


Climate Change Economics

Jon Haveman, Ph.D.

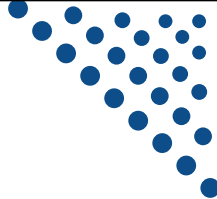


Democracy Winters

February 1, 2020

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National Economic Education Delegation




- **Vision**

 - One day, the public discussion of policy issues will be grounded in an accurate perception of the underlying economic principles and data.
- **Mission**

 - NEED unites the skills and knowledge of a vast network of professional economists to promote understanding of the economics of policy issues in the United States.
- **NEED Presentations**

 - Are **nonpartisan** and intended to reflect the consensus of the economics profession.



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Who Are We?

- **Honorary Board: 46 members**

- 2 Fed Chairs: Janet Yellen, Ben Bernanke
- 6 Chairs Council of Economic Advisers
 - o Furman (D), Rosen (R), Bernanke (R), Yellen (D), Tyson (D), Goolsbee (D)
- 3 Nobel Prize Winners
 - o Akerlof, Smith, Maskin

- **Delegates: 487 members**

- At all levels of academia and some in government service
- All have a Ph.D. in economics
- Crowdsource slide decks
- Give presentations

- **Global Partners: 45 Ph.D. Economists**

- Aid in slide deck development

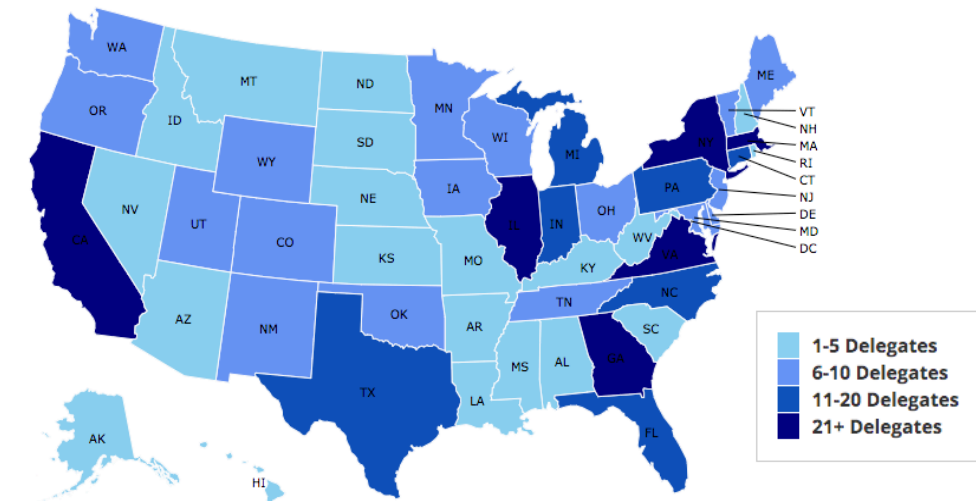


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Where Are We?



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Credits and Disclaimer

- **This slide deck was authored by:**
 - Shana Mcdermott, Trinity University
 - Sarah Jacobson, Williams College
 - Sharon Shewmake, Western Washington University
- **This slide deck was reviewed by:**
 - Jason Shogren, University of Wyoming
 - Walter Thurman, North Carolina State University
- **Disclaimer**
 - NEED presentations are designed to be nonpartisan.
 - It is, however, inevitable that the presenter will be asked for and will provide their own views.
 - Such views are those of the presenter and not necessarily those of the National Economic Education Delegation (NEED).



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Outline

- **Economics of climate change**
- **Economics of responding to climate change**
- **Addressing the sources of our emissions**
- **Climate change policy**
- **Policy in action**



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How Can Economists Contribute to Thinking about Climate Change?

- **By measuring:**
 - the damage resulting from climate change.
 - estimating the economic costs of fighting climate change.
- **By designing smart policies that minimize costs.**
 - Balance economic growth with GHG emission mitigation.



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Economics of Climate Change



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Pollution Is Different From Oranges

- Human activity creates pollution.
- Pollution is an **EXTERNALITY**:
 - a side effect (cost or benefit) that affects someone else when something is bought or sold.
 - This is a *market failure*.
- The price of electricity does not reflect all of the costs.
 - Electricity is too cheap. The balance is wrong.
 - There is too much pollution.



