

Computable General Equilibrium Modeling for the Second Section 812 Prospective Analysis

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Topics

- EMPAX-CGE modeling system overview
- Use of model inputs
- Model's policy findings



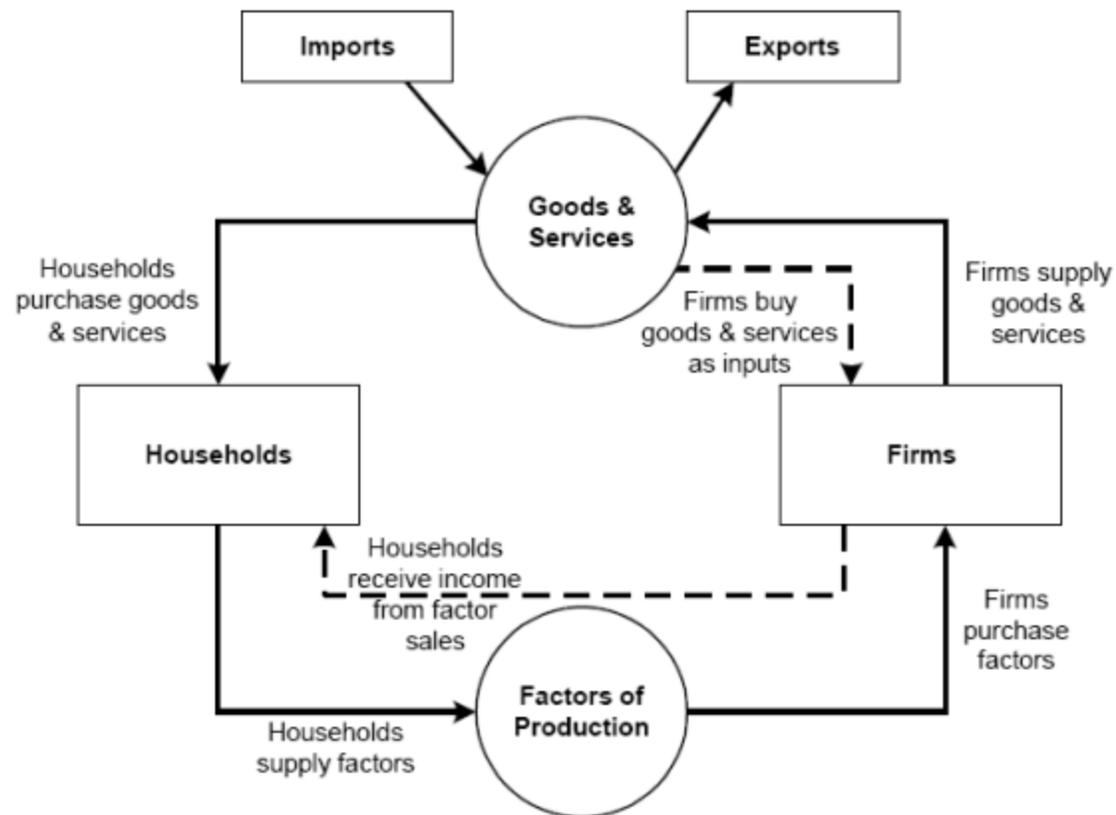
MODELING SYSTEM OVERVIEW

Development Background

- Use in **Regulatory Impact Analysis**
 - OAQPS, Health and Environmental Impacts Division, Air Benefit and Cost Group
- **Documentation** and **peer-review** process
- **Current** and **anticipated uses**

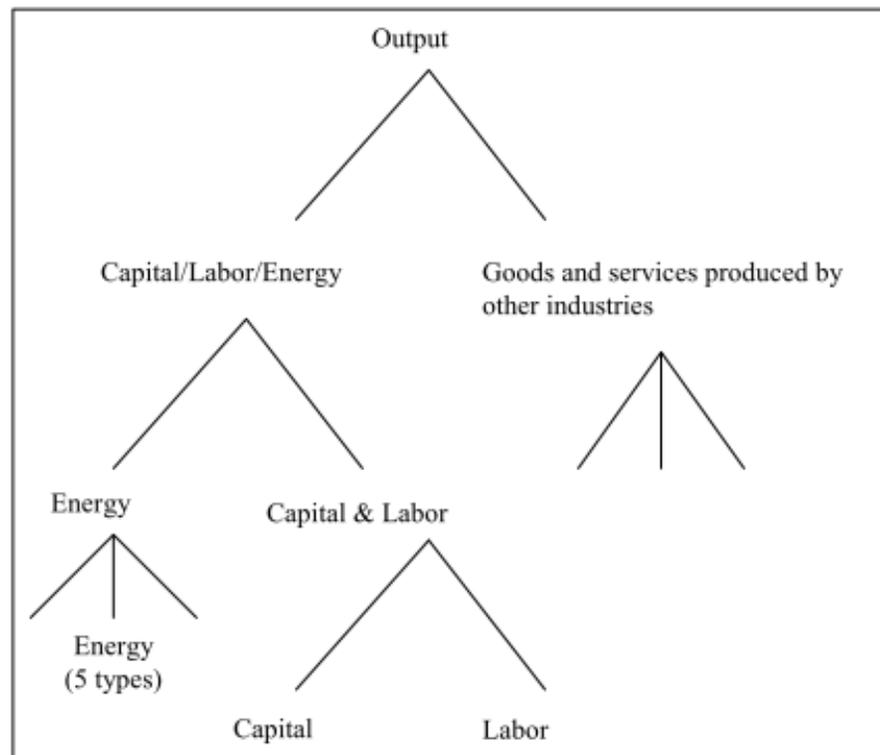
Tracing economy-wide responses to Clean Air Act Programs

