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**Economic growth in a context of
demographic transition:
The case of Uruguay**

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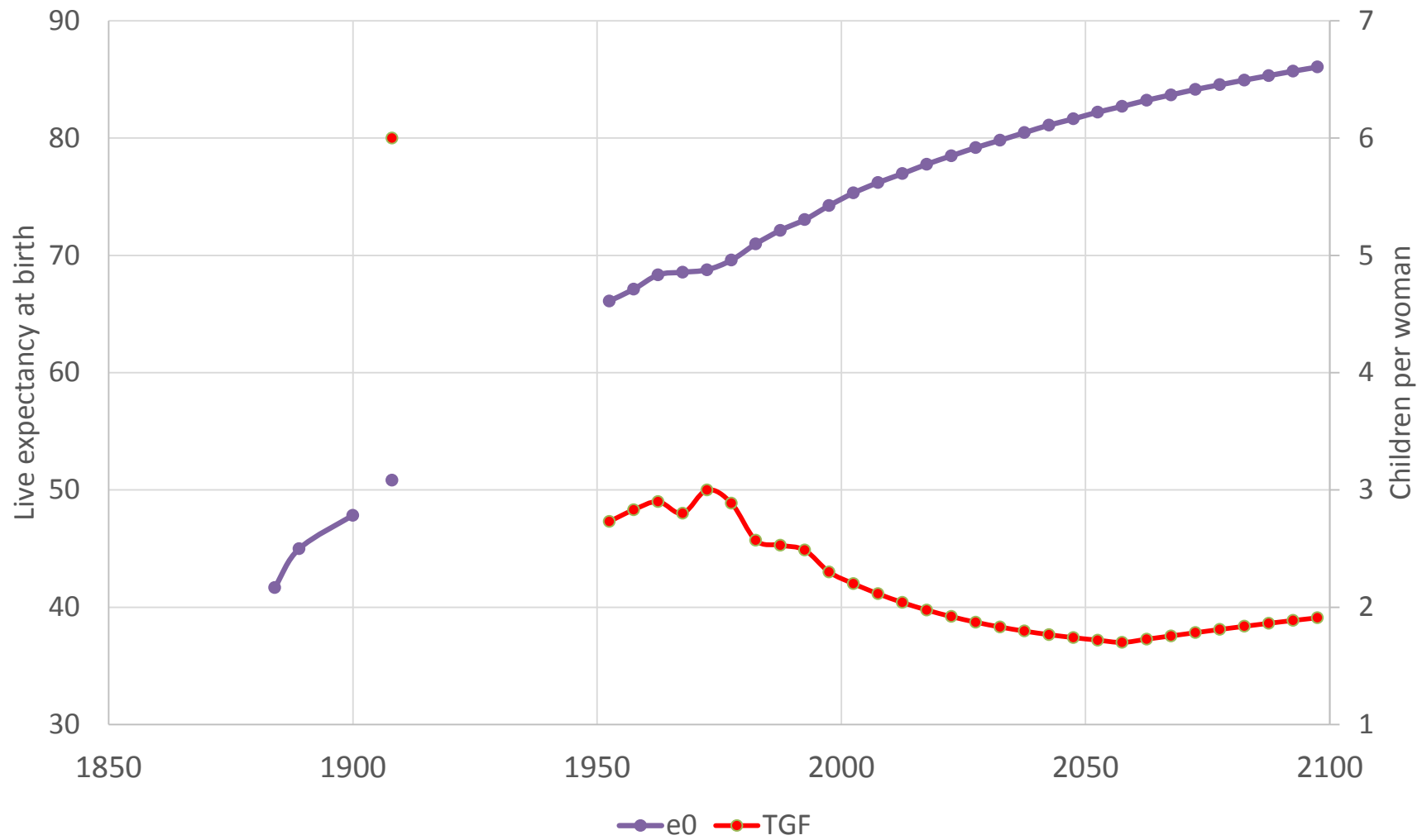
Motivation

- Among Latin American countries, Uruguay began its demographic transition earliest
- At the beginning of the 20th century, the country exhibited demographic trends similar to those in several European countries
- Population aging could have negative effects on the economy, including a fall in the GDP per capita, due to the reduction in the labor force and the savings level

