



Centro Clima
CENTER FOR INTEGRATED STUDIES ON
CLIMATE CHANGE AND THE ENVIRONMENT

Modelling Improvements in IMACLIM-BR

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MILES meeting
Paris, January 2017



Modelling Improvements

Task 1:

- 1.1. Demographic trends, regarding the increasingly ageing population and its impacts on the social security system
- 1.2. Evolution of social security costs and how they relate to total public expenditure.
 - Is a reform necessary?
 - Is it feasible?
- Better representation of different income classes allowing for tracking their consumption patterns evolution
 - Household sector split into ten income deciles, that can be aggregated in different ways, according to modeling objectives
 - Enables better assessment of consumption and equity
 - Ready to be implemented in the coming modeling exercises

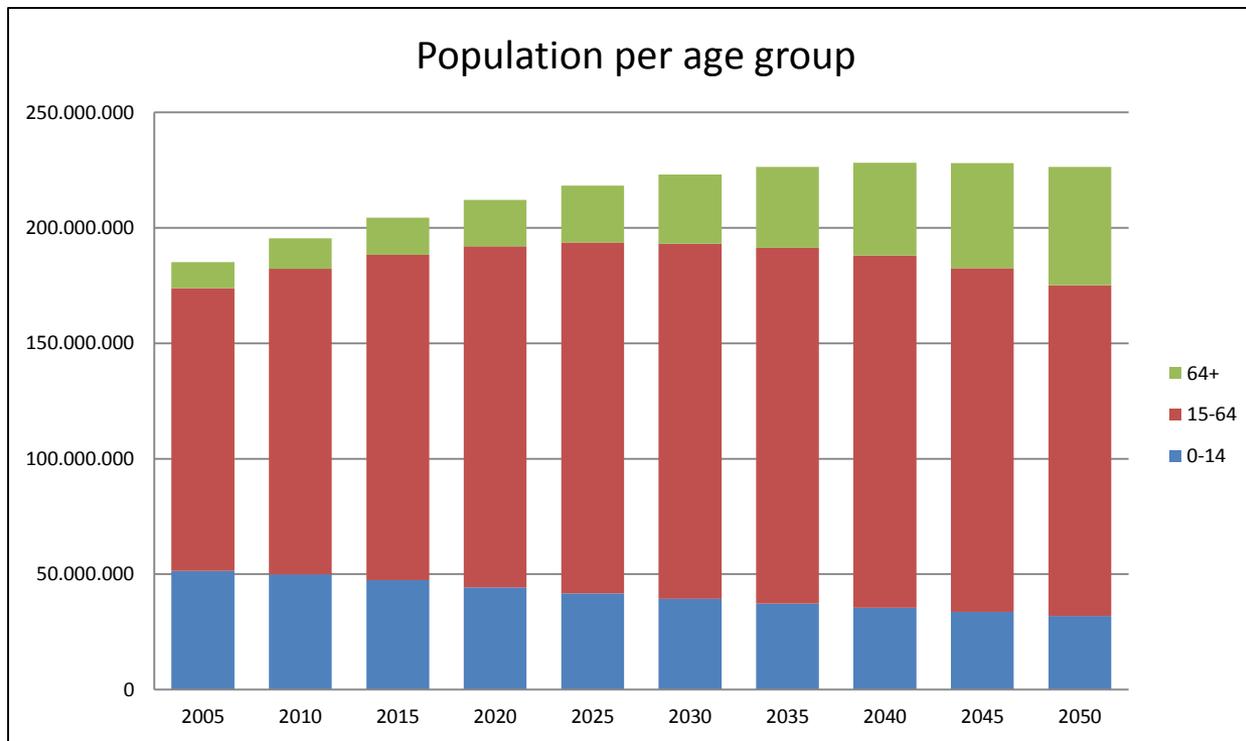


1.1. Demographic Trends

Demographic transition in Brazil poses a double challenge:

- 1) To produce more with a reduced workforce
- 2) To cope with increasing social security costs

