

*Global Conference on
Prosperity, Equality and Sustainability:
Perspectives and Policies for a Better World*
1-3 June 2016: New Delhi (India)

**DEMOGRAPHIC TRANSITION, PUBLIC EXPENDITURE
ON EDUCATION AND ECONOMIC GROWTH: NEW
MACROECONOMIC EVIDENCE FROM INDIA**

M.R. Narayana
Centre for Economic Studies and Policy
Institute for Social and Economic Change
Bengaluru 560072, India

Thematic Session 2.2
Education for Capability Expansion
2 June 2016

Background description

Figure 1: Age structure transition, India, 1961 - 2100

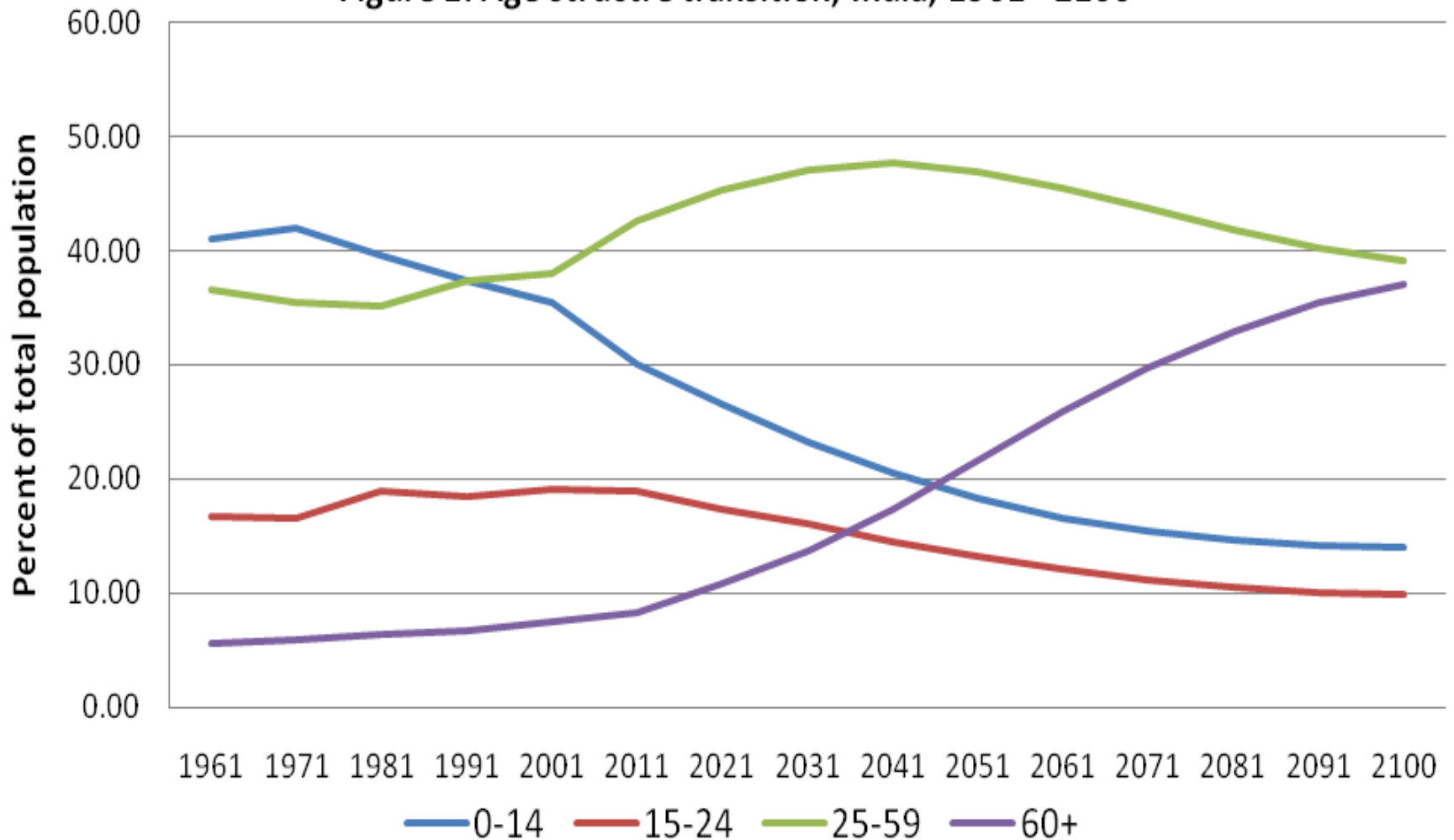
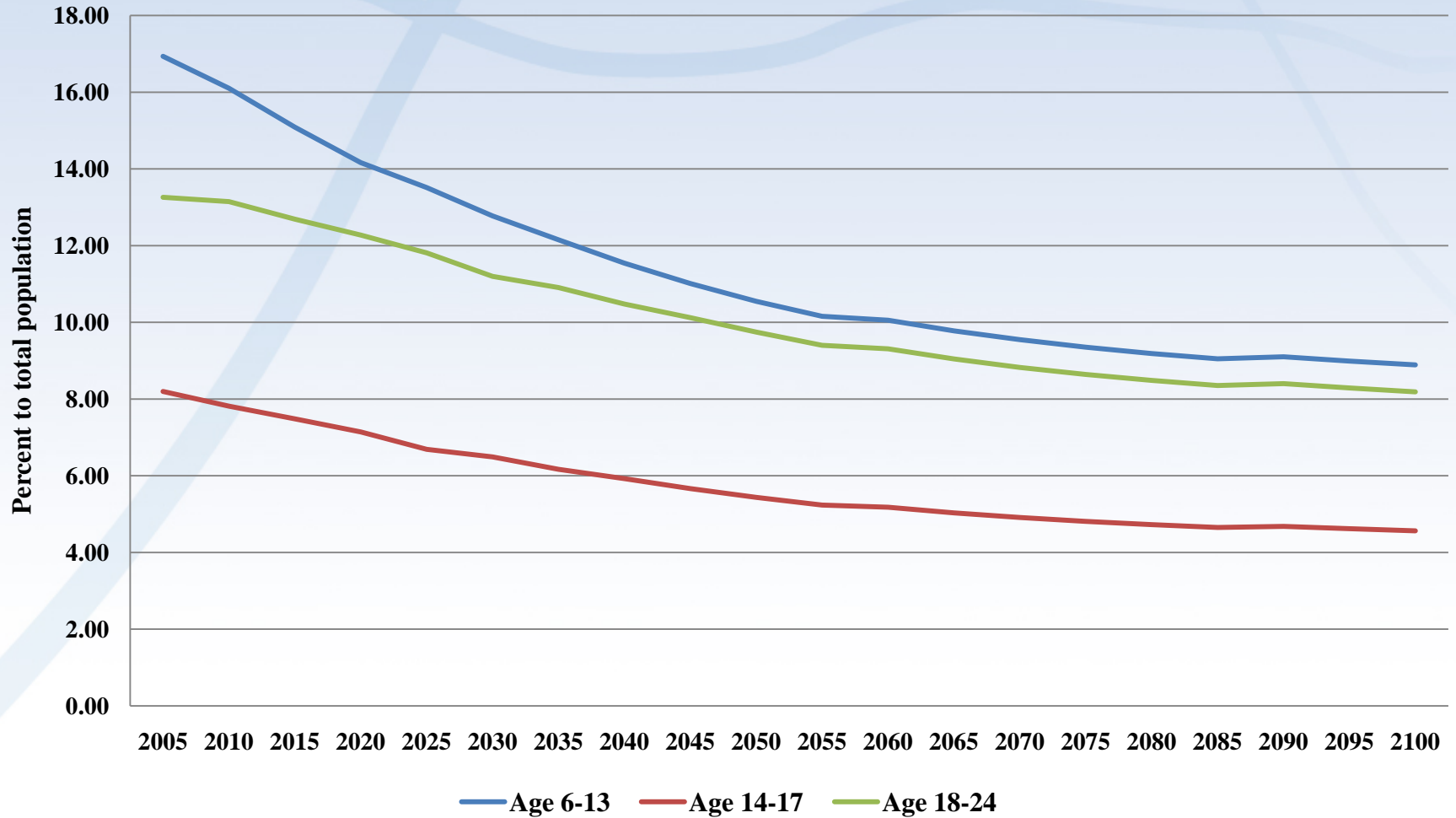


