

Osher Lifelong Learning Institute, Spring 2019
**What Economists Know About Important
 Policy Issues**

**Lecture 4: Safety Net
 & Climate Change**

April 16, 2019

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 National Economic Education Delegation

National Economic Education Delegation

• **Vision**

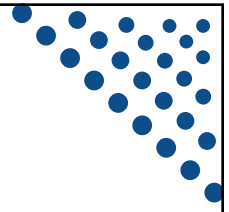
- One day, the public discussion of policy issues will be grounded in an accurate perception of the underlying economic principles and data.

• **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.



Finishing off The Safety Net

Safety Net: A Collection of Separate Programs



- **Different forms of assistance**
 - Medical Assistance
 - Cash Assistance
 - Nutritional Assistance
 - Housing Programs
- **Different eligibility (income & categorical)**
- **Different work rules and limits**
- **Different agencies and funding streams**

Major Safety Net Programs

- Medicaid
- Supplemental Security Income (SSI)
- Temporary Assistance to Needy Families (TANF)
 - (formerly AFDC)
- Earned Income Tax Credit (EITC)
- Supplemental Nutrition Assistance Program (SNAP)
 - (formerly food stamps)
- School nutrition programs
- Special Supplemental Nutrition Program for Women, Infants and Children (WIC)
- Housing Assistance
 - Vouchers
 - Rental Assistance
 - Public Housing
- Head Start



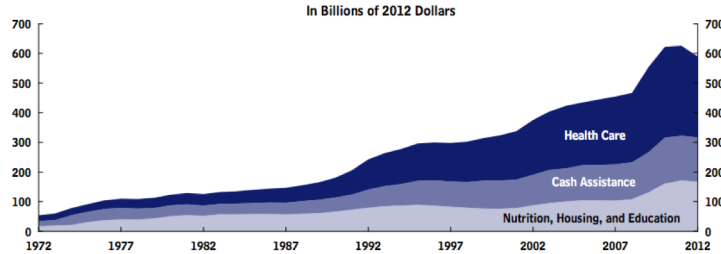
Social Insurance Programs: Not Means-Tested

- Social Security
(Old Age and Survivors Insurance Program)
- Medicare
- Unemployment Insurance
- Disability Insurance
- Workers' Compensation



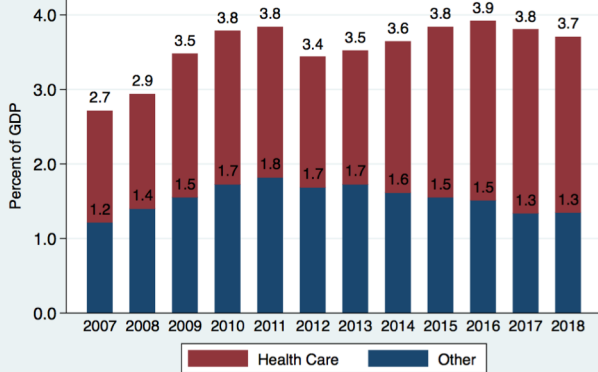
Expenditures on Means-Tested Transfers over Time

Federal Spending on Various Categories of Means-Tested Programs and Tax Credits, 1972 to 2012



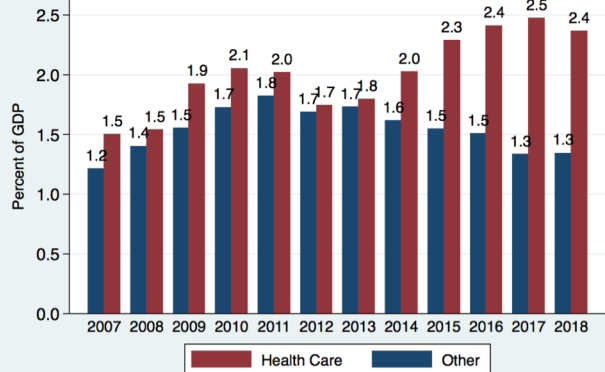
Expenditures on Means-Tested Transfers over Time

Recent Trends on Safety Net Spending



2018 is an estimate.

Recent Trends on Safety Net Spending



2018 is an estimate.

Expenditures on Specific Means-Tested Programs

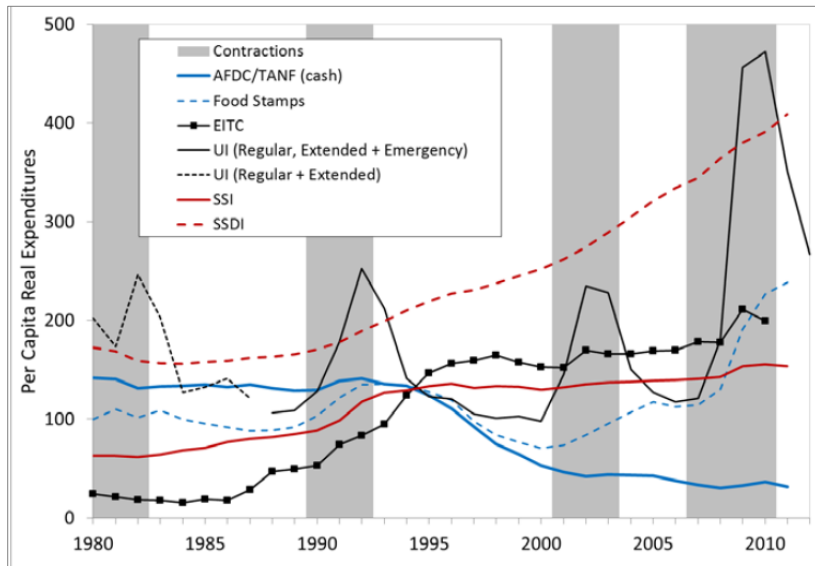
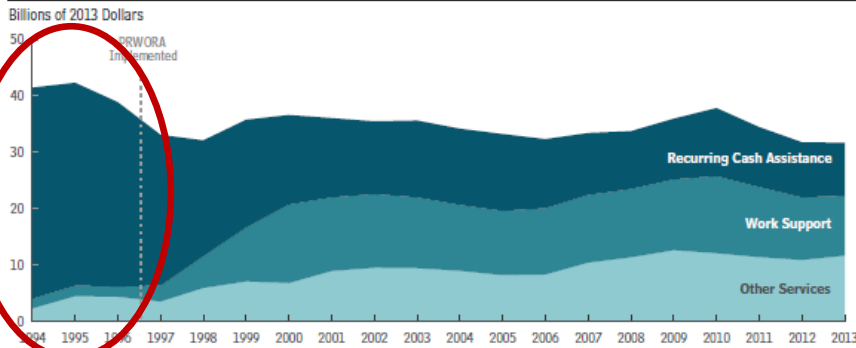


Figure 4.
Spending on TANF and the Programs That Preceded It, by Type of Assistance, 1994 to 2013



Source: Congressional Budget Office based on data from the Department of Health and Human Services.

Notes: Before PRWORA, Aid to Families With Dependent Children distributed recurring cash assistance, while the Job Opportunities and Basic Skills Training program provided work support and the Emergency Assistance program supplied other services for low-income families. Administration and systems costs are distributed proportionally among the three types of assistance.

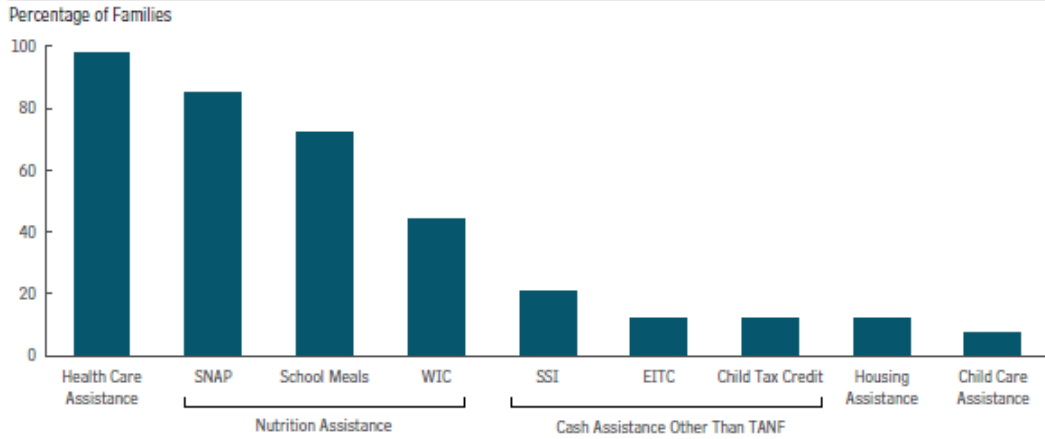
This figure includes TANF funding that states transferred to the Child Care and Development Block Grant and to the Social Services Block Grant.

Because the available data are limited, the figure does not include three of the smaller federal funding mechanisms for TANF. In every year, those mechanisms have provided less than \$0.3 billion in total.

TANF = Temporary Assistance for Needy Families; PRWORA = Personal Responsibility and Work Opportunity Reconciliation Act of 1996.

Figure 12.

