



# Seminar Series on Regional Economic Integration

## “Assessing the Economy-wide Impacts of RCI Instruments”

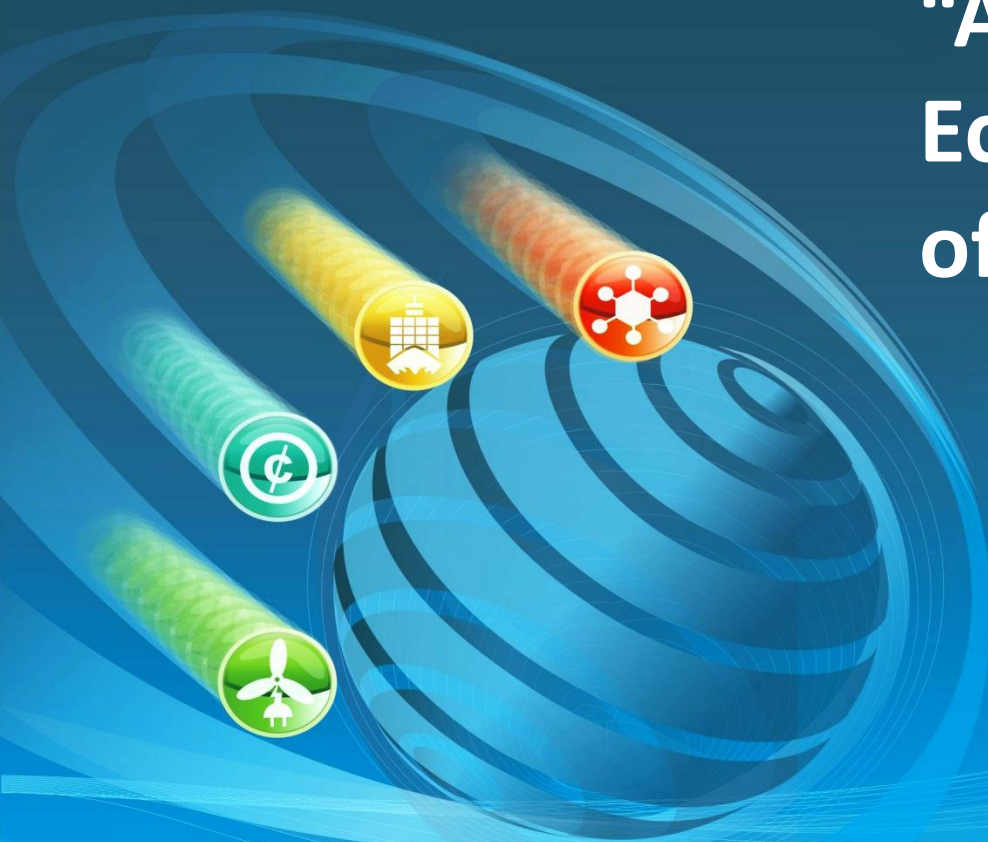
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27 May 2014, 10:30am–12:00nn

1650S, ADB Headquarters



# Background (1)

- About the Productivity Commission
  - Government's principal review and advisory body on microeconomic policy reform and regulation
- Roles of the Commission
  - Objective analysis for better informed policy decisions
  - Supporting community awareness and policy debate
- Three core design features
  - Independent
  - Transparent
  - Community-wide perspective

# Background (2)

- Extensive use of quantitative tools and economic models
  - Particularly, CGE models for analysing economy-wide issues
  - Involved in the development of many CGE models, such as various Australian models (CoPS), SALTER model (the origin of GTAP)

# Modelling economic integration

## – The degrees economic integration

- Preferential trading area
- Free trade area (NAFTA)
- Custom union
- Common market
- Economic union (EU)
- Economic and monetary union (EU/€)
- Complete economic integration

# PC's recent work related to economic integration

- Bilateral and Regional Trade Agreements (2010)
  - Review of bilateral and regional trade agreements
  - Their impacts on Australian trade and economic performance
  - Their impacts on reducing the barriers to the markets of Australia's trading partners
- Strengthening trans-Tasman Economic Relations (2012)
  - Review the 30 years Australia-New Zealand Closer Economic Relations Trade Agreement (ANZCERTA)
  - Achievements so far and areas for reforms
  - The ways forward to closer economic integration

# A case study: trans-Tasman economic integration

## – History

- Started with the Australia-New Zealand Closer Economic Relations Trade Agreement (ANZCERTA) in 1983
- Rapid progress on economic integration after a review in 1988
- CER has been highly successful in removing explicit restrictions on trade and substantial progress has been made on reducing other barriers to integration, such as labour and capital movements

## – Achievements

- Trade in goods largely liberalized
- Trade in services is partially liberalized
- Substantial increase in bilateral investment flows
- Free movement of people, a key feature
- Extensive inter-government cooperation

# Review of 30 years of CER

- A joint study by the Productivity Commissions of Australia and New Zealand
  - Final report “*Strengthening trans-Tasman Economic relations*” released in 2012
- Purposes
  - Potential areas of further economic reform and integration
  - Economic impacts and benefits of reform
  - Transition and adjustment costs that could be incurred
  - Identification of reform where joint net benefits are highest
  - The means by which they might be best actioned
  - The likely time paths over which benefits are expected to accrue

# Quantifying the effects of economic integration

- Require global CGE modelling
  - A global CGE model (ANZEA), developed for this study
- The ANZEA model
  - Developed on the basis of a simple global model (Zhang, 2013 GTAP conference paper)
  - Use data drawn from GTAP database (version 8)
- A simple model approach
  - CGE models structurally similar and simple
  - Model code can be made simple and transparent



# Motivations for simple models

- Diverse policy issues
  - Require different models: national/global or static/dynamic
  - Each used for a wide-range of applications
- Off-the-shelf models
  - Long and complex code: too many variables/equations
  - Designed for multi-purposes
  - Mix model theory and interpretation
  - Costly to modify and adapt to new applications

