Disaggregation of CGE results into household level results through micro-macro linkage: Analysing climate change mitigation policies from 2005 to 2030

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Introduction

- Not endorsed by the Garnaut Review and does not form part of its Report, due to time constraints
- Outline of the presentation:
  - Project overview
  - Focus on the approach
  - Main characteristics of the microsimulation model (MITTS)
  - Main limitations
  - Overview of the results

Project overview

- Objective: disaggregation of CGE results into household level
- 3 scenarios for the period 2005-2030:
  - Reference: business as usual scenario (assume negligible climate effects on economy until 2030)
  - 550 ppm scenario: reducing emissions for Australia to a level of 80 per cent below 2000 levels by 2050
  - 450 ppm scenario: involves a reduction to 90 per cent below 2000 levels by 2050
- Both mitigation policies
  - introduce an Emissions Trading Scheme on 1 July 2013
  - are assumed to be part of a coordinated global effort to stabilise carbon dioxide equivalent concentrations

Project overview

- Output to be produced:
  1. Real net income per adult equivalent
  2. Gini coefficient
  3. Budget shares of basic necessities
  4. Budget shares of energy expenditures
  5. Weekly hours of work
- Breakdown:
  - 5 points in time: 2005, 2010, 2015, 2020, 2025 and 2030
  - Income quintile (5)
  - State (8)
  - Household type (couples, singles, sole parents)

Project overview

- Input to be used:
  - Population projections by age, gender and State (from Treasury and ABS)
  - Input from CGE:
    - Employment levels by industry and State
    - Unemployment by State
    - Interstate migrations
    - Changes in labour and non-labour income by State
    - Price changes by State and commodity (63)
    - Changes in consumption levels by State and commodity
    - Permit revenue generated by the ETS (to be redistributed on a per capita basis)

The approach (overview)

- Use changes in **population** composition and size and changes in employment to reweight a current sample (2003-2004 Survey of Income and Housing Cost), more on next slide
- Increase **wages** with real wage growth (by State)
- Use changes in **consumption** levels and consumer **prices** to compute household-specific price indices
- Update **non-labour** non-benefit **incomes** with changes in household real capital returns by State
- This sample can then be used in an usual microsimulation approach to:
  - reflect future populations
  - compute benefit payments and income taxes at the household level
  - derive household real net incomes and household budget shares

The approach (reweighting)

- Benchmarks used in the reweighting:
- Step 1 (common to all scenarios):
  - Numbers of people by age, gender and state as provided by Treasury+ABS projections
  - 29 age groups * 2 genders * 8 regions = 66 constraints
- Step 2 (scenario-specific):
  - CGE employment by industry (63→13) and state (8)
  - Unemployment by state (8)
  - Interstate migration (7)
  - Numbers of people by age and gender at the national level from step 1 (29)
  - Total number of constraints = 13*8 + 8 + 7 + 29 = 148
- New weights are obtained using a mathematical procedure minimising changes in original sample weights

The approach (household consumption)

- No consumption in MITTS
- Link MITTS sample to household expenditure survey
  - ☞ compute household budget shares for the 63 CGE commodities
- Use changes in consumption levels (by State) from CGE to update household budget shares
- 2 usages:
  1. Provide updated budget shares for basic necessities and a pre-defined energy bundle at the household level
  2. Combine updated budget shares with price changes from CGE to compute household specific price indices → used to deflate gross income

MITTS

- Melbourne Institute Tax and Transfer Simulator
  - Incorporates full complexity of direct income taxes & transfers
    - Replicates the rules of the actual tax and transfer system
  - Uses detailed individual level data: Survey of Income and Housing Cost (SIHC) collected by the Australian Bureau of Statistics (ABS)
    - Detailed information on income from a range of sources, labour supply, individual and household characteristics
  - Usually rules of the tax and transfer system are changed to simulate policy changes
    - Here we change the sample, the tax thresholds and incomes

MITTS

- Individual and aggregate changes can be computed
- Use weights to predict changes at the population level
- Government revenue and expenditure (relating to households) can be determined
- For this project, all behavioural changes are taken from the CGE modelling
- The behavioural component of MITTS is not used, but net incomes are calculated in MITTS, after applying wage changes and income changes derived from the CGE modelling
- Except for income tax thresholds, the tax and transfer system is unchanged

