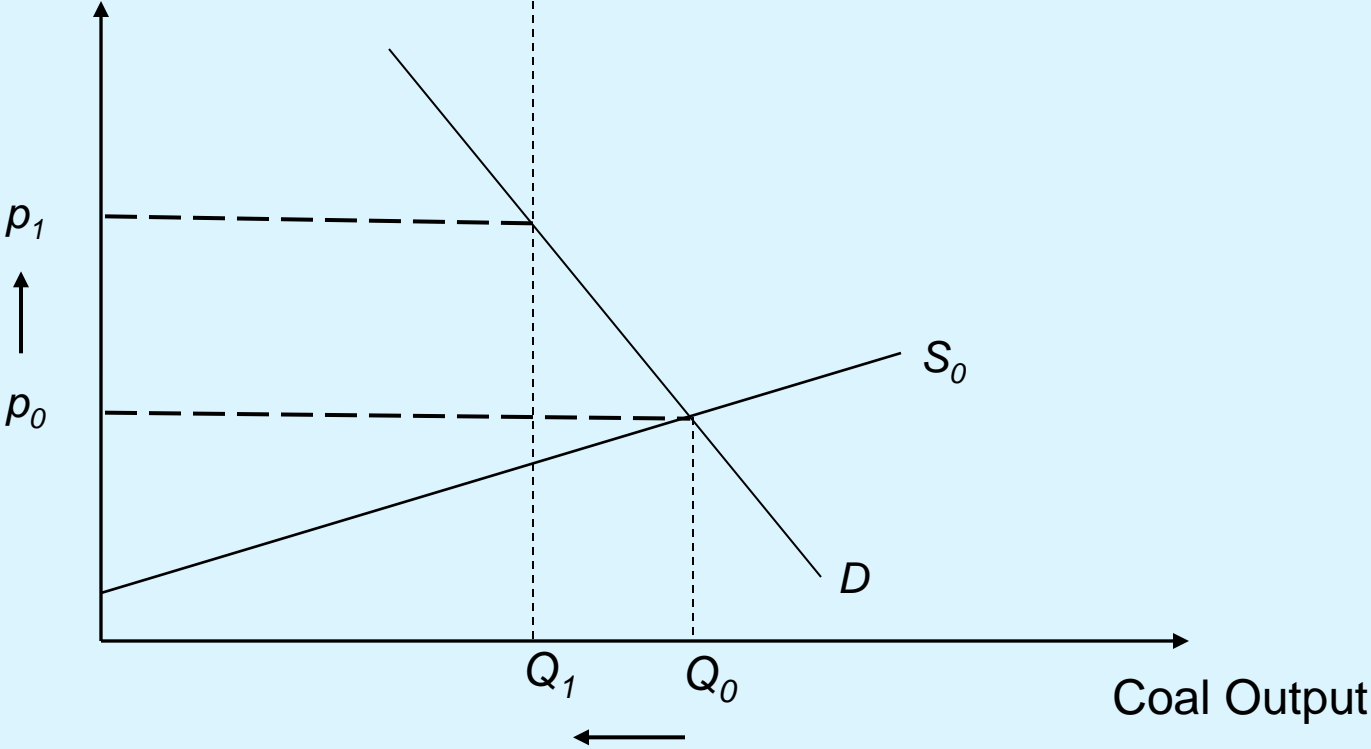
-- Recycling via Labor (Payroll) Tax Cuts



