Regional Meeting on National Transfer Accounts in Asia
3-4 December 2015, Amari Watergate Bangkok, Bangkok, Thailand

Use of NTA data for macroeconomic policy advocacy for India

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4 December 2015

Figure 1: India's age structure transition, 1961 to 2100

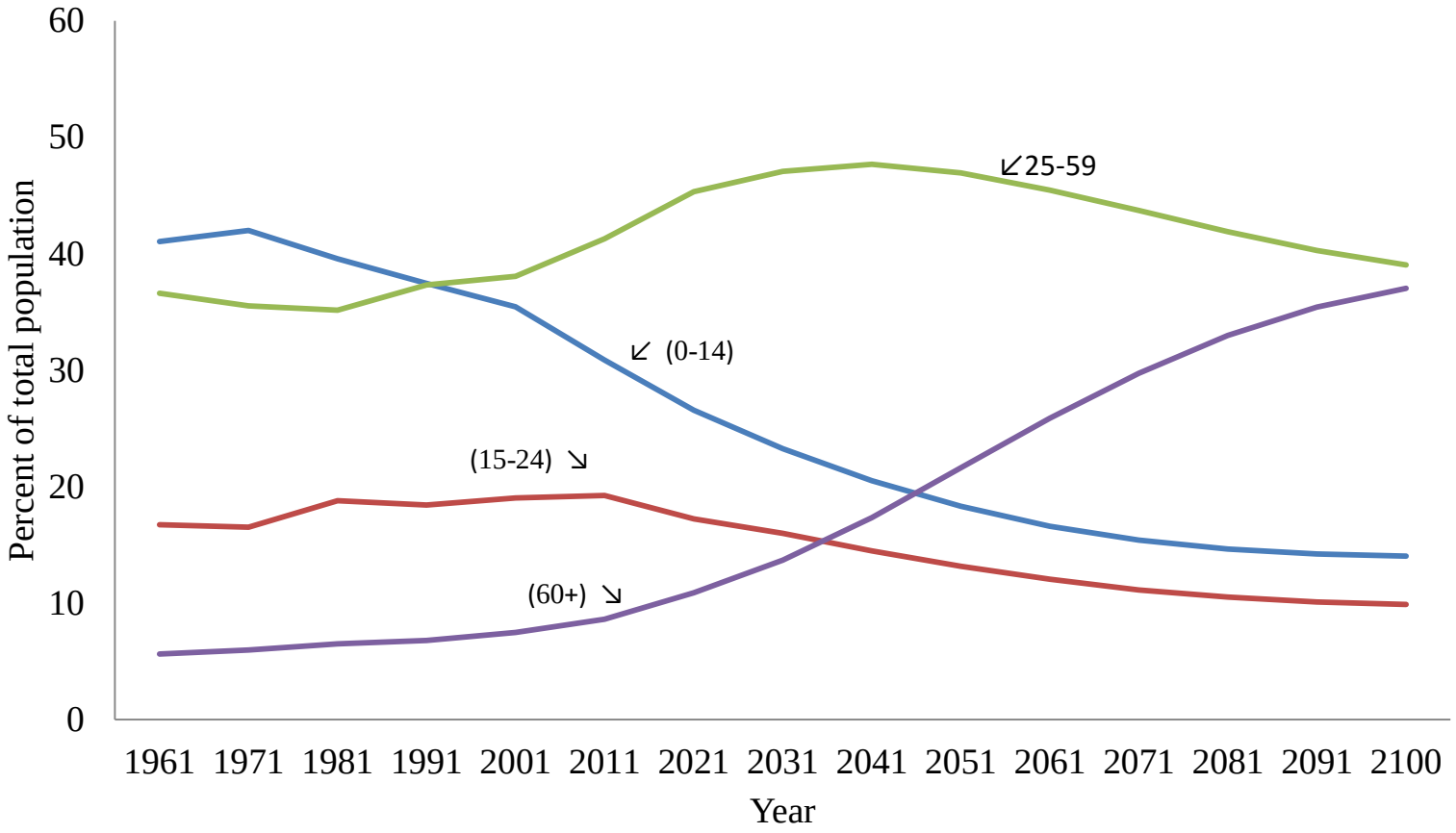
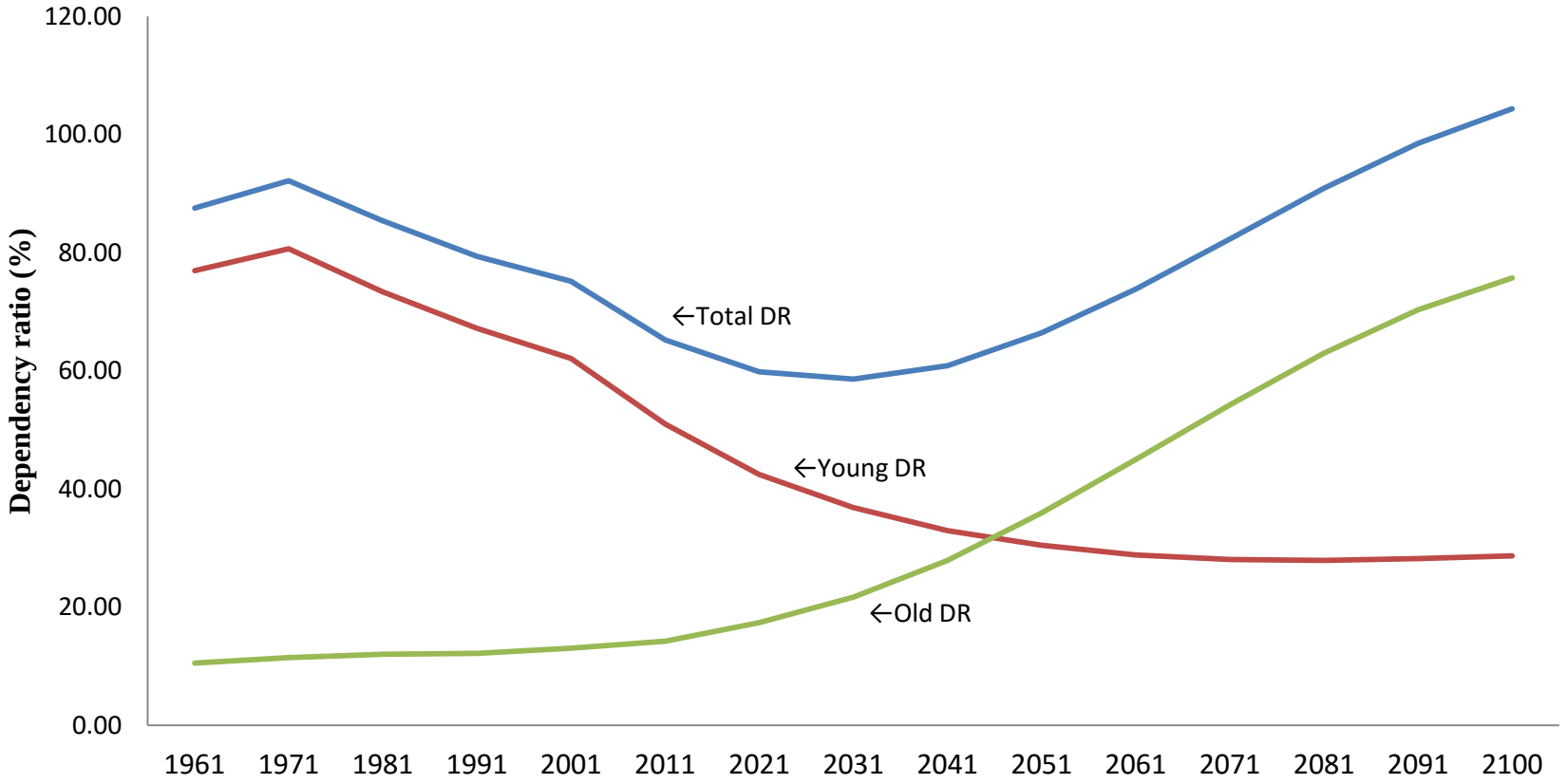