# An alternative modelling approach

- The ideal approach
  - A simple model structure with a simple database
  - Easily adaptable to any application
- The meaning of “*simple*”
  - Not a stylised “toy” model
  - Not with a small-sized database
  - A simple structure for model equations and database
- Benefits from a simple model
  - Transparent and easy to understand the theory
  - Easy to change or modify to incorporate new features
  - Develop application-specific models from a basic model

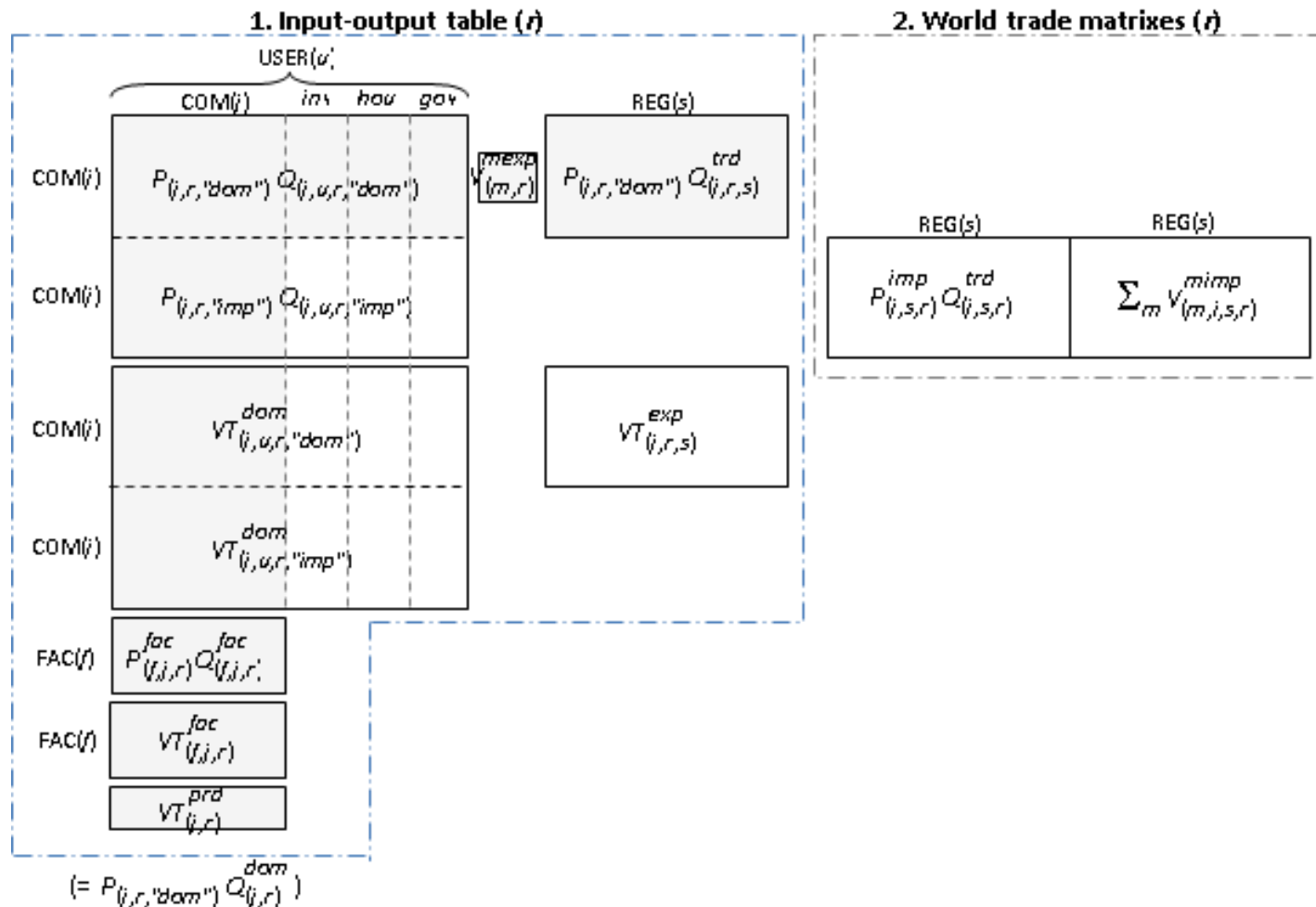
## *ANZEA model database structure (1)*

- Country/region input-output tables (6 matrixes and 2 vectors)
  - Purchases of domestic and imported goods by users
  - Indirect tax revenues
  - Basic values of non-margin exports
  - Export tax revenues
  - Purchases of primary factors
  - Factor tax revenues
  - Basic value of margin exports (vector)
  - Production tax revenue (vector)
- World trade data (2 matrixes)
  - Basic values of imports
  - Import margins

## *ANZEA model database structure (2)*

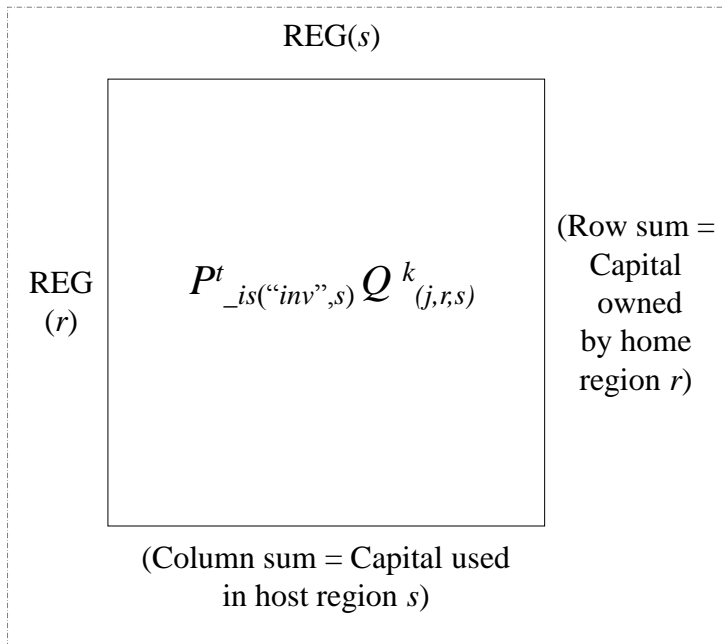
- Bilateral capital and investment data (2 matrixes)
  - Bilateral capital stocks by industry and country
  - Bilateral saving-investment flows by country