Participation in Other Means-Tested Programs by Families Receiving Recurring Cash Assistance Through TANF

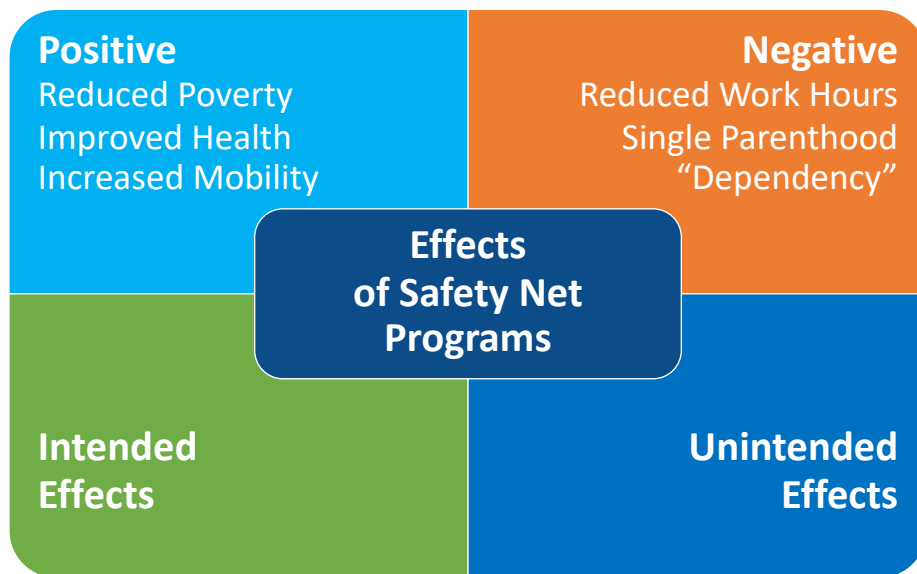


Source: Congressional Budget Office based on data from the Department of Health and Human Services and from the Census Bureau.

Notes: Most of the percentages are based on data from 2012, but for school meals, WIC, and SSI, the most recent readily available data cover 2009.



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Challenge: Measuring Effects of Safety Net on Poverty

- **Official Poverty Measures: Includes only cash income**
 - Excludes: SNAP, EITC, Housing Assistance
- **Supplemental Poverty Measure (SPM):**
 - Includes in-kind & after tax benefits.
- **SPM is a more inclusive measure of what the safety net does.**

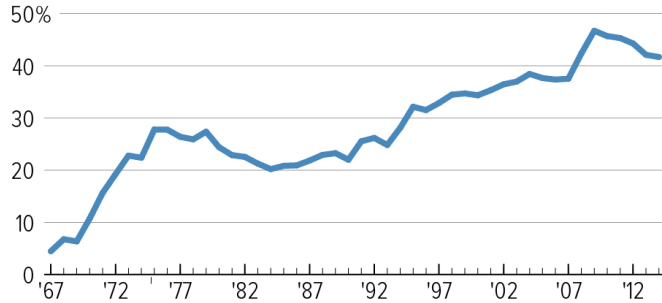
Table 5a.
Effect of Individual Elements on SPM Rates: 2015
 (Margin of error in percentage points. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see www2.census.gov/programs-surveys/cps/techdocs/cpsmar16.pdf)

Element	All people		Under 18 years		18 to 64 years		65 years and over	
	Estimate	Margin of error ¹ (±)	Estimate	Margin of error ¹ (±)	Estimate	Margin of error ¹ (±)	Estimate	Margin of error ¹ (±)
All people	14.32	0.28	16.11	0.50	13.80	0.30	13.67	0.50
ADDITIONS								
Social Security	-8.34	0.19	-2.12	0.18	-3.99	0.16	-36.04	0.79
Refundable tax credits	-2.88	0.13	-6.52	0.34	-2.16	0.10	-0.19	0.05
SNAP	-1.44	0.09	-2.70	0.21	-1.13	0.08	-0.77	0.11
SSI	-1.04	0.08	-0.79	0.12	-1.07	0.09	-1.30	0.16
Housing subsidies	-0.80	0.06	-1.16	0.14	-0.61	0.06	-0.99	0.14
Child support received	-0.43	0.05	-1.07	0.13	-0.29	0.04	-0.03	0.02
School lunch	-0.10	0.05	-0.96	0.14	-0.27	0.03	-0.03	0.02
TANF/general assistance	-0.21	0.04	-0.47	0.10	-0.15	0.03	-0.02	0.02
Unemployment insurance	-0.26	0.03	-0.26	0.06	-0.23	0.04	-0.02	0.01
LIHEAP	-0.08	0.03	0.10	0.04	-0.06	0.02	-0.10	0.04
Workers' compensation	-0.08	0.03	0.15	0.07	-0.13	0.03	-0.03	0.02
WIC	-0.08	0.03	0.29	0.09	-0.08	0.02	Z	Z
SUBTRACTIONS								
Child support paid	0.08	0.02	0.07	0.03	0.10	0.02	0.02	0.02
Federal income tax	0.44	0.05	0.37	0.07	0.54	0.06	0.11	0.05
FICA	1.52	0.10	2.07	0.19	1.58	0.10	0.41	0.09
Work expenses	1.75	0.10	2.44	0.22	1.80	0.10	0.47	0.09
MOOP	3.52	0.14	3.41	0.21	3.05	0.16	5.65	0.30

¹ The margin of error (MOE) is a measure of an estimate's variability. The larger the MOE in relation to the size of the estimate, the less reliable the estimate. The MOE is the estimated 90 percent confidence interval. The MOEs shown in this table are based on standard errors calculated using replicate weights. For more information, see "Standard Errors and Their Use" at www2.census.gov/library/publications/2016/demo/p60-256sa.pdf.
 Z Represents or rounds to zero.
 Source: U.S. Census Bureau, Current Population Survey, 2016 Annual Social and Economic Supplement.

Safety Net's Effectiveness at Reducing Poverty Has Grown Nearly Ten-Fold Since 1967

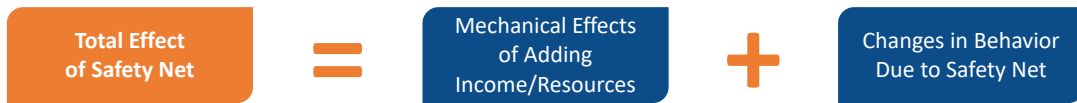
Percent of otherwise poor lifted above the poverty line by the safety net



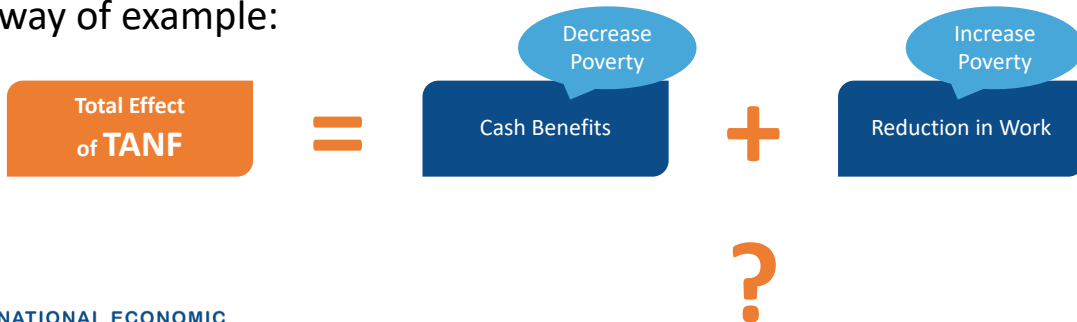
Note: For each year, figures show the percent reduction in the number of people in poverty from when government benefits and taxes are not counted to when they are counted. Calculations use Supplemental Poverty Measure (SPM) and 2012 SPM poverty line adjusted for inflation.

Source: 1967-2012 data are from Christopher Wimer et al., "Trends in Poverty with an Anchored Supplemental Poverty Measure," Columbia Population Research Center, December 2013. (Plot points generously shared by the authors.) For 2013-2014, CBPP analysis of Census Bureau data from the March Current Population Survey and SPM public use files.

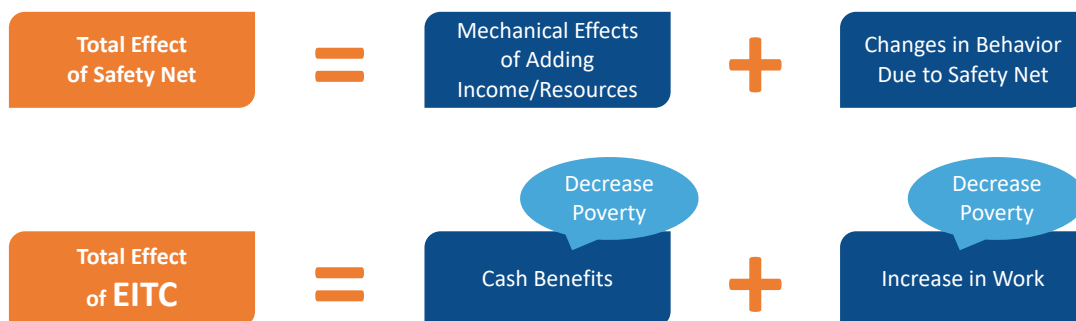
Total Effects are Complicated



By way of example:

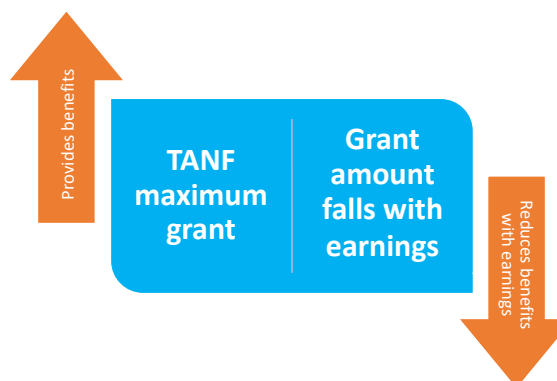


Total Effects are Complicated: EITC



Full Effect of Safety Net: Includes Behavioral Changes

- **Focus on work effects of safety net**
 - one of several possible unintended consequences.
- **What does economics tell us about safety net programs and work?**



Two Effects of Welfare Payment on Work

Welfare Provides Income

- More income increases consumption
- One form of consumption is leisure
- More income reduces work (by encouraging leisure)

Work Reduces Welfare Payments

- Rising earnings reduce benefit level
- Wage for working is effectively reduced
- Welfare discourages work (due to benefit reduction)



What do we know about magnitude of work disincentives from welfare?

