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# Growth effects of current public expenditure on education:
# New evidence from India

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**Technical Session B (2 pm – 3.30 pm):**
**Quantity & Quality Tradeoff**
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# Background description (March 2013): Schools and students

- 1.46 million schools up to secondary education (class IX to class XII) with 83 percent belonging to elementary education (class 1 to class VIII); 712 Universities and 36,671 colleges in higher (post-secondary) education and 11,445 stand-alone institutions (e.g., diploma-level institutions).

- Total enrolment of students in elementary, secondary and higher education institutions was 280 million, with 70 percent of students (196.30 million) in elementary education, 19 percent of students (54.10 million) in secondary education, 11 percent of students ( 9.60 million) in higher education.

- Gross Enrolment Ratios varied across the levels of education: 101 percent for elementary education, 56 percent for secondary education, and 18 percent for higher education.

- 76 percent of elementary schools, 37 percent of secondary schools, and 80 percent of universities are in the public sector. Thus, public spending is important for education in general and for elementary and higher education in particular.

- India's public spending on education is less than 5% of GDP. India's ranking in UNDP-HDI 2015 was 130/188 and WEF-HCI 2014 was 78/122. Thus, there is a clear cause to argue for more public education spending in India.

# Background description



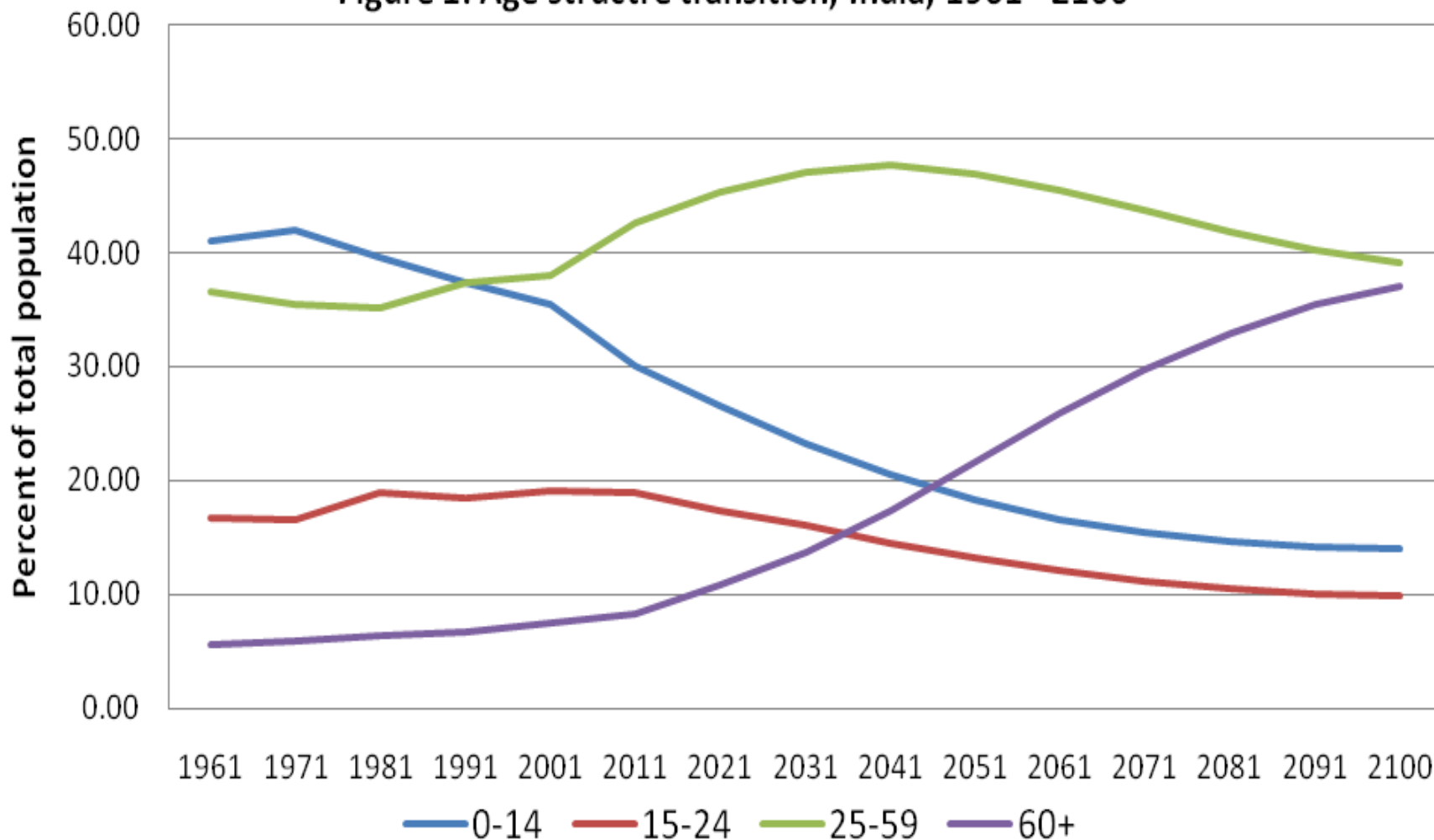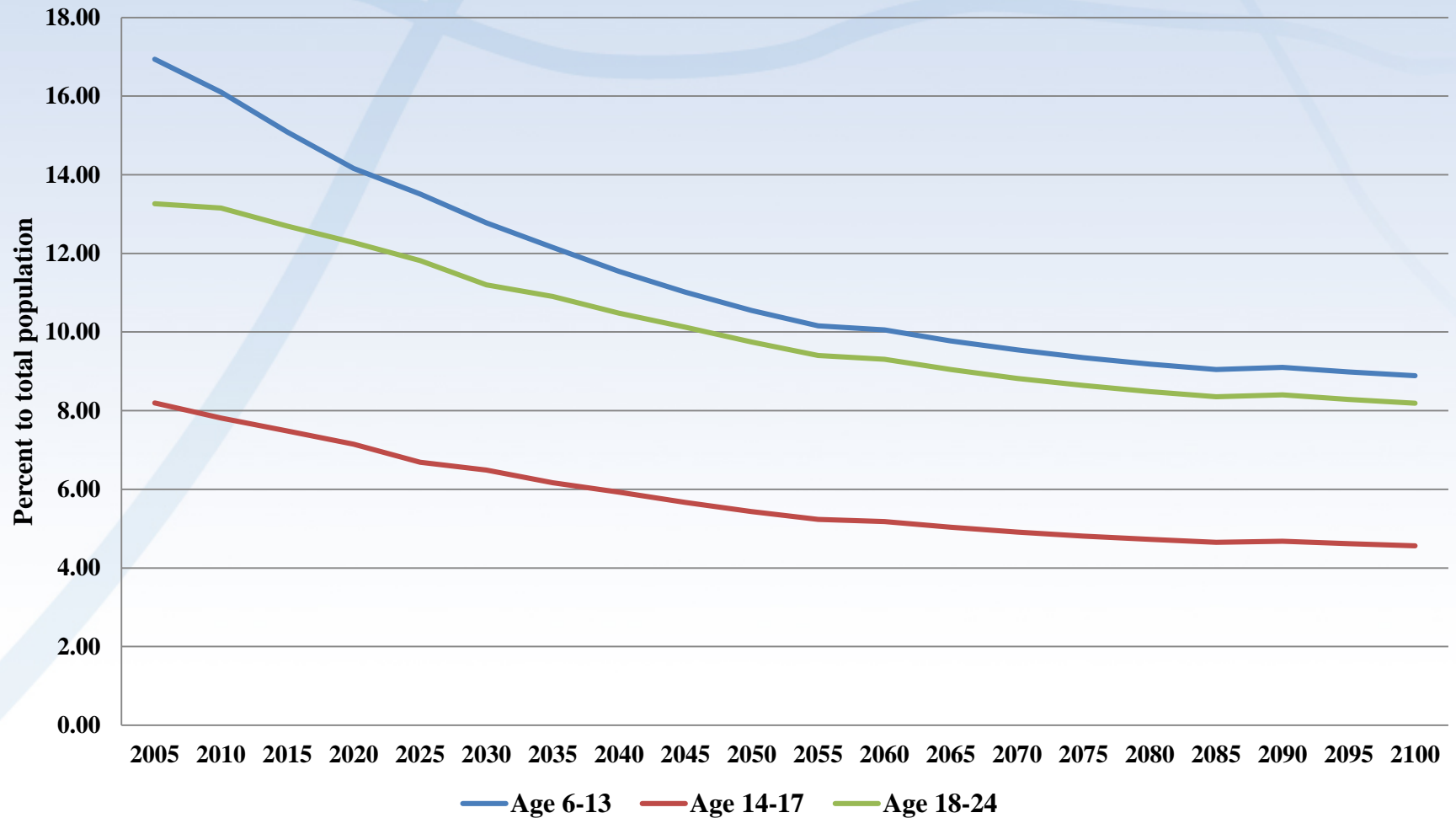Figure 1: Age structre transition, India, 1961 - 2100

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

# Focus of the presentation

- 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 affect public spending on education? What is the nature and magnitude of this impact by level of education?

  - Will the age-structure transition result in saving of public spending for elementary education? If so, can those savings be new and innovative instruments of financing, allowing an increase in investment 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 education spending responds to demographic changes and draw implications for economic growth through human-capital formation and accumulation.