Figure 2: Dependency ratio (DR), India, 1961-2100



Key macroeconomic policy issues for advocacy

Focus: Impact of India's age structure transition on :

(a) Intra-sectoral allocation of resources – case of public education
(b) Economic growth
(c) Universal social pension for elderly individuals

Expected new evidence-based policy advocacy

a) Higher allocation of resources for higher education
b) Higher human capital investments for productivity improvement to attain higher economic growth
c) Fiscally sustainable social pension scheme for elderly individuals

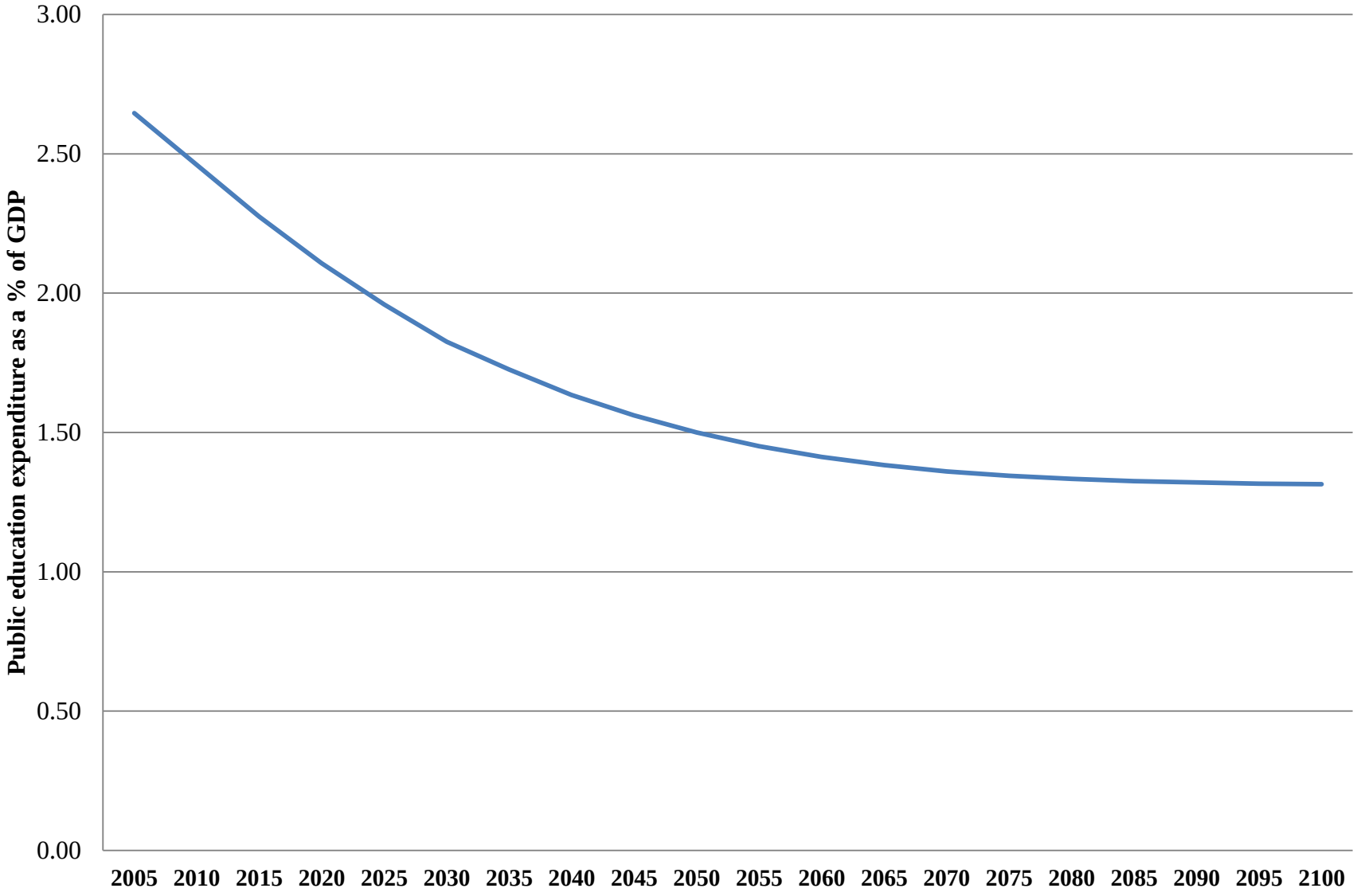
1. Resource allocation effects

- What does a long run decline in young and youth population imply for public expenditure on education by levels of education?
- NTA Flow Account – Age profile of public education consumption – Converted into public education expenditure profile
- Tim Miller's Budget Forecasting Model – Narayana (2012) – Forecasting of total public education expenditure, among others, based on growth rate nominal labour productivity [g(L)] - Figure 2 - Decomposition of total changes in expenditure
- Forecasting uses fixed age profile of public education expenditure (2004-05) and UN Population Projection 2012 Revision, (Medium Term Fertility)

Simulation

- We assume here that (a) public education expenditure on elementary education (up to 8 Standard) moves upward over time at the rate of inflation and (b) secondary and higher education moves upward at the rate of g(L) - Figure 5, Figure 6 and Figure 7

