Plan of Talk

- Major externalities and designing fiscal policies to address them
- Measuring externalities
- Corrective tax estimates
- Implications for carbon pricing
Based On

Getting Energy Prices Right
From Principle to Practice

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How Much Carbon Pricing is in Countries’ Own Interests? The Critical Role of Co-Benefits

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Major Externalities and How to Address Them
Major Environmental Problems

- Carbon emissions
  - projected warming 3-4°C by 2100 (with tail risks)

- Local (outdoor) air pollution
  - > 3 million premature deaths a year

- Road congestion/accidents
  - London motorists impose congestion cost of $40/gal.
  - accidents cause 1.2 million deaths

- Other externalities beyond our scope:
  - opaque (e.g., energy security, indoor air pollution)
  - smaller in magnitude (e.g., oil spills)
Fiscal Instruments must be Center Stage

- Effective
  - if targeted at the right base

- Cost effective
  - if revenues used productively

- Balance environmental benefits and costs
  - if tax rates aligned with external costs

- Fiscal policies should have three elements…
1. Fuel Charges for Carbon Emissions

- $= \text{CO}_2 \text{ damage/ton} \times \text{CO}_2 \text{ emissions factor}$
  - e.g., straightforward extension of motor fuel excises

- Or price emissions (but administration more complex)
Problem is fine particulates

- produced directly
- indirectly from \( \text{SO}_2, \text{NO}_x \)

\[ \text{= damage/ton} \times \text{emissions factor (summed over emissions)} \]

- with rebates for control technologies
- or price emissions (if administration feasible)
3. Charges for Congestion, Accidents

- Excessive because motorists do not consider
  - congestion costs
  - pedestrian injuries, property damage, etc.

- Ideal policy: mileage-based charges
  - for busy roads (congestion)
  - varying with driver risks (accidents)
  - on axle weight of trucks (road damage)

- Interim: reflect externalities in fuel taxes
  - but reduce ~50% (mileage portion of fuel response)
…are needed, such as:
- public infrastructure investments
- for related market failures (e.g., technology spillovers)

But should not detract from getting prices right
- corrective taxes may yield biggest welfare gains
- other policies don’t affect efficient energy taxes
Measuring Externalities
No ‘correct’ tax all should agree on but
- provide transparent framework
  - accommodates different views (disciplines debate)
  - robust direction for reform
- spreadsheet tool for sensitivity analysis
$35/ton CO_2 \ (US \ govt.)

- recent EU ETS prices < $10/ton
Air Pollution Damages from Coal

- Population exposure
  - power plant location → number of people in proximity

- Exposure → mortality risk
  - evidence from Global Burden of Disease

- Monetize health effects
  - evidence on inc. elast. of VSL (OECD)

- Damage per unit of fuels
  - country-specific emissions factors
Nationwide average travel delays extrapolated
- city-level database → average delay = F(transportation indicators)

Average delay → marginal delay
- functional forms from transport engineering literature

Monetize
- value of time = 60 percent of market wage
Corrective Taxes
Corrective Taxes on Coal, 2010

Corrective coal tax, $/GJ

- Australia
- Brazil
- Chile
- China
- Germany
- India
- Indonesia
- Israel
- Japan
- Kazakhstan
- Mexico
- Poland
- South Africa
- South Korea
- Thailand
- Turkey
- United Kingdom
- United States

World price
Corrective Taxes on Natural Gas, 2010

- Australia
- Brazil
- Chile
- China
- Egypt
- Germany
- India
- Indonesia
- Israel
- Japan
- Kazakhstan
- Mexico
- Nigeria
- Poland
- South Africa
- South Korea
- Thailand
- Turkey
- United Kingdom
- United States

Corrective natural gas tax, $/GJ

- Carbon
- Local pollution
- Current tax

World price
Corrective Taxes on Gasoline, 2010

- Australia
- Brazil
- Chile
- China
- Egypt
- Germany
- India
- Indonesia
- Israel
- Japan
- Kazakhstan
- Mexico
- Nigeria
- Poland
- South Africa
- South Korea
- Thailand
- Turkey
- United Kingdom
- United States

Corrective tax, $/liter

- carbon
- local pollution
- accident
- congestion
- current tax
Global Benefits from Getting Energy Prices Right

- **Health**
  - 63 percent reduction in air pollution deaths

- **Climate**
  - 23 percent reduction in CO$_2$ emissions

- **Fiscal**
  - 2.6 percent of GDP in new revenue
Implications for Carbon Pricing
Welfare gains from near term CO$_2$ pricing include:
- (non-internalized) domestic envir. co-benefits

How much (second-best) carbon pricing is in countries’ own national interests?
Net Benefit from CO₂ Tax (Exc. Climate Benefit)

- Price per unit
- Demand
- net benefits from carbon charge
- cost of carbon charge exc. dom. envir. benefits

- domestic co-benefits per unit
- carbon tax
- prior fuel tax

Fuel consumption
Nationally Efficient CO$_2$ Prices from Co-Benefits

- Top 20
- Poland
- Spain
- France
- Australia
- Italy
- Indonesia
- South Africa
- Mexico
- United Kingdom
- Canada
- Korea
- Germany
- Japan
- India
- Russia
- United States
- China

$/ton CO$_2$
Implications for International Agreements

- Raises questions about
  - free rider argument
  - need for international transfers for large developing country emitters
  - argument for uniform carbon pricing
    - welfare gains from differentiated vs. uniform pricing 23 percent greater
    - case for agreements over price *floors* not *levels*
Concluding

- Finance ministries have key role
  - championing environmental taxes
  - administration
  - putting revenues to good use