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# Methodology
# Public education expenditure forecast

- **Tim Miller's 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

$$E(t) = \sum \rho E(x,t_0)P(x,t) \quad (1)$$

- Aggregate labour income in year t

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

- GDP in year t

$$GDP(t) = [GDP(t_0)/Y(t_0)].Y(t) \quad (3)$$

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

# Methodology
## Reallocation of public education expenditure

- We examine the sensitivity of forecast assumptions by considering a counter-factual case in which public expenditure on elementary education would grow at the rate of inflation and that of secondary and higher education would grow at the growth rate of nominal labour productivity.

- This reallocation within the education sector is intended to show how many more resources can be allocated to secondary and higher education than to elementary education.

# Methodology: NTA-based growth model

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 the growth rate of the Economic Support Ratio (ESR) and labour productivity $[(Y(t)/L(t)]$. We measure these production effects by modifying the standard growth equation in NTA-based FDD as follows:

$$g[Y(t)/N(t)]^* = g\{Y(t)/L(t)\}^* + g(ESR)^* \qquad (4)$$

where $g(ESR)^* = g[(L(t)/N(t)] + g[\omega(t)]$ is the modified ESR where $g[(L(t)/N(t)]$ is the standard ESR and $g\{\omega(t)\} = g[\sum E(x,t_0)P(x,t) - \sum c(x,t_0)P(x,t)]$, is growth of producers from a marginal increase in public non-consumption education expenditure

$g\{Y(t)/L(t)\}^* = g(Y(t_0)/L(t_0) + \eta(t)$ is the modified labour productivity, where $g[Y(t_0)/L(t_0)]$ is the growth rate of labour productivity in the base year and $\eta(t) \approx [w(t)/YoYLs(t)]$, is growth of new human capital created by a change in non-consumption education expenditure and expressed in years of average labour income.

We use equation (4) 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.

# Methodology: Growth effects of public education expenditure

- The growth effects are distinguished by four scenarios:

- Baseline scenario: Uses the data in the benchmark year 2004-05 without inclusion of non-consumption public education expenditure and calculates growth effects.

- Simulation 1: Extends the Baseline scenario with inclusion of public non-consumption education expenditure, and calculates growth effects.

- Simulation 2: Extends the Baseline scenario with inclusion of public non-consumption education expenditure, assumes that public education expenditure grows at the nominal growth rate of productivity by using the total education expenditure forecast from Equation (1), and calculates growth effects by using equation (4).

- Simulation 3: Extends the Baseline scenario with inclusion of public non-consumption education expenditure, assumes that public education expenditure for secondary and higher education grows at the nominal growth rate of productivity and that expenditure for elementary education grows at the annual rate of inflation by using the total education expenditure forecast from Equation (1), and calculates growth effects by using equation (4).

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# 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