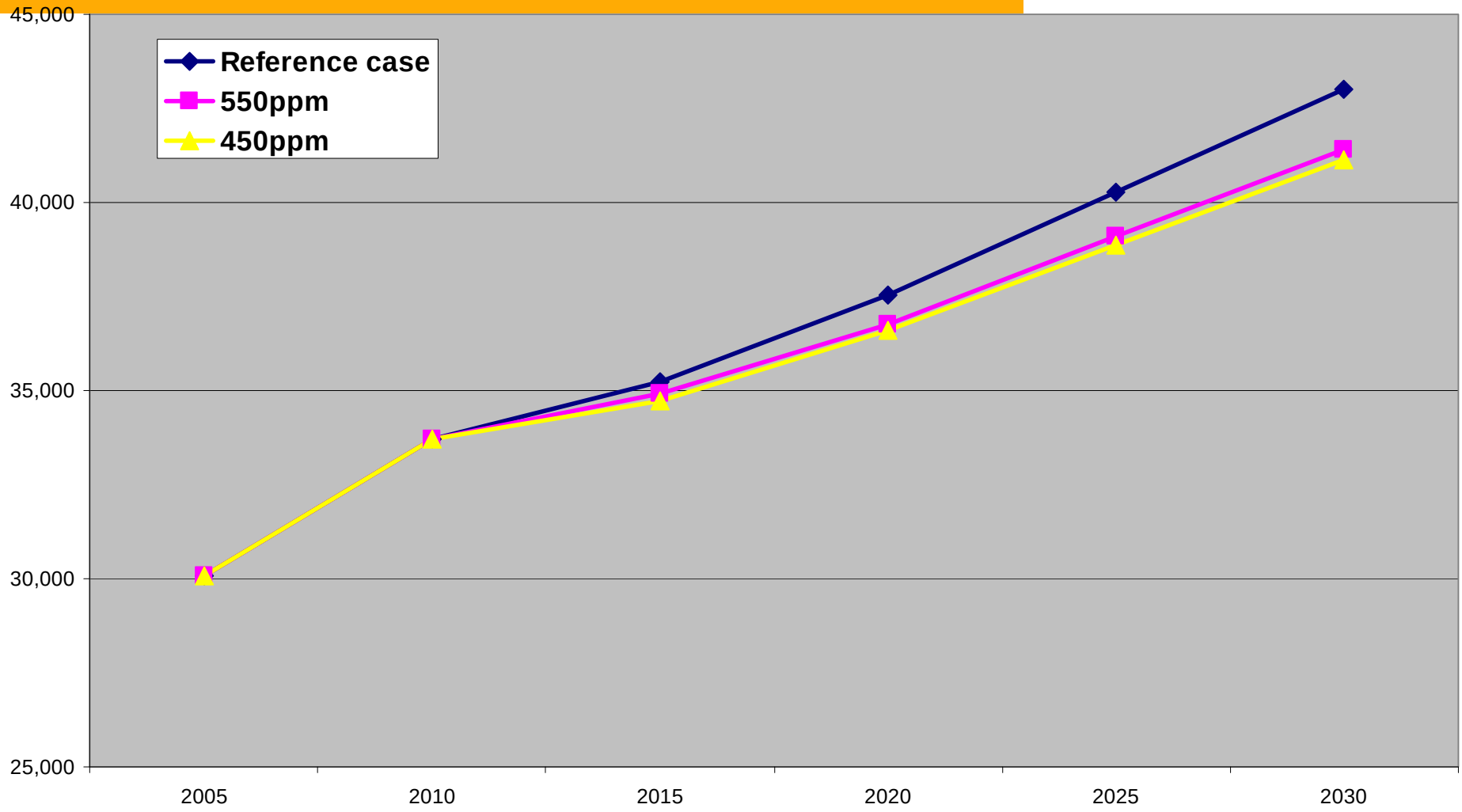
Some issues

- Average tax rates are assumed constant in CGE model:
  - due to real wage growth, tax thresholds need to increase in line with real wage growth
- No distinction between skill levels for employment and wage changes, and other limitations in the detail that is available
- One representative household per State
  - Changes in consumption in response to price changes are the same for all households in one State
  - However, starting point of consumption is different for each household
- Matching of categories in the two models, e.g. industries, commodities
- Assumptions about future income support levels
- Reweighting is, to some extent, a ‘black box’ for employment changes and interstate migrations