Objective

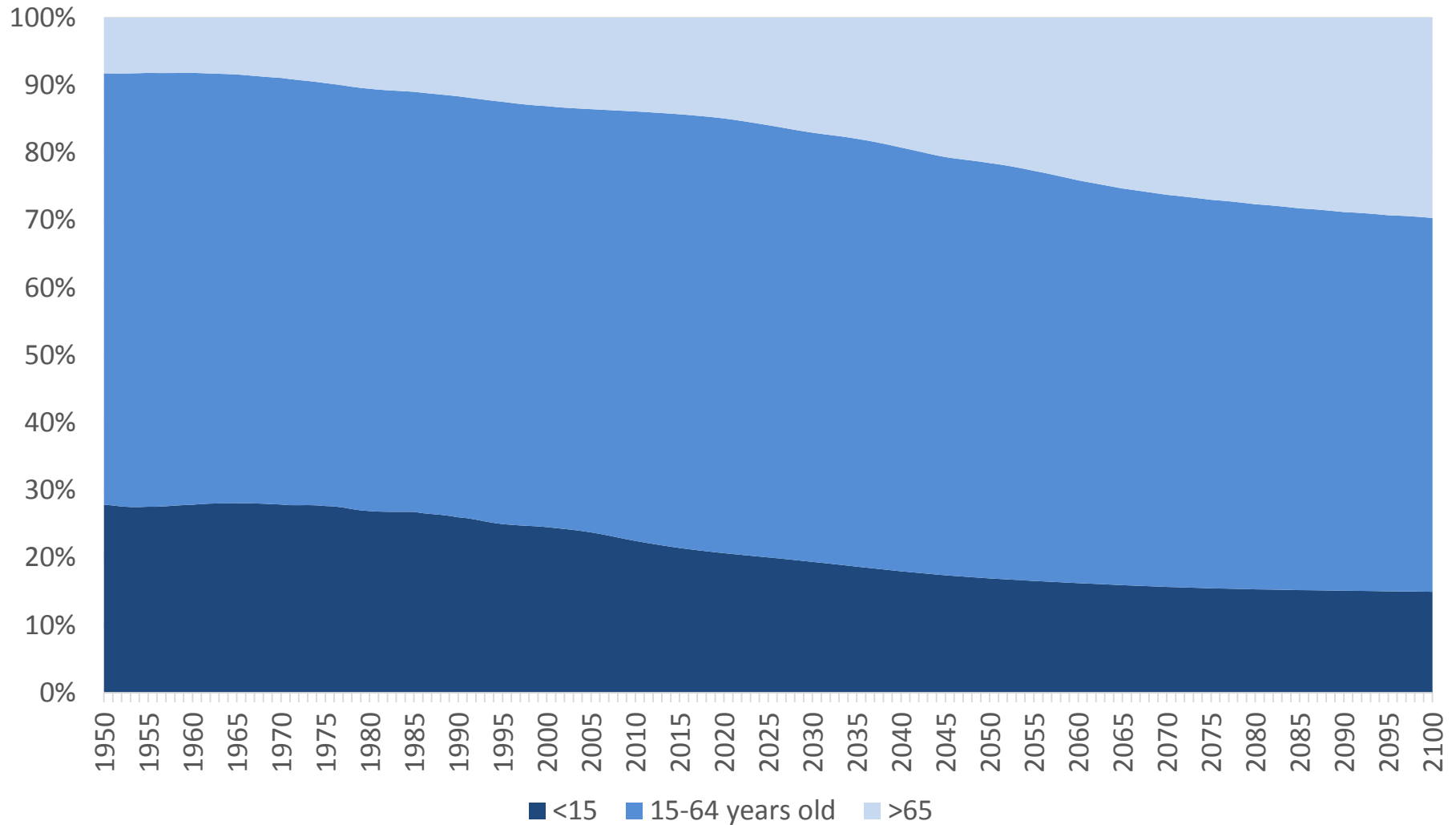
- Quantify the potential macroeconomic impacts of the demographic transition
- Analyze how demographic change transforms economic growth, based on the analysis of simulation exercises
- Identify the sources of economic growth in an aging context

Total fertility rate will decrease and life expectancy will increase



Source: Own our elaboration based on National Bureau of Statistic and Population Division, United Nation