# Reducing Opposition from Industrial Stakeholders

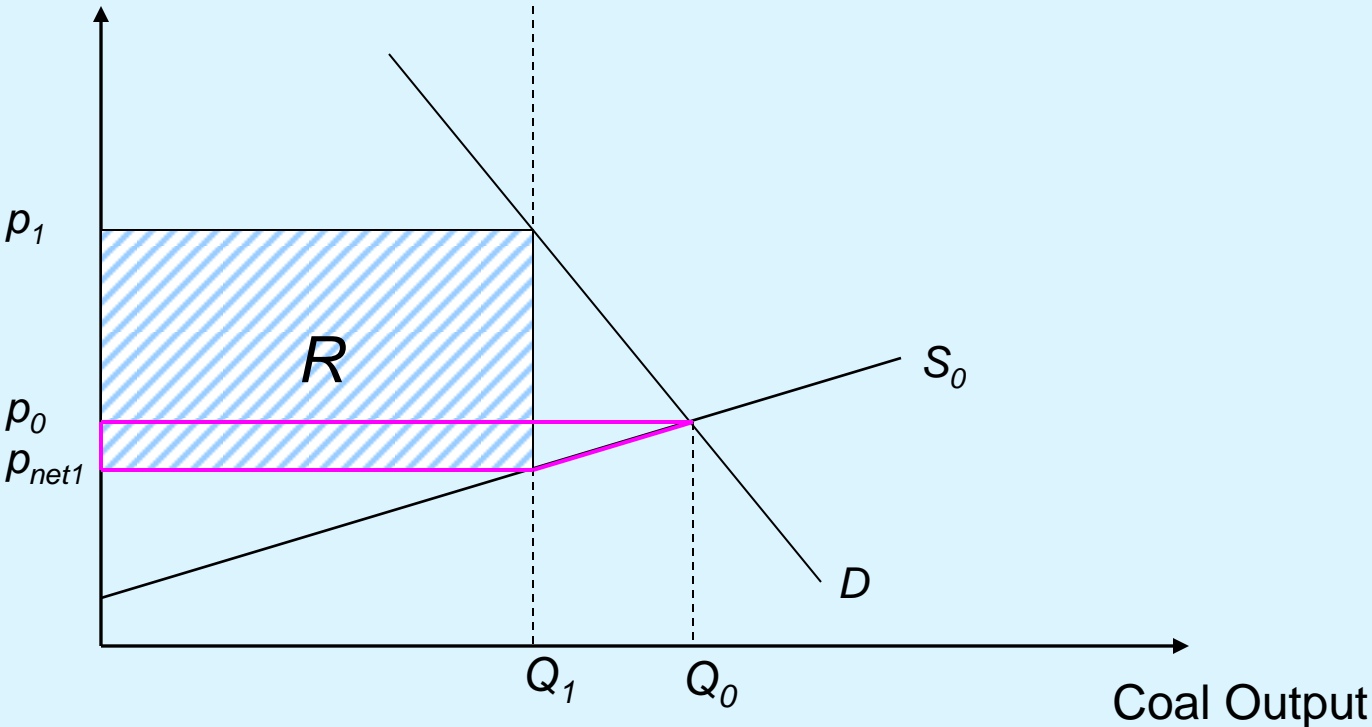
# Free Allocation of Emissions Allowances

## Can Prevent a Profit Loss



# Free Allocation of Emissions Allowances

## Can Prevent a Profit Loss



## Profit and GDP Impacts under Alternative Policy Designs

Industry	Profit-Preserving		
	100% Auctioning	Free Allocation	100% Free Allocation
<b>Percentage Change in Profits *</b>			
Coal Mining	-28.7	0 (3.2)	178.8
Coal Fired Electricity Generation	-28.4	0 (3.2)	177.2
Petroleum Refining	-4.7	0 (0.7)	29.4
Chemicals	-3.2	0 (2.4)	20.7
Primary Metals	-3.5	0 (0.8)	22.2
Railroads	-2.5	0 (0.6)	15.6
Electricity Transmission/Distribution	-2.5	0 (2.5)	15.5
Natural Gas Distribution	-2.8	0 (0.3)	17.5
All Industries Above	-5	0	31.6
All Other Industries	0.1	0.2	0.4
All Industries	-0.2	0.2	2.7

