Macroeconomic Impacts of Climate Policies in California

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GHG Mitigation Benefits

• Direct benefits – avoided damages of climate change
  – scientific consensus of vulnerability (IPCC Report)
  – coastal erosion, wildfires, drought, public health issues

• Co-benefits
  – reduction in ordinary (EPA “criteria”) pollutants
  – decrease in energy use & hence improved energy security
  – “double-dividend” from fiscal adjustments
  – increase in economic activity, especially jobs
  – improvement in income distribution
    (of course, the last two impacts could be negative or have offsetting effect to each other)
Objectives of Macro Analysis

Use macroeconomic models to evaluate the total and sectoral impacts of GHG mitigation policy options on the State/Regional economy

- Micro level analysis of costs and benefits only pertains to the site of mitigation option application
- Both increases and decreases in economic activity generate “ripple” effects throughout the economy
- Macroeconomic impact is usually some multiple of original direct on-site impact (but reversals do happen)
- Substitutions and price changes also have macro effects
Objectives of Income Distribution Impact Analysis

Analyze the policy impacts on the size distribution of personal income overall and with a special focus on the lowest income groups.

• Provide insights on who gains and loses.

• Evaluate the overall fairness of the burden-sharing of the costs, and, in some cases, the savings.

• Important for popular support for and compliance with the policies.

• Provide insights on potential trade-off between efficiency and equity.
Modeling Framework

Micro-level Analysis

Changes in Upfront Capital Investment; Annualized Capital Cost, O&M Cost, Fuel Expenditures; Administrative Costs; Government Subsidies; etc.

Mapping of Micro Analysis Results to REMI Inputs

REMI PI+

Aggregate Impacts
GSP
Employment

Sectoral Impacts
Employment
Output
Import/Export
Delivery Prices

Factor Price Impacts
Wage Income
Capital Income

Update Shares of Wage & Capital Income by Sector

MSIDM

Distribution Impacts

Obtaining Data from Micro-level Analysis

Modeling of Aggregate Economic Impacts

Modeling of Income Distribution Impacts
REMI Policy Insight Plus (REMI PI+) Model

Structural economic forecasting and policy analysis model:

- Integrates I-O, CGE, econometric & economic geography methods
- Dynamic model, superior in its forecasting ability
- Generates forecast on an annual basis
- Has finely-grained sectoring details (169-sectoral scheme)
- Five major blocks:
  - Output and Demand
  - Labor and Capital Demand
  - Population and Labor Supply
  - Compensation, Prices, and Costs
  - Market Shares
REMI Policy Insight Plus (REMI PI+) Model
Multi-sector Income Distribution Matrix

- MSIDM consists of the distribution of labor and capital income payments by sector and by income bracket.

- The labor income matrix is constructed by combining the 2007 CA employment data, occupations per sector data, and wage estimates by occupation.

- The capital income matrix covers dividend income, rental income, estate income, royalties, interest income, etc.

- Data sources include: U.S. Internal Revenue Service, California Department of Finance, California Employment Development Division, and California Franchise Tax Board.
Example Study 1

Analyze the aggregate and distributional impacts of four GHG emission allowance allocation/recycling alternatives for AB32.

S1. CARB Case 1 in 2008 Scoping Plan with 100% Auction of GHG emission allowances
   a. Revenue recycled as proportional personal income tax reduction
   b. Revenue recycled as per capita dividend

S2. CARB Case 1 in 2008 Scoping Plan with 100% Free Allocation of GHG emission allowances
   a. 0% pass-through of opportunity costs of allowances
   b. 100% pass-through of opportunity costs of allowances
Summary of Key Findings

• Four allowance allocation/recycling scenarios are projected to yield a small positive impact on the State’s economy by Year 2020.

• Two auction scenarios lead to improvements in the overall income distribution. However, both scenarios are projected to incur small losses to the lowest income group.

• Two free-granting scenarios make overall income distribution less equitable. The 100% opportunity cost pass-through scenario also incurs small losses to the lowest income group.

• Revenue recycling is a flexible policy instrument that can be further refined to alleviate inequities to any specific income groups.

• The results indicate some important efficiency-equity tradeoffs.
  
  – Scenario 2a yields the largest increase in GSP and employment, but makes the overall income distribution least equitable.

  – The difference in economic gains between the most regressive scenario (2a) and the most progressive scenario (1a) is only $4.6 billion in GSP and 25,000 jobs, which might be an acceptable gain to give up to avoid the largest worsening in the income distribution of all scenarios.
Example Study 2

SCAG Climate and Economic Development Project: Analyze the macroeconomic impacts of AB32 and SB375 on the SCAG Economy

• Include 28 GHG mitigation policy options

• Aggregately can reduce 63.0 MMtCO2e of GHG emissions (or 26.4% from the baseline level) by 2035

• Weighted average cost-effectiveness is -$3.7/tCO2e
Summary of Key Findings

• The 28 GHG mitigation options yield a slight positive impact on the regional economy:
  – An increase of GDP of $1.9 billion by 2035
  – An increase of employment of 86 thousand jobs by 2035

• More than half the individual options yield positive impacts:
  – Improving energy efficiency and thus reducing production costs and raising consumer purchasing power
  – Increasing investment in plant and equipment, transportation system

• Sensitivity analyses indicate possible ways to improve economic performance of the mitigation options:
  – Attract more green manufacturing firms
  – Invest in R&D
  – Attract more federal subsidies and out-of-region investment
For Additional Information...

Recent publications on macro modeling of climate change policies