# Database structure for a representative region ( $r$ )

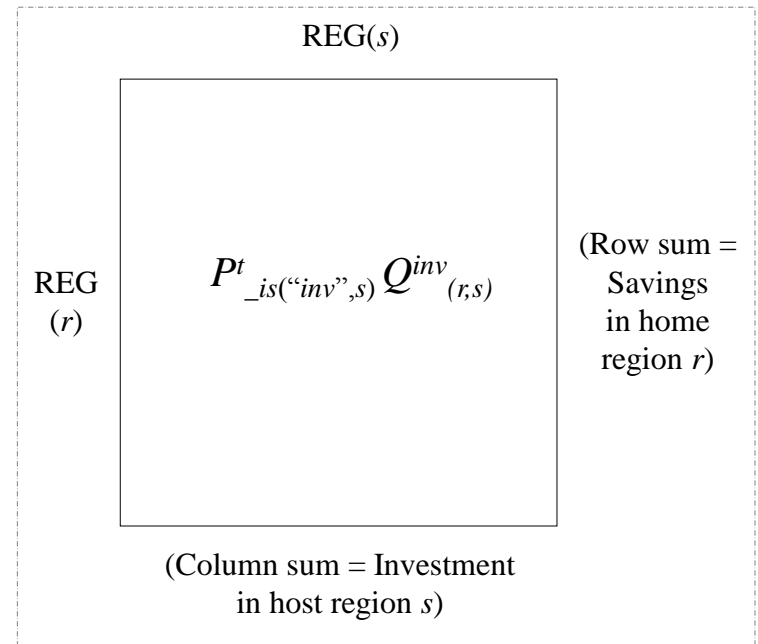


# Bilateral capital stock and saving-investment matrixes

## 3. Capital stock matrices ( $j, r, s$ )



## 4. Investment matrix ( $r, s$ )



## *Equation structure (1)*

- A system of 35 equation blocks in 4 sections
  - **Consumption:** region and user demands for goods
  - **Production:** industry outputs and demands for factors
  - **Factor supplies:** factor market clearing conditions
  - **Income distribution:** allocation of income between final users
- Note that
  - Includes only *core* variables essential for model solution
  - No *reporting* variables

## *Equation structure (2)*

- Demand for imports and domestic goods (eqs.1-9)
  - Three levels of demands for goods by user
  - Associated purchasers' prices derived from their basic prices
- Industrial demands for factors (eqs.10-17)
  - Outputs by industry (CRTS)
  - Demands for factors by industry
  - Basic prices of goods (CRTS)
- Regional supplies of factors (eqs.18-24)
  - Market equilibrium for factors
  - Factor price equalisation for mobile factors



## *Equation structure (3)*

- Final users' expenditure (eqs.25-35)
  - Income derivation
  - Expenditure by final user
  - Trade balance or saving-investment gap

## Core variables and equations

- Overall 35 equation blocks
  - 28 define 28 endogenous variables
  - 7 specify solution conditions (eqs.18, 19, 21, 23, 32, 34 and 35)
- 7 variable blocks undefined
  - 3 for factor basic prices ( $P^f_{(\text{“land”},j,r)}$ ,  $W_{(r)}$ ,  $P^k_{(j,r,s)}$ )
  - 1 for rate of return to home capital ( $R_{js(r)}$ )
  - 1 for bilateral investment flows ( $V^{inv}_{(r,s)}$ )
  - 1 for world expected rate of return ( $R^e_{rs}$ )
  - 1 for net foreign investment inflows ( $Y^{NFI}_{(r)}$ )
- Undefined variables solved from solution conditions
  - Market Clearing Conditions (MCC)
  - Price Equalisation Conditions (PEC)

# Undefined variables and MCC/PEC equations

| <i>Undefined variables</i>  |                                | <i>MCC/PEC equations</i> |  |                                  |
|-----------------------------|--------------------------------|--------------------------|--|----------------------------------|
| $P^f_{(\text{"land"},j,r)}$ | Basic price of land            | Eq.18                    | MCC for sectoral land                          | $Q^f_{(\text{"land"},j,r)}$      |
| $W_{(r)}$                   | Basic price of labour          | Eq.19                    | MCC for regional labour                        | $\bar{X}^{lab}_{(r)}$            |
| $R_{js(r)}$                 | Rate of return to home capital | Eq.21                    | MCC for home capital                           | $\bar{X}^k_{(r)}$                |
| $P^k_{(j,r,s)}$             | Basic price of capital         | Eq.23                    | PEC for rates of return to capital             | $R_{(j,r,s)}$                    |
| $R^e_{rs}$                  | World expected rate of return  | Eq.32                    | MCC for global savings                         | $\sum_r V^{sav}_{(r)}$           |
| $V^{inv}_{(r,s)}$           | Bilateral investment flows     | Eq.34                    | PEC for expected rates of return to investment | $R^e_{(r,s)}$                    |
| $Y^{NFI}_{(r)}$             | Net foreign investment         | Eq.35                    | MCC for host real investment                   | $\sum_i Q_{s(i,\text{"inv"},r)}$ |

# Applications to regional economic integration

- A case study: Australia-New Zealand close economic relations
- 5 scenarios analysed
  1. Eliminating Australian and New Zealand tariffs on imports from all sources;
  2. Productivity improvements in Australia and New Zealand;
  3. Economic expansion in Asia;
  4. Migration from New Zealand to Australia;
  5. Liberalising trade in services via commercial presence (by reducing barriers to trans-Tasman FDI in services)