Population by age group. 1950-2100

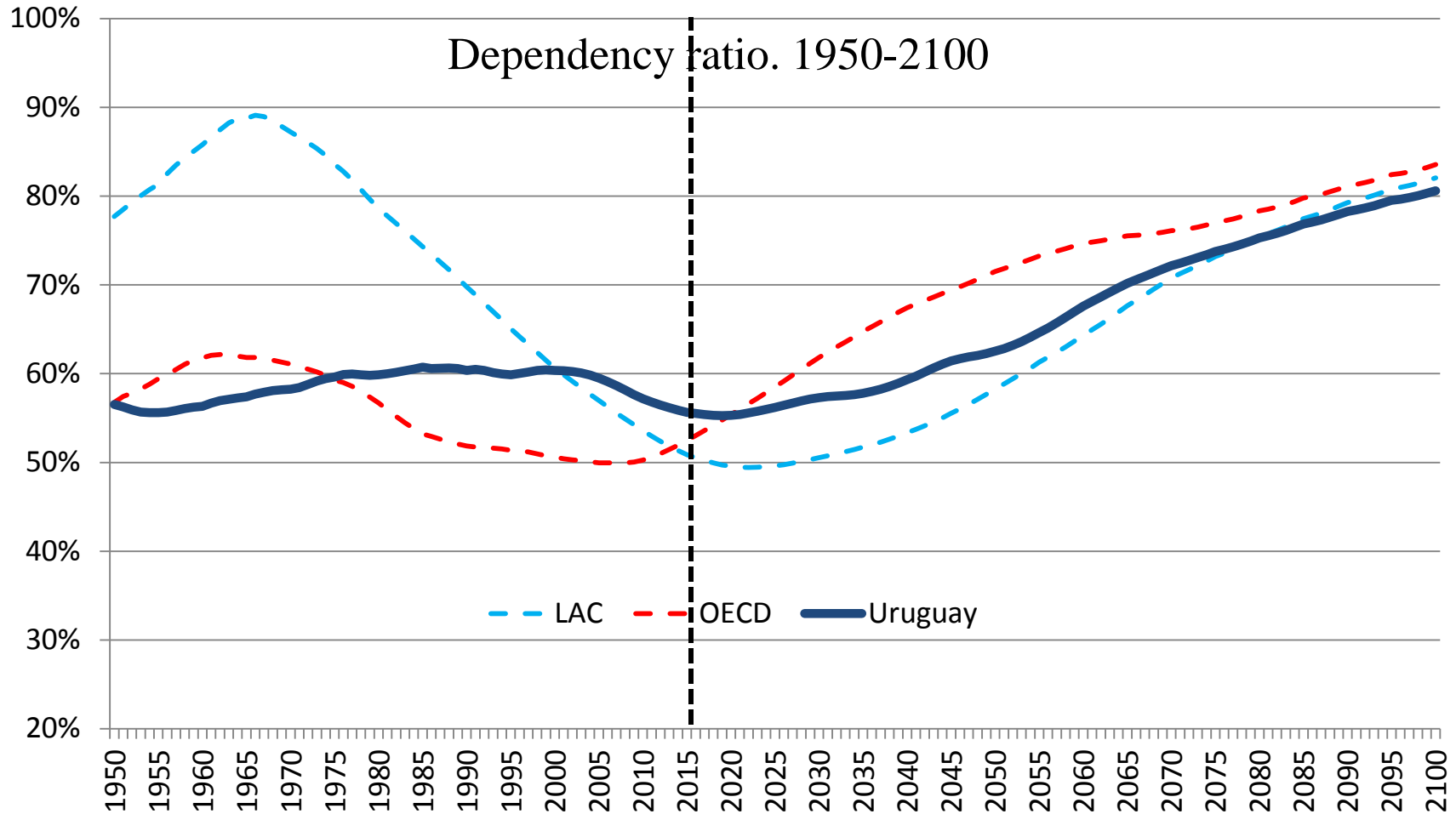


Source: Population Division, United Nation

Economic growth and demographic transition

- The effects of the demographic transition on economic growth are related to the first and second demographic dividends
- The **first dividend** refers to the increase of the relative share of the working-age population during the window of opportunity
- The **second dividend** occurs during the window of opportunity, and it is a consequence of the increase of the share of the population that can be considered “net savers”

The window of opportunity is shorter and less intensive than the region's one



Source: Population Division, United Nation

Growth accounting

- Although Uruguay has been aging fast, the country has had positive economic growth
- Traditional **factor decomposition of GDP growth** to estimate:
 - The contribution of primary productive factors
 - The contribution of TFP

Sources of economic growth

$$Y = e^A K^\alpha L^\beta$$

- where
 - Y represents the GDP
 - K is the stock of physical capital
 - L is the labor force
 - A is a stochastic process that controls technological change
 - α and β are the proportion of capital and labor in national income, respectively

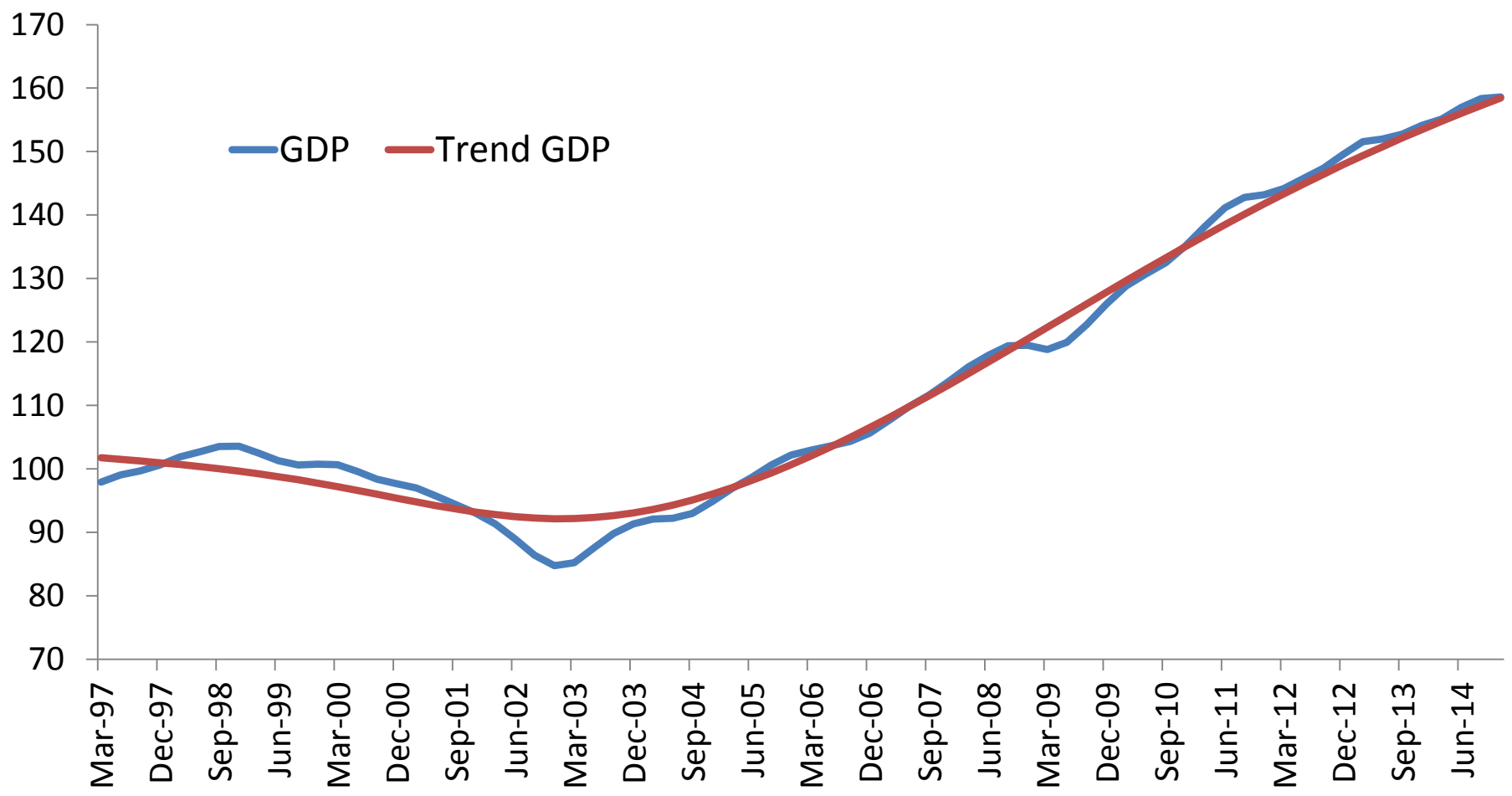
Sources of economic growth (cont.)