Figure 2: Share of school and college going population in total population, India, 2005-2100



Focus of the paper

- Empirical linkages between demographic transition (through age structure transition), public spending/expenditure on education and economic growth – This linkage is explained and predicted by answering the following research questions
 - How does age structure transition impact on public spending on education? What is the nature and magnitude of this impact by levels of education?
 - Will age structure transition result in savings of public spending in elementary education? If so, can those savings be new and innovative instruments of financing increasing investment requirements for secondary and higher education?
 - What are the growth effects of public education spending through human capital formation and accumulation?
- Plausible answers to these questions are essential to offer empirical evidence on how public educational spending responds to demographic changes and draw implications for economic growth through human capital formation and accumulation.

Methodology

Age profile of public education expenditure

- **National Transfer Accounts (NTA)** is the key methodology - Developed by Professor Ronald Lee (University of California at Berkeley) and Professor Andrew Mason (University of Hawaii at Manoa)
- **NTA** - Introduces age into National Income and Product Accounting - **NTA's (Flow Account)** for individual at age i

$$Y_{L,i} + Y_{A,i} + (T_{f,i}^+ + T_{g,i}^+) = (C_{f,i} + C_{g,i}) + S_i + (T_{f,i}^- + T_{g,i}^-) \quad (1)$$

- This introduction gives a macroeconomic framework for measurement of aggregate level of reallocation of resources from one age group (e.g. working age) to other age groups (e.g. young and elderly), because consumption and production of individuals differ by age.
- Public education consumption is included in the public sector's consumption inflows in (1). The public education consumption profile measures the age-specific public education consumption.

Methodology

Public education expenditure forecast

- **Public education forecasting model** – long run impact of age structure transition on public education expenditure by levels of education is quantified - Focuses on forecasting of aggregate public education expenditure and GDP

- Aggregate public expenditure in year t

$$E(t) = \sum \rho E(x, t_0) P(x, t) \quad (2)$$

- Aggregate labour income in year t

$$Y(t) = \sum \rho L(x, t_0) P(x, t) \quad (3)$$

- GDP in year t

$$GDP(t) = [GDP(t_0)/Y(t_0)].Y(t) \quad (4)$$

GDP forecast is required to determine the share of forecast public education expenditure over the period 2005 to 2050

Methodology

NTA-based growth model

National income per capita

$$Y(t)/N(t) = \{Y(t)/L(t)\} \{L(t)/N(t)\} \quad (5)$$

In terms of growth rate:

$$g[Y(t)/N(t)] = g[Y(t)/L(t)] + g[L(t)] - g[N(t)] \quad (6)$$

Where

$L(t) = \sum \gamma(a)P(a,t)$ = effective number of producers

$N(t) = \sum \phi(a)P(a,t)$ = effective number of consumers

$[L(t)/N(t)]$ is called the **economic support ratio (ESR)** or ratio of effective producers to effective consumers of goods and services.

Age structure transition leads to large shifts in the support ratio and interacts with labour productivity to determine the economic growth. *Given productivity, the period during which growth of support ratio leads to increase in the economic growth (or growth of national income per effective consumer) is called First Demographic Dividend (FDD).*

NTA-based growth model (Continued)

A change in non-consumption revenue expenditure on education (or, in brief, non-consumption public education expenditure) is a form of human capital investment within the government consumption expenditure and may contribute to production through changes in $L(t)$ and $[(Y(t)/L(t))]$. We measure these production effects by modifying equation (8) as follows.

$$g[Y(t)/N(t)]^* = g\{Y(t)/L(t)\}^* + g[\{L(t)+\omega(t)\}/N(t)] \quad (9)$$

where $\omega(t)$ is total number of effective producers from a marginal increase in public non-consumption education expenditure, and $g\{Y(t)/L(t)\}^* = g(Y(t_0)/L(t_0) + \eta'(t))$; where $g[Y(t_0)/L(t_0)]$ is the growth rate of labour productivity in the base year and $\eta'(t) \approx g[Y(t_0)/L(t_0)]/g[\omega(t)]$, is a change in non-consumption education expenditure elasticity of labour productivity.

Thus, the growth rate of national income per effective consumer in (9) is decomposed into modified growth rate of productivity and growth rate of modified ESR. We use equation (9) as a framework to evaluate the impact of age structure transition on public education spending and the impact of this spending on economic growth through the FDD.

Variables and data

- Throughout, public expenditure on education refers to the budgetary expenditure of the Education and other departments of the Union and State governments
- For lack of time series data for complete construction of (1), age profile of public education consumption $[E(x,t_0)]$ and labour income $[L(x,t_0)]$ is calculated for the benchmark year 2004-05 and all analyses are based on the constancy of these profiles.
- Details of variable construction and data sources are given **Table 1** of the paper.