# 1. Removing most-favoured-nation (MFN) tariffs

- Shocks
  - Reduce Australia and New Zealand MFN tariffs on all imports to zero
- Gains from
  - More efficient allocation of resources from protected sectors to more competitive sectors
  - Seme inputs and more outputs
- Results
  - GDP  $\uparrow$  0.3% in AU and 0.4% in NZ
  - Output and export  $\uparrow$  in mining, food prods and services and  $\downarrow$  in TCF and motor vehicle and parts

## 2. Productivity improvements in Australia and New Zealand (1)

- Shocks
  - An improvement in productivity (specifically, factor augmenting technical change) of 1 percent for all factor inputs in each economy
  -
- Transmission mechanisms
  - $\uparrow$  competitiveness and output of country A and  $\downarrow$  output of B;
  - $\uparrow$  factor income in A and import demand from B,  $\uparrow$  output in B;
  - $\uparrow$  factor income in A leads to mobile factor move from B and  $\downarrow$  output of B.
- The results: 1% productivity improvement in New Zealand
  - NZ GDP 1.37%, AU GDP -0.01%
  - AU export – 0.09%: to NZ 1%, to others -0.15%
  - AU import 0.09%

## 2. Productivity improvements in Australia and New Zealand (2)

- The results: 1% productivity improvement in Australia
  - AU GDP 1.31%, NZ GDP -0.09%
  - NZ export – 0.32%: to NZ 0.38%, to others -0.5%
  - AU import 0.22%

# 3. The effects of Asian economic growth

## – Shocks

- 10 percent increase in economic activity for all Asian economies
- Modelled as a uniform expansion in labour and capital (and therefore their corresponding aggregate incomes) of 10 percent in all Asian economies

## – Two main effects

- ↑ Asia income increases its demand for AU and NZ exports by 3.8% and 3.6%
- ↓ Asia costs crowds out ANZ exports in world market, AU and NZ exports to non-Asia market decline by 2.1 and 1.5%.

## – Net effects

- AU and NZ exports increase by 1.4 and 0.4%
- AU and NZ GDP increase by 0.2 and 0.1%



# 4. Trans-Tasman migration

## – Shocks and assumptions

- 1 percent increase in the supply of New Zealand labour in Australia (about 3000 workers)
- Keep capital fixed in AU and NZ

## – Motivation of migration

- Expected wage differential net of migration costs
- Migration reduce wage differentials and increase total output

## – Results

- Employment  $\uparrow$  0.02% in AU and  $\downarrow$  0.14% NZ
- GNI  $\uparrow$  0.01% in AU and  $\downarrow$  0.08% NZ
- GNI per worker  $\downarrow$  0.01% in AU and  $\uparrow$  0.06% NZ

# 5. Reducing barriers to commercial presence in services (1)

## – Shocks

- Empirical estimates of barriers to foreign investment in service industries (CIE 2010)
- Adjustments for the project: cost-escalating and rent-creating barriers

## – Scenarios

- A reduction in trans-Tasman barriers to FDI in all services industries (except the banking sector)
- A reduction in trans-Tasman barriers to FDI in communications industries
- A reduction in the barriers to FDI in communications industries irrespective of where the FDI originates

# 5. Reducing barriers to commercial presence in services (2)

## – Results

- Preferential barriers to services
- Preferential barriers to Communications
- Non-preferential barriers to Communications

# Effects on GDP and GNI of eliminating barriers to commercial presence

|   | <i>Australia</i> | <i>New Zealand</i> |
|---|------------------|--------------------|
|   | % changes        | % changes          |
| <i>GDP</i>  |                  |                    |
| <b>Preferential</b>                                   |                  |                    |
| Remove trans-Tasman barriers to FDI — all services    | -0.01            | 0.13               |
| Remove trans-Tasman barriers to FDI — communications  | —                | 0.01               |
| <b>Non-preferential</b>                               |                  |                    |
| Remove barriers to FDI all countries — communications | 0.11             | 0.22               |
| <i>GNI</i>  |                  |                    |
| <b>Preferential</b>                                   |                  |                    |
| Remove trans-Tasman barriers to FDI — all services    | —                | 0.07               |
| Remove trans-Tasman barriers to FDI — communications  | —                | 0.01               |
| <b>Non-preferential</b>                               |                  |                    |
| Remove barriers to FDI all countries — communications | 0.06             | 0.10               |

# Sensitivity analysis: closure settings

- Sensitivity to closure settings: test assumptions about capital mobility
  - C1: K stock fixed in host countries
  - C2: **K stock fixed in home countries, mobile across host countries**
  - C3: Variable global K, fixed investment/capital ratio
  - C4: Variable global K stock, fixed rates of return
- Sensitivity to parameter values
  - Amington substitution
  - Factor substitution
  - Capital substitution
  -
- Importance of the “range”

# Concluding remarks

- CGE models are suitable for a wide range of policy options for regional economic integration
- A simple model structure is adaptable to many applications of regional integration

# **Infrastructure reform and income distribution: A case study of Australia**

*Xiao-guang Zhang*

Productivity Commission, Australia

Seminar, OREI, ADB, May 27, 2014, Manila

# Outline

- Back ground
  - The 1990 Structural changes in Australian infrastructure industries in the 1990s
  - Effects on production and consumption
- Analytical framework: a two-model approach
  - A regional CGE model of the Australian economy
  - A micro-simulation model based in the household expenditure survey data
- An example of the results: electricity industry
  - CGE results
  - Micro-simulation results



# Modelling income distribution impacts

- “Distributional effects of changes in Australian infrastructure industries during the 1990s”, with G. Verikios, Staff Working Paper, 2008, Productivity Commission.
- Infrastructural industries
  - Electricity
  - Gas
  - Ports and rail freight
  - Telecommunications
  - Urban transport
  - Water and sewerage

# Back ground (1)

- During the 1990s, many changes occurred in these industries
  - Management structure
  - Ownership structure
  - Taxation treatment
  - Technology and management practices
- Expected effects on production
  - Costs, prices
  - Productivity
  - Outputs, employment
  - Factor income

# Back ground (2)

- Expected effects on households
  - Household nominal income
  - Household expenditure
  - Household real income

