Economic Modeling Using E-DRAM

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Environmental Revenue Dynamic Assessment Model (E-DRAM)

- E-DRAM is a computable general equilibrium (CGE) model of the California economy.
- E-DRAM was developed by Professor Peter Berck of the University of California, Berkeley in collaboration with the Department of Finance and the Air Resources Board.
- E-DRAM has been peer reviewed and the model code and data are available for public use.

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General Equilibrium

- The model solves for the prices of goods and services and factors of production that make quantity demanded and supplied equal.
- Equilibrium results in the conservation of both product and value

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Data Sources

- U.S. Department of Commerce's Bureau of Economic Analysis Census of Business (2003)
- Employment is from CA Employment Development Department.
- The BEA data are corrected for energy use based on the California Energy Balances (CALEB) study
- Demand is estimated from the Consumer Expenditure Survey for the Western U.S.
- State Government data comes from CA state records
- Most parameters (e.g., elasticities of substitution) are taken from the literature.

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Future years

Future years (without policy changes) are constructed by use of forecasts for:

- personal income
- population
- energy use
- these forecasts imply an estimate of technical progress

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Structure of E-DRAM

- 188 distinct sectors:
  - 120 industrial sectors
  - 2 factor of production sectors (labor and capital)
  - 10 household sectors
  - 9 consumption sectors
  - one investment sector
  - 45 government sectors
  - one sector that represents the rest of the world.

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Consumption

- Estimated by an Almost Ideal Demand System (AIDS) for 9 composite goods.
- Composite goods are fixed coefficient combinations of the industrial goods.
- Changes in technology affect consumption.
  - -More fuel efficient cars provide same use value with less gasoline

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Production

- Constant Elasticity of Substitution (CES) in labor and capital
- Fixed coefficients in intermediates, including energy.
  - Energy efficiency experiments are conducted through changing the requirements matrix.
  - Technical Innovation is imposed.

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E-DRAM
Major Model Outputs

- Change in output
- Change in prices
- Change in employment
- Change in personal income
- Change in consumer spending

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E-DRAM

- Depends on exogenous specification of control technologies
- Firm's become more GHG efficient only to the degree specified in the "new technologies" given by the regulatory process.
- and economy reacts by…

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Substituting

Away from goods made more expensive

- consumers buy less of those goods and more of other goods
- exports of those goods go down
- imports of those goods go up

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Factor Movements

- For a regulation that is cost increasing
  - less investment
  - less labor force participation
  - emigration
- If factors of production are immobile, then effect on the State of a policy must be large.

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Summary

- E-DRAM is a California model tuned to the California economy
- E-DRAM can be used as a PART of an evaluation of GHG policies

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