International Input-Output Association

Introduction to the E3-India model

IIOA Annual Conference 2017

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Introduction to the E3-India model

- Computer-based model to asses the energy-economy linkages in India
- Organised into 32 Indian states and territories
- The model consists of collections of stochastic behavioural equations and accounting identities
- Based on an accounting framework and designed for projections for business and policy analysis
- Annual projections out to 2035

E3-India

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E3-India Key Features

Detailed Coverage

- 32 Indian states and territories
- 20 economic sectors
- 8 users of 5 different energy carriers
- CO2 emissions by 8 users

Comprehensive

- whole energy, environment and economy system
- two ways feedbacks between each module
- many policy instruments

Highly Empirical

- 16 sets of econometric equations
- accounting identities
- database 1993-2012

Consistent

- based on system of national accounting
- input-output tables

Forward Looking

- annual projections to 2035
- behavioural equations with effects from previous outcomes
- ex-ante scenario analysis (ex-post is also feasible)

Modular

- E3: Energy, Environment, Economy
- power generation sub-module
- research can be decentralised

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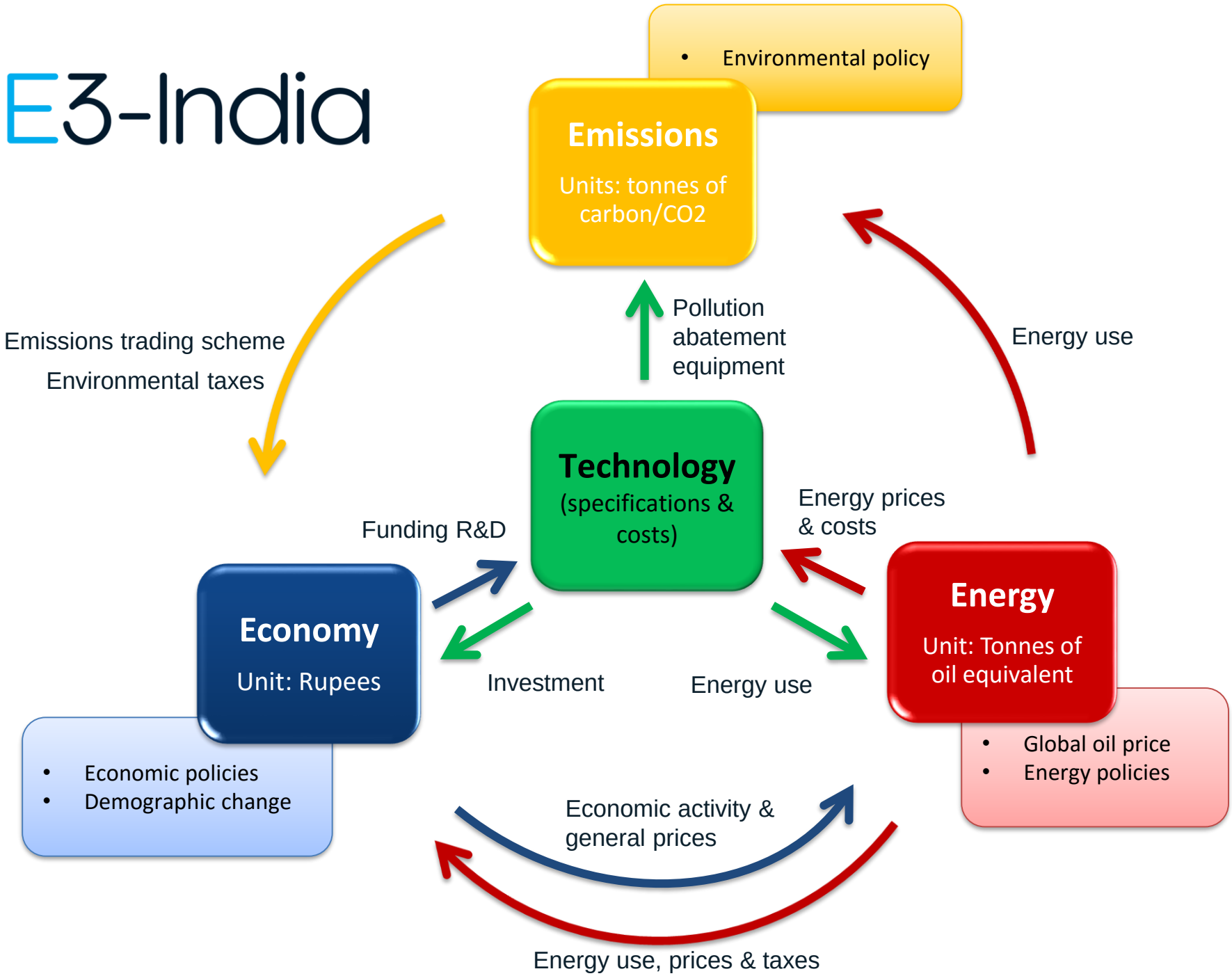
Features of the model