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Social Cost of Carbon

- Cost above price paid.
- The expected cost of damages from each unit of greenhouse gas emissions.
- Current EPA estimate: ~\$40 per metric ton of CO₂.
 - About \$123/car per year.
 - \$26 Billion for all vehicles in the US.
- Social cost of carbon will increase over time.



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Externalities

- **An externality occurs when market activity affects people outside of a market.**
 - Market activity SPILLS OVER onto others.
 - A **negative externality** occurs when a *cost* spills over.
 - A **positive externality** occurs when a *benefit* spills over.



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Examples of Externalities

- | | |
|---|--|
| <ul style="list-style-type: none"> • Negative Externalities: <ul style="list-style-type: none"> - Heating your house - Smoking - Getting a dog - Pig farming | <ul style="list-style-type: none"> • Positive Externalities <ul style="list-style-type: none"> - Education - Growing apples - Getting a vaccination - Basic scientific research |
|---|--|




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Addressing a Negative Externality

The diagram illustrates the internalization of a negative externality. On the left, a factory icon represents the source of the externality. A blue arrow points from the factory to a person icon, labeled $\$.14/\text{kwh}$. A red arrow points from the factory to the person, labeled $\$.16/\text{kwh}$. A yellow box in the center contains the text "Social cost = $\$.02/\text{kwh}$ ". On the right, the person icon has two arrows pointing to thermostat settings: a blue arrow labeled "Set thermostat to: 68 degrees" and a red arrow labeled "Set thermostat to: 65 degrees".

The social cost of $\$.02/\text{kwh}$ has been INTERNALIZED.

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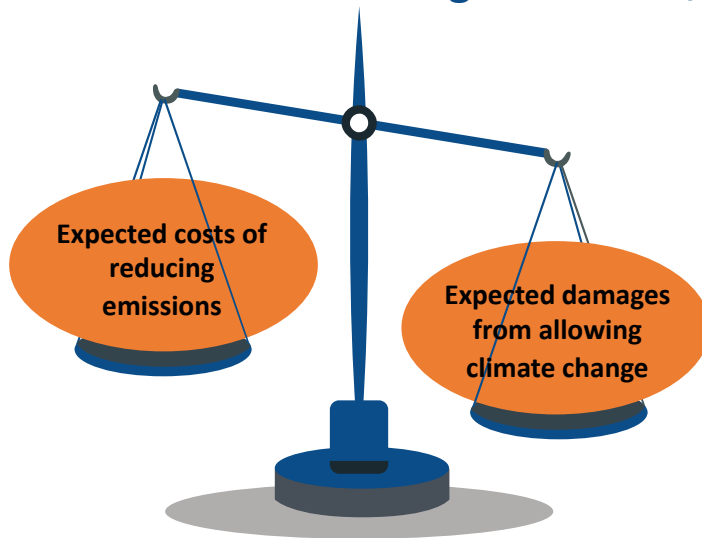
Economics of Responding to Climate Change

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How Economists Decide How Much to Fight Climate Change

- Cost Benefit Analysis
- Weigh:



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Cost-Benefit Analysis of Fighting Climate Change

- Most economic models suggest the costs of keeping warming below 2°C are relatively small.
 - Costs amount to 1-4% of GDP by 2030.
- Costs of acting to keep warming below 2°C are almost certainly less than future economic damages they would avoid.
 - Damages estimated to be between: 7 - 20% of worldwide GDP.
- Caveat: Uncertainty

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This is What Precisely Wrong Looks Like

San Francisco Airport

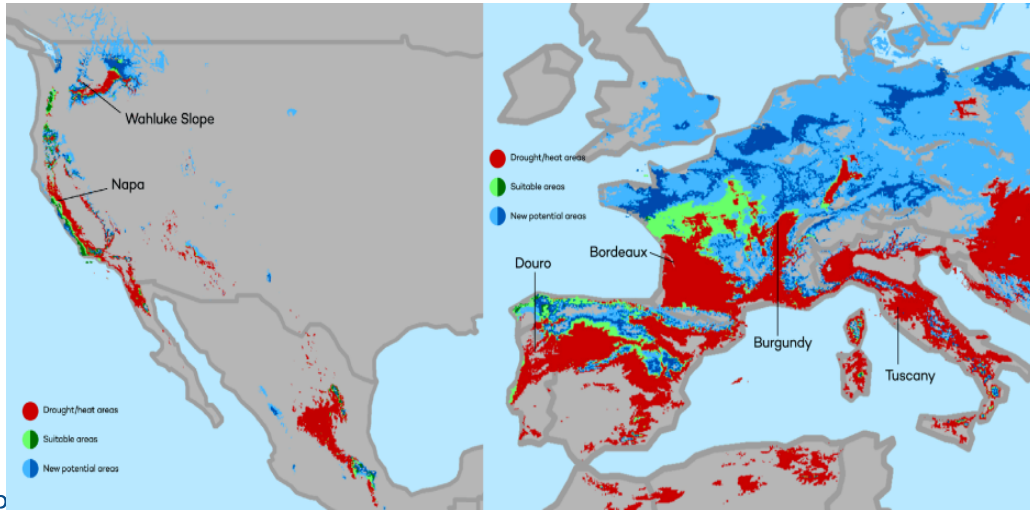
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This is What Precisely Wrong Looks Like