EXHIBIT 8-1. CGE MODEL SCHEMATIC



Behavioral Choices Within EMPAX- CGE: An Example

EXHIBIT 8-3. EMPAX-CGE NESTED STRUCTURE FOR PRODUCERS



EMPAX-CGE Characteristics

- **Countries:** 1 (United States); with import supply and export demand
- **Regions:** 5 within the U.S.
- **People:** 4 households in each region
- **Industries:** 35
- **Time Periods:** 2005, 2010, 2015,...2050 with intertemporal optimization



USE OF MODEL INPUTS: COST- ONLY CASE

Influence of Clean Air Act Program Costs

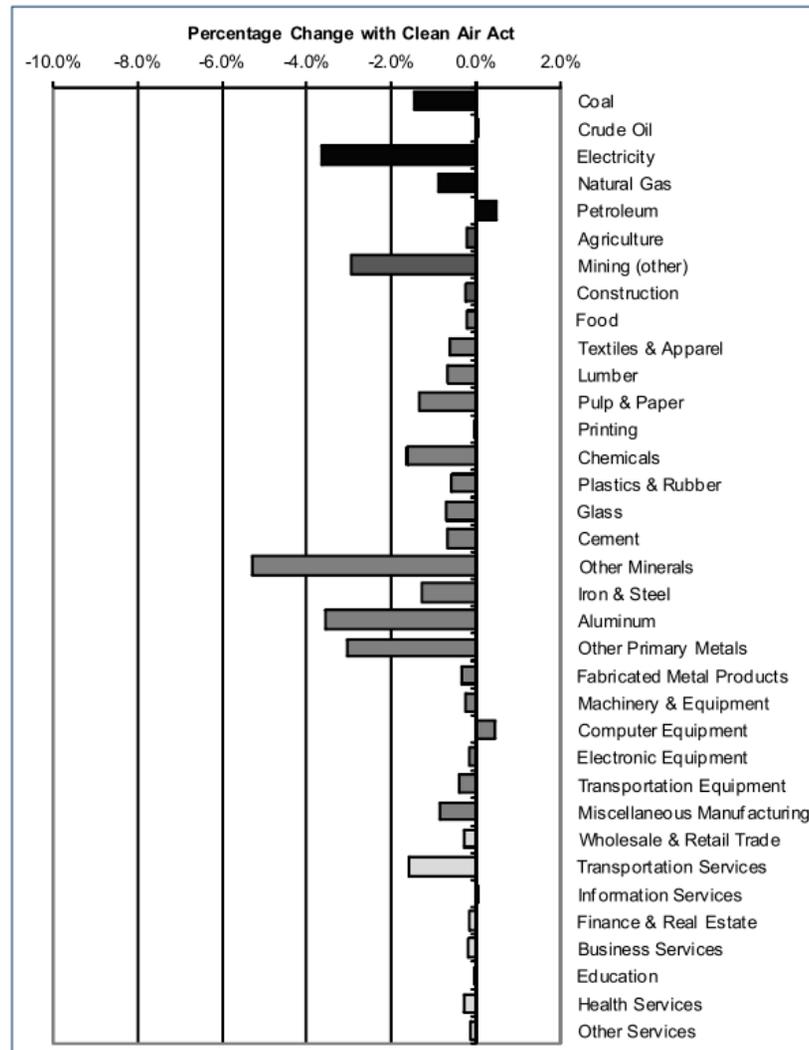
- **Industries:** productivity adjustment
 - More inputs required to produce the same level of output
- **Households:** “utility” adjustment
 - More consumption goods required to produce the same level of happiness/satisfaction
 - Lump-sum transfers

Policy Findings: Cost-Only Case

EXHIBIT 8-11. SUMMARY OF MACROECONOMIC IMPACTS: COST-ONLY CASE¹

VARIABLE	MODEL RUN	2010	2020
GDP	With Clean Air Act (\$ billion)	\$15,027	\$20,202
	Without Clean Air Act (\$ billion)	\$15,106	\$20,310
	Change (\$ billion)	-\$78.4	-\$108.0
	% change	-0.52%	-0.53%
Consumption	With Clean Air Act (\$ billion)	\$10,969	\$14,881
	Without Clean Air Act (\$ billion)	\$11,026	\$14,961
	Change (\$ billion)	-\$57.6	-\$79.4
	% change	-0.52%	-0.53%
Hicksian EV (annual)	Change (\$ billion)	-\$46.3	-\$39.2
	% change	-0.41%	-0.42%
Notes:			
1. Results are expressed in year 2006 dollars.			
2. Source: RTI (2010)			