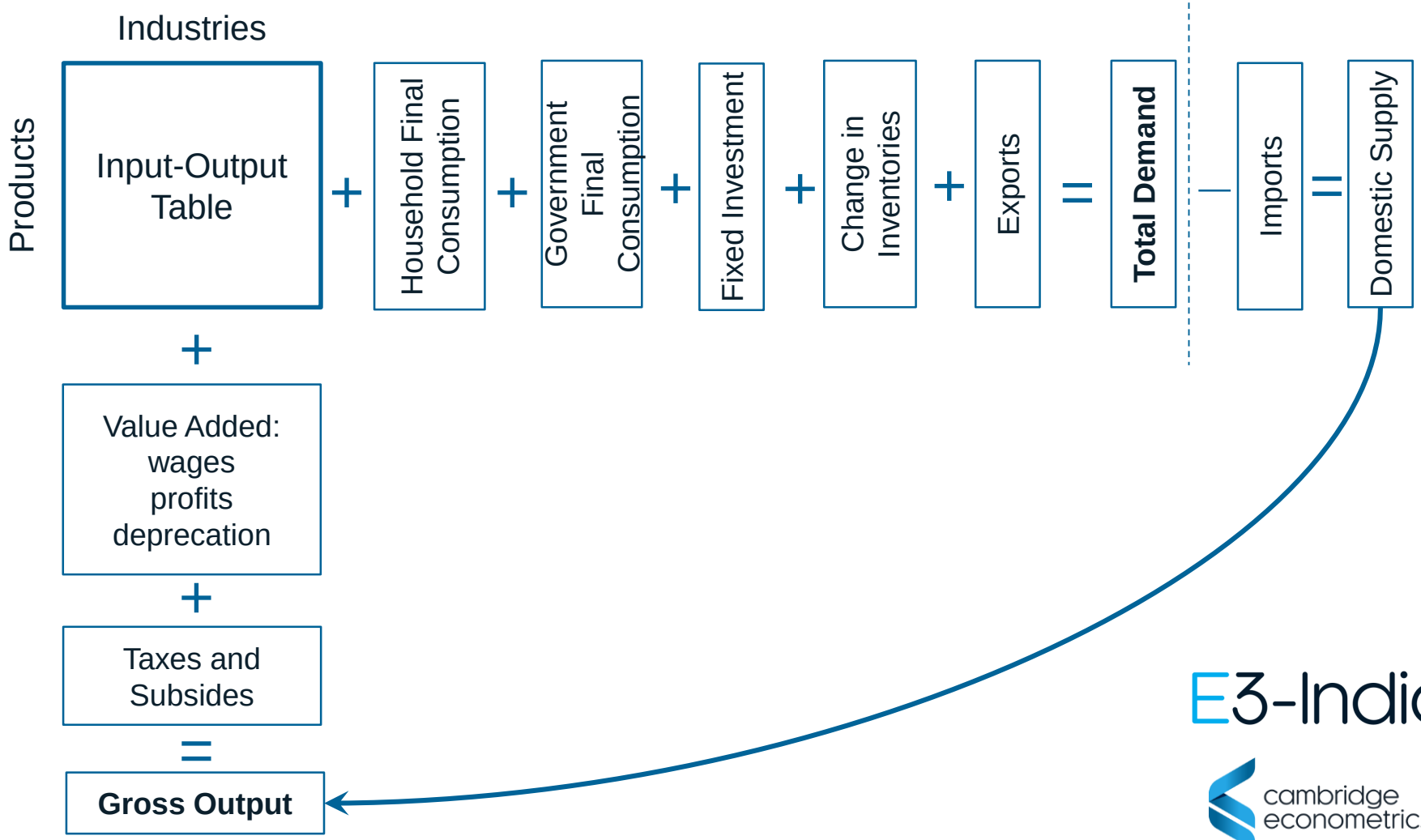
- Structural
  - disaggregation of variables
- Organized around a Social Accounting Matrix
  - i.e. on accounting principles, e.g. System of National Accounts; Accounting Identities
- Dynamic
  - behavioural equations with effects from previous outcomes: i.e. history matters
- Estimated on time-series data
  - identifies current-year responses and long-term trends
  - allows sectoral and regional differences

Features of the model (contd.)

- Open as regards economic policy, i.e. no assumptions of full employment, budget balance, or balance of payments equilibrium
- “Scenario” approach:
  - computation of many scenarios with comparisons of policy packages and provides quantified explanation of results
- Treatment of uncertainty
  - in parameter estimates (econometric estimation of error distribution)
  - in assumptions and policies (by scenario analysis)


E3-India
• Environmental policy
Emissions
Units: tonnes of carbon/CO2
Emissions trading scheme
Environmental taxes
Pollution abatement equipment
Energy use
Technology
(specifications & costs)
Funding R&D
Energy prices & costs
Economy
Unit: Rupees
Investment
Energy use
Energy
Unit: Tonnes of oil equivalent
• Economic policies
• Demographic change
• Global oil price
• Energy policies
Economic activity & general prices
Energy use, prices & taxes