The changing map of the world's wine-growing regions.



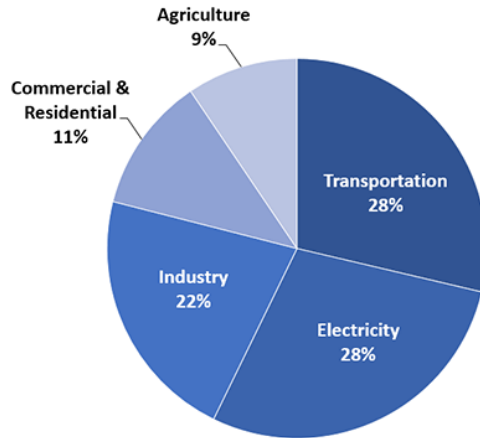
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Addressing the Sources of Our Emissions

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Total U.S. Greenhouse Gas Emissions by Economic Sector in 2016

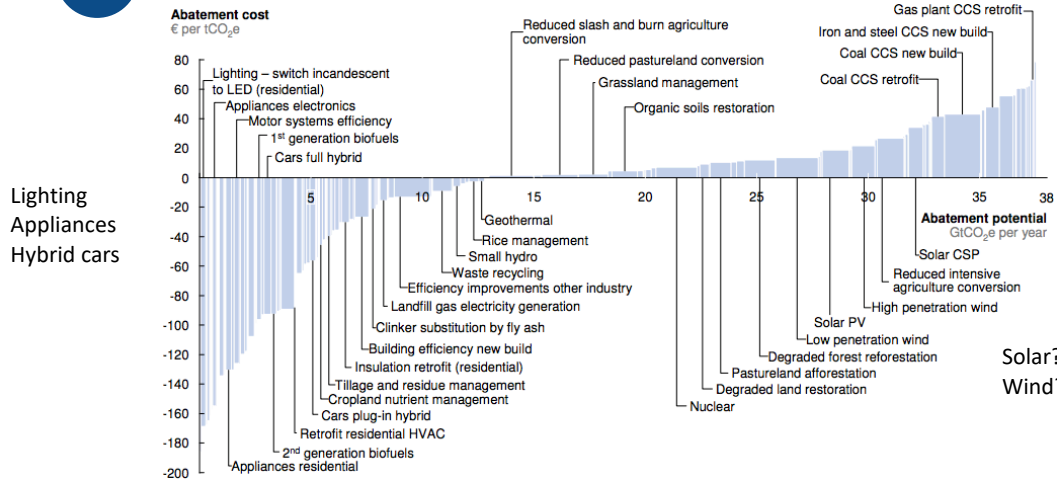


U.S. Environmental Protection Agency (2018). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016



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Global GHG Abatement Cost Curve



Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €80 per tCO₂e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.
Source: Global GHG Abatement Cost Curve v2.1



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Climate Change Policy



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Policies That Reduce Emissions: Directly

- **Regulation**

- Emissions standards or limits
 - E.g., CAFE standards

- **Market-oriented policies**

- Putting a price on emissions
 - Subsidizing green energy (*e.g.*, feed-in tariffs)
 - Tax or cap & trade



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How Does Cap and Trade Work?

- **Activities to be covered are determined.**
- **Acceptable emissions levels are indicated.**
- **“Permits” that allow acceptable emissions levels are issued.**
 - How?
- **A “market” is developed.**
 - Those desiring to emit will have to buy sufficient permits to accommodate their emissions.
 - Those wishing to abate will offer their permits on the “market”.
- **Gov’t agency determines equality of permits in possession and emissions.**



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How Does a Carbon Tax Work?