- **Many studies**
- **Basic approach is important**



Perfect (but Impossible) Approach to Research

- Randomly divide population into two groups
- Offer some individuals welfare, others no welfare
- Compare how much the two groups work
- Challenge of social science:

no controlled experiments

Challenges to Empirical Studies

Does welfare use cause low work effort?



But we know low earnings (low work)
result in eligibility for welfare



HARD to
distinguish
between
these two
different
scenarios

How can we separate correlation (no direction implied) from cause and effect?

- **Can compare work behavior among welfare recipients**
 - Across states with different rules/benefit levels
 - Before-after policy changes within states

Compare Work Effort in States With Different Benefit Levels



Benefits Year 1
Benefits Year 2

Work Year 1
Work Year 2



How can we separate correlation (no direction implied) from cause and effect?

- **Can compare work behavior among welfare recipients**

- Across states with different rules/benefit levels
- Before-after policy changes within states
- Challenge: state policies may differ in multiple ways
- Rare to implement NEW safety net programs to study

What evidence do we have? What does it say?

“ Studies across states, or across states over time, of policy changes ”
~ Robert Moffitt (1983)

- **AFDC program as a whole reduced hours of work by participating single parents by:**

10% to 50%, 546 hours per year

What evidence do we have? What does it say?

- Study of food stamp program (FSP) introduction
- Work hours per year fall by 183 (20%) among single-parent families in counties introducing FSP (relative to counties that did not)
- About 32% of single parents received food stamps



What evidence do we have? What does it say?

Overall effect = 183 hours =
fraction receiving food
stamps * (effect for
recipients) +
fraction not receiving *
(effect for non-recipients)

OR

183 = .32 (effect among
recipients) + .68 (0)
Effect among recipients =
183/.32 or 571 hours per
year

**Food Stamp Program as a whole reduced work for recipients by
571 hours per year**



Welfare (TANF) today

- Adds explicit work requirements to welfare program.
- Increase in employment with welfare reform suggests TANF may have smaller work disincentives than prior programs.



International Evidence (Developing Countries)

- Abhijit Banerjee & co-authors look across many randomized experiments with cash transfers in developing countries.
- Most programs were cash transfers with no benefit reduction for work.
 - This is DIFFERENT than typical U.S. transfer programs.
- Treatment groups received cash transfers; control groups did not.



How large are welfare/work disincentives?

- **United States: old-style AFDC/Food Stamp programs reduced work by around 500 hours per year among recipients.**
- **TANF likely has smaller effects on work (designed to encourage/require work).**
- **International evidence suggests fairly small effects of cash assistance on work.**

How Big Are Work Disincentives?

Median marginal tax rate, by earnings group



Alternative to multi-part safety net: Universal Basic Income (UBI)

- UBI is an unconditional cash transfer that is regularly and equally distributed to everyone over 18, regardless of income or need.
- It is a significant departure from U.S.-style welfare system.

Examples of UBI or similar programs:

- **Alaska Permanent Fund:**
 - Alaskan residents have been receiving a percentage of the Alaskan natural extraction revenue.
 - Showed no effect on employment
 - Similar to a small UBI
- **Native American Casinos:**
 - 2010 study showed that some Native American groups received a percentage of revenue from casinos.
 - Showed that recipients didn't decrease hours worked.

Universal Basic Income (UBI)

✓ PROS

- Provides basic income to everyone
- Will help supplement income in face of job loss or low wages
- Less disincentive for work
 - No benefit phase out
 - (based on findings from the Alaskan Permanent Fund where Alaskan residents receive a percent of natural resource extraction profits)



Universal Basic Income (UBI)

✗ CONS

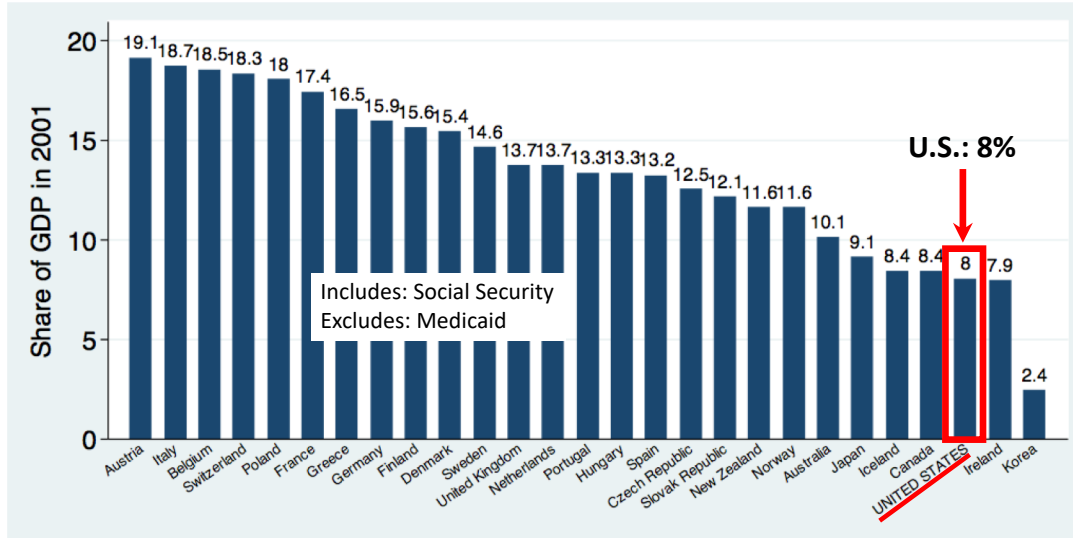
- Unaffordable: expensive because of universal nature.
- Does not address inequality: replaces safety net programs AND would provide everyone with transfer incomes, not simply those in need.
- Negative Incentives on work possible: people won't be as inclined to join the workforce.
- Delays Discussion of Job Creation: may crowd out discussion of job creation or growth for poverty reduction.



Summary: U.S. Safety Net

- **The U.S. safety net is a complex set of programs to aid the poor.**
 - Medical, nutrition, education, housing, cash
 - Different benefit amounts, eligibility rules, duration of assistance, administration
- **There are unintended consequences on the labor supply, and possibly on marriage and childbearing as well.**
- **There are substantial direct effects on measured poverty.**

Safety Net Spending Across the OECD



Questions?

Climate Change Economics



Credits and Disclaimer

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 - 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).



Outline

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



But First: What Is Economics?

- **Economics is about making choices under scarcity.**
 - Individuals and firms
- **How do goods and services get allocated among entities in society?**
- **How is value created by trade?**
- **How do “market failures” restrict that value creation?**

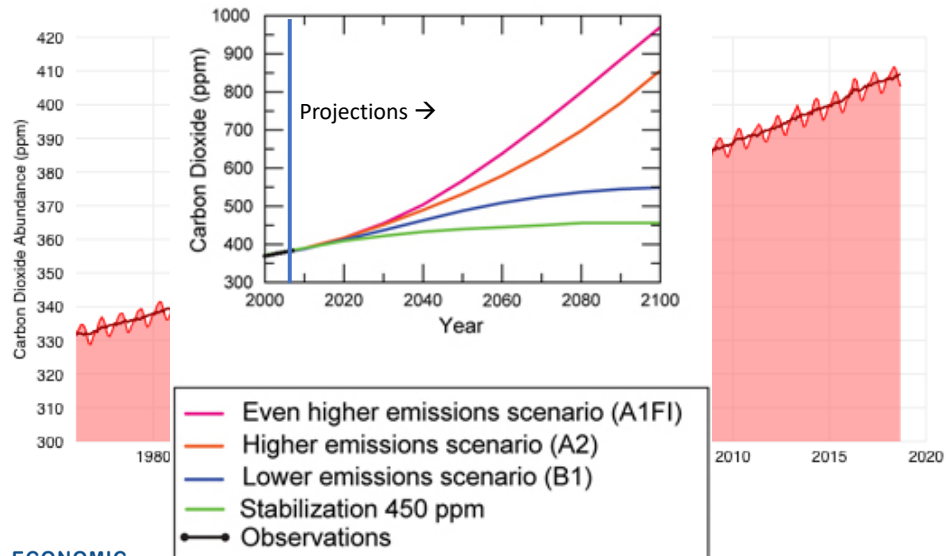
How Can Economists Contribute to Thinking about Climate Change?

- **By assessing behavioral reactions to climate change.**
- **By measuring the damage and estimate the economic costs of fighting climate change.**
- **By designing smart policies that minimize costs.**
 - Balance economic growth with GHG emission mitigation.