$$\ln y = A + \alpha \ln K + \beta \ln L$$

$$\Delta \ln y = \Delta A + \alpha \Delta \ln K + \beta \Delta \ln L$$

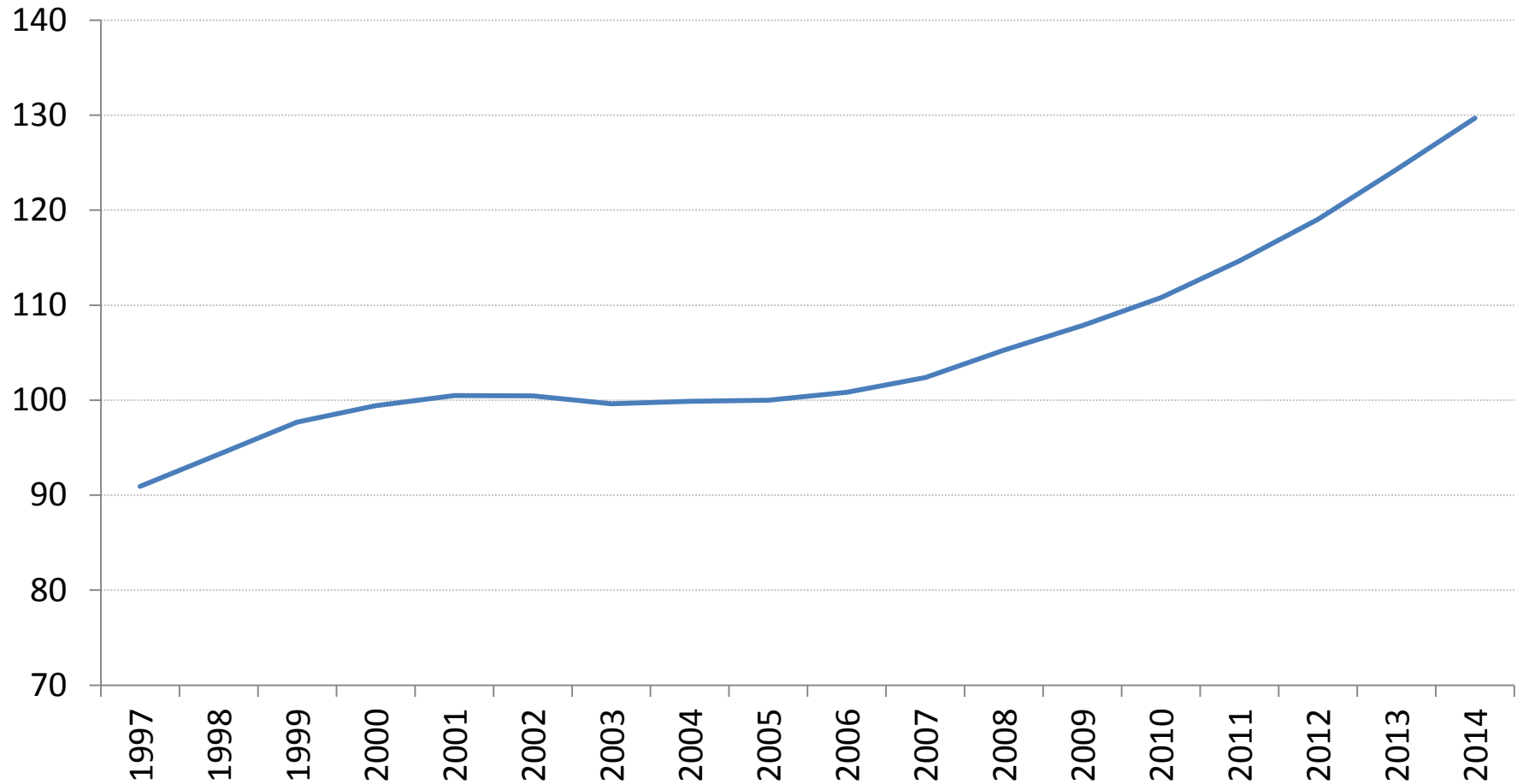
- ΔA is commonly known as the *Solow Residual* or TFP
- According to the 2005 National Account the values of α and β are 0.45 and 0.55, respectively
- We describe the contribution of the primary factors of production and TFP to the economy's performance during 2005 and 2014