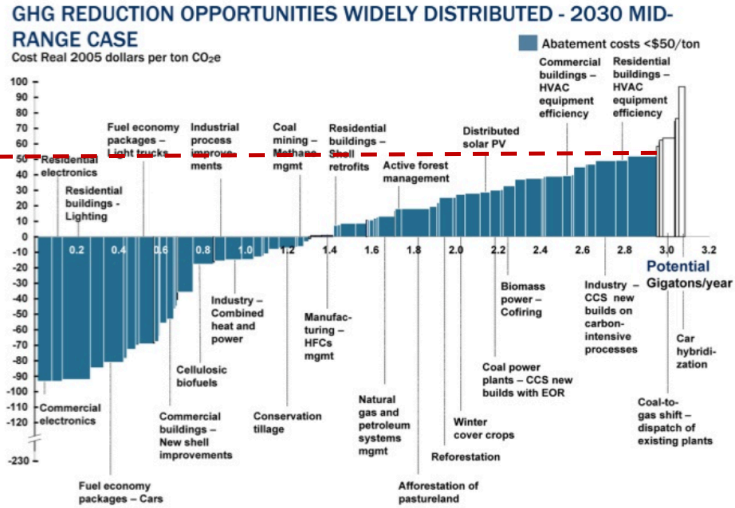
- **Activities to be covered are determined.**
- **The price of emissions is determined.**
 - Presumably some relation to the social cost of polluting.
- **Emissions are measured.**
- **Taxes are determined.**



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Putting a Price on Carbon

Suppose a Social Cost Of Carbon of \$50



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Carbon Tax and Cap & Trade: the Differences

	Carbon Tax	Cap & Trade
Carbon Price	Certain	Uncertain
Emissions	Uncertain	Certain
Ease of Implementation	May be easier to implement	
Additional concerns	1) Always generates revenue 2) May require legislation to change 3) Predictability	1) Susceptible to lobbying. 2) Only generates revenue if government sells permits. 3) Cap can be changed by regulator. 4) Less certainty over future. 5) Regulations reduce efficacy of Cap & Trade



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One Other Thing: Cap and Trade vs. Carbon Tax

- **Emissions regulations and Cap and Trade can work at cross purposes.**
 - Regulations that lower emissions from big polluters...
 - Lower the demand for permits
 - Lowers the price of permits
 - Reduces incentives for other industries to cut emissions
- **Regulations can undermine the effectiveness of Cap and Trade.**
- **The same is not true of a carbon tax.**
 - Though regulations might cut tax revenue, revenue is not the goal of the carbon tax.



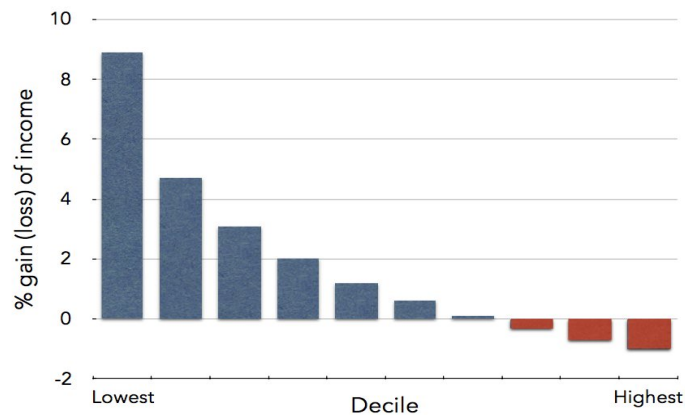
Thoughts on Regulation vs Market-Oriented

- **Equity.**
 - Both types of policies can be regressive.
 - Cap and Trade and a Carbon Tax can offset the regressivity.
 - Regulations do not.
- **Efficiency.**
 - Market-oriented policies tend to achieve emissions reduction at much lower cost.
 - Example: CAFÉ Standards vs Carbon Tax
 - Tax is significantly more efficient.
 - Costs of reductions are 3-15 times higher with CAFE standards
 - Why?
 - New vehicles only, rebound effect, slower turnover