Climate Change Science

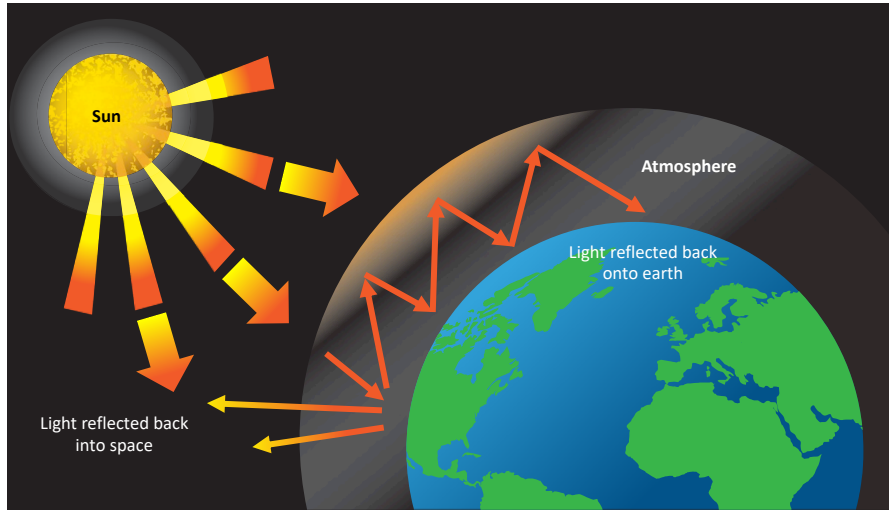


Atmospheric CO₂ Concentrations



Source: IPCC data distribution center and climate.gov

The Atmospheric Greenhouse Effect



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Uncertainty



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How Much Pollution Does Society Want? Analogy: How Many Oranges Does Society Want?

- People grow and sell oranges for a price that at least covers costs (*supply*).
- People will not pay more for them than what they consider to be their value (*demand*).
- Prices let *supply* and *demand* balance out. The price settles where:

of oranges people want to sell = # of oranges people want to buy

- This is the “right” number of oranges for society.
- Prices reflect scarcity and the social value of the resource.



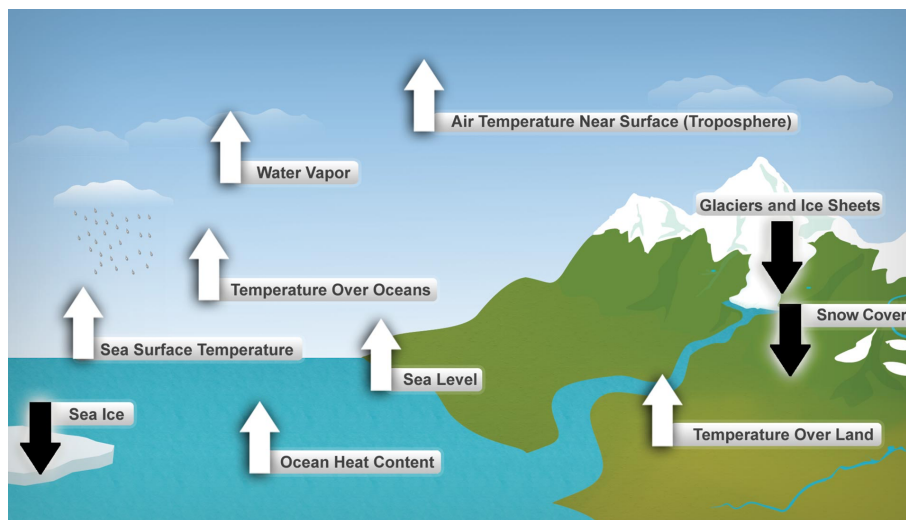
Pollution Is Different From Oranges

- **Human activity creates pollution.**
 - The goal is not zero pollution but society's best balance between pollution and human benefits.
- **Pollution is an EXTERNALITY: a side effect (cost or benefit) that affects someone else when something is bought or sold.**
 - The power company sells you electricity for your house, but the pollution from the power plant affects everyone, not just you!
 - This is a *market failure*.
- **All of the effects are not always felt by the buyers and sellers.**
 - The price of electricity does not reflect all of the costs—there is too much pollution.
 - Electricity is too cheap. The balance is wrong.



Impacts of Climate Change

Global Warming Indicators



How These Impacts Affect Humans

- Agriculture
- Fisheries
- Coastal damages
- Direct health effects, including sickness and death (temperature & drought; also pollution)
- Indirect health effects (vector-borne disease)
- Reduced fresh water availability
- Wildfires
- Shifting zones for important ecosystems, and desertification
- Reduced worker productivity
- Increased violence
- Some of these may cause human migration and/or conflict



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Adaptation Reduces Damages

- Human *adaptations* are costly actions that can reduce damages from climate change.
- The **net cost to society** is the **cost of adaptation** plus the **cost of the remaining damages**.
- People will take some actions on their own, up to the point where they find it worthwhile.
- Some responses require government involvement: large-scale actions or actions with shared benefits.
- Adaptation is already underway.



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Individual-Level Adaptation Examples

- **Do you behave differently on a hot day?**

- Staying inside more.
- Turn on the air conditioning.
- Plant at different times.
- Plant new crops.
- Think about moving.



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Public Adaptation

- **Governments can help:**

- When collective action is less costly than everyone acting alone.
- When individual action is not possible or likely.
- When some people can't protect themselves.

- **Sea walls**

- **Ecosystems that provide protection**

- **Supporting low-income and vulnerable populations**

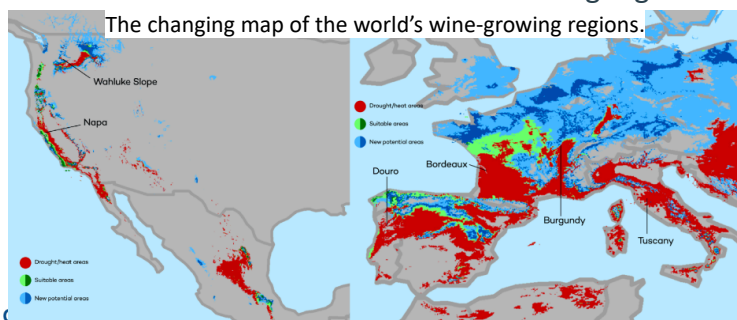
- **Moving residents of a town**



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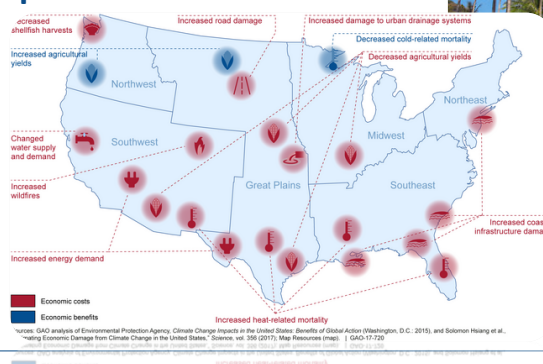
Market Based Adaptation

- **Prices and costs influence behavior.**
 - Where to live.
 - Where/when/what to plant.
- **Avoid barriers to market adjustment.**
 - Trade barriers, immigration restrictions, federal flood insurance, agricultural subsidies, and zoning regulations.



Most Vulnerable People and Places

- **Tropical areas**
- **Low-lying coastal areas**
- **Low-income people**



Projected Effects Vary Across the U.S. but Are Estimated at 1.2% of GDP per 1C Increase

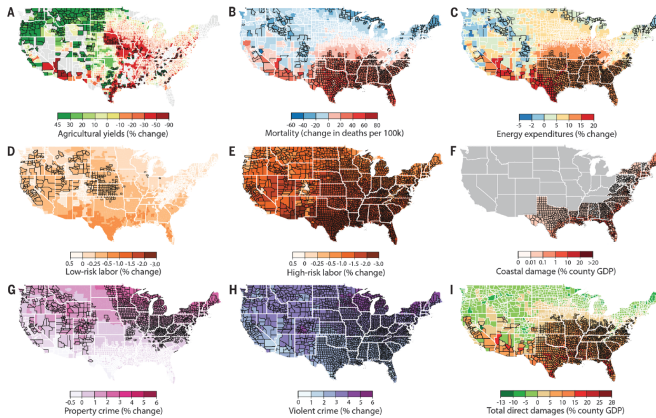
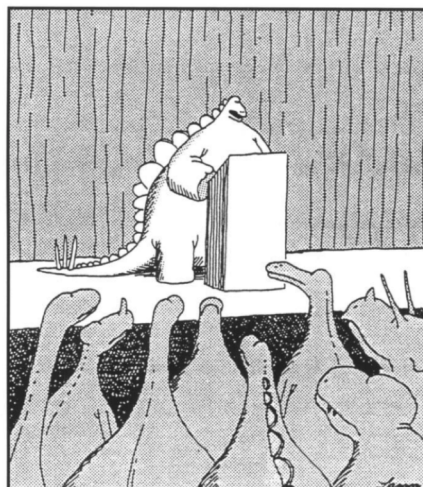


Fig. 2. Spatial distributions of projected damages. County-level median values for average 2080 to 2099 RCP8.5 impacts. Impacts are changes relative to counterfactual "no additional climate change" trajectories. Color indicates magnitude of impact in median projection; outline color indicates level of agreement across projections (thin white outline, inner 66% of projections disagree in sign; no outline, $\geq 83\%$ of projections agree in sign; black outline, $\geq 95\%$ agree in sign; thick white outline, state borders; maps without outlines shown in fig. S2). Negative damages indicate economic gains. **(A)** Percent change in yields, area-weighted average for maize, wheat, soybeans, and cotton. **(B)** Change in all-cause mortality rates, across all age groups. **(C)** Change in electricity demand. **(D)** Change in labor supply of full-time-equivalent workers for low-risk jobs where workers are minimally exposed to outdoor temperature. **(E)** Same as (D), except for high-risk jobs where workers are heavily exposed to outdoor temperatures. **(F)** Change in damages from coastal storms. **(G)** Change in property-crime rates. **(H)** Change in violent-crime rates. **(I)** Median total direct economic damage across all sectors [(A) to (H)].