GDP and Trend GDP (2005 = 100)



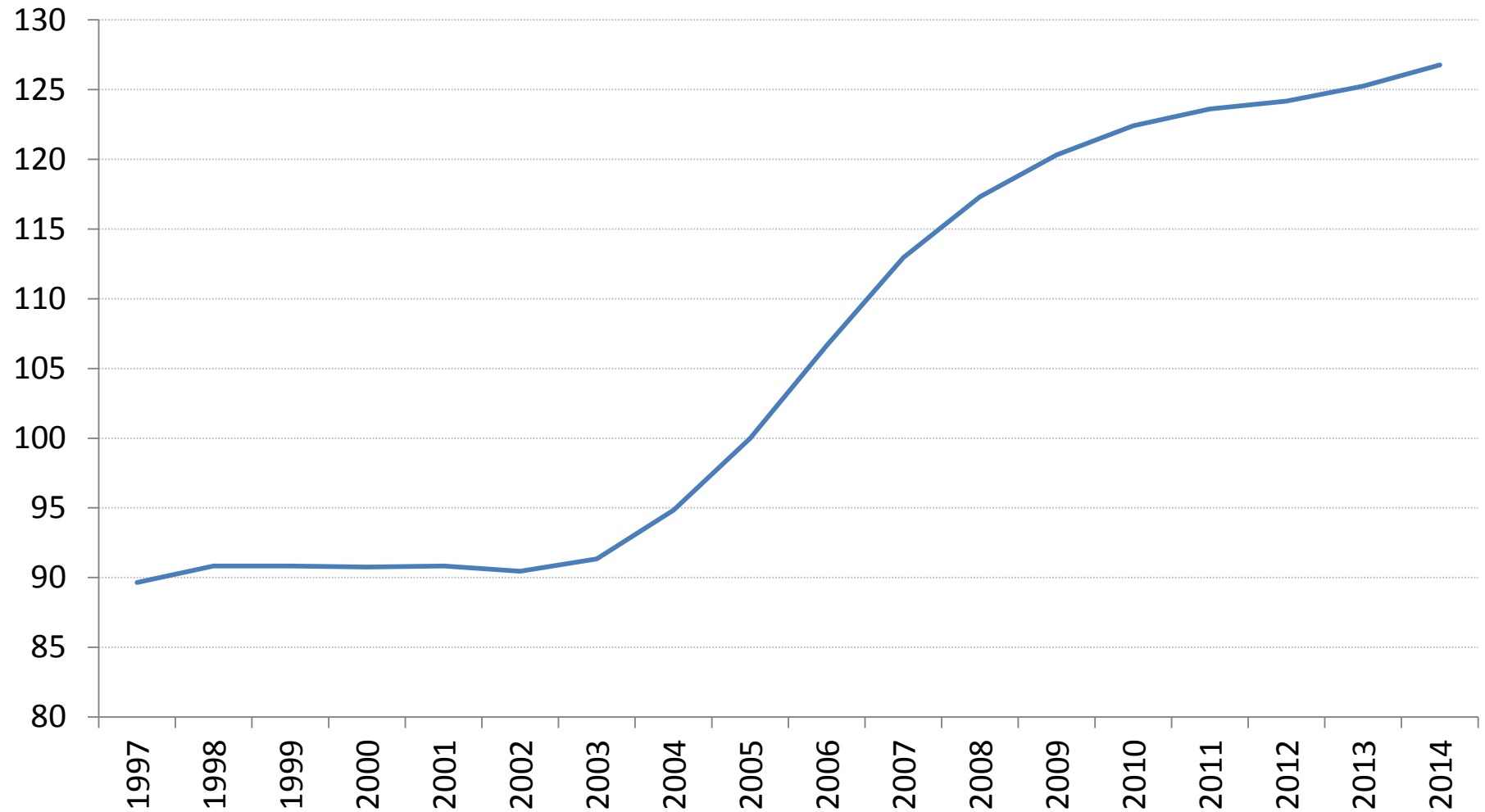
Source: Our own elaboration based on Central Bank of Uruguay data

Stock of Physical Capital (2005 = 100)



Source: our own elaboration based on Central Bank of Uruguay data

Human Capital Index (2005=100)



Source: Our own elaboration based on National Bureau of Statistic

Factor Decomposition of Growth

44% of the growth is explained by the TFP

	K	Contribution L (Human Capital)	TFP	Total
GDP	1.3%	1.5%	2.4%	5.2%
GDP (in % of total)	24.3%	29.5%	46.5%	
Trend GDP	1.3%	1.5%	2.2%	5.0%
Trend GDP (in % of total)	25.3%	30.7%	44.0%	