- Because of the lack of time-series data for complete construction of (1), per capita age profiles of public education consumption $[E(x,t_0)]$ and labour income $[L(x,t_0)]$ are 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 NTA Working Paper#WP-16-1, *Demographic transition, public expenditure on education, and economic growth: New macroeconomic evidence from Ind*ia.
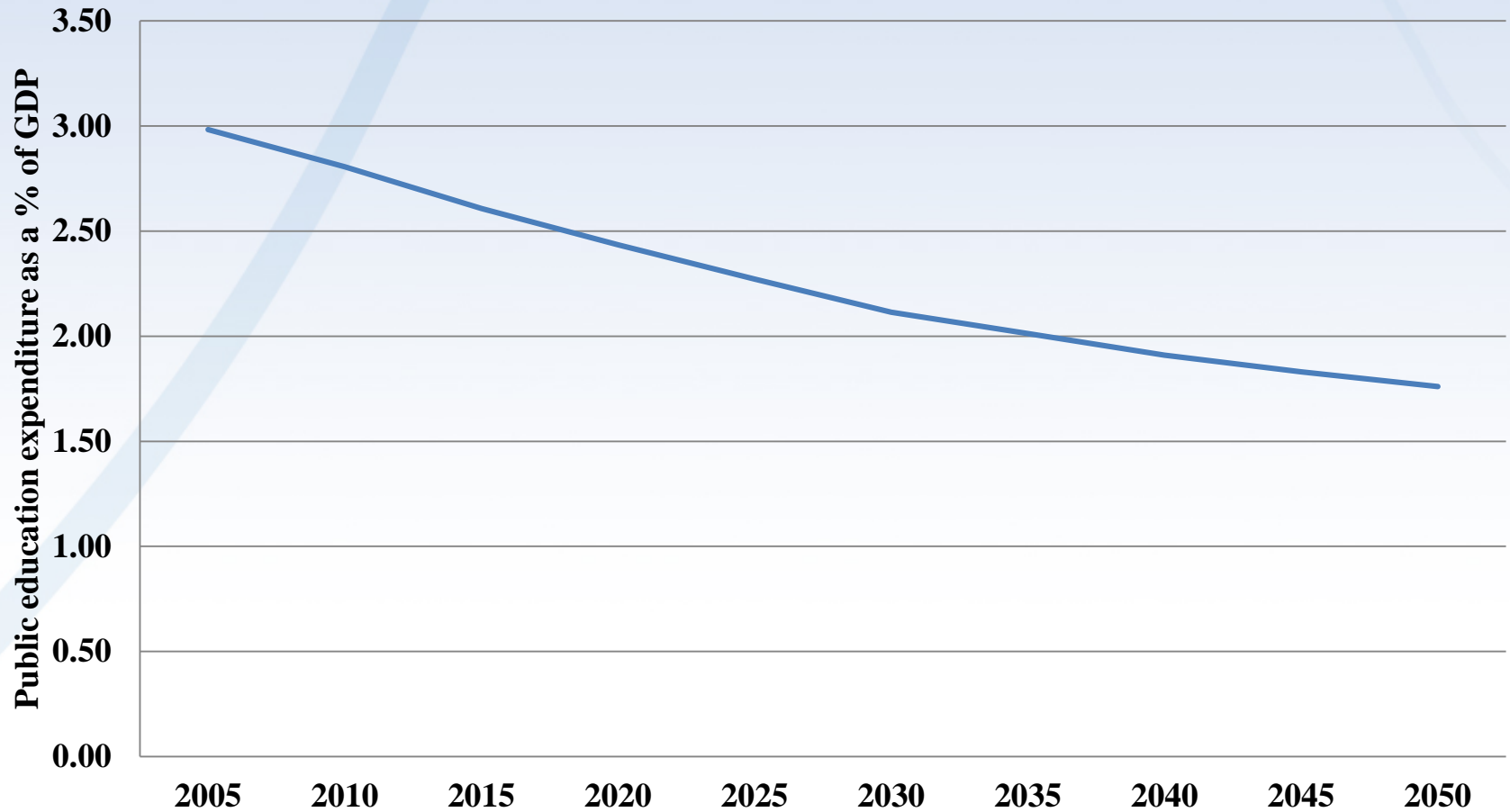
# Forecasting result-1

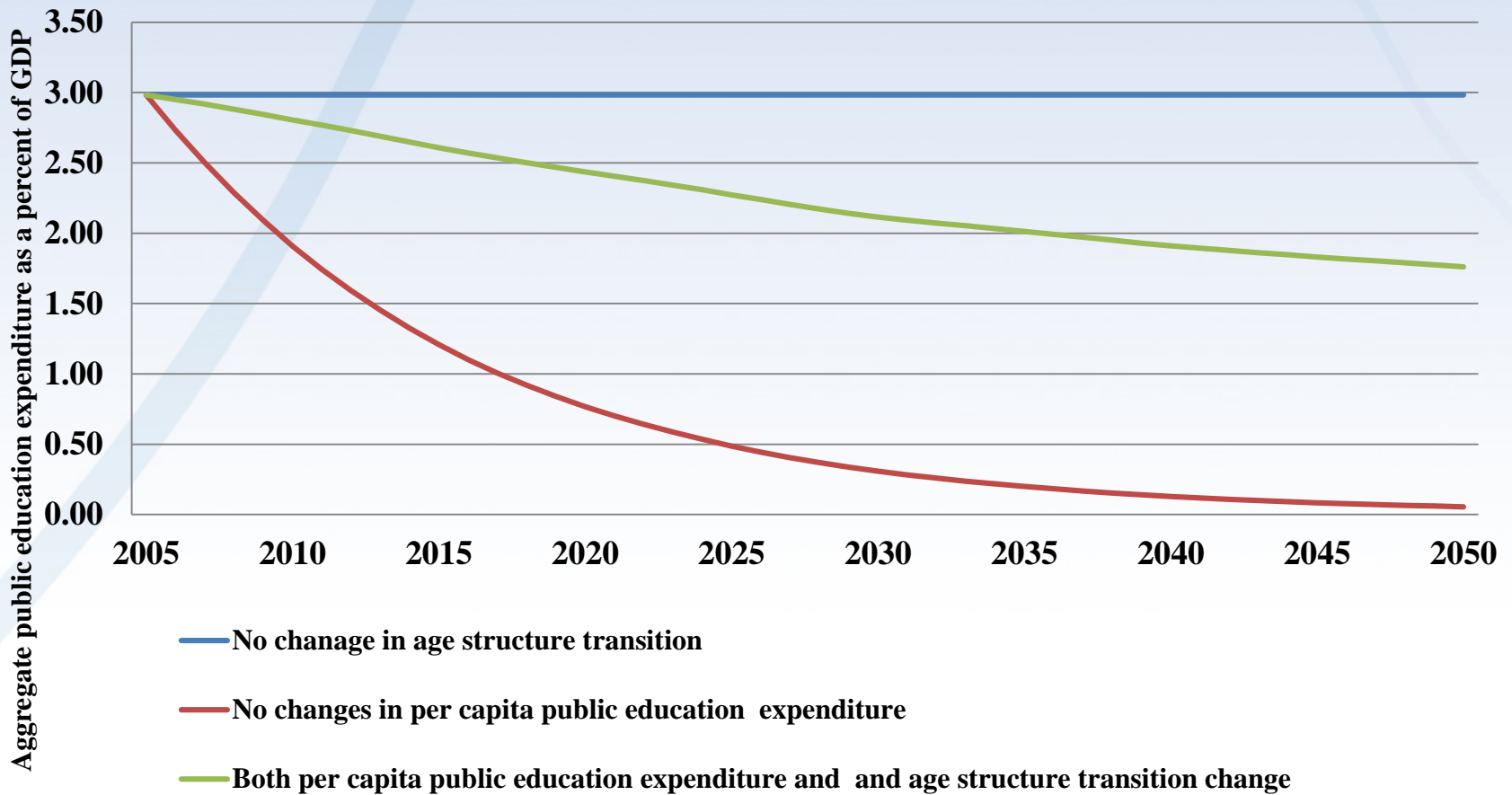**Figure 3: Per capita public education expenditure by age, India, 2004-05**