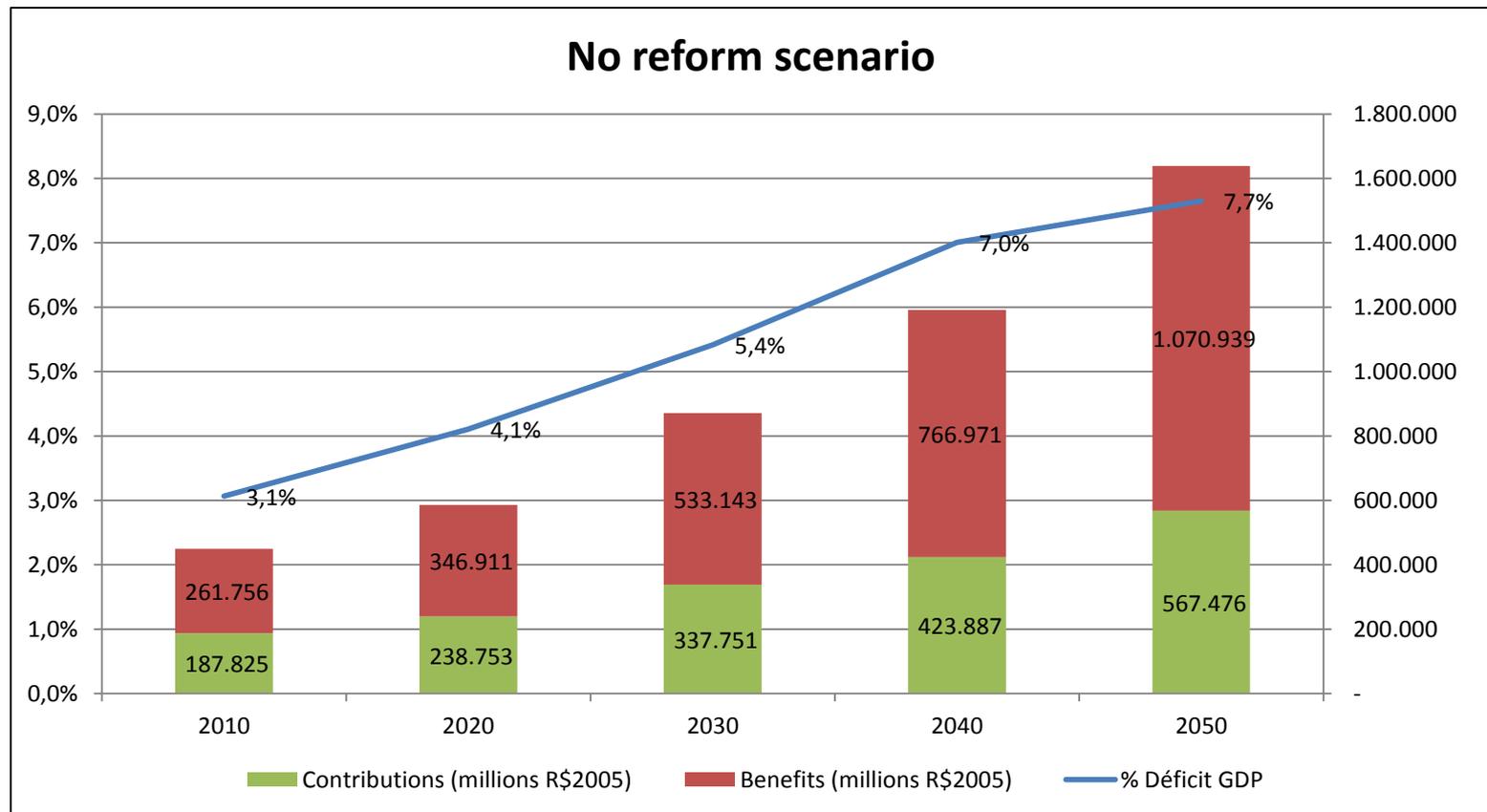
Will the social security system compete for public resources with other areas?