Figure 2: Public education expenditure as a perentage of GDP, India, 2005-2100



Decomposition of education expenditure as a percentage of GDP for India

- Based on the methodology in Andrew Mason and Sang-Hyop Lee (2013) paper on *Are Current Tax and Spending Regimes Sustainable in Developing Asia*.
- This decomposition accounts for changes in education expenditure as a percentage of GDP in figure 2 as a consequence of three changes: (a) Age-specific level of public expenditure on education, (b) age structure transition and (c) interaction between (a) and (b). These changes are measured by percentage point changes over the period, 2010-2020, 2010-2030,….,and 2010-2100.
- The results of this decomposition analysis are shown in Figure 5 which shows the importance of age transition effects on changes in expenditure for India.

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

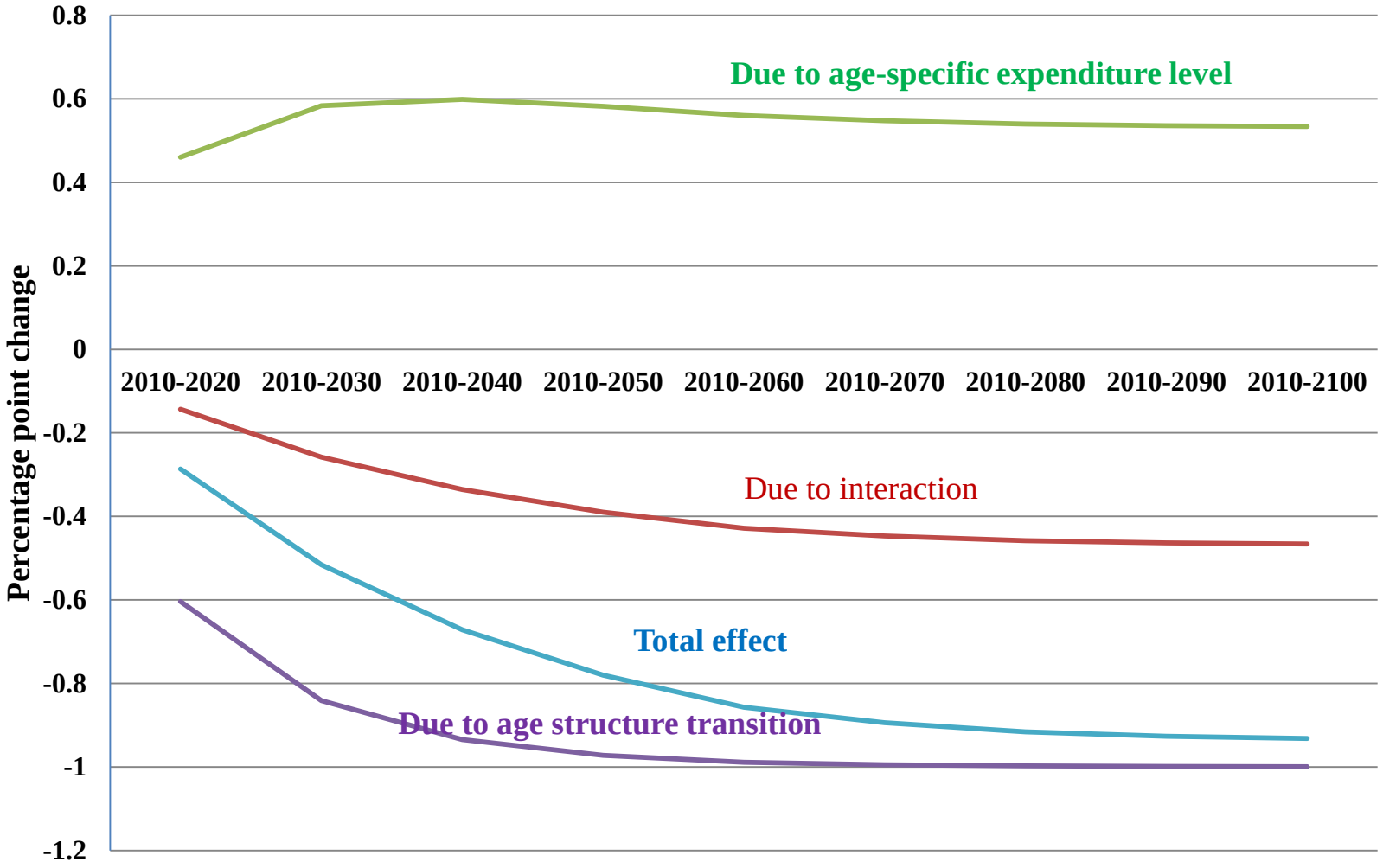


Figure 5: Allocation of public expenditure on education by levels of education, India, 2005-2100 – Simulation result