# Forecasting result-2

**Figure 4: Public education expenditure as a perentage of GDP, India, 2005-2050**
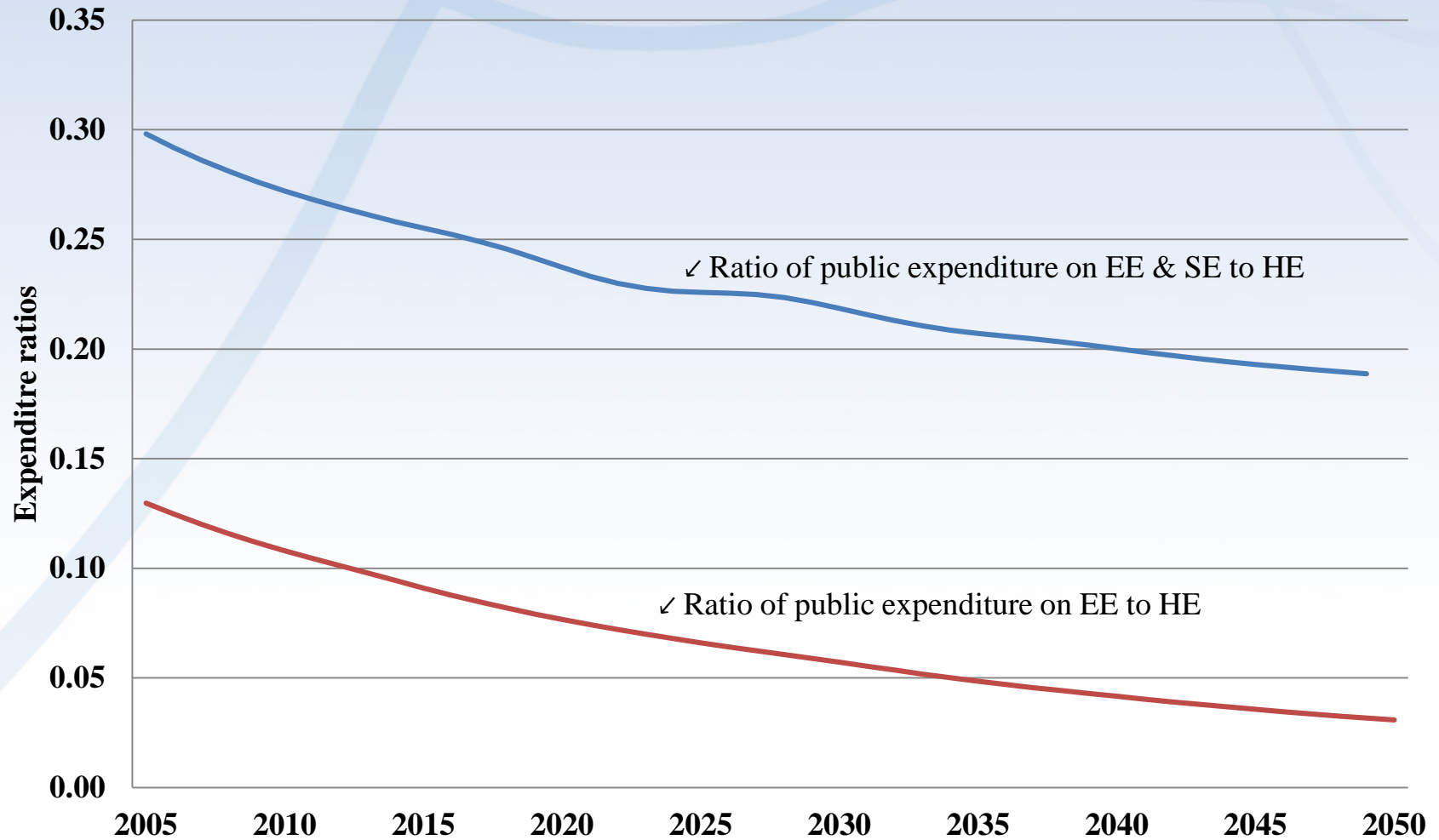
# Forecasting result-3