1.2. Social security system

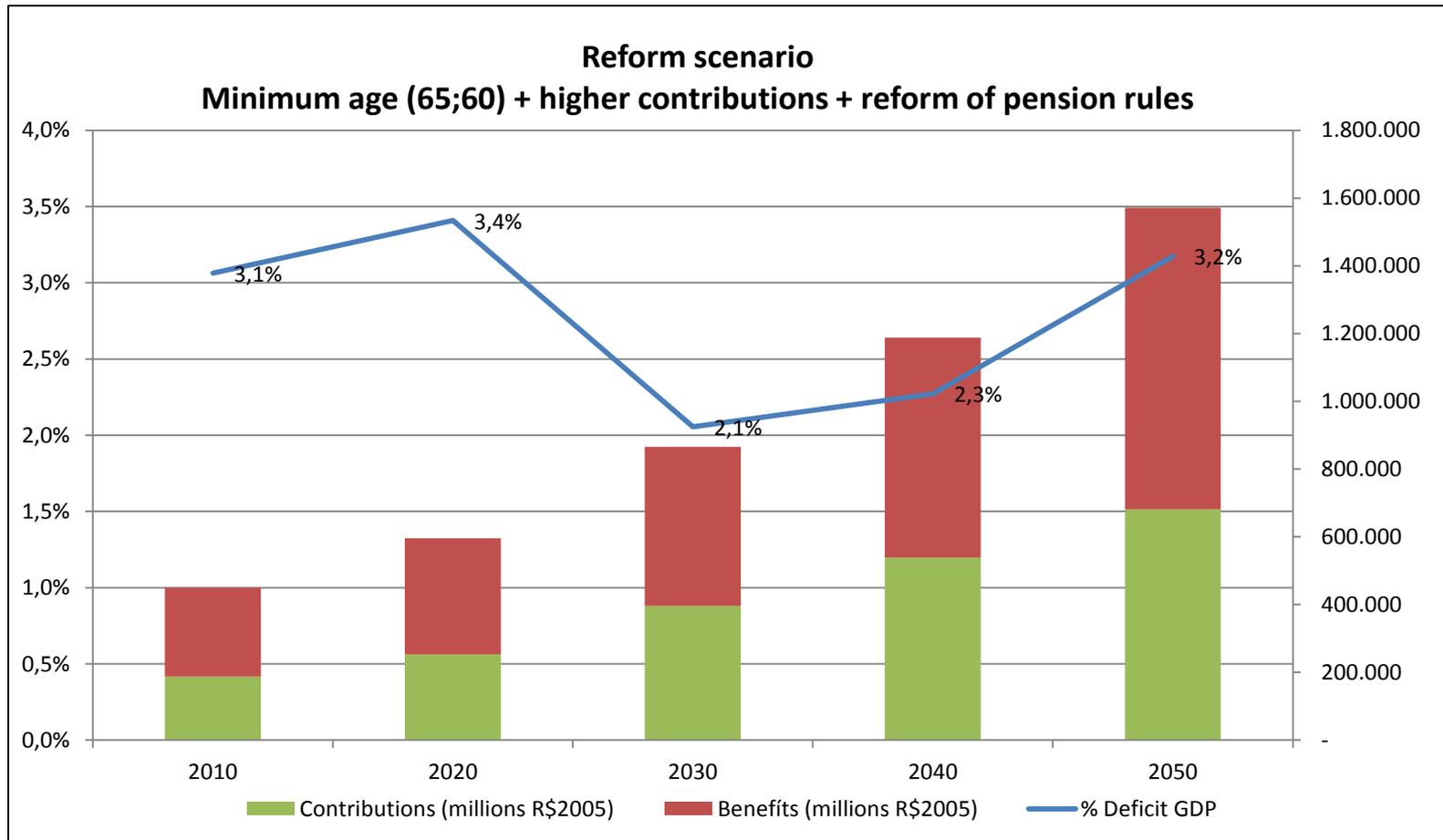
If no reform is put in place, the system deficit increases 4.6% of GDP, putting a heavy pressure on public expenditure.