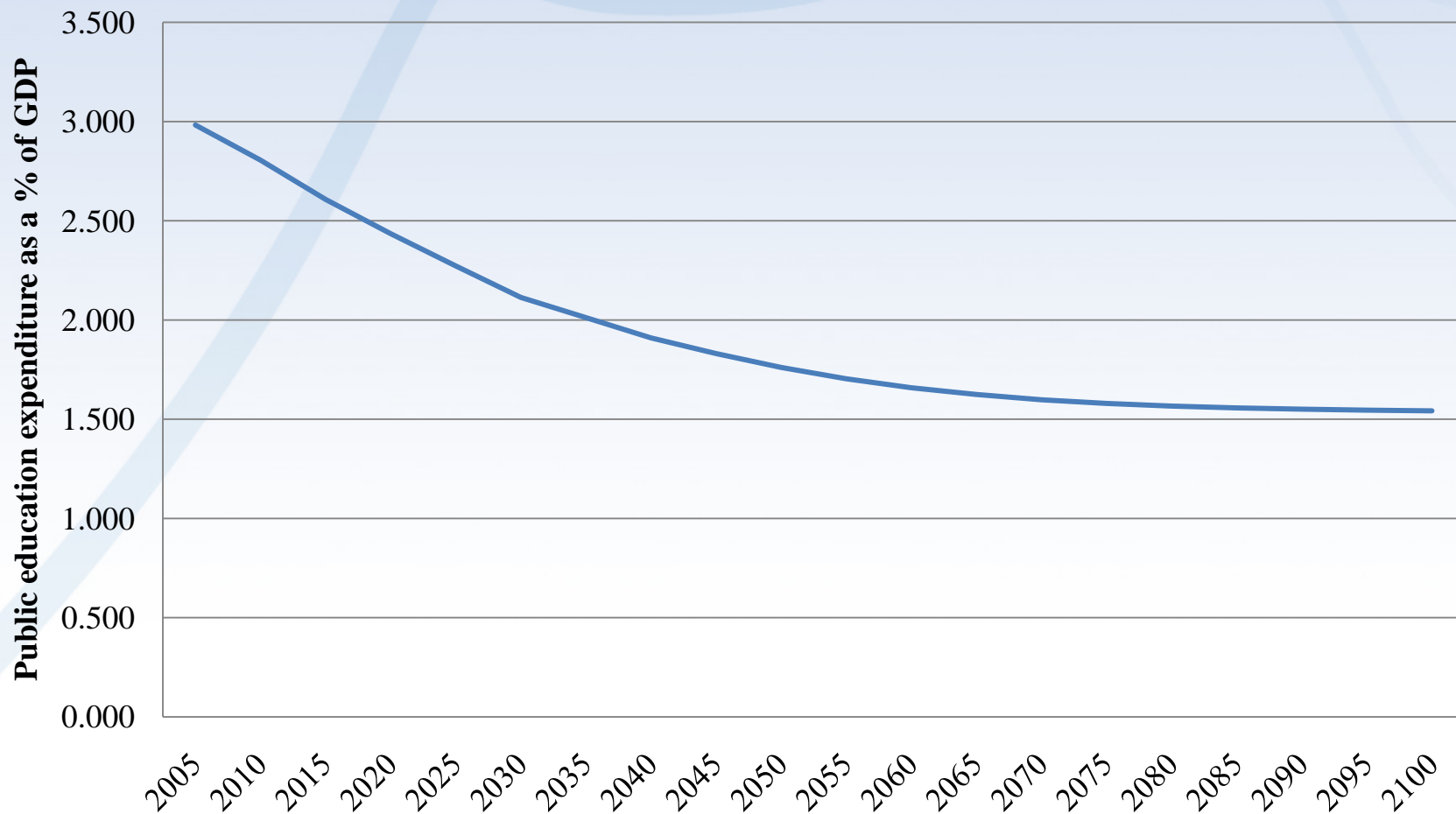
Forecasting result-1

Figure 3: Per capita public education expenditure by age, India, 2004-05



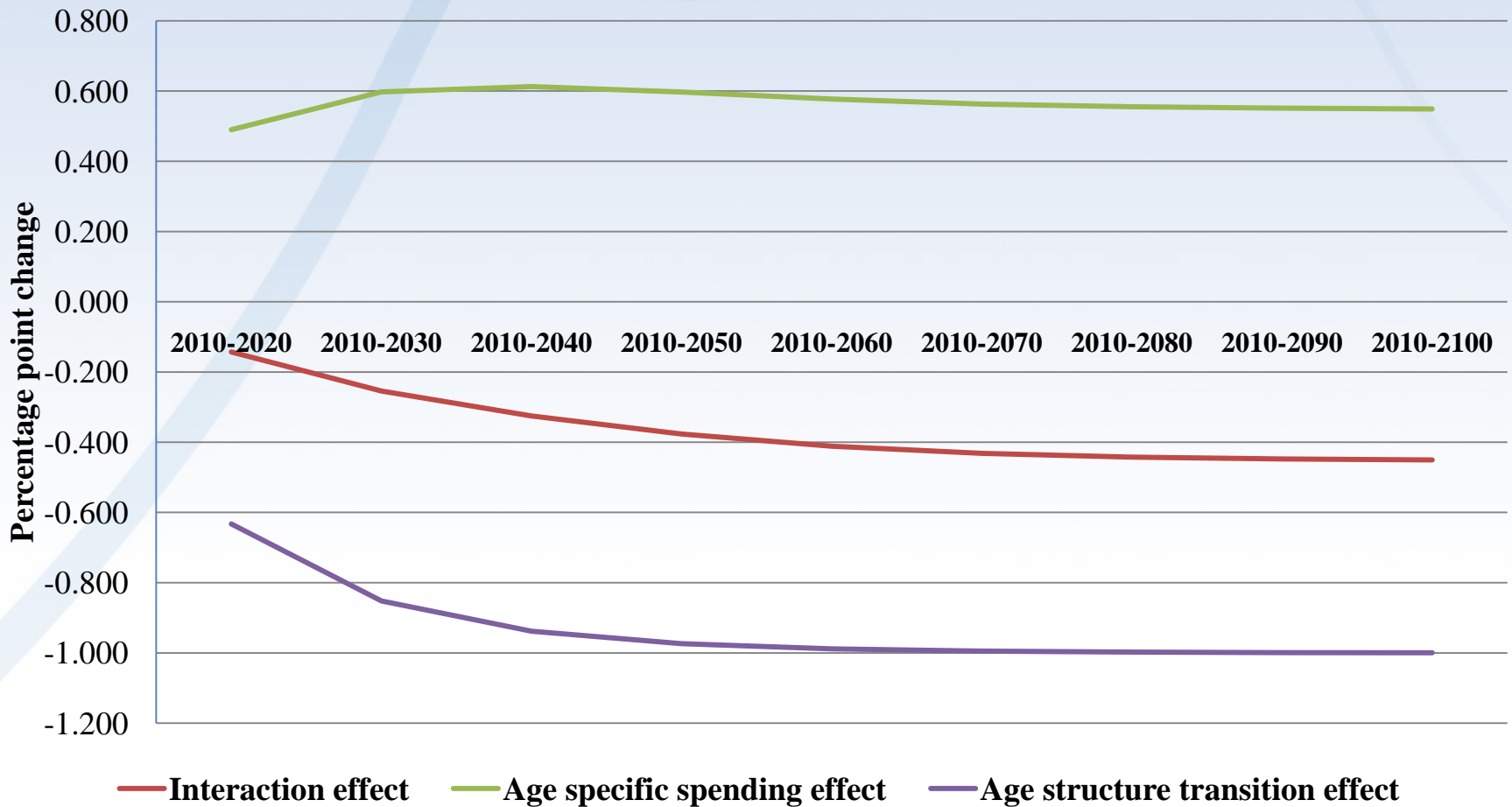
Forecasting result-2

