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An Economic Approach to Climate Change

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Why is economics important

- Economics provides mathematically precise theories and empirically sound methods
- Evaluation of costs and benefits associated with policy proposals
- Modeling behavioral responses to changing costs and benefits

Benefit / Cost Analysis

- Information organizing tool
- Translation of all stocks and flows into a common unit of measurement
- Dollar prices reveal how people value scarce resources (use value)
- Non-use value is considered

Global Warming Science

- IPCC 2007 4th Assessment Report (SPM)
- 9/10 experts agree humans have net warming effect p.4
- 66% certain human influence has been enough to affect storm patterns p.6
- 50% certain humans have affected heatwaves and droughts p.6
- 66% certain we will see drastic climatic events (cyclones, storms, droughts) p.8
- 90% chance we will see increases in temperature extremes p.8

- *Probabilities defined on p. 3 of introduction of actual report.

An Economic Approach

- CO_2 emissions are a negative externality
- External to market transactions, not considered in the prices we pay for goods and services
- Taking science into account, economists try to estimate the value of the negative externality
- Ex: price of CO_2 / ton

Theoretical Background

- 1960 JLE The Problem of Social Cost
- 1967 AER Toward a Theory of Property Rights
- Externalities result from poorly defined PR's
- With PR's & low transaction costs, externalities can be internalized via markets (bargaining)

Organized Exchanges

- CCX- carbon offsets
- Kyoto Protocol- EU
- $100/ton Summer ‘07

Nordhaus vs. Stern

- Stern Review on the Economics of Climate Change, Sir Nicholas Stern, Head of the Government Economic Service, UK
- A Review of the Stern Review on the Economics of Climate Change. William D. Nordhaus. Journal of Economic Literature, 45(30:686-702 September 2007.
- DICE-2007 model: Dynamic Integrated Model of Climate and the Economy
- Consists of mathematical equations that represent the laws of motion of output, emissions, climate change, and economic impacts
- Each component is a submodel that draws upon research from the natural sciences.

Baseline Case

- No action taken
- 2100: CO2 = 685 ppm
- Temperature increases 2.4 C
- PV(damages) = $22.6 trillion
- damages consider agriculture, sea level effects, health, and other ‘non-market’ values.
- *IPCC indicates temperature ranges could increase 1.8-4C

Stern Review

- Taking no action, damage from climate change will equal 5% of global GDP/year
- Could be as much as 20% GDP/year
- Abatement costs ~1% GDP/year

Stern Proposal (in DICE-2007)

YEAR	TAX/TON CO2	NOTES
2020	$300	Would increase gas prices by $1.20
2050	$600-$800	$700/ton ~increasing the cost of coal fired electricity by 150%
COST $27 trillion	BENEFITS $13 trillion	Negative net benefits

Nordhaus' 'Optimal Policy'

YEAR	TAX/TON CO2	NOTES
2010	$34	gas price increase ~$.15/gallon
2015	$42	
2050	$90	
2100	$207	
COST $2.2 trillion	BENEFITS $5.2 trillion	Positive net benefits

Different Conclusions, Different Discount rates

- Nordhaus: should approximate the market return on capital.
- Investments in reducing climate change should be given equal weight to investments in other technology and capital
- Stern: r = .1%
- Inflates future damages from climate change, or the benefits of immediate action

Agreement Among Economists?

- For effective policy, we must raise the price of carbon
- Signals to consumers about their ‘carbon footprint’
- Provide incentives for technological change
- Markets economize on the information- partial bits of decentralized information that are that are possessed by multitudes are coordinated to produce results.

Market vs. Regulatory Approaches

- “proposals resulting in increased fuel efficiency for cars, requiring high efficiency light bulbs, subsidizing solar and wind power ..are largely fluff”- Nordhaus
- Regulatory approaches shrink the pool of knowledge for solving resource related problems
- Motivate ‘rent seeking’ by big business and special interests.

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