## Figure 5: Aggregate public education expenditure as a percentage of GDP by sources, India, 2005-2050
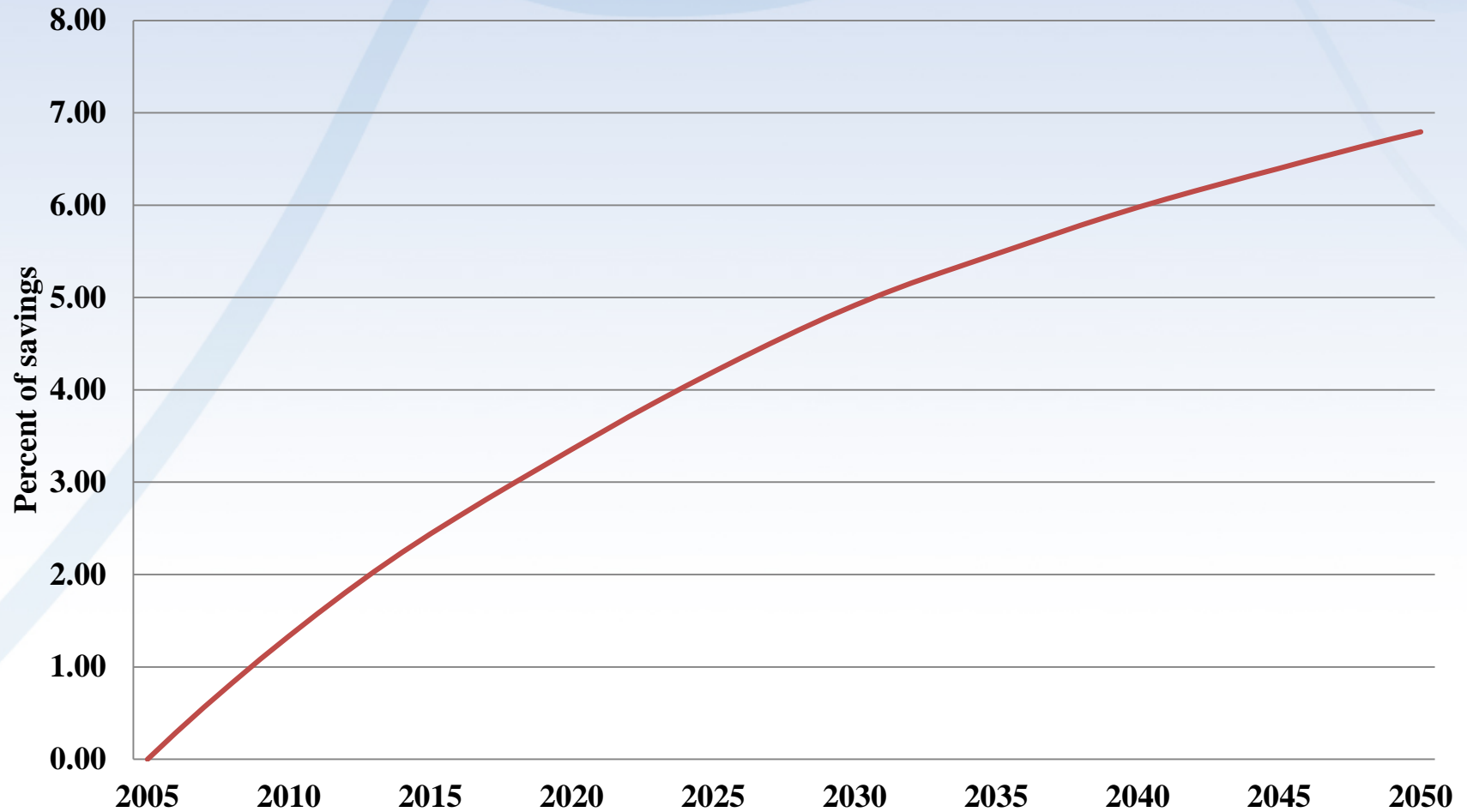


