

Modeling the Health Benefits of Carbon Emissions Reductions: The Case of China

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Overview of Model

- Policy simulations are conducted with a CGE model (originally constructed to analyze the effects of carbon emissions reductions)
- A model of the health effects of fossil fuel use (constructed by the World Bank) is integrated with the economic model
- Outputs include both effects on human health and valuation of damages



Health Effects of Air Pollution in Urban China, 1995

- 178,000 premature deaths in urban areas
- Hospital admissions 346,000 higher than if Chinese air pollution standards were met
- 6.8 million additional emergency room visits
- 4.5 million additional person-years lost because of pollution-related illness
- Health damages valued at almost 5% of GDP

Source: World Bank (1997).



Projected Health Effects of Air Pollution in Urban China, 2020

- 600,000 premature deaths in urban areas
- 9 million person-years lost because of pollution-related illness
- 20 million cases of respiratory illness per year
- 5.5 million cases of chronic bronchitis
- Health damages valued at 13% of GDP

Source: World Bank (1997).

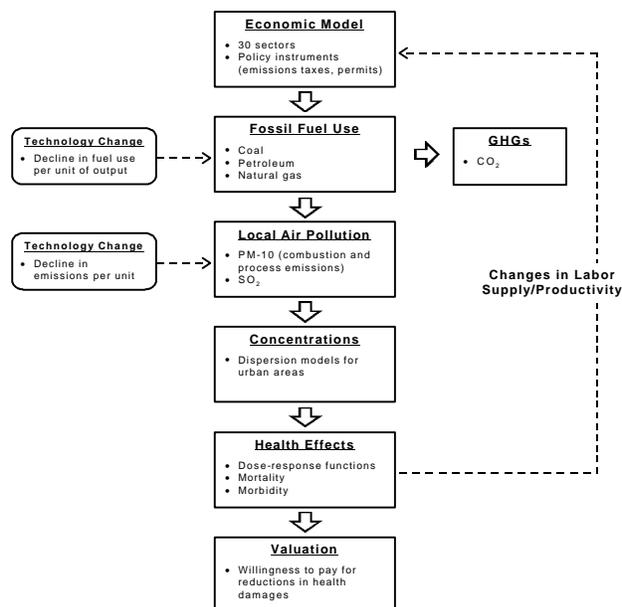


Major Features of Economic Model

- Dynamic Solow growth model
- 30 sectors
- 5 energy sectors
- Includes both plan and market institutions
- 50 Year simulation period



Flowchart: CGE Model for China with Health Effects



Design of Simulation

- 1) Run base case (business as usual) simulation
- 2) Rerun model holding output of carbon to 10% of the base case
 - a) Carbon tax is an endogenous variable
 - b) Reduce other taxes proportionately to keep simulations revenue neutral



Effects of a 10% Reduction in Carbon Emissions in China, 2010

- 13% increase in price of coal
- 12% reduction in use of coal
- 6% reduction in particulate emissions
- 7% reduction in premature deaths

Source: Garbaccio, Ho, and Jorgenson (2000).



Effects of a 10% Reduction in Carbon Emissions in China, 2010 (cont.)

- GDP decreases during initial years of simulation period
- However, after year 3, GDP is higher than in base case
- With assumption of inelastic supply of labor, carbon tax transfers income to enterprises, increased investment increases growth rate of GDP (and after year 3, consumption)



Ongoing Work

- Work at Harvard and Tsinghua Universities to improve components of health effects model
- Work with China's State Environmental Protection Administration (SEPA) to improve regional and other data
- Attempt to endogenize health effects on labor supply and productivity