1.2. Social security system

If the proposed reform is put in place, the system deficit can be kept at 2010 level by the end of the time horizon





1.3. Household sector

- **Better representation of different income classes**

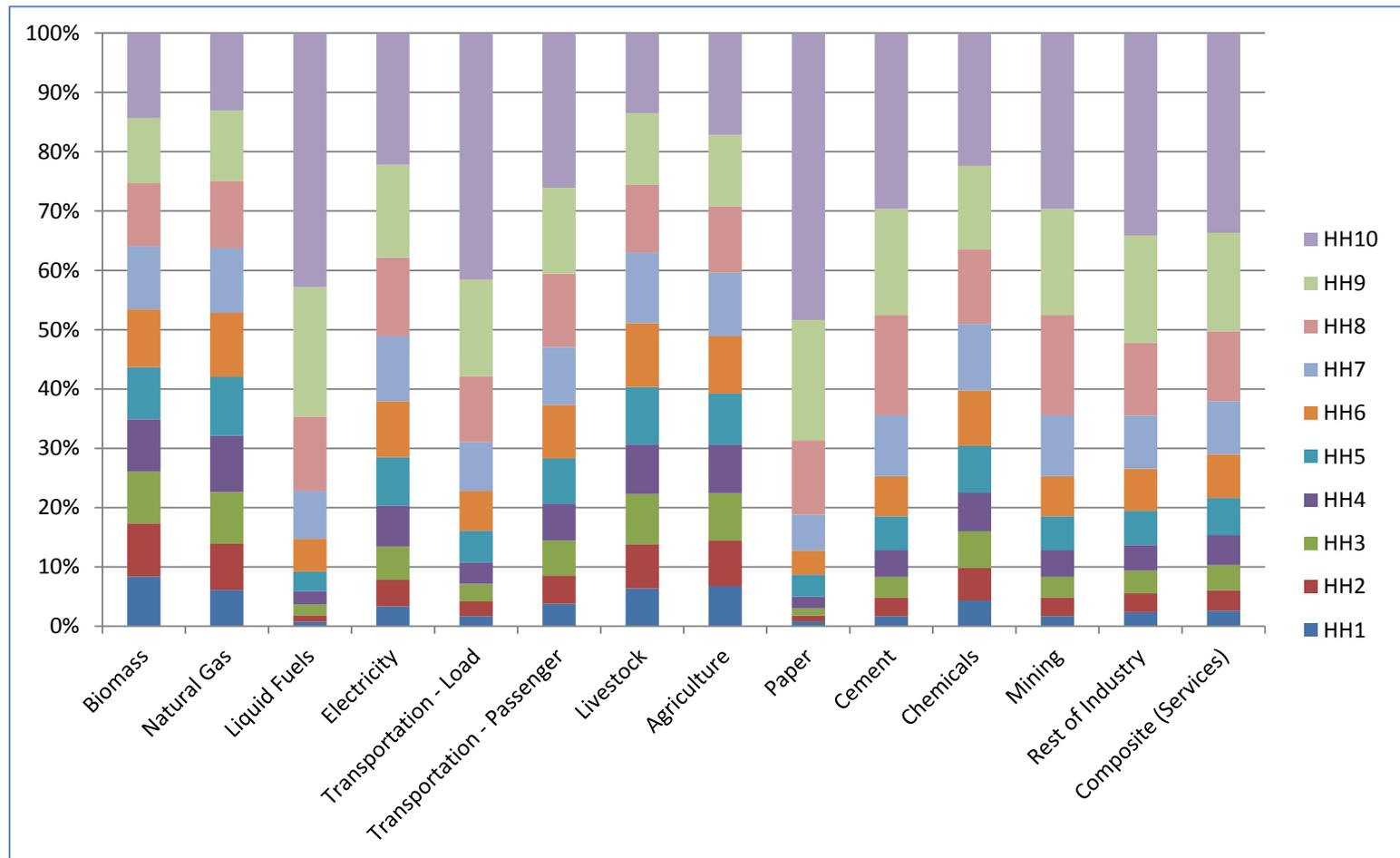
- **Microdata from National Household Budget Survey 2002-2003**
 - Consumption of goods and services,
 - Other expenditures
 - Sources of income