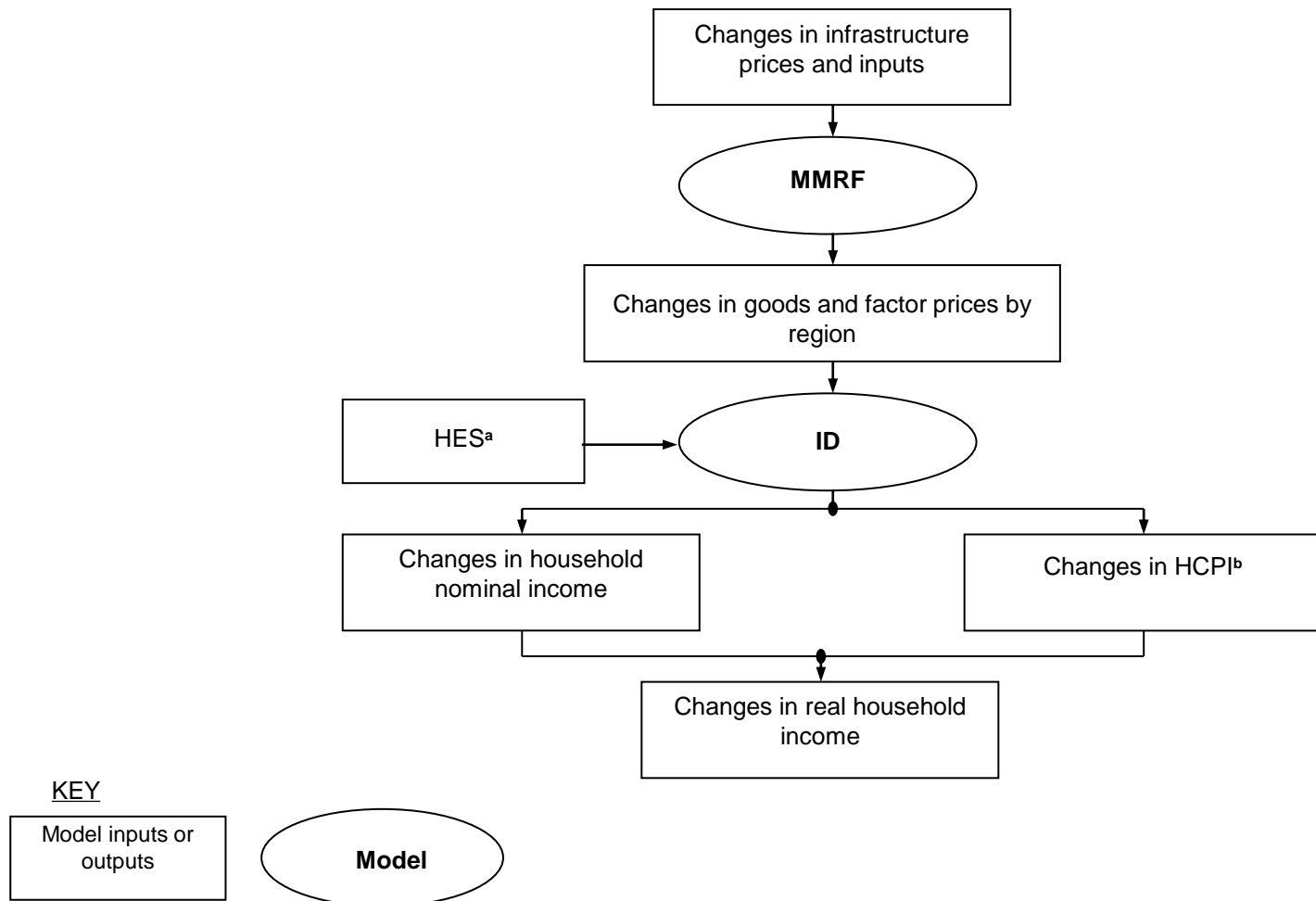
# Aim of the study

- Focus on
  - The effects on the distribution of real income between households at the regional level

# Analytical framework: a two-model approach

- A regional CGE model of the Australian economy (MMRF)
  - 8 states/territories
  - Each has one aggregate household
  - 54 goods/industries
  - 8 labour occupations
  - Early 1990s data
- A micro-simulation model based on the household expenditure survey data (ID model)
  - the 1993-94 Household Expenditure Survey (HES)
  - Expenditure data: goods and services > 700
  - Income source data: 8 labour occupations, many non-labour incomes and income tax, transfer payments
  - Sample size > 8000 households

# MMRF-ID framework



# Use of the MMRF-ID framework

- Changes in an infrastructure industry are introduced in the MMRF model to simulate the effects on
  - Goods prices
  - Factor prices
- The CGE effects are used to shock the equivalent variables in the ID model to derive changes in each household's
  - Nominal income: factor price index
  - Nominal expenditure: household CPI or HCPI
  - $\Rightarrow$  Change in household real income = change in household factor price index - change in HCPI
  - Compare changes in real income distribution

# Linking the micro-sim model to the CGE model

- Linking household income sources with MMRF factor incomes
- Linking household expenditure items with MMRF consumption goods



# Sources of household income in MMRF and ID

| <i>MMRF model</i>                                    | <i>ID model (as defined in HES)</i>   |
|--|---|
| Wages for eight occupations (same as those in ID)    | Wages for Managers and administrators; Professionals; Para-Professionals; Tradespersons; Clerks; Salespersons and personal service workers; Plant and machine operators and drivers; Labourers and related workers  |
| Non-labour (capital and land) private income sources | Interest; Investment; Property rent; Superannuation; Business; Workers compensation; Accident compensation; Maintenance; Other regular sources; Private scholarship; Government scholarship; Overseas pensions  |
| Unemployment benefits (Commonwealth)                 | Unemployment benefits   |
| Other government benefits (Commonwealth and State)   | Sickness benefits; Family allowance; Veterans' pensions; Age pensions; Widows' pensions; Disabled pensions; Supporting parenting benefits; Wives' pensions; Other Australian government benefits; AUSTUDY support; Carers' pensions; Other overseas government benefits |
| Direct taxes   | Direct taxes  |

# Important features of the ID database

- Household expenditure patterns
- Household income source patterns
- Provide a simple but powerful basis for result interpretation: why a set of the same price changes could lead to a diverse changes in household incomes.