Legend:
- No chanage in age structure transition
- No changes in per capita public education expenditure
- Both per capita public education expenditure and and age structure transition change

# Forecasting result-4

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



✓ Ratio of public expenditure on EE & SE to HE

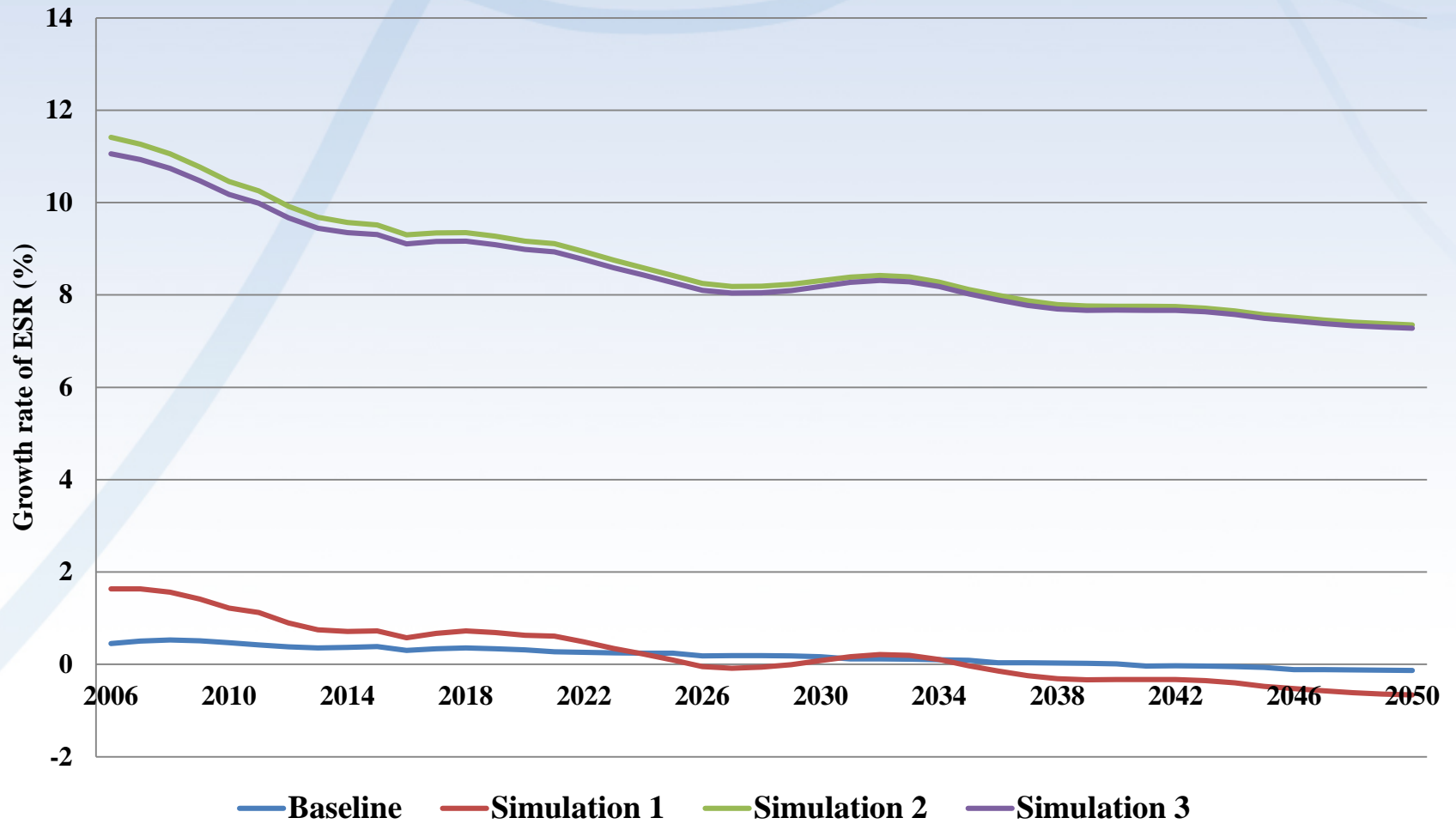✓ Ratio of public expenditure on EE to HE