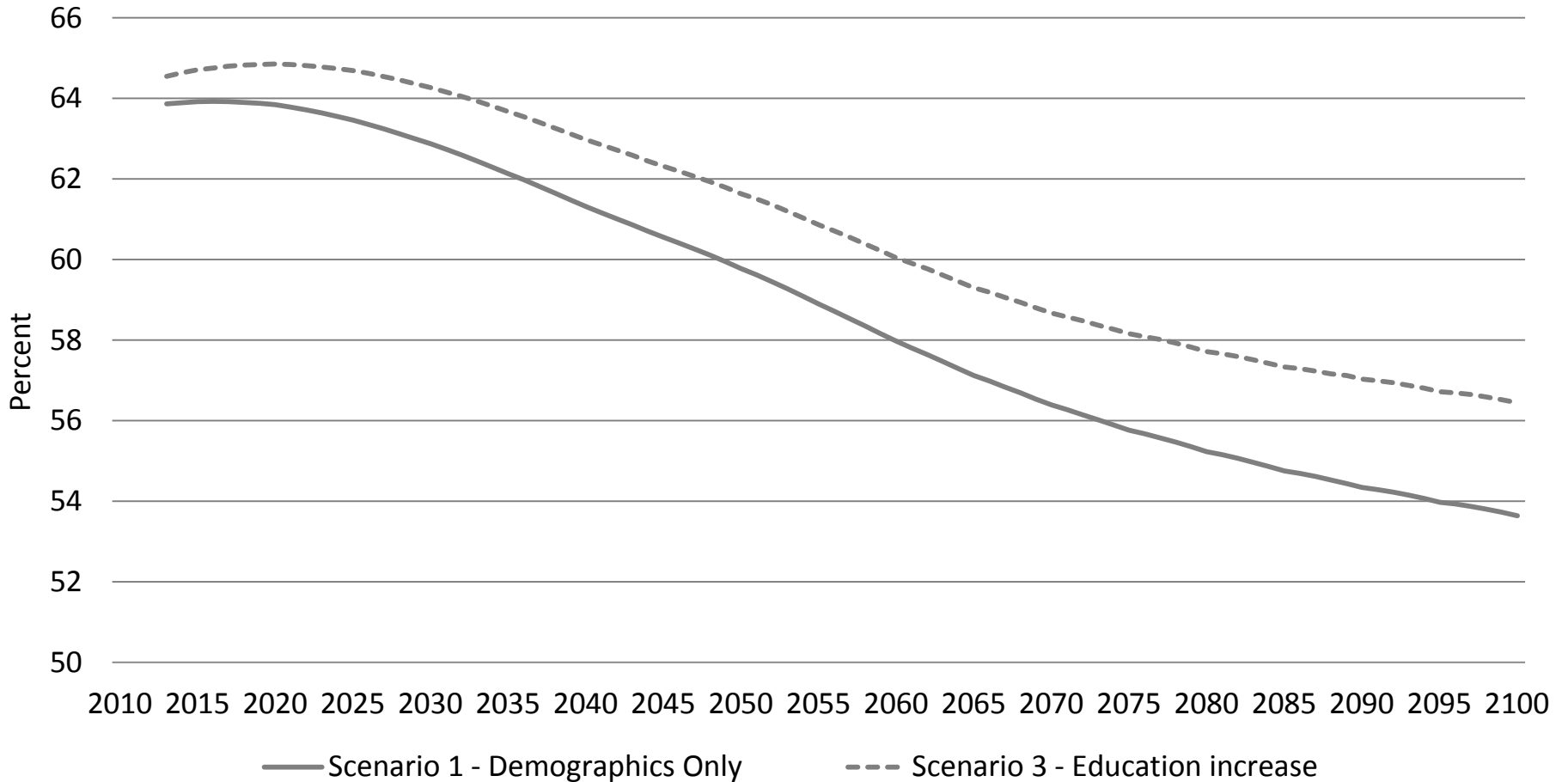
Economic growth forecast in an aging context

- We evaluate the impact of demographic change on economic growth during 2015 and 2100
- Considering the expected changes in both factors of production, as well as progress in TFP
- We simulate four scenarios using different assumptions about human capital's contribution and TFP evolution

Four scenarios

Scenario	Labor force	TFP Contribution to the growth
1	Demographic projection of the labor force	Proportional (33% of the total variation of GDP)
2		Exogenous (1.5%)
3	Demographic projection of labor force with higher level of education	Proportional (33% of the total variation of GDP)
4		Exogenous (1.5%)

Under either scenario, the LFPR would decrease



Source: Our own elaboration based on household surveys and Population Division, United Nation

Estimation of the physical capital endowment contribution

- The estimation of the stock of capital is endogenous to GDP
- The estimation is based on the estimation of the marginal propensity to save
- Marginal propensity to save is negative related with age (*support ratio*) and positive related with growth of the GDP per capita

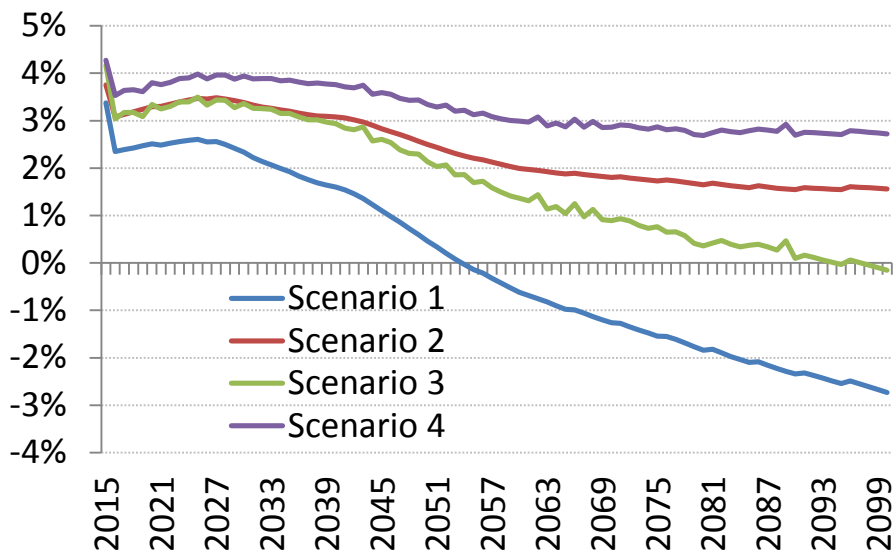
$$K_t = K_{t-1} \cdot \delta + \left[1 - \left(\frac{C_t}{Y_t} - \overline{\Delta y}_t \cdot \varepsilon \right) \right] \cdot Y_t + S_t^f$$