Figure 4: Public education expenditure as a percentage of GDP, India, 2005-2100



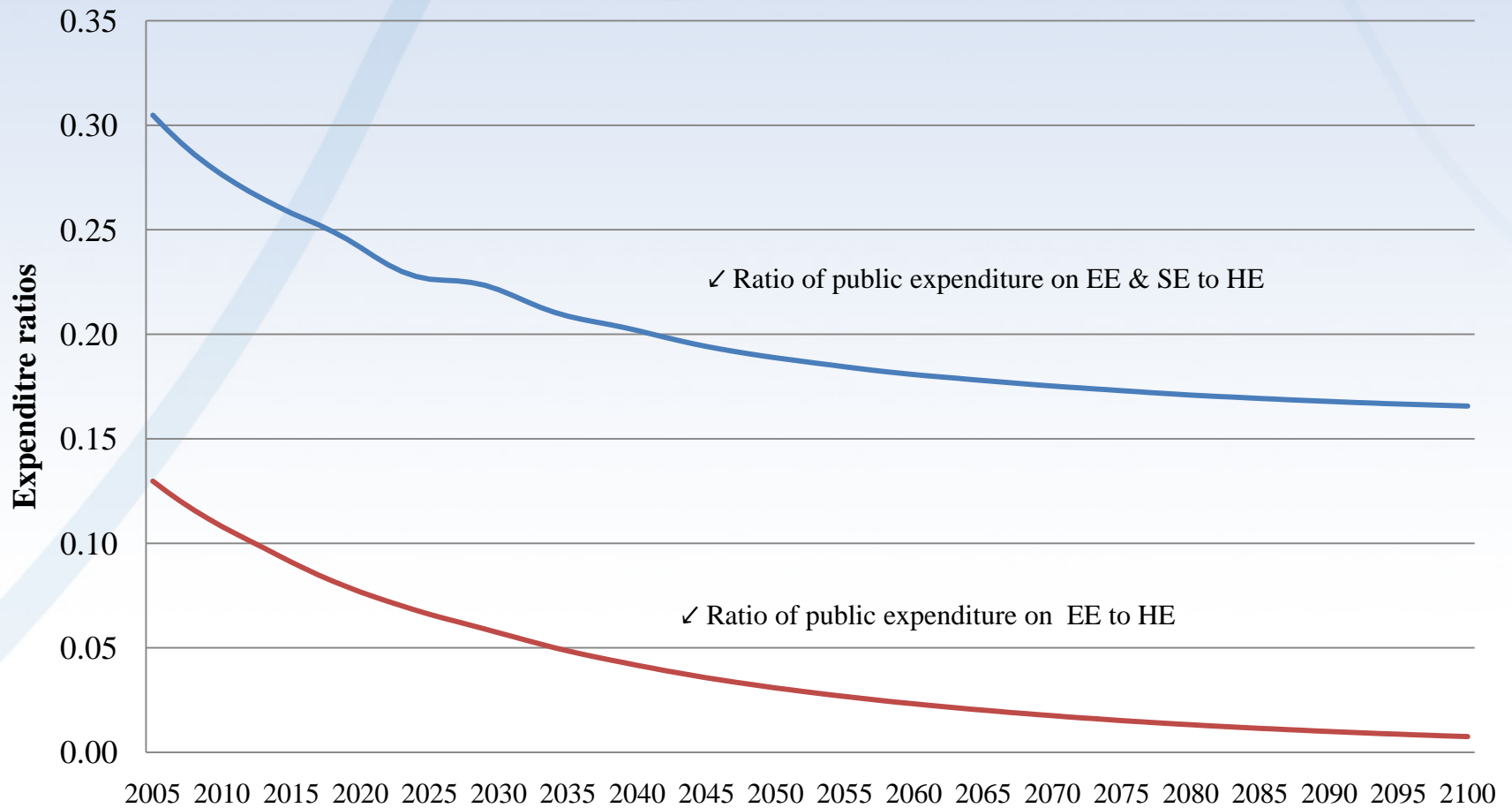
Forecasting result-3

Figure 4: Sources of change in education expenditure as a percentage of GDP, India, 2010-2100