EXHIBIT 8-12. PERCENT CHANGE IN INDUSTRY OUTPUT IN 2020: COST-ONLY CASE



USE OF MODEL INPUTS: BENEFITS- ADJUSTED CASE

Influence of Selected Clean Air Act Program Benefits

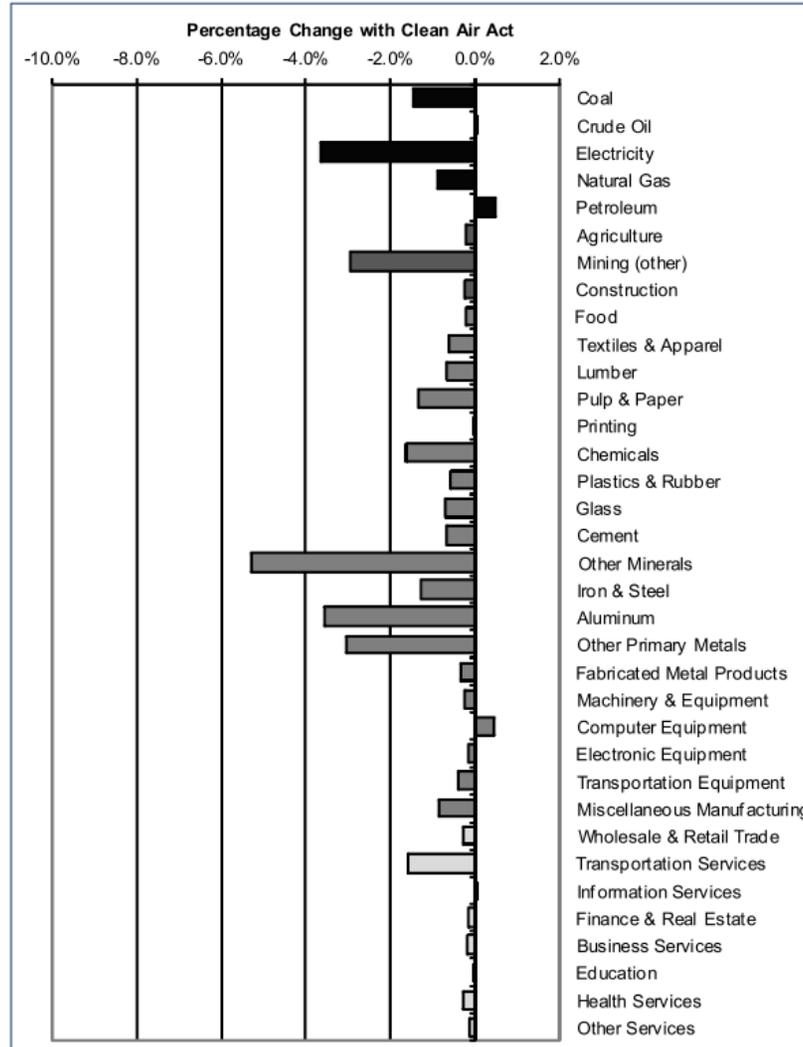
- **Household Health**
 - Time endowment
 - Work and leisure choice
 - Health-care spending
 - Fewer health-care goods required to produce the same level of utility (i.e., happiness/satisfaction)

Policy Findings: Benefits-Adjusted Case

EXHIBIT 8-13. SUMMARY OF MACROECONOMIC IMPACTS: BENEFITS-ADJUSTED CASE¹

VARIABLE	MODEL RUN	2010	2020
GDP	With Clean Air Act (\$ billion)	\$15,027	\$20,202
	Without Clean Air Act (\$ billion)	\$15,053	\$20,185
	Change (\$ billion)	-\$26.3	\$17.5
	% change	-0.17%	0.09%
Consumption	With Clean Air Act (\$ billion)	\$10,969	\$14,881
	Without Clean Air Act (\$ billion)	\$10,970	\$14,873
	Change (\$ billion)	-\$1.6	\$8.5
	% change	-0.01%	0.06%
Hicksian EV (annual)	Change (\$ billion)	\$10.2	\$16.3
	% change	0.09%	0.17%
Notes:			
1. Results are expressed in year 2006 dollars.			
2. Source: RTI (2010)			

EXHIBIT 8-12. PERCENT CHANGE IN INDUSTRY OUTPUT IN 2020: COST-ONLY CASE



Analytical Limitations

- **Model inputs**
 - Health Effects “outside” the economy
 - Exclusion of Ozone mortality
 - Other Clean Air Act Program Benefits
- **Behavioral**
 - Perfect foresight
 - Parameter uncertainty