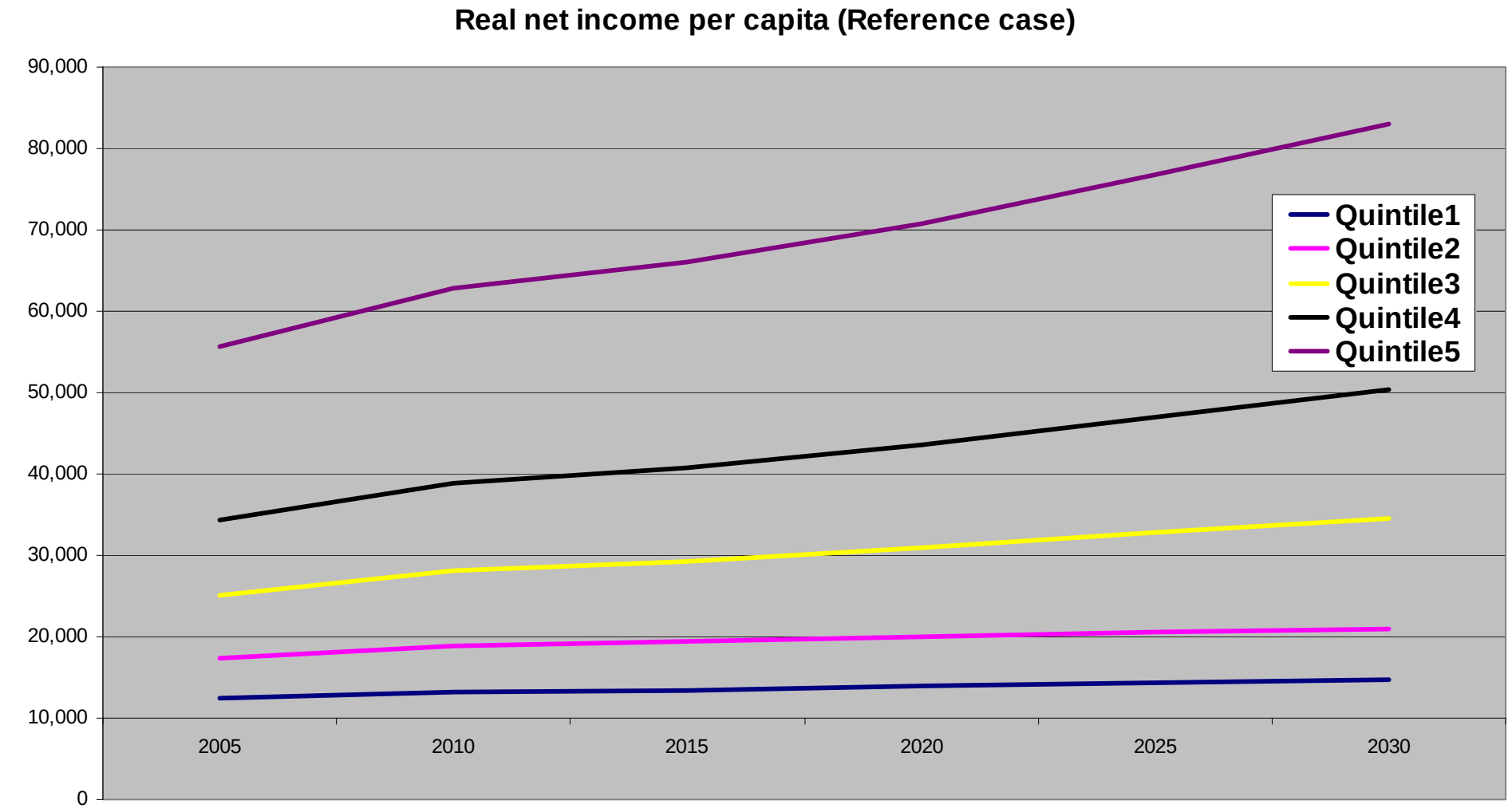
Analysis of real net income

- An example of the output the model generates.
- All incomes and wages are expressed in 2005 dollars.
- Household specific CPIs are used to calculate real incomes
- Equivalised incomes are used