- **Harmonized with base-year Social Accounting Matrix (SAM)**



1.3. Household sector

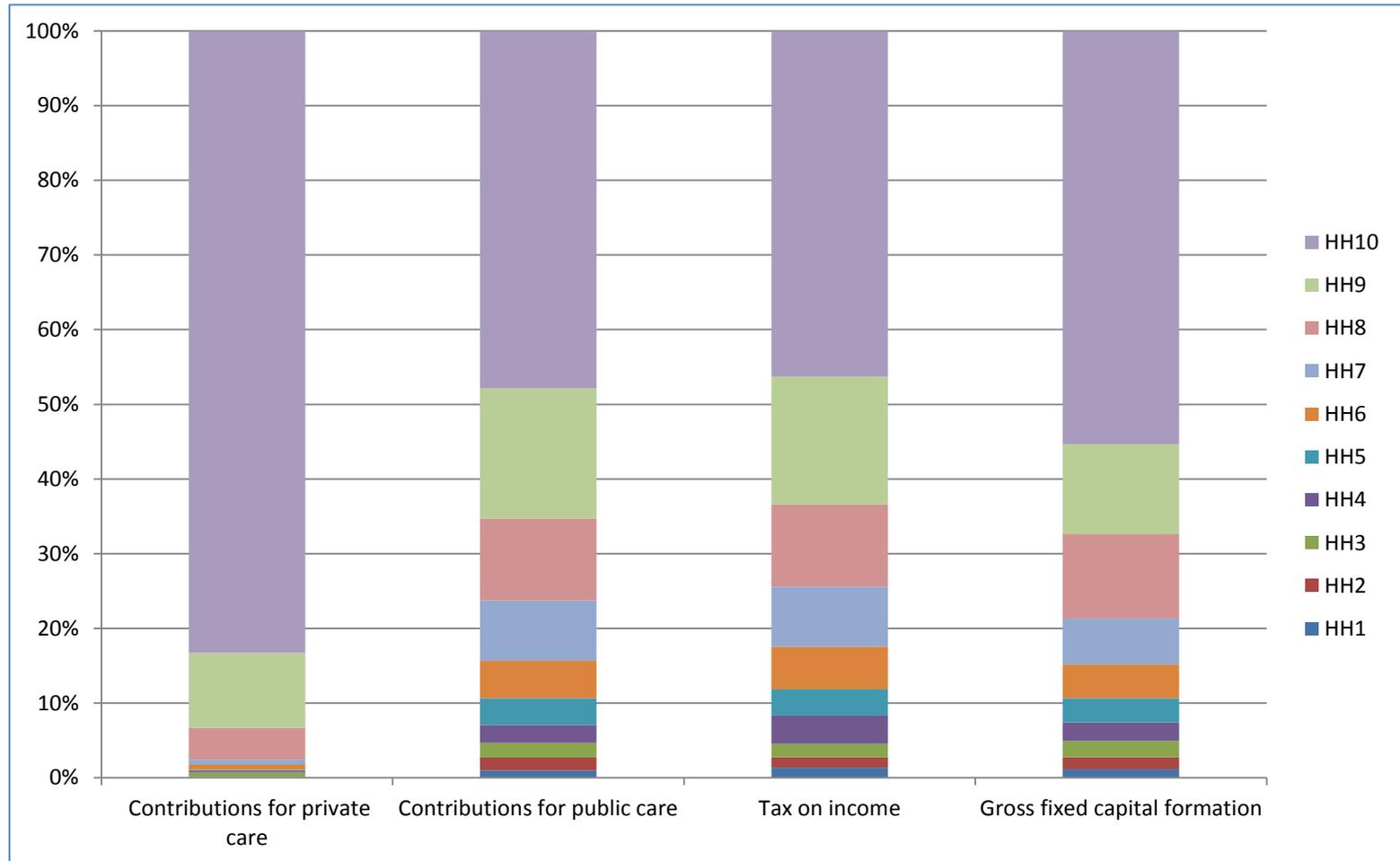
Consumption disaggregation per income decile:





1.3. Household sector

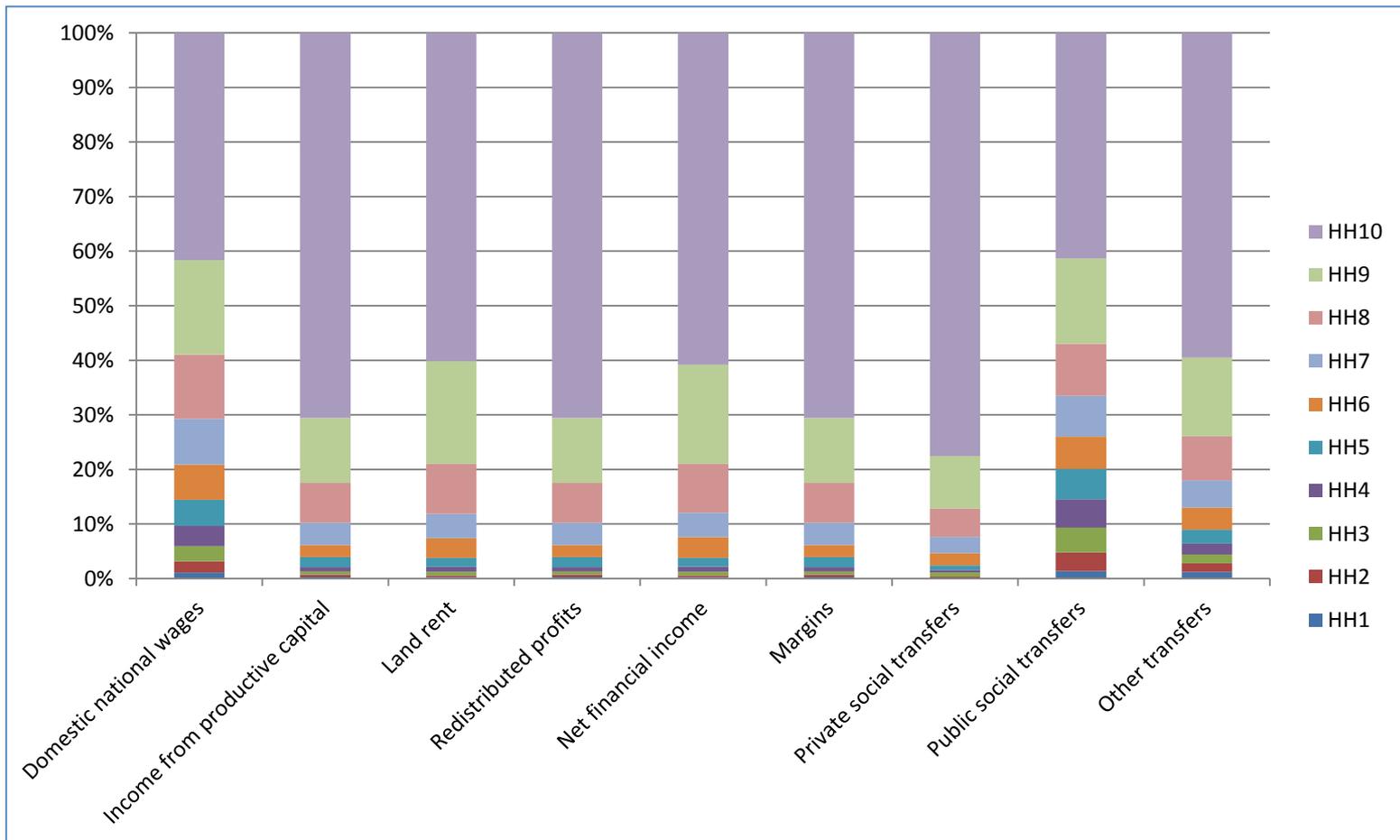
Other expenses and contributions per income decile:





1.3. Household sector

Income sources per income decile:





Task 2.1 - Further development of mid-term equilibria and capital dynamics

- Development of a simplified recursive dynamic version: IMACLIM-R BR
- Specific nexus models for IMACLIM-R BR not available yet
 - Integration with sectorial models is still limited in the sense of providing multiple runs:
 - Different sectorial runs takes several days.
- Capital dynamics description where the capital at time $t + n$ (end of regime) is a function of capital at time t (beginning of regime), depreciated at a given rate, plus the need for investment for that regime.
 - The shortest the regime is, the more accurate is the approach.
 - This simplified approach was inspired in the EPPA model developed by Paltsev et al (2005).
 - In addition, the IMACLIM-R BR model can also receive, every five years, information about technology and investment requirements, coming from the sectorial models.