Revenue Dividend Eliminates Regressivity

IMPACT OF CARBON DIVIDENDS ON U.S. FAMILY INCOMES

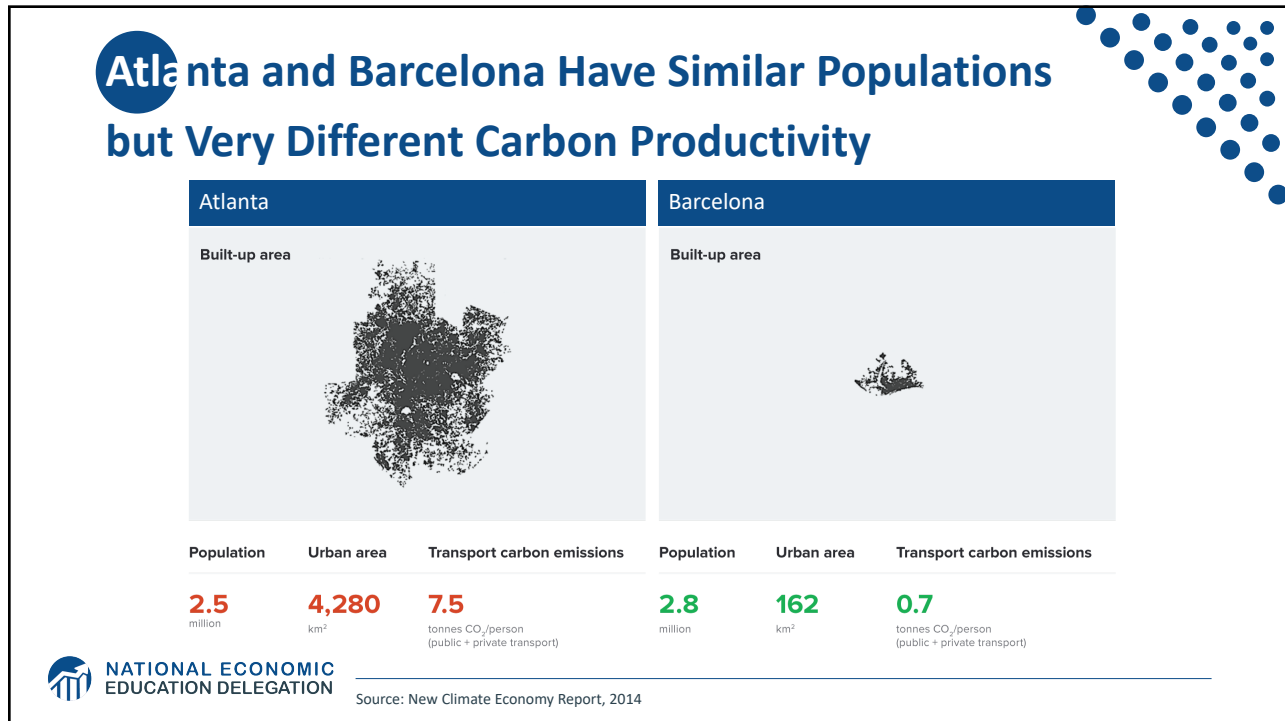


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Policies That Reduce Emissions: INDIRECTLY

- Subsidizing R&D
- Grid / infrastructure
- Energy efficiency mandates and subsidies
- Mandating renewable energy (*e.g.*, renewable portfolio standards)
- Land use policies