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.





"The picture's pretty bleak, gentlemen. ...
The world's climates are changing, the mammals
are taking over, and we all have a brain
about the size of a walnut."

Economics of Responding to Climate Change

International Climate Policy Goals

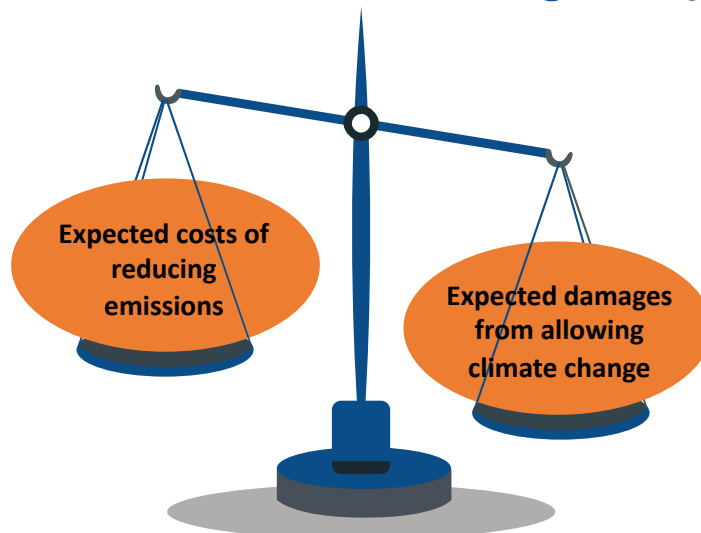
- **Intergovernmental Panel on Climate Change (IPCC)**
 - Global effort to fight climate change
 - Reports on consensus of climate science, including economics
- **IPCC report in 2007:**
 - Recommended goal: < 2 degrees C (3.6 degrees F)
 - Industrialized countries should reduce GHG emissions between 25% and 40% below 1990 levels by 2020.
- **2016 Paris Agreement:**
 - Basic goal of 2 degrees C: requires 40-70% GHG reduction 2010 → 2050
 - Reach goal of 1.5 degrees C: requires 70-95% GHG reduction 2010 → 2050
- **IPCC report in 2018:**
 - Temperature has already increased by 1.0 degrees C - Recommended: < 1.5 C



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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, amounting 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.
 - Stern Report estimate: damages could be as high as **20% of worldwide GDP**.
- **Caveats:**
 - Putting a monetary value on priceless things
 - Inequality
 - Uncertainty and risk



This is What Precisely Wrong Looks Like



This is What Precisely Wrong Looks Like



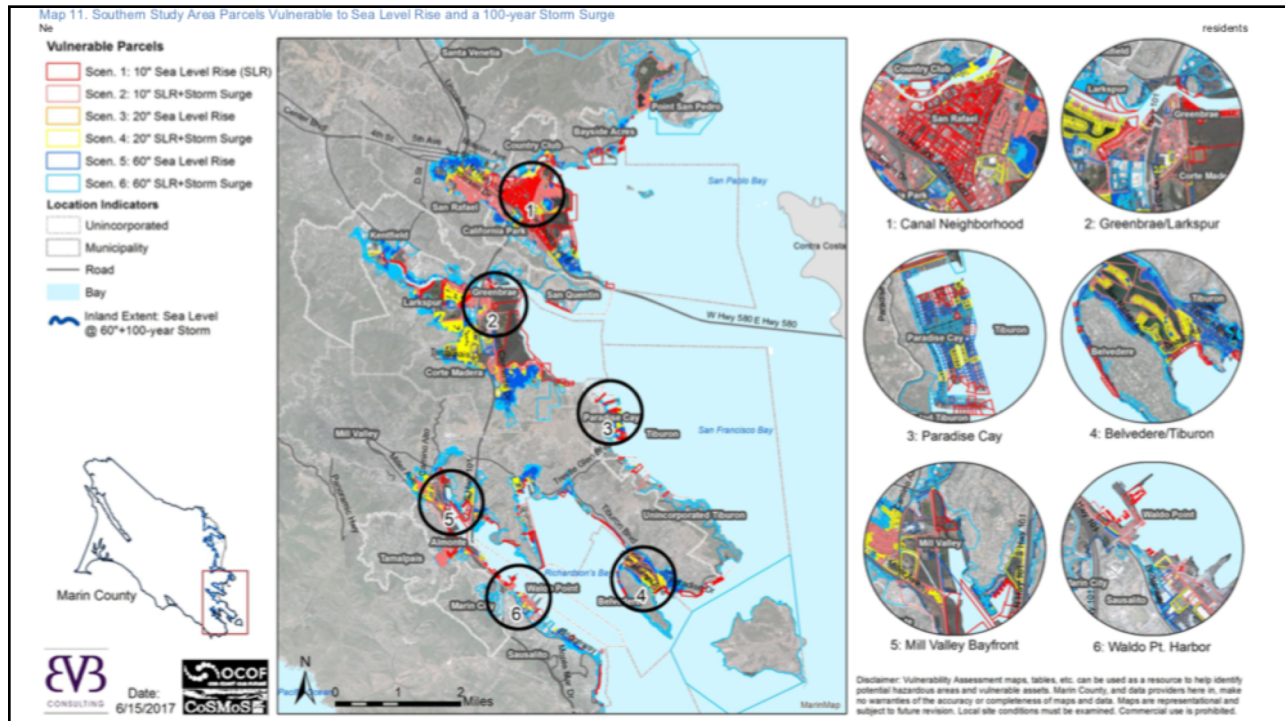
Facebook's office may be fully underwater by 2100, based on worst-case scenario sea level rise projections. Shayanne Gal/ Business Insider

This is What Precisely Wrong Looks Like



This is What Precisely Wrong Looks Like





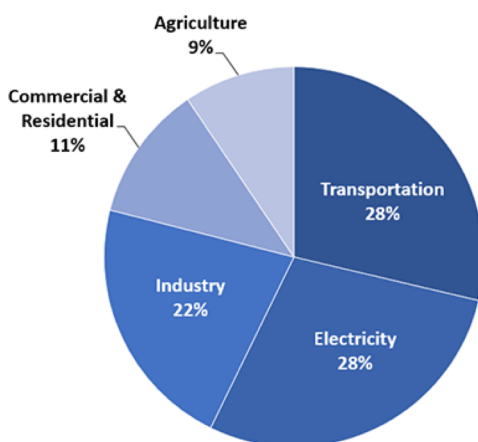
Economic Growth and Climate Change Action Are Compatible

- Abating greenhouse gas emissions is costly...
... but climate change damages are even more costly.
- Economic growth comes with consequences that we have to deal with, including climate consequences.
- Economies with environmental regulations can still be dynamic.
- Goal: design policies that reach climate goals at the least possible cost.

Addressing the Sources of Our Emissions

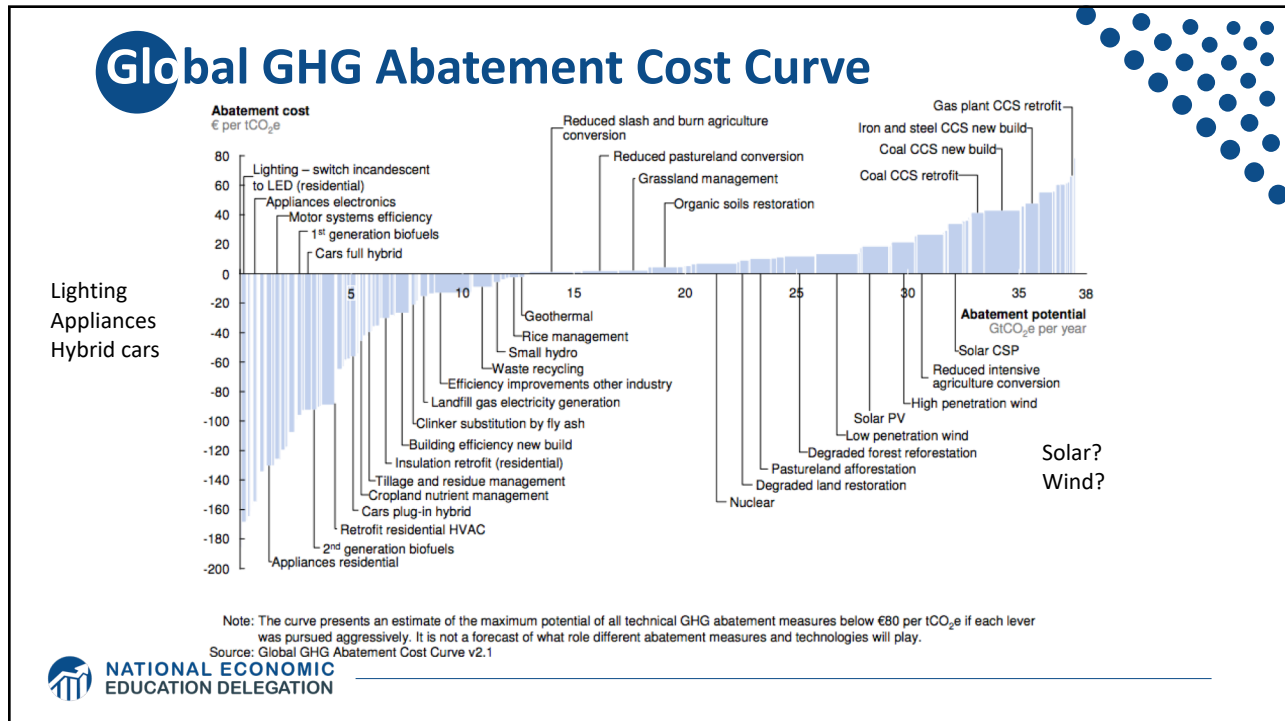


Total U.S. Greenhouse Gas Emissions by Economic Sector in 2016






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





Challenges with Renewable Energy

- **It's intermittent - only produced if there is sun or wind.**
- **Energy is needed all day and night, with peak times.**
- **Limited w/o storage.**
 - Creative storage options are under development