# Composition of gross income and direct taxes by decile (%)

| <i>Income decile</i> | <i>Labour income</i> | <i>Non-labour income</i> | <i>Government benefits</i> | <i>Direct taxes</i> |
|----------------------|----------------------|--------------------------|----------------------------|---------------------|
| Lowest               | 32.7                 | -9.1                     | 76.4                       | 3.0                 |
| Second               | 41.7                 | 9.9                      | 48.5                       | 6.0                 |
| Third                | 33.8                 | 14.2                     | 52.0                       | 6.4                 |
| Fourth               | 50.1                 | 10.9                     | 39.0                       | 9.3                 |
| Fifth                | 63.3                 | 18.1                     | 18.6                       | 14.0                |
| Sixth                | 73.7                 | 15.6                     | 10.7                       | 16.5                |
| Seventh              | 77.1                 | 15.8                     | 7.1                        | 18.5                |
| Eighth               | 84.2                 | 13.3                     | 2.5                        | 20.2                |
| Ninth                | 86.3                 | 12.6                     | 1.2                        | 22.5                |
| Highest              | 80.2                 | 19.5                     | 0.3                        | 29.1                |

# Shares of occupational wages in labour income by decile (%)

| <i>Occupation</i>                       | <i>1st</i> | <i>2nd</i> | <i>3rd</i> | <i>4th</i> | <i>5th</i> | <i>6th</i> | <i>7th</i> | <i>8th</i> | <i>9th</i> | <i>10th</i> |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| Managers & administrators               | 14.2       | 8.0        | 10.8       | 10.0       | 10.7       | 9.6        | 12.2       | 13.1       | 14.4       | 25.7        |
| Professionals                           | 8.2        | 9.9        | 13.1       | 11.8       | 12.8       | 14.3       | 15.8       | 15.8       | 19.4       | 33.1        |
| Para-professionals                      | 6.8        | 9.9        | 8.0        | 5.5        | 12.6       | 7.9        | 8.1        | 9.4        | 9.0        | 8.9         |
| Tradespersons                           | 11.9       | 19.5       | 19.8       | 18.6       | 20.3       | 16.7       | 12.6       | 14.3       | 12.7       | 6.0         |
| Clerks                                  | 9.8        | 10.5       | 16.1       | 14.2       | 14.2       | 15.0       | 19.0       | 17.2       | 18.2       | 12.4        |
| Salespersons & personal service workers | 13.8       | 12.5       | 12.7       | 13.2       | 9.8        | 13.0       | 12.1       | 12.1       | 11.7       | 6.9         |
| Plant & machine operators, & drivers    | 12.8       | 9.8        | 5.0        | 9.7        | 5.6        | 10.0       | 7.7        | 8.4        | 7.6        | 4.7         |
| Labourers & related workers             | 22.4       | 19.8       | 14.7       | 17.0       | 13.9       | 13.4       | 12.6       | 9.7        | 7.0        | 2.3         |

# Shares of infrastructure services and capital expenditure in total household expenditure (%)

| <i>Income decile</i> | <i>Electricity</i> | <i>Gas</i> | <i>Ports &amp; rail freight</i> | <i>Telecommunications</i> | <i>Urban transport</i> | <i>Water &amp; sewerage</i> | <i>Capital spending</i> |
|----------------------|--------------------|------------|---------------------------------|---------------------------|------------------------|-----------------------------|-------------------------|
| Lowest               | 2.4                | 0.7        | 0.4                             | 2.6                       | 1.0                    | 0.8                         | 9.9                     |
| Second               | 2.3                | 0.6        | 0.3                             | 2.3                       | 1.0                    | 0.9                         | 12.9                    |
| Third                | 2.4                | 0.7        | 0.4                             | 2.6                       | 1.2                    | 1.1                         | 11.2                    |
| Fourth               | 2.0                | 0.6        | 0.3                             | 2.3                       | 1.0                    | 1.0                         | 18.8                    |
| Fifth                | 1.7                | 0.5        | 0.3                             | 1.9                       | 0.9                    | 0.9                         | 21.9                    |
| Sixth                | 1.5                | 0.5        | 0.4                             | 1.7                       | 0.8                    | 0.8                         | 24.8                    |
| Seventh              | 1.4                | 0.5        | 0.5                             | 1.6                       | 0.8                    | 0.7                         | 26.7                    |
| Eighth               | 1.2                | 0.4        | 0.5                             | 1.4                       | 1.1                    | 0.6                         | 29.9                    |
| Ninth                | 1.1                | 0.4        | 0.5                             | 1.3                       | 0.9                    | 0.6                         | 35.4                    |
| Highest              | 0.8                | 0.3        | 0.3                             | 1.0                       | 0.6                    | 0.5                         | 44.1                    |
| Average              | 1.5                | 0.4        | 0.4                             | 1.7                       | 0.9                    | 0.7                         | 27.7                    |

# Interpretation of the results

- Economy-wide results (CGE model)
  - Mechanism of transmission from shocks to final changes in goods and factor prices
  - Can be explained by CGE model's theoretical structure
  - **First round effects:**  $\uparrow$  labour productivity in an infr-ind.  $\rightarrow \downarrow$  its price and  $\uparrow$  output  $\rightarrow \downarrow$  the costs and  $\uparrow$  outputs of downstream inds.
  - $\downarrow$  employ in the infr-ind.  $\rightarrow \downarrow$  its wage and  $\uparrow$  returns to other factors
  - **Second-round effects:**  $\uparrow$  household income  $\rightarrow \uparrow$  demands for all goods  $\rightarrow$  goods price changes again
- Subsequent changes in household incomes (micro-sim model)
  - Can be explained by each household's unique consumption and income source patterns