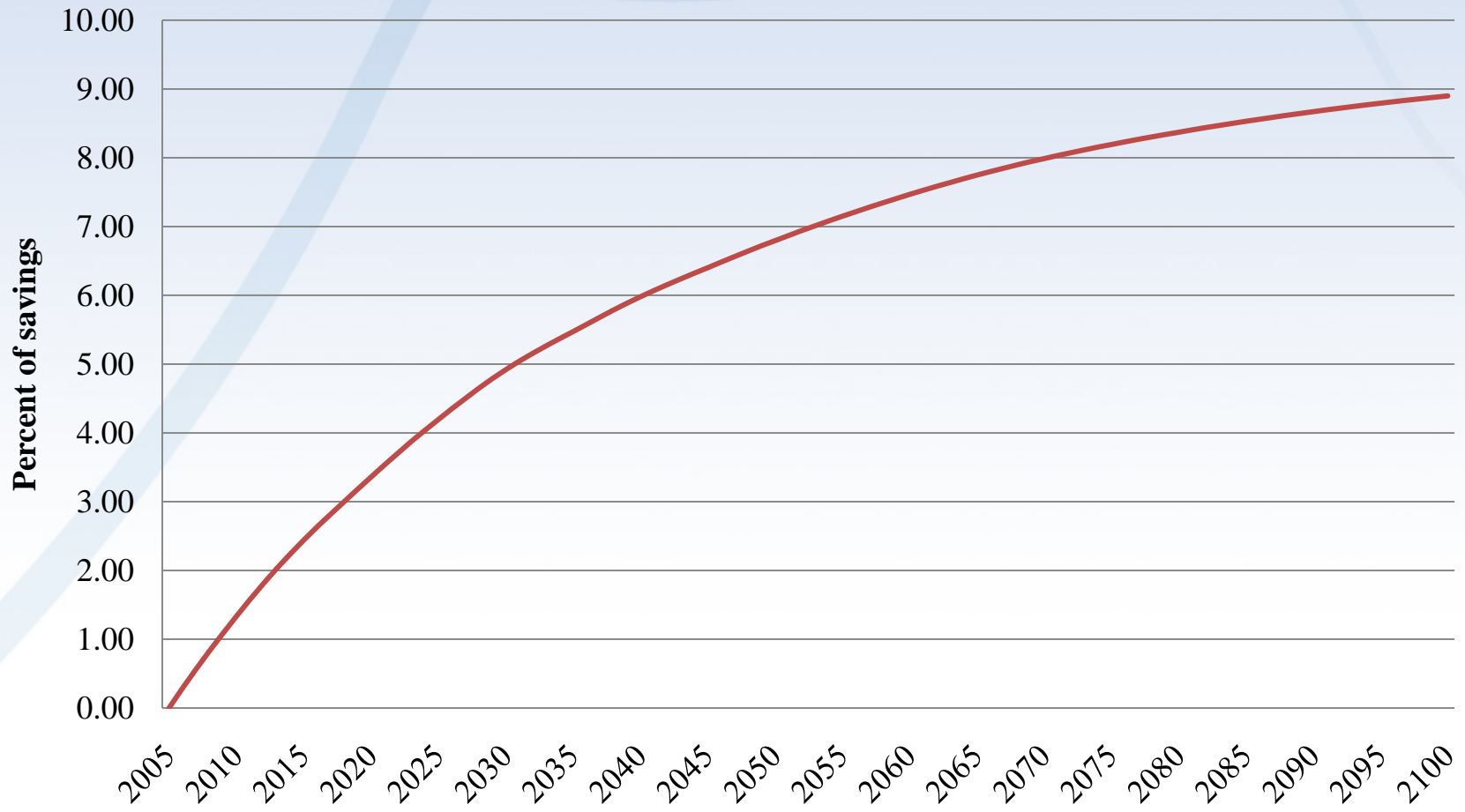
Forecasting result-4

Figure 6: Reallocation of public expenditure on education, India, 2005-2100