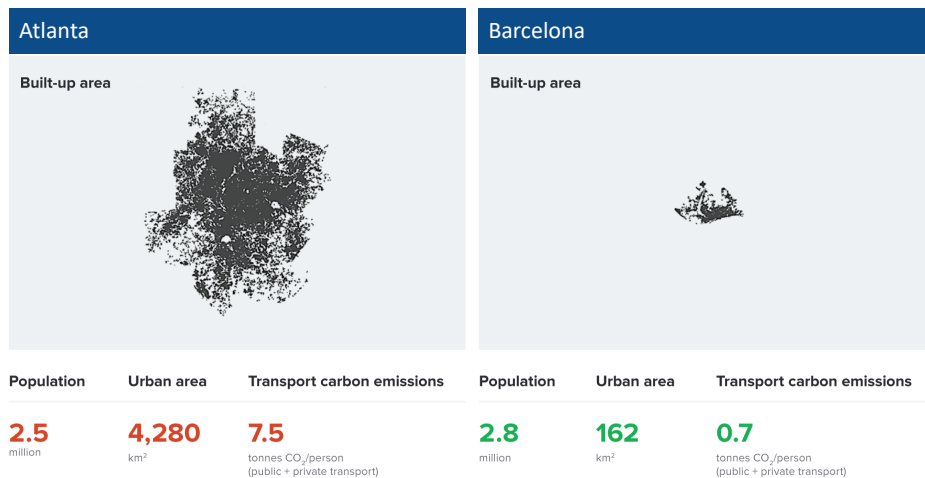
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Infrastructure and Climate Change

- **\$90 trillion in investment will be needed for U.S. infrastructure, 2015-2030.**
- **Add \$4 trillion (< 5%) to make it low-carbon infrastructure.**
 - This would also reduce climate damage to infrastructure.
 - Railway, urban transport, renewables.
- **The electrical grid is particularly troublesome.**
 - It is outdated and not suited for renewable energy storage.
 - Those with solar panels use the grid but contribute little to its upkeep.



Atlanta and Barcelona Have Similar Populations but Very Different Carbon Productivity



Source: New Climate Economy Report, 2014

Land Use: Restoration Is Possible



South Korea restored its forest cover from 35% to 64% of the country's total area

Climate Change Policy

Policies That Reduce Emissions: Directly

- **Regulation**

- Emissions standards or limits

- **Market oriented policies**

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



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?
 - According to historical emissions?
 - Evenly across emitters?
 - Sold at some price?
- **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”.**
 - The price of a permit indicates:
 - The cost of eliminating further emissions.
 - The cost of emitting.
- **Gov’t agency determines equality of permits in possession and emissions.**

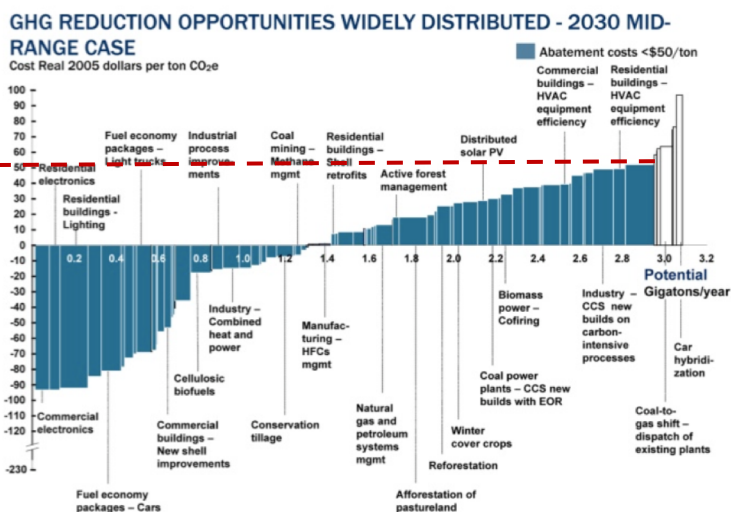


How Does a Carbon Tax Work?

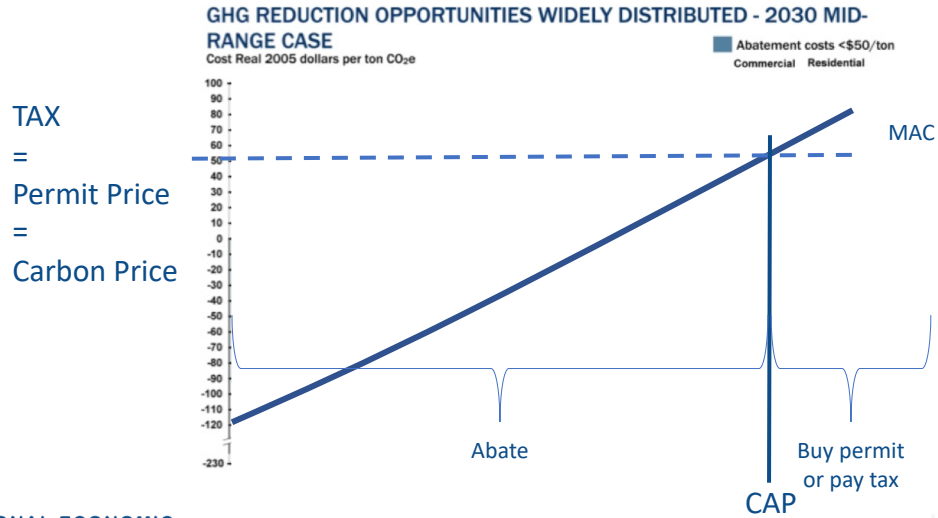
- Activities to be covered are determined.
- The price of emissions is determined.
 - Presumably some relation to the social cost of polluting.
- Emissions are measured.
- Taxes are determined.
- Q: What to do with the tax revenue?

Putting a Price on Carbon

Suppose a Social Cost Of Carbon of \$50



Putting a Price on Carbon



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Carbon Prices: the Good and Bad

- **Good:**
 - Provide price signal to lower emissions.
 - They yield low-cost reductions in emissions.
- **Bad:**
 - Regressive
 - Costs weigh more heavily on low-income people.
 - Firms might leave to flee regulation.
 - It is necessary to monitor emissions.



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Carbon Tax and Cap & Trade: the Differences

	Carbon Tax	Cap & Trade
--	------------	-------------

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	Always generates revenue May require legislation to change	May be more susceptible to lobbying Only generates revenue if government sells permits Cap can be changed by regulator

Policies That Reduce Emissions: INDirectly

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



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Climate Change Policy in Action

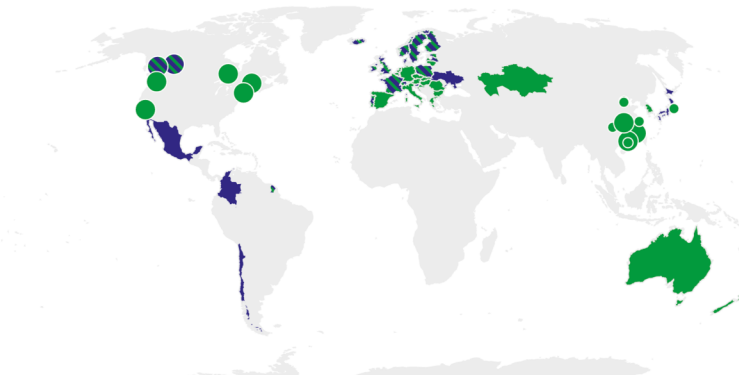


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Carbon Policies Across the World

Data last updated December, 01 2017

Summary map of regional, national and subnational carbon pricing initiatives



- STATUS**
 - Implemented
 - Scheduled
 - Under consideration
- TYPE OF INSTRUMENT**
 - Carbon tax
 - ETS
 - Undecided
- TYPE OF JURISDICTION**
 - National
 - Regional
 - Subnational