# An example: the electricity industry

- Estimated shocks
  - Employment (per unit of output)
  - Business prices (relative to CPI)
  - Household prices (relative to CPI)
- Economy-wide results (MMRF model)
  - Industry effects
  - Income effects
  - Price effects
- Household effects (ID model)
  - Nominal household incomes
  - Household specific CPI
  - Real household income

# Estimated changes in electricity industry variables, 1989-90 to 1999-2000 (%)

| <i>Variable</i>               | <i>NSW</i> | <i>Vic</i> | <i>Qld</i> | <i>SA</i> | <i>WA</i> | <i>Tas</i> | <i>NT</i> | <i>ACT</i> |
|-------------------------------|------------|------------|------------|-----------|-----------|------------|-----------|------------|
| Employment per unit of output | -65.1      | -80.0      | -46.8      | -69.5     | -59.3     | -59.4      | -54.1     | -45.3      |
| Business prices (real)        | -35.6      | -22.8      | -10.3      | -29.6     | -22.1     | -9.1       | -18.9     | -26.7      |
| Household prices (real)       | -11.0      | 8.5        | -16.3      | 6.5       | -12.9     | 6.5        | -8.1      | -2.3       |



# Electricity industry effects due to changes in unit output employment and real prices, 1989-90 to 1999-2000 (%)

| <i>Variable</i>                   | <i>NSW</i> | <i>Vic</i> | <i>Qld</i> | <i>SA</i> | <i>WA</i> | <i>Tas</i> | <i>NT</i> | <i>ACT</i> |
|-----------------------------------|------------|------------|------------|-----------|-----------|------------|-----------|------------|
| Labour productivity               | 378.1      | 1330.5     | 183.3      | 445.8     | 310.4     | 332.7      | 204.7     | 122.7      |
| Other inputs productivity         | 13.5       | -8.5       | 1.9        | 3.0       | 4.1       | -8.3       | -4.3      | 5.3        |
| Average productivity <sup>a</sup> | 29.5       | 10.6       | 9.6        | 11.5      | 18.2      | 1.8        | 15.2      | 19.9       |
| Supply price                      | -31.5      | -15.2      | -11.4      | -22.5     | -20.5     | -4.6       | -17.1     | -22.3      |

# Economywide effects of changes in the electricity industry, 1989-90 to 1999-2000 (%)

| <i>Variable</i>                         | <i>NSW</i> | <i>Vic</i> | <i>Qld</i> | <i>SA</i> | <i>WA</i> | <i>Tas</i> | <i>NT</i> | <i>ACT</i> | <i>National</i> |
|---|------------|------------|------------|-----------|-----------|------------|-----------|------------|-----------------|
| CPI                                     | -0.3       | 0.7        | 0.1        | 0.5       | 0.1       | 0.7        | 0.3       | 0.1        | 0.1             |
| <i>Occupational wage rates:</i>         |            |            |            |           |           |            |           |            |                 |
| Managers & administrators               | 1.2        | 2.3        | 1.7        | 2.1       | 1.7       | 2.4        | 1.9       | 1.7        | 1.7             |
| Professionals                           | -3.5       | -2.5       | -3.0       | -2.6      | -3.1      | -2.4       | -2.8      | -3.0       | -3.0            |
| Para-professionals                      | 0.1        | 1.1        | 0.6        | 1.0       | 0.5       | 1.2        | 0.8       | 0.6        | 0.6             |
| Tradespersons                           | -2.8       | -1.8       | -2.4       | -2.0      | -2.4      | -1.8       | -2.2      | -2.4       | -2.4            |
| Clerks                                  | 2.3        | 3.4        | 2.8        | 3.2       | 2.7       | 3.4        | 3.0       | 2.8        | 2.8             |
| Salespersons & personal service workers | 1.9        | 2.9        | 2.4        | 2.7       | 2.3       | 3.0        | 2.5       | 2.3        | 2.3             |
| Plant & machine operators, and drivers  | 3.1        | 4.1        | 3.6        | 3.9       | 3.5       | 4.2        | 3.7       | 3.5        | 3.5             |
| Labourers & related workers             | 1.6        | 2.6        | 2.1        | 2.5       | 2.0       | 2.7        | 2.3       | 2.1        | 2.1             |
| Average wage rate                       | 0.2        | 1.2        | 0.7        | 1.0       | 0.6       | 1.3        | 0.7       | 0.6        | 0.7             |
| Returns to capital <sup>a</sup>         | 0.2        | 0.8        | 0.5        | 0.7       | 0.5       | 0.7        | 0.6       | 0.5        | <b>nc</b>       |
| Unemployment benefit indexation         | 0.1        | 0.1        | 0.1        | 0.1       | 0.1       | 0.1        | 0.1       | 0.1        | 0.1             |
| Other government benefit indexation     | 0.7        | 0.7        | 0.7        | 0.7       | 0.7       | 0.7        | 0.7       | 0.7        | 0.7             |
| Direct tax rate                         | -0.5       | -0.8       | -0.2       | -0.8      | -0.7      | -0.7       | -1.0      | -0.5       | <b>nc</b>       |