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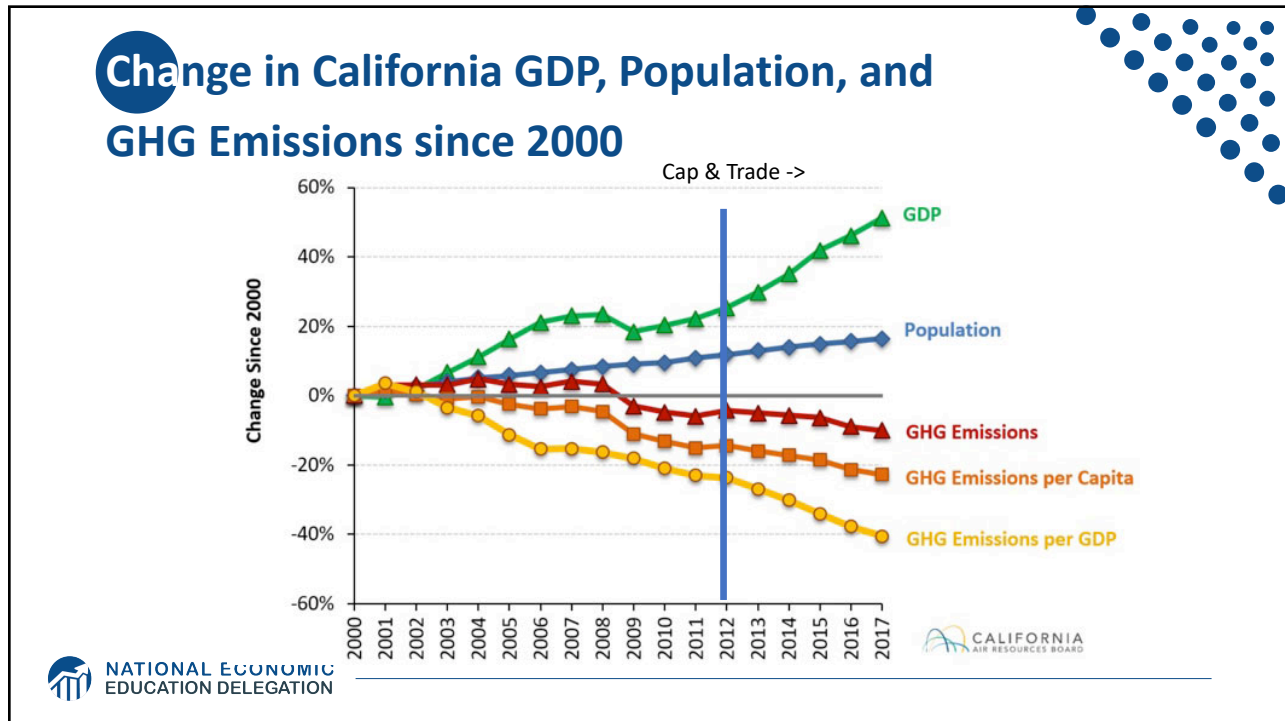


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Climate Change Policy in Action

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Sweden's Carbon Tax Policy

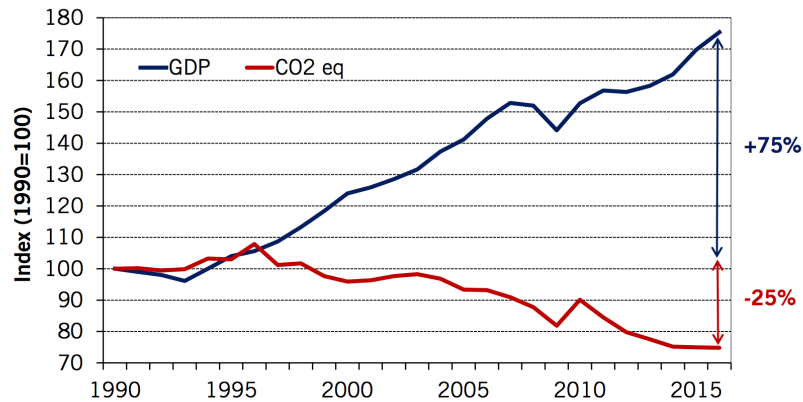
Started in 1991

Currently at \$140/ton

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Real GDP and Domestic CO₂eq Emissions¹ In Sweden, 1990-2016



¹ In accordance with Sweden's National Inventory Report, submitted under the UNFCCC and the Kyoto Protocol. CO₂ = approx. 80 % of total CO₂eq emissions. Preliminary data for 2016.

Sources: Swedish Environmental Protection Agency, Statistics Sweden



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Policy Responses

- **Regulations**
- **Market oriented: pricing carbon**
 - Cap and trade
 - Carbon tax
- **Other policies**
 - Ie, Land use
- **Note: All policies raise prices! There is no free lunch.**
 - But some lunches are cheaper than others.



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Summary

- There are many ways to reduce emissions.
- Taxes and cap and trade are proven effective tools to fight climate change!
- Economics-inspired policies can help us do this at the lowest cost.
- Other tools may also be necessary.
 - Regulations may well be necessary in some circumstances, but they are generally inefficient.
- Scientists and the IPCC recommend that we work to keep warming below 1.5 degrees celsius.
 - *Economists believe that this goal is well worth the costs!*



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Thank you!

Any Questions?

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Jon D. Haveman, Ph.D.

Jon@NEEDelegation.org

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- Economic Mobility
- Trade Wars
- Housing Policy
- Federal Budgets
- Federal Debt
- 2017 Tax Law
- Autonomous Vehicles