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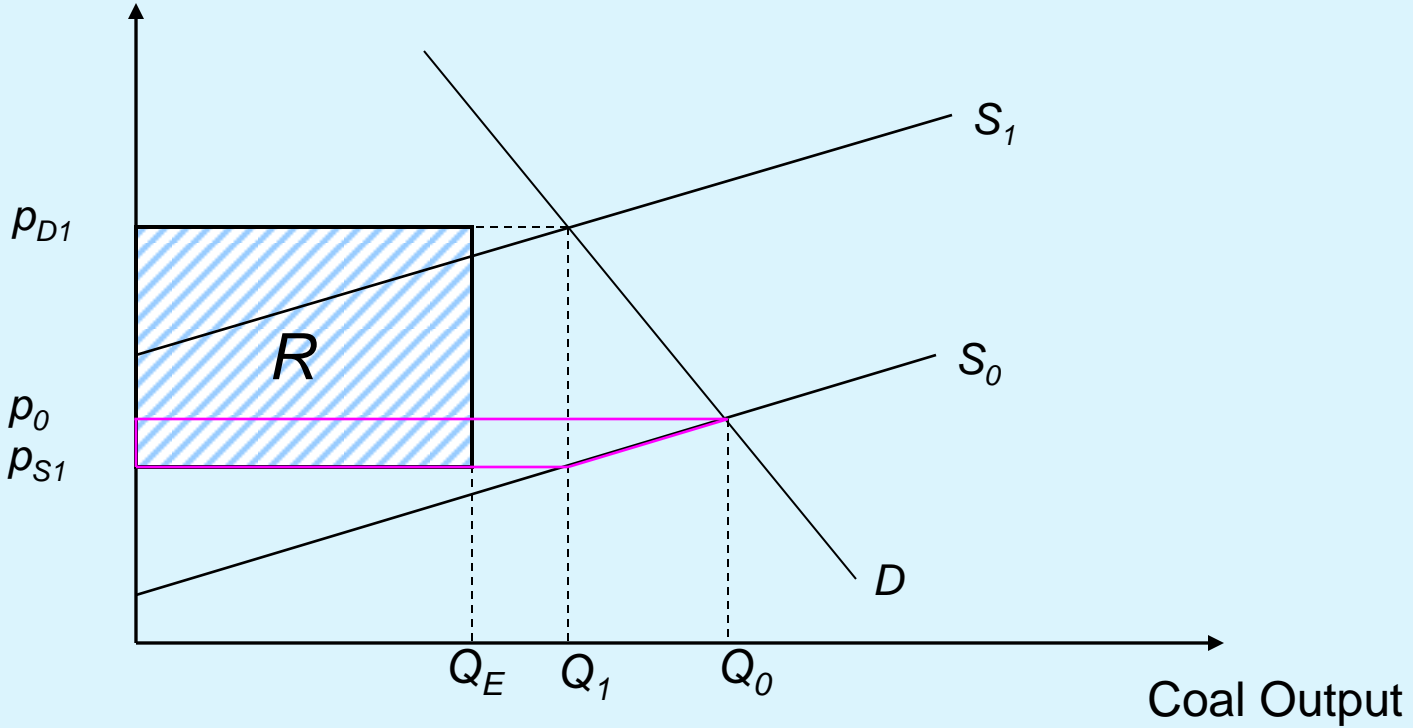
Total: 13.7

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All Industries	-0.2	0.2	2.7
<b>GDP Cost **</b>	<b>0.58%</b>	<b>0.63%</b>	<b>0.95%</b>

Total: 13.7

Free Allocation of Emissions Allowances  
or Provision of Carbon Tax Exemptions  
Can Prevent a Profit Loss





# Will “Local” Policies Be Environmentally Ineffective?

*-- how can leakage be controlled?*

# A Leakage Challenge: Potential Demand-Side Substitutions by California Utilities

CA's response: Include "imported emissions" in the cap-and-trade system

Challenges:

- No way to identify the emissions intensities
- Contract reshuffling

How Can Threats to International  
Competitiveness Be Subdued?

# To help import-competing industries:

What not to do: extra (exogenous) allowances or (exogenous) tax exemptions

Better options:

- Border Taxes
- Output-Based Free Allowance Allocation

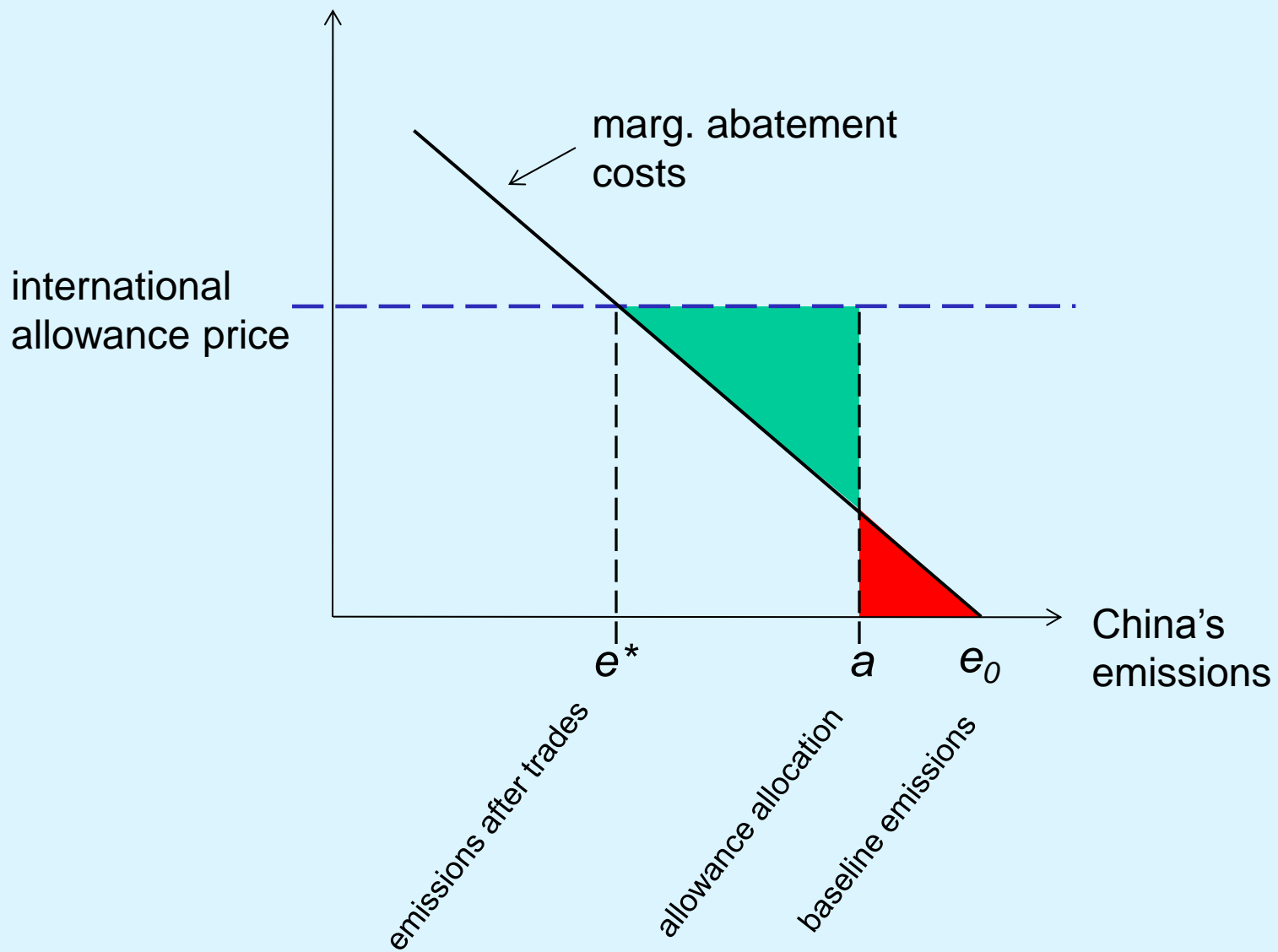
## To help exporters:

Exempt emissions associated with production of exports

- Under cap and trade, no requirement to submit allowances for such emissions
- Under carbon tax, no tax obligation for such emissions

Ultimate solution to leakage and competitiveness problems is a global climate policy

How can developing-country participation be promoted?



# Pricing greenhouse gases is crucial, but not the whole solution

GHG pricing does not directly address the “innovation market failure”

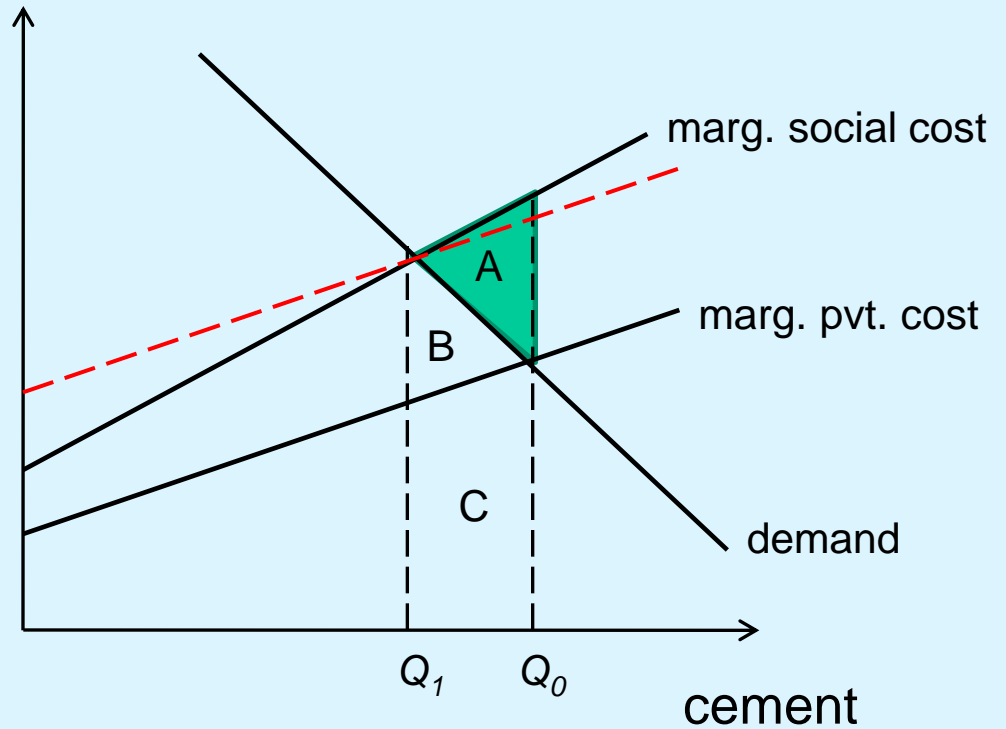
- **emissions market failure:** Stems from externality from fossil-fuel use. Implies fossil-fuel prices are below social cost, and excess reliance on fossil fuels.
- **innovation market failure:** Stems from appropriability problem (or knowledge externality). Implies insufficient private R&D.