ETS = Emissions Trading System = Cap and Trade

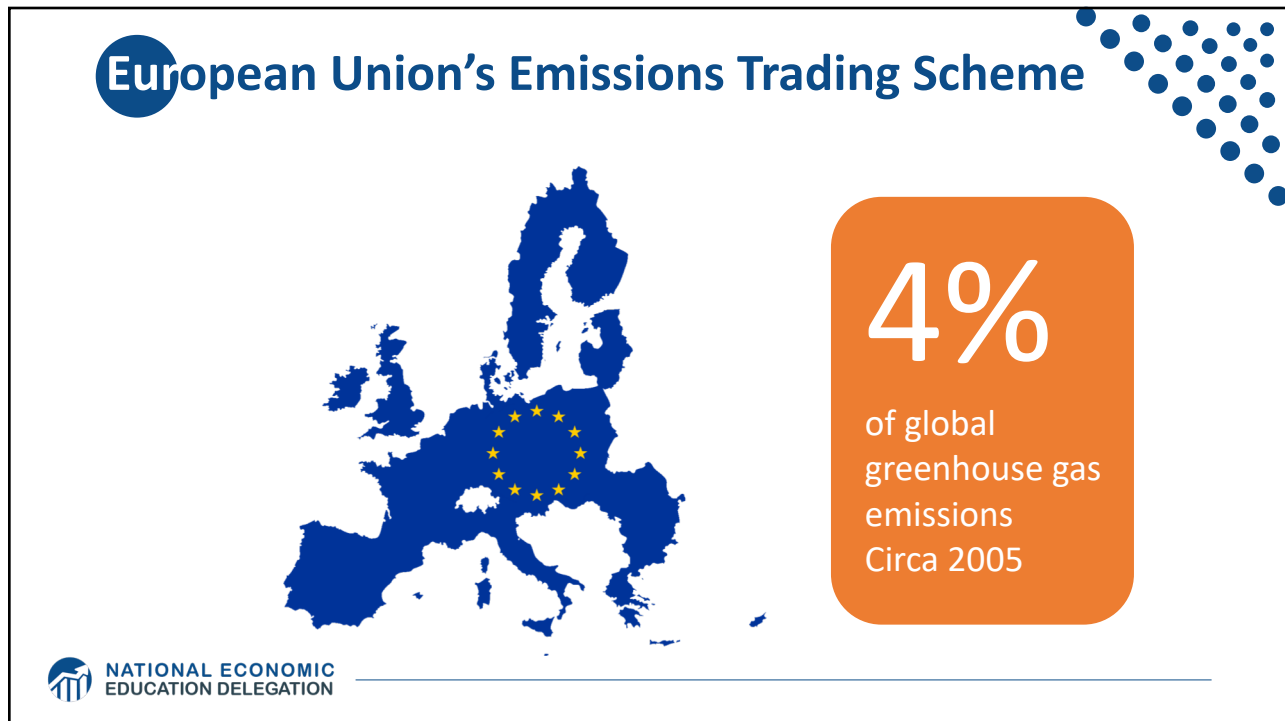
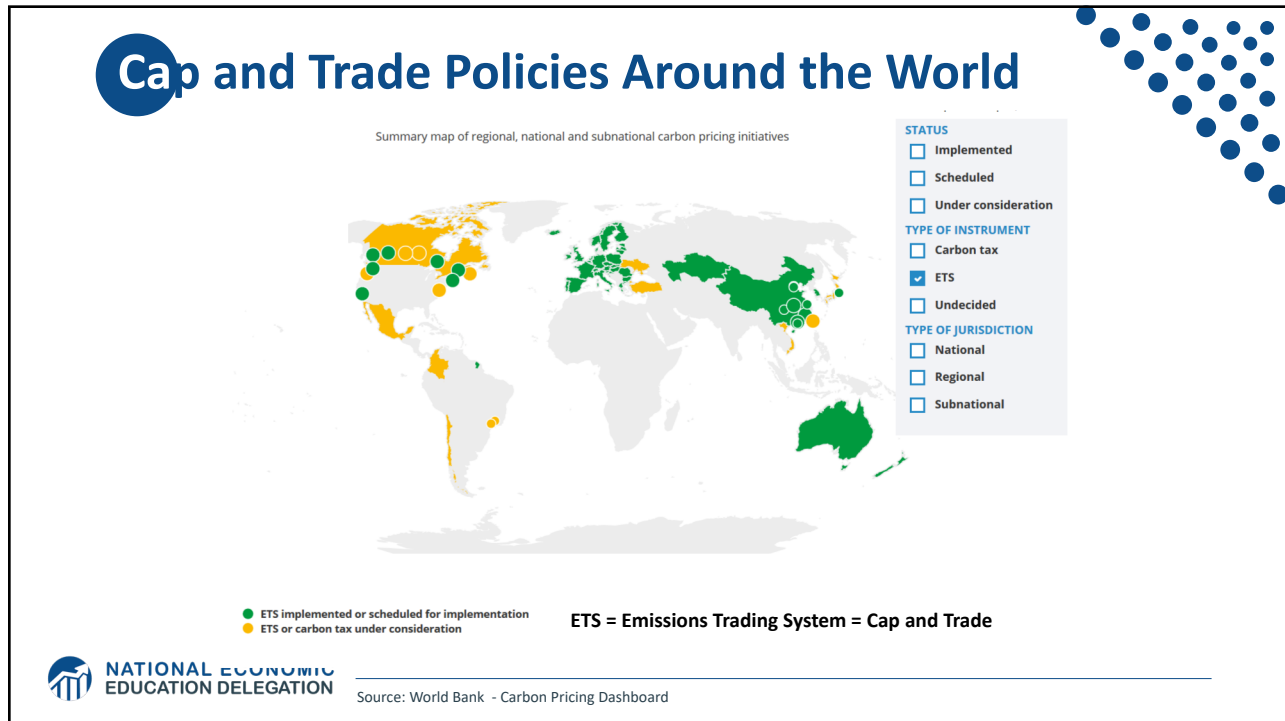
- ETS implemented or scheduled for implementation
- Carbon tax implemented or scheduled for implementation
- ETS and carbon tax implemented or scheduled



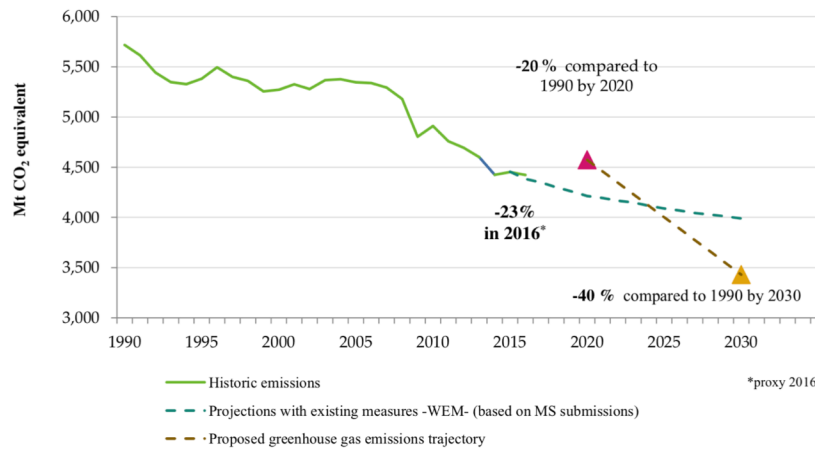
Source: World Bank Carbon - Pricing Dashboard

Cap and Trade



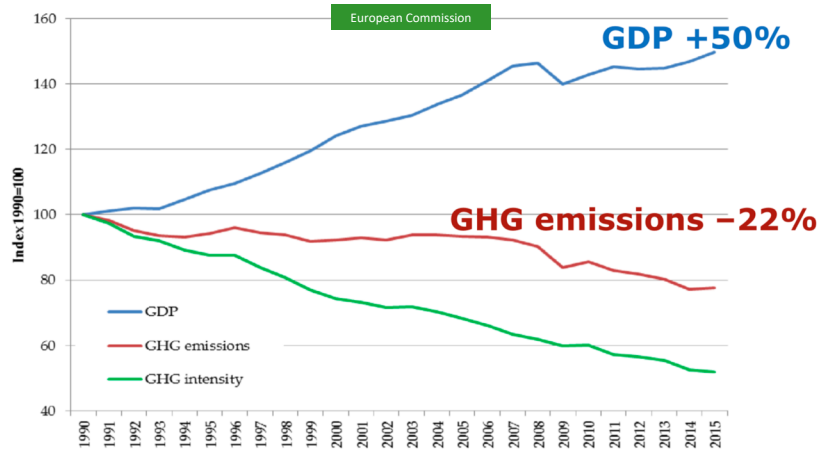


Progress Towards Meeting Europe 2020 And 2030 Targets (EU Total GHG Emissions)



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EU Has Decoupled Economic Growth from Greenhouse Gas Emissions



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California's Cap and Trade System: 2012+



0.7%

of global
greenhouse gas
emissions

California's System Is Flexible



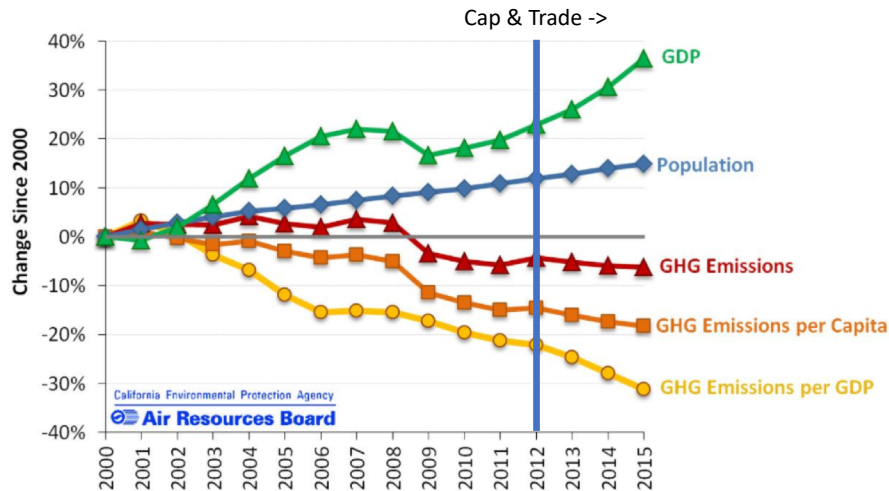
- **California's goals:**

- Reduce emissions to 1990 levels by 2020
- An 80% reduction in emissions from 1990 levels by 2030