Depreciation rate

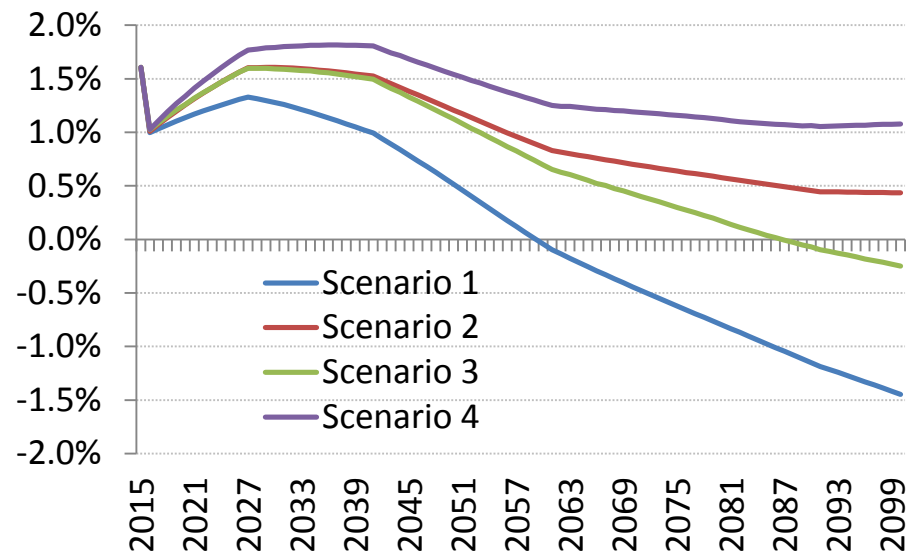
Marginal propensity
to consume

Marginal propensity
to consume elasticity

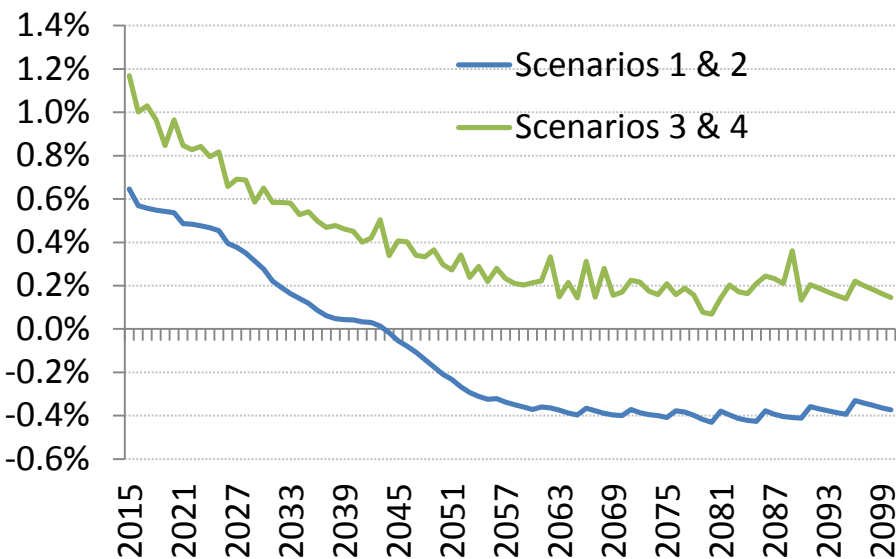
GDP growth



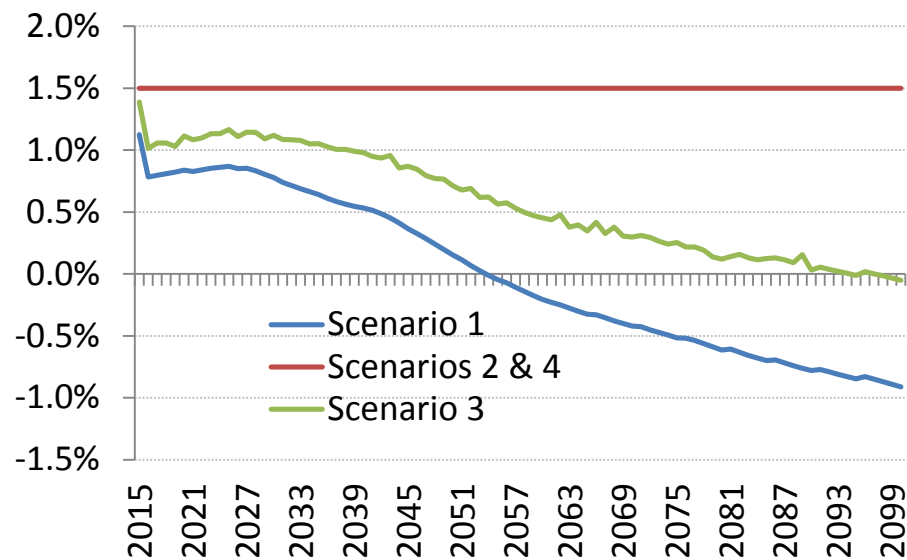
Physical capital contribution



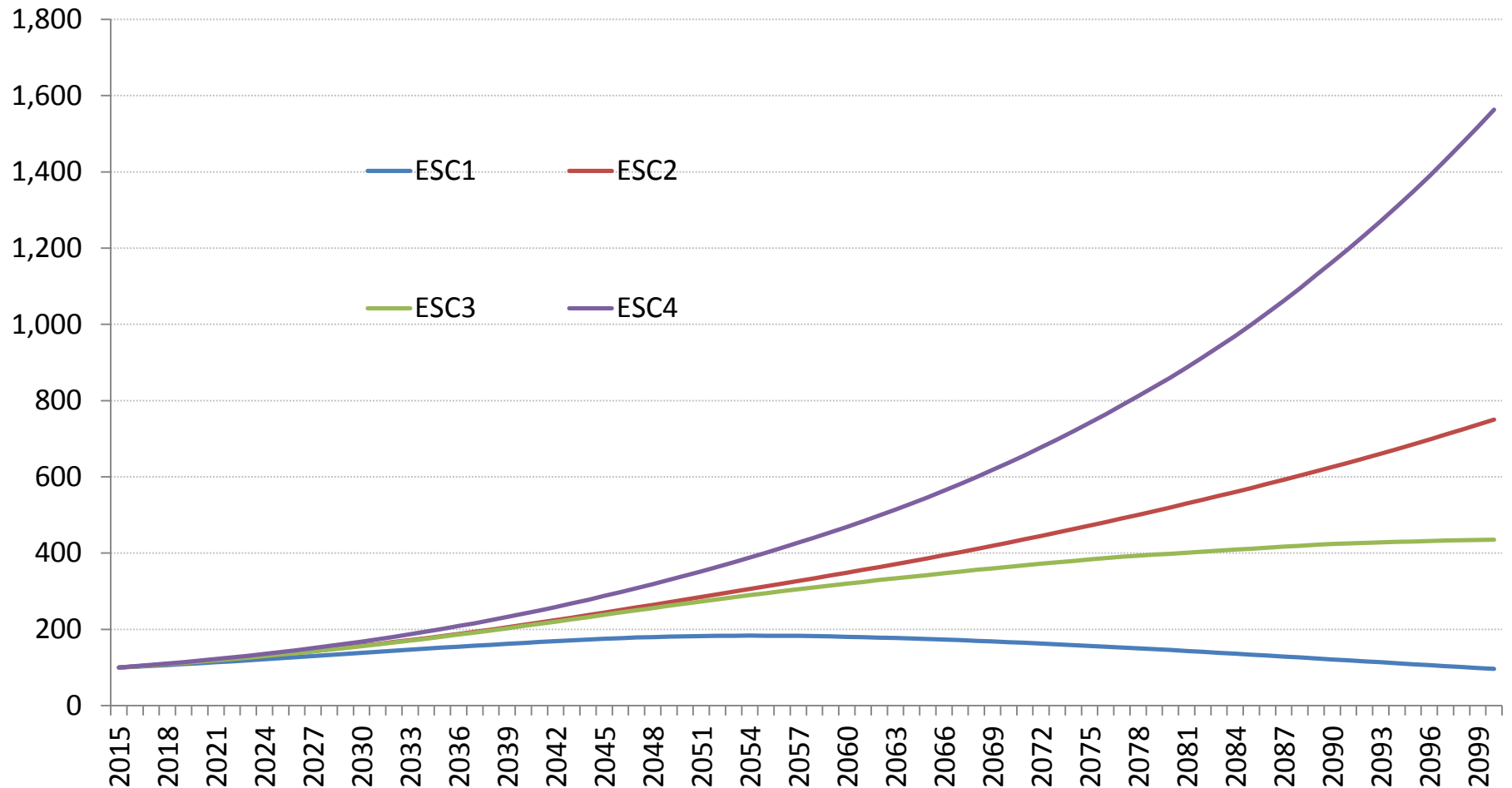
Human capital contribution



TFP contribution



In an aging context, the GDP per capita evolution is critical. If TFP grows fast enough, GDP per capita may grow even if the labor force is declining.



Source of economic growth, long term

1. Labor force growth (women and the elderly)
2. Per Capita Capital Stock (through saving incentives)
3. Human Capital Investment (education system)
4. Investment in R&D as a way to generate and adopt new technology (policies oriented to promotion)

There are three policy issues to promote long-term growth

1. Promote labor participation, particularly among women and older adults
2. Increase human capital, expanding the coverage and quality of education, and physical capital, increasing domestic savings
3. Promote productivity gains through innovation and adoption of new technologies.



DIRECTIONS IN DEVELOPMENT
Human Development

Demographic Change in Uruguay

Economic Opportunities and Challenges

Rafael Rofman, Verónica Amarante, and Ignacio Apella,
Editors



Thank you!

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