These two market failures provide justification for two types of policies -- one to address each externality:

- **Emissions policies** (e.g., GHG pricing) to address the former
- **Direct technology-push policies** (e.g., R&D subsidies) to address the latter

*Given emissions-reduction targets are met at least cost when both market failures are addressed.*





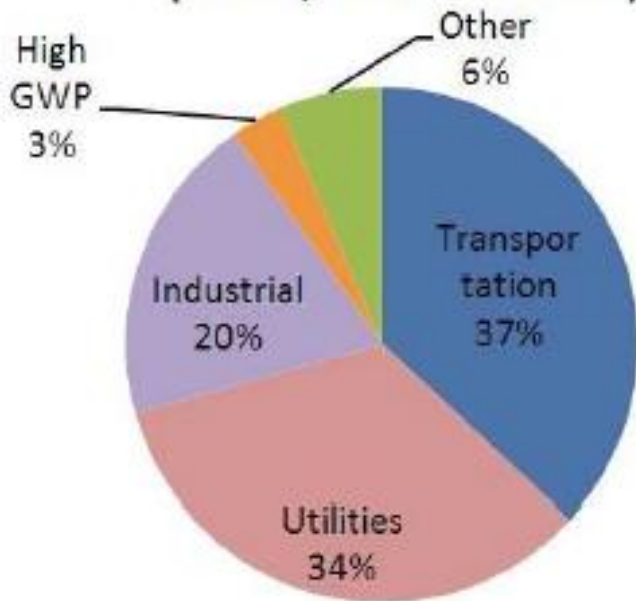
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# California's AB 32: Global Warming Solutions Act

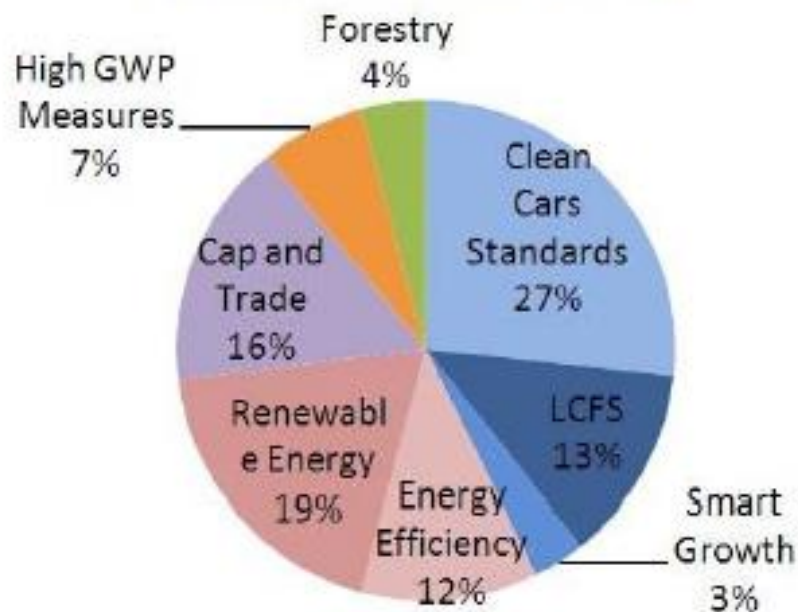
- Signed September 2006. First economy-wide greenhouse gas cap to be introduced by any U.S. state.
- Target: 1990-level GHG emissions by 2020.
  - 170 mmt reduction in 2020 relative to BAU
  - ~15% reduction from actual 2010 levels
- How to reach the target?
  - Mechanisms to reach the target not specified in the legislation. CA Air Resources Board given responsibility to determine specifics.
  - The ARB now uses a mix of conventional regulation and cap and trade.

**California Emission Sources (2008)**  
**(Sector, Percent of Total)**



Source: CARB, California GHG Inventory for 2000-2008

**AB 32 Emission Reduction Strategies**  
**(Measure, Percent of Total)**



Source: CARB, Emissions Reductions from Scoping Plan Measures; 2020 GHG Emissions Forecast