The core input-output structure



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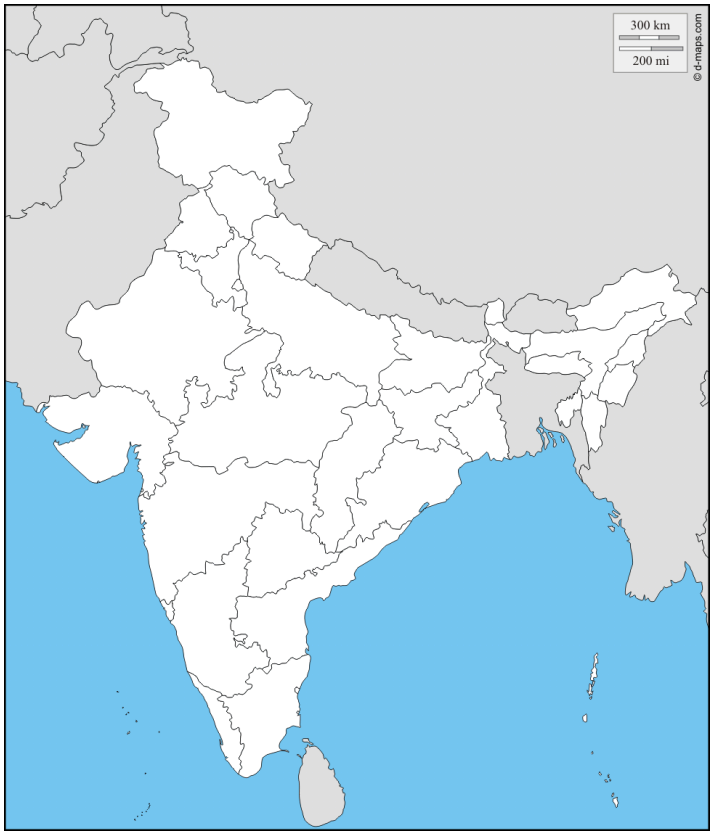
Inputs to the model

- E3-India is usually used to assess policies
- Examples of energy policies include:
  - carbon/energy pricing instruments
  - incentives for renewables
  - energy efficiency regulation
- Price shocks (e.g. in oil markets) can be modelled
- The model can also be used to assess more general economic policies or shocks

Main model outputs

- GDP and output
  - GDP, output by sector, GVA by sector and by state
- Other economic indicators
  - consumption
  - investment
  - prices and inflation
  - trade



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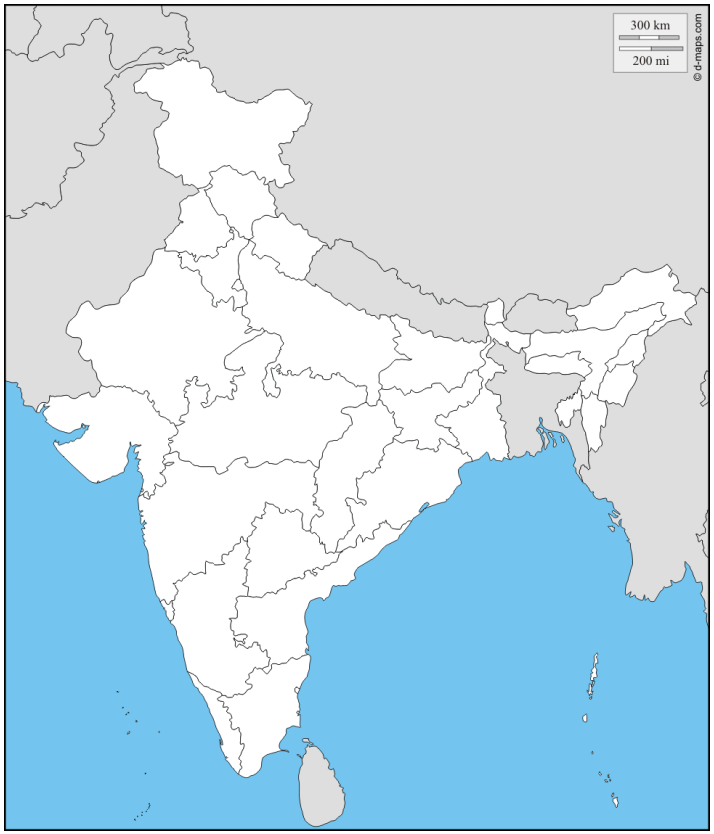
Main model outputs (contd.)

- Labour market
  - employment by sector
  - unemployment
  - wage rates
  - labour supply
- Energy and environment
  - energy consumption by fuel type and fuel user
  - energy prices
  - CO_2 emissions by sector



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Key characteristics

- E3-India is defined at state level
  - state-level policy can be assessed
- Within each state the economy is broken down into around 20 sectors
- The model is highly empirical, based on econometric relationships derived from historical data
- It is not a CGE model, so short-term impacts and (involuntary) unemployment can be assessed

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