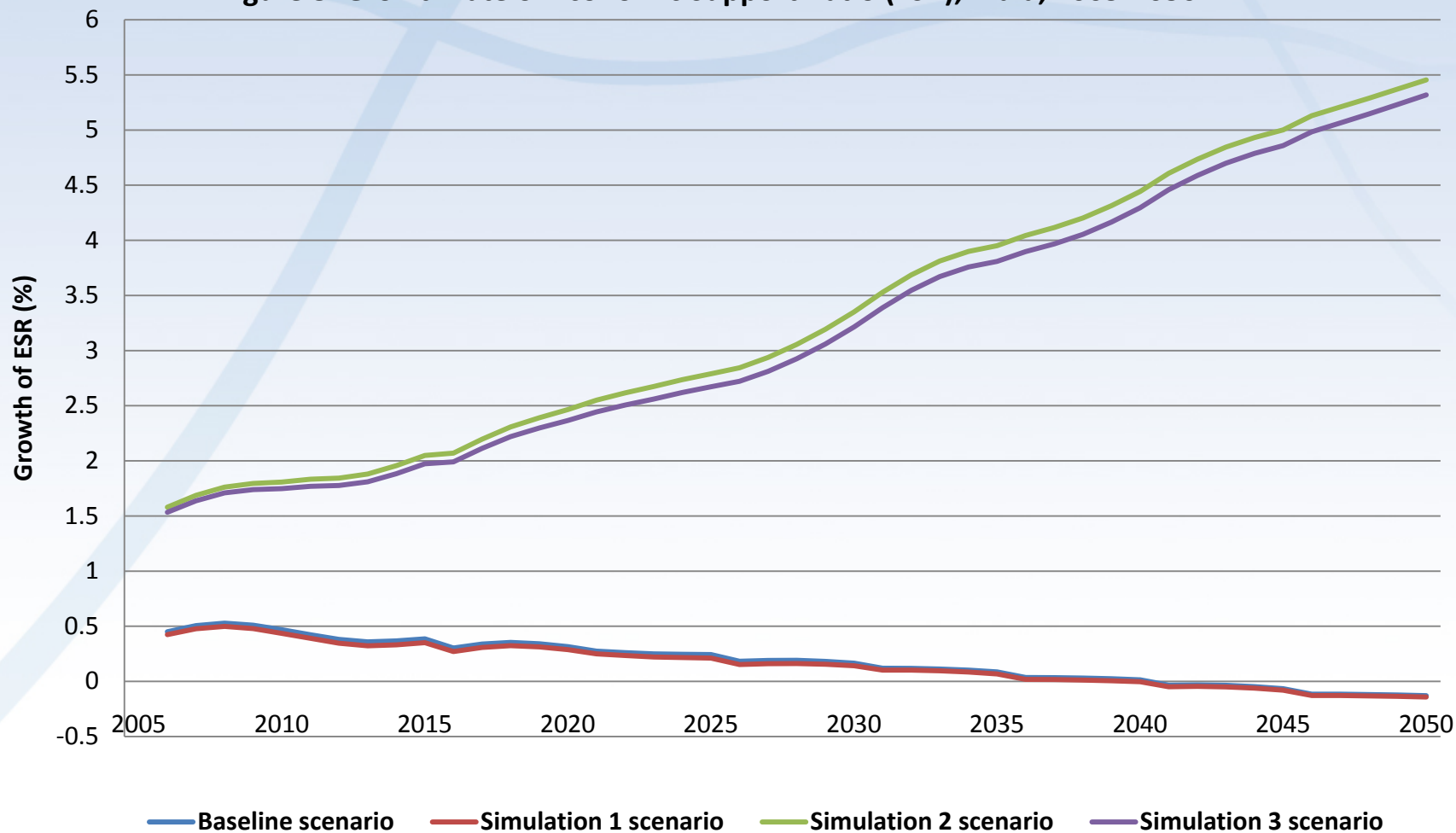
Forecasting result-5

Figure 7: Savings from reallocation of public education expenditure, India, 2005-2100