## Simulated effects on nominal household income of changes in the electricity industry (%)

| <i>Income decile</i> | <i>NSW</i> | <i>Vic</i> | <i>Qld</i> | <i>SA</i> | <i>WA</i> | <i>Tas</i> | <i>NT</i> | <i>ACT</i> | <i>National</i> |
|----------------------|------------|------------|------------|-----------|-----------|------------|-----------|------------|-----------------|
| Lowest               | 0.60       | 1.08       | 0.80       | 1.47      | 1.66      | 0.95       | -0.50     | 0.88       | 0.92            |
| Second               | 0.48       | 1.28       | 0.49       | 0.49      | 0.94      | 1.14       | 1.33      | 0.74       | 0.76            |
| Third                | 0.57       | 0.90       | 0.62       | 0.67      | 0.33      | 0.90       | -0.31     | 1.03       | 0.64            |
| Fourth               | 0.60       | 1.12       | 0.80       | 0.85      | 0.51      | 0.98       | 2.59      | 1.56       | 0.86            |
| Fifth                | 0.23       | 1.09       | 0.72       | 1.65      | 0.60      | 0.97       | -0.23     | 1.44       | 0.73            |
| Sixth                | 0.49       | 1.35       | 0.96       | 1.51      | 0.73      | 1.38       | 1.86      | 1.03       | 0.92            |
| Seventh              | 0.60       | 1.60       | 1.22       | 1.23      | 0.87      | 1.66       | 1.93      | 0.74       | 1.07            |
| Eighth               | 0.49       | 1.87       | 0.93       | 1.39      | 0.59      | 2.56       | 0.18      | 0.71       | 1.03            |
| Ninth                | 0.26       | 1.56       | 0.91       | 1.91      | 1.01      | 2.16       | 1.16      | 0.51       | 0.97            |
| Highest              | 0.03       | 0.99       | 0.40       | 1.18      | 0.47      | 1.45       | -0.85     | 0.22       | 0.50            |
| All deciles          | 0.37       | 1.33       | 0.79       | 1.32      | 0.71      | 1.60       | 0.66      | 0.80       | 0.83            |

# HCPI effects of changes in the electricity industry, 1989-90 to 1999-2000 (%)

| <i>Income decile</i> | <i>NSW</i> | <i>Vic</i> | <i>Qld</i> | <i>SA</i> | <i>WA</i> | <i>Tas</i> | <i>NT</i> | <i>ACT</i> | <i>National</i> |
|----------------------|------------|------------|------------|-----------|-----------|------------|-----------|------------|-----------------|
| Lowest               | -0.43      | 0.85       | 0.09       | 0.63      | 0.02      | 0.85       | 0.29      | 0.09       | 0.16            |
| Second               | -0.44      | 0.87       | 0.10       | 0.68      | -0.05     | 0.87       | 0.46      | 0.09       | 0.15            |
| Third                | -0.46      | 0.87       | 0.09       | 0.74      | -         | 0.84       | 0.23      | 0.12       | 0.15            |
| Fourth               | -0.41      | 0.77       | 0.10       | 0.65      | 0.06      | 0.89       | 0.27      | 0.14       | 0.17            |
| Fifth                | -0.38      | 0.73       | 0.13       | 0.54      | 0.06      | 0.80       | 0.33      | 0.13       | 0.15            |
| Sixth                | -0.34      | 0.68       | 0.12       | 0.46      | 0.07      | 0.81       | 0.34      | 0.12       | 0.12            |
| Seventh              | -0.32      | 0.68       | 0.15       | 0.49      | 0.06      | 0.74       | 0.28      | 0.10       | 0.13            |
| Eighth               | -0.29      | 0.62       | 0.18       | 0.50      | 0.10      | 0.70       | 0.27      | 0.12       | 0.14            |
| Ninth                | -0.29      | 0.59       | 0.20       | 0.43      | 0.10      | 0.70       | 0.26      | 0.11       | 0.14            |
| Highest              | -0.27      | 0.49       | 0.16       | 0.39      | 0.11      | 0.63       | 0.29      | 0.12       | 0.12            |
| All deciles          | -0.34      | 0.66       | 0.14       | 0.50      | 0.07      | 0.75       | 0.30      | 0.12       | 0.14            |

# Real household income effects due to changes in the electricity industry, 1989-90 to 1999-2000 (%)

| <i>Income decile</i> | <i>NSW</i> | <i>Vic</i> | <i>Qld</i> | <i>SA</i> | <i>WA</i> | <i>Tas</i> | <i>NT</i> | <i>ACT</i> | <i>National</i> |
|----------------------|------------|------------|------------|-----------|-----------|------------|-----------|------------|-----------------|
| Lowest               | 1.03       | 0.23       | 0.71       | 0.84      | 1.64      | 0.09       | -0.79     | 0.79       | 0.76            |
| Second               | 0.92       | 0.40       | 0.39       | -0.19     | 1.00      | 0.27       | 0.87      | 0.65       | 0.61            |
| Third                | 1.04       | 0.03       | 0.53       | -0.06     | 0.33      | 0.05       | -0.54     | 0.91       | 0.49            |
| Fourth               | 1.01       | 0.35       | 0.70       | 0.20      | 0.45      | 0.09       | 2.31      | 1.42       | 0.69            |
| Fifth                | 0.61       | 0.36       | 0.59       | 1.10      | 0.55      | 0.17       | -0.56     | 1.31       | 0.58            |
| Sixth                | 0.83       | 0.67       | 0.84       | 1.04      | 0.66      | 0.57       | 1.51      | 0.91       | 0.80            |
| Seventh              | 0.92       | 0.91       | 1.06       | 0.73      | 0.82      | 0.91       | 1.64      | 0.64       | 0.93            |
| Eighth               | 0.78       | 1.24       | 0.74       | 0.89      | 0.48      | 1.84       | -0.09     | 0.59       | 0.89            |
| Ninth                | 0.55       | 0.97       | 0.70       | 1.47      | 0.91      | 1.45       | 0.89      | 0.39       | 0.82            |
| Highest              | 0.30       | 0.50       | 0.25       | 0.78      | 0.36      | 0.82       | -1.13     | 0.10       | 0.38            |
| All deciles          | 0.71       | 0.66       | 0.64       | 0.82      | 0.65      | 0.84       | 0.35      | 0.69       | 0.69            |
| Gini coefficient     | -0.15      | 0.11       | -0.05      | 0.18      | -0.05     | 0.26       | -0.25     | -0.22      | -0.02           |

# Strengths and limitations of this approach

## – Strengths

- Structurally simple
- Straight forward interpretation
- Flexible

## – Limitations

- No feedback effects in the micro-simulation model

# An alternative approach

- Incorporate micro-sim model with CGE model
  - Internally consistent
  - Feedback effects
- Require more work on CGE model and database

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