- **California's Tools:**

- Cap and Trade
- Renewable Portfolio Standard
- Clean Cars Program
- Low Carbon Fuel Standard

Change in California GDP, Population, and GHG Emissions since 2000



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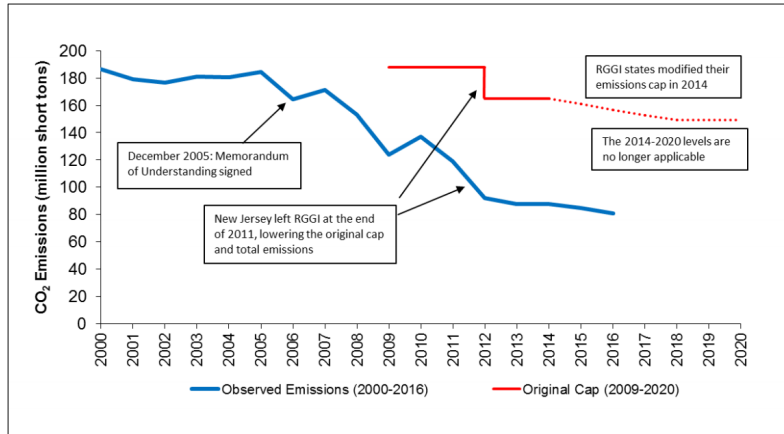
RGGI: the Regional Greenhouse Gas Initiative

- **Participants: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont**
 - 7% of US emissions
- **Covers power plants**
- **First implemented in 2009**
- **Caused emissions reduction of 24% below what they would have been**

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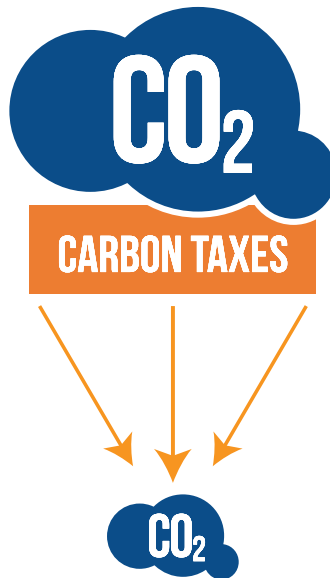
RGGI's Effect on Emissions

Figure I. Observed Emissions Compared to the Original Emissions Cap



Source: Prepared by CRS; observed state emission data (2000-2016) provided by RGGI at <http://www.rggi.org>.

Carbon Tax



Worldwide Carbon Taxes

26

carbon tax programs

24

national jurisdictions covered

5.3%

of global greenhouse gas emissions



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British Columbia's Carbon Tax Policy



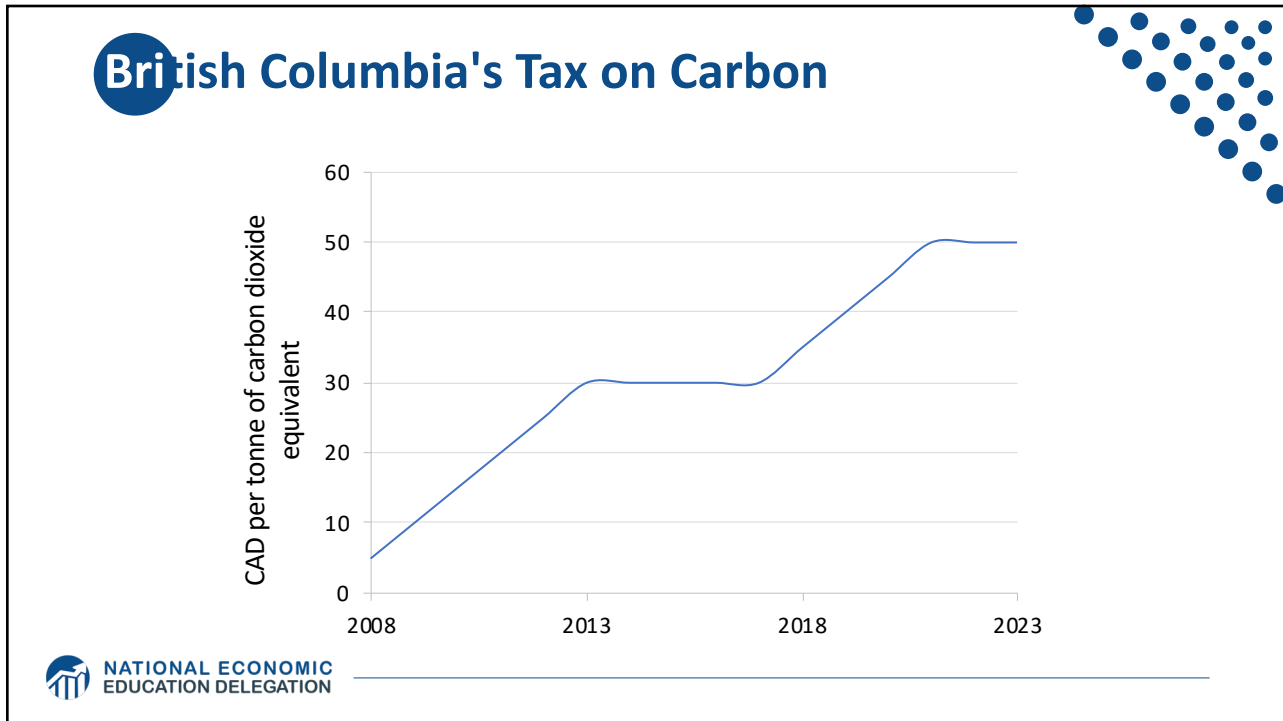
0.1%

of global greenhouse gas emissions

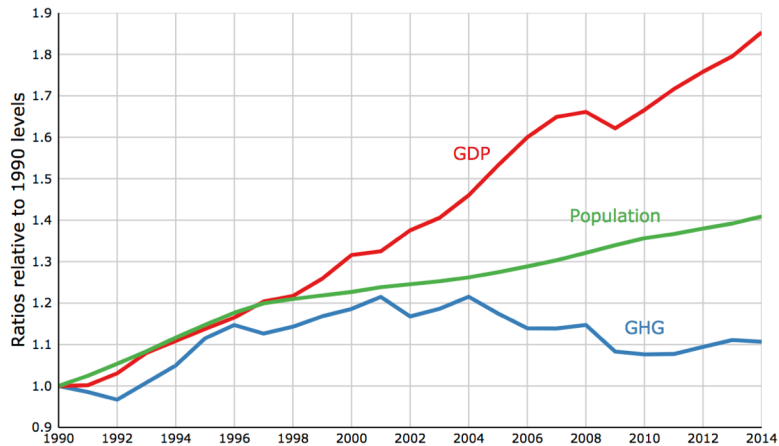


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“ Tax the pollution we do not want, and return the money for what we do want — money in people’s pockets, jobs and investment. ”
- B.C. Government - Carbon Tax Brochure



Relative Greenhouse Gas Emissions, GDP & Population Size: British Columbia



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Sweden's Carbon Tax Policy



Oldest
Carbon
Tax

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Sweden's Carbon Tax Policy

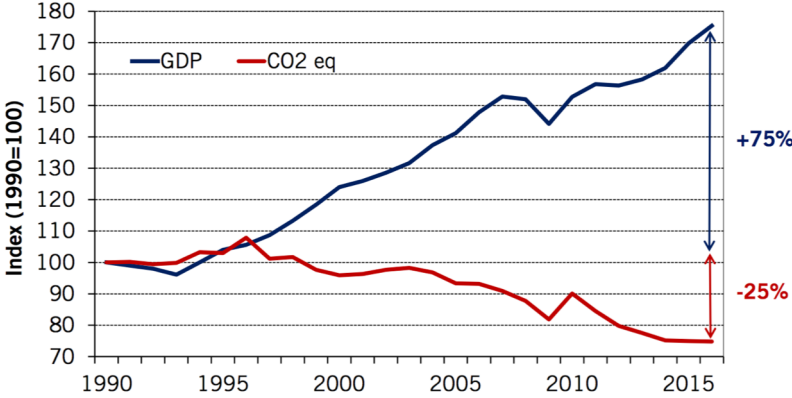


Started in 1991

Currently at \$140/ton

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



Year	Real GDP (Index 1990=100)	Domestic CO ₂ eq Emissions (Index 1990=100)
1990	100	100
1995	105	100
2000	125	95
2005	145	90
2010	155	80
2016	175	75

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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U.S. Carbon Tax Plans

- Climate Leadership Council
- Citizens Climate Lobby
- States and municipalities:
Washington state, Oregon,
Washington, DC



“ Economic policies will be central to accomplishing the goals we choose.”

- Harris and Roach (2007)

Summary

- Climate change is real, is caused by human actions, and has impacts we're already feeling.
- We need to reduce emissions to balance the costs of action against the costs of inaction.
- Scientists and the IPCC recommend that we work to keep warming below 2 degrees celsius.

- *Economists believe that this goal is well worth the costs!*



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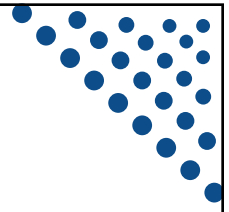
Summary – *continued*

- There are many ways to reduce emissions.
- Economics-inspired policies can help us do this at the lowest cost.
- Taxes and cap and trade are proven effective tools to fight climate change!
- Other tools may also be necessary.



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Thank you!



Any Questions?

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