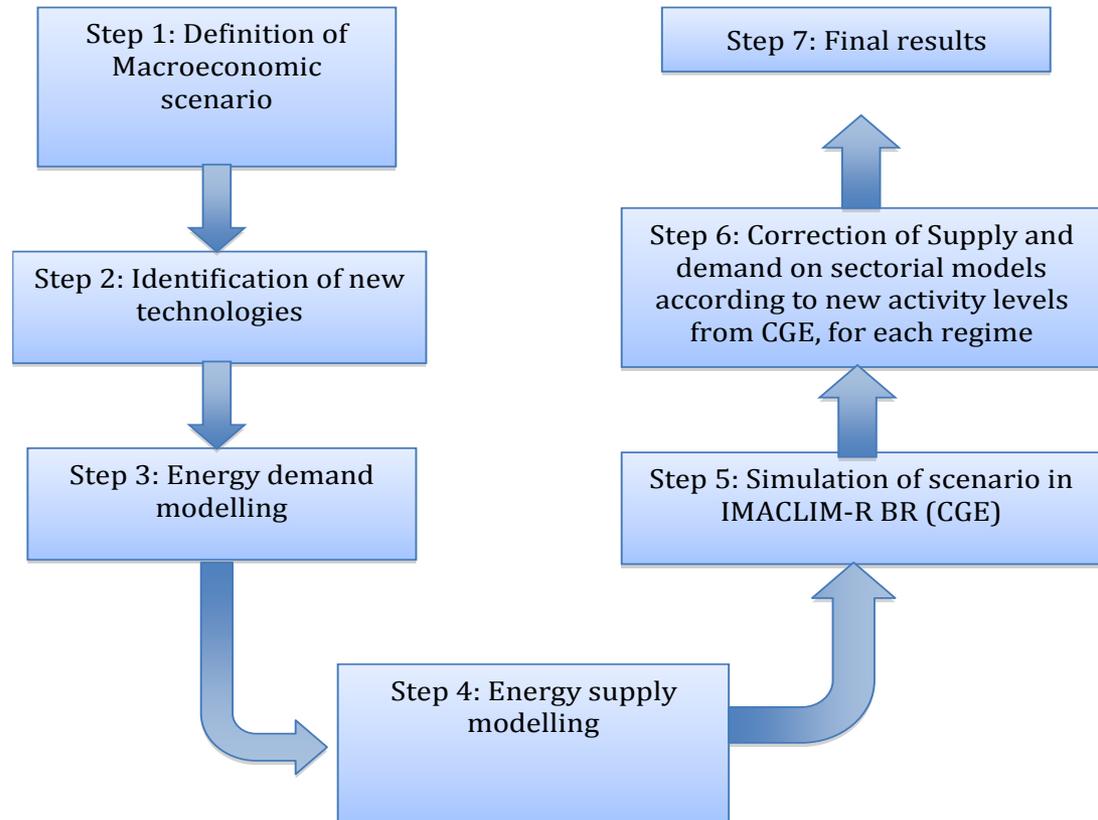


Task 2.1 - Further development of mid-term equilibria and capital dynamics

- Definitions related to "**time**" used in this model version:
 - **Base year:** 2005
 - **Time horizon:** Final year of simulation - 2050 for this study
 - **Regime:** This variable is used to help on the simulation of different patterns of GDP growth, demographic trends, technologies, investment, etc. In the last year of the regime information is exchanged with BU models. For this study we have 3 different regimes:
 - **2005-2015** - first regime - update our base year according to verified macroeconomic indicators;
 - **2016-2030** - second regime - mid term simulation including only already available technologies;
 - **2031-2050** - third regime - long term simulation including new technologies.
 - **Time step:** Minimum regime duration - used only for mathematical reasons, and can be as small as desired. For this study we use a 5 years time step.

Figure 4.2.-1 – Information exchange among sectorial models (BU) and IMACLIM-BR (CGE)

Task 2.2
Information exchange
between sectorial
models (BU) and
IMACLIM-R BR



Task 2.3. Integrated modelling

- All GHG emission sources are accounted by the sectoral models
- Special emphasis on the exchange of the energy supply and demand models and IMACLIM-R BR model
- Soft links between IMACLIM-BR and BU models