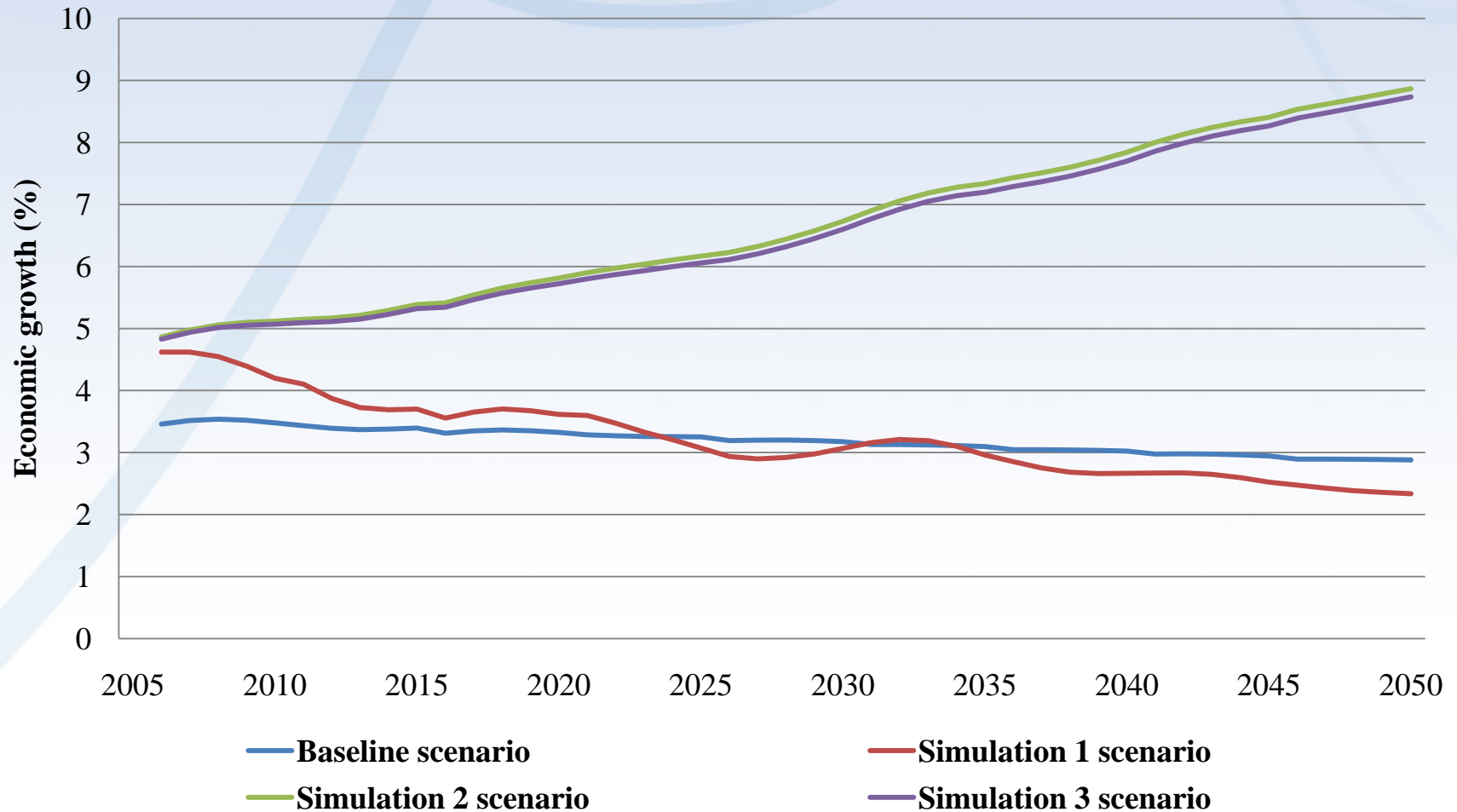
Results of growth effects -1

Figure 8: Growth rate of Economic Support Ratio (ESR), India, 2005-2050



Results of growth effects -2

Figure 9: Growth effects of public education expenditure, India, 2005-2050



Major conclusions and implications

- Age structure transition impacts on public education expenditure because of a long term decline in young and youth population reduces the public expenditure on pre-secondary education.
- Age structure transition is a major source for the decline in public expenditure on education as compared to changes in per capita spending levels and interaction effects between age structure transition and changes in spending levels.
- Thus, age structure effects are important for design of long term public education expenditure policies on size and pattern of spending by levels of education in India.

Major conclusions and implications

- Using this approach in the NTA framework, growth effects of public education spending operate through the growth rate of economic support ratio, growth rate of labour productivity and expenditure elasticity of labour productivity.
- Growth effects can be positive, higher and longer through the demographic dividend, if more public education spending on human capital formation is allocated on secondary and higher education in India and the growth of those spending is linked to growth rate of nominal productivity.
- This approach broadens the scope of determinants of economic growth and useful to identify key policy determinants to promote growth through higher and longer demographic dividend as they are related to public education expenditure policies and programmes.

THANK YOU