# Forecasting result-5

**Figure 7: Savings from reallocation of public education expenditure, India, 2005-2050**
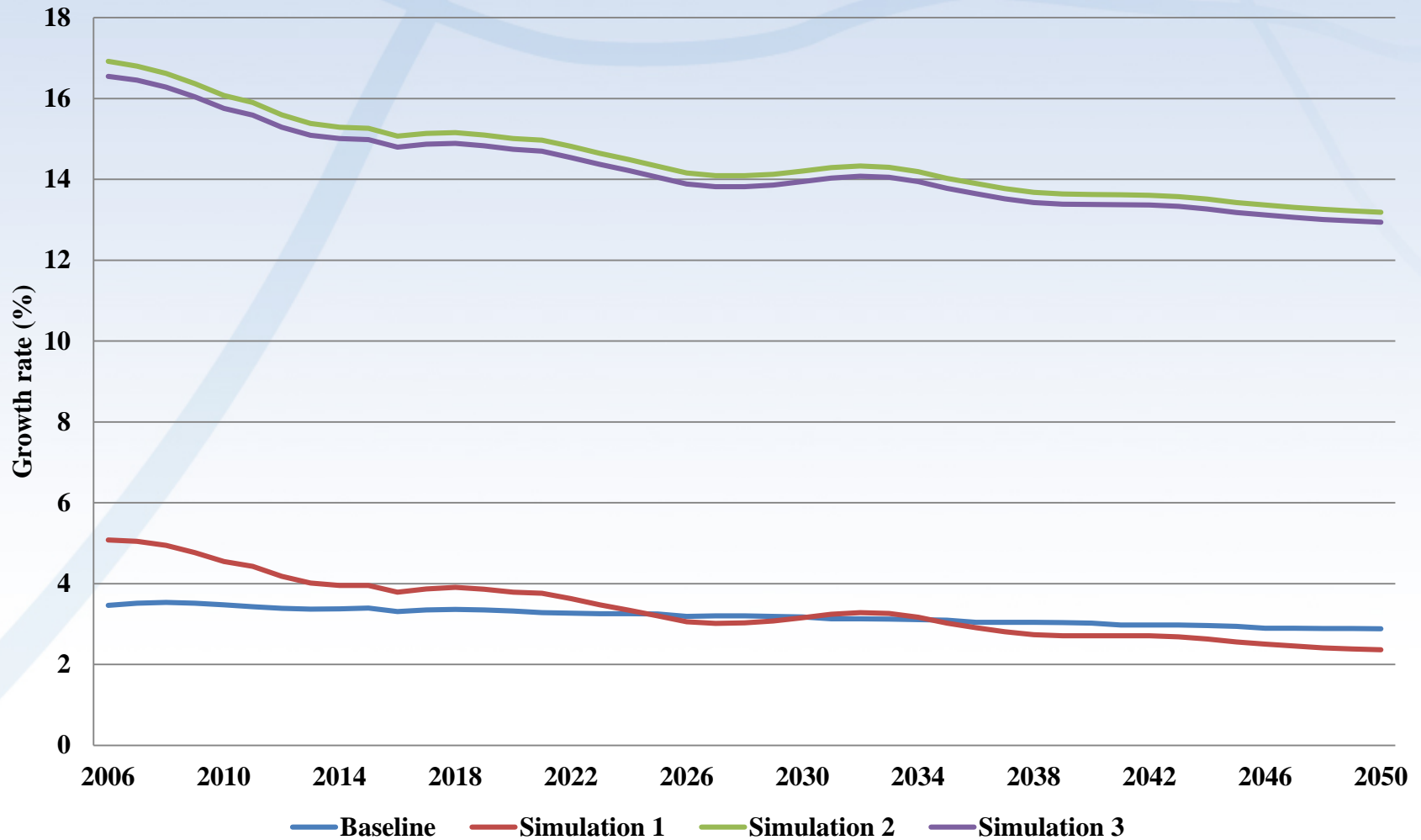
# Results of growth effects -1

**Figure 8: Growth rate of Economic Supprt Ratio (ESR), India, 2006-2050**

# Results of growth effects -2

**Figure 9: Growth effects of public education expenditure, India, 2006-2050**

# Major conclusions and implications

- Age structure transition affects public education expenditure because a long-term decline in the young population reduces public expenditure on pre-secondary education.

- Age structure transition is a major source of 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 the design of long-term public education expenditure policies related to size and pattern of spending by levels of education in India.

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# Major conclusions and implications

- Using this approach with the NTA framework, growth effects of public education spending operate through the growth rate of the 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 to secondary and higher education in India, and the growth of this spending is linked to the growth rate of nominal productivity.

- This approach broadens the scope of determinants of economic growth and is useful for identifying key policy determinants to promote growth through a higher and longer demographic dividend as related to public education expenditure policies.

# THANK YOU