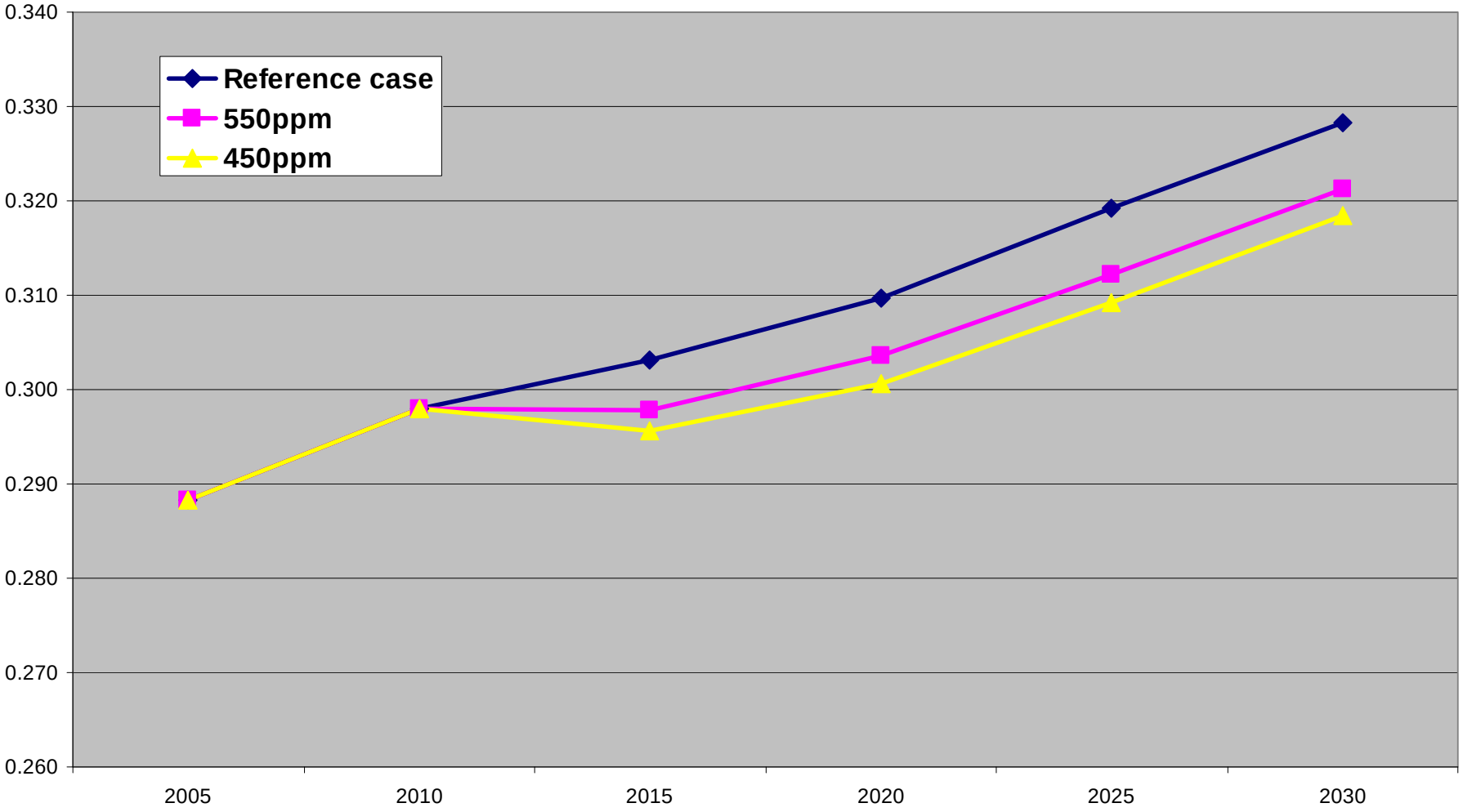
Real net income



Real net income by quintile



Inequality (Gini coefficient)



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