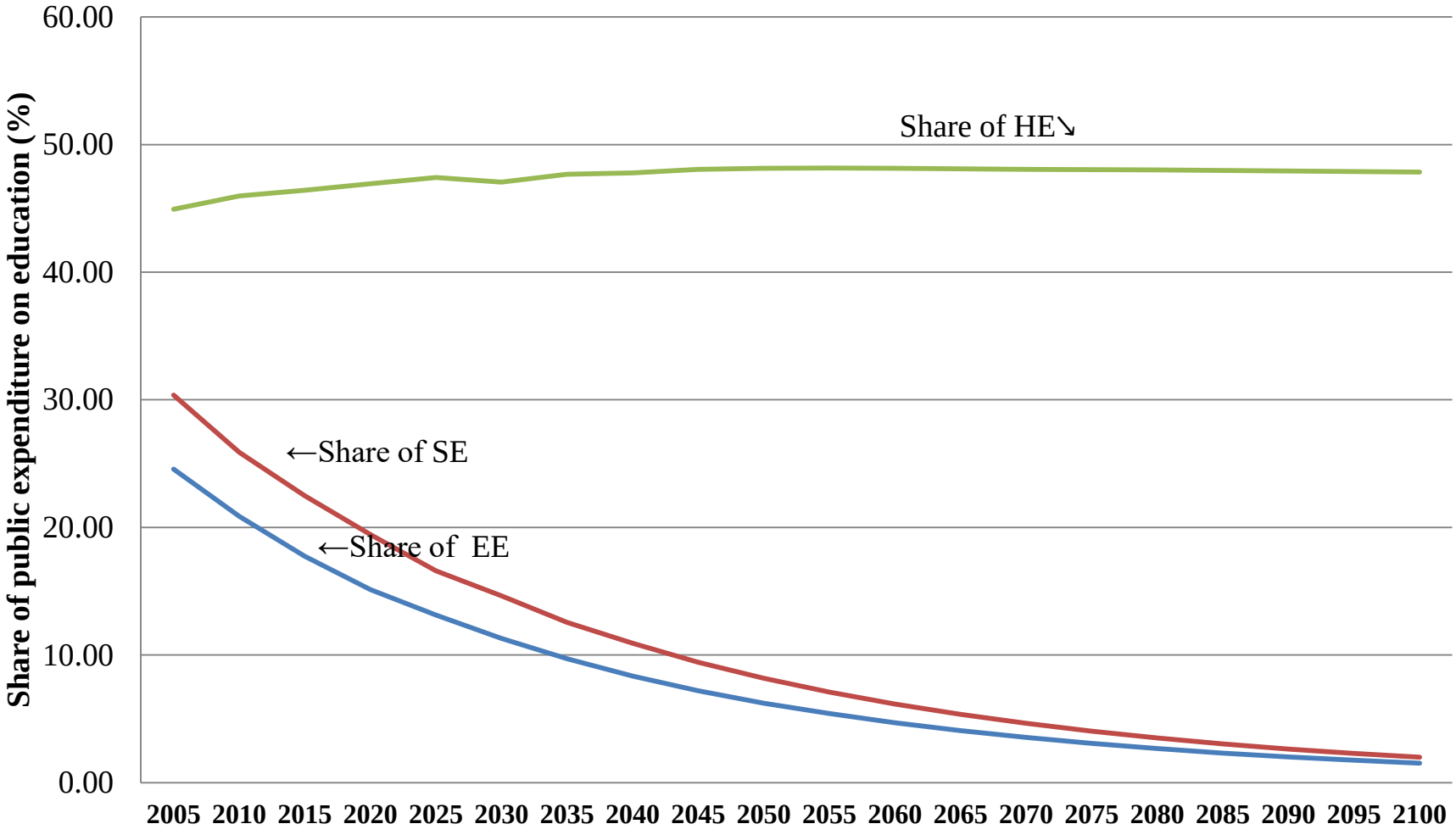


Figure 6: Changing ratio of public expenditure on education, India, 2005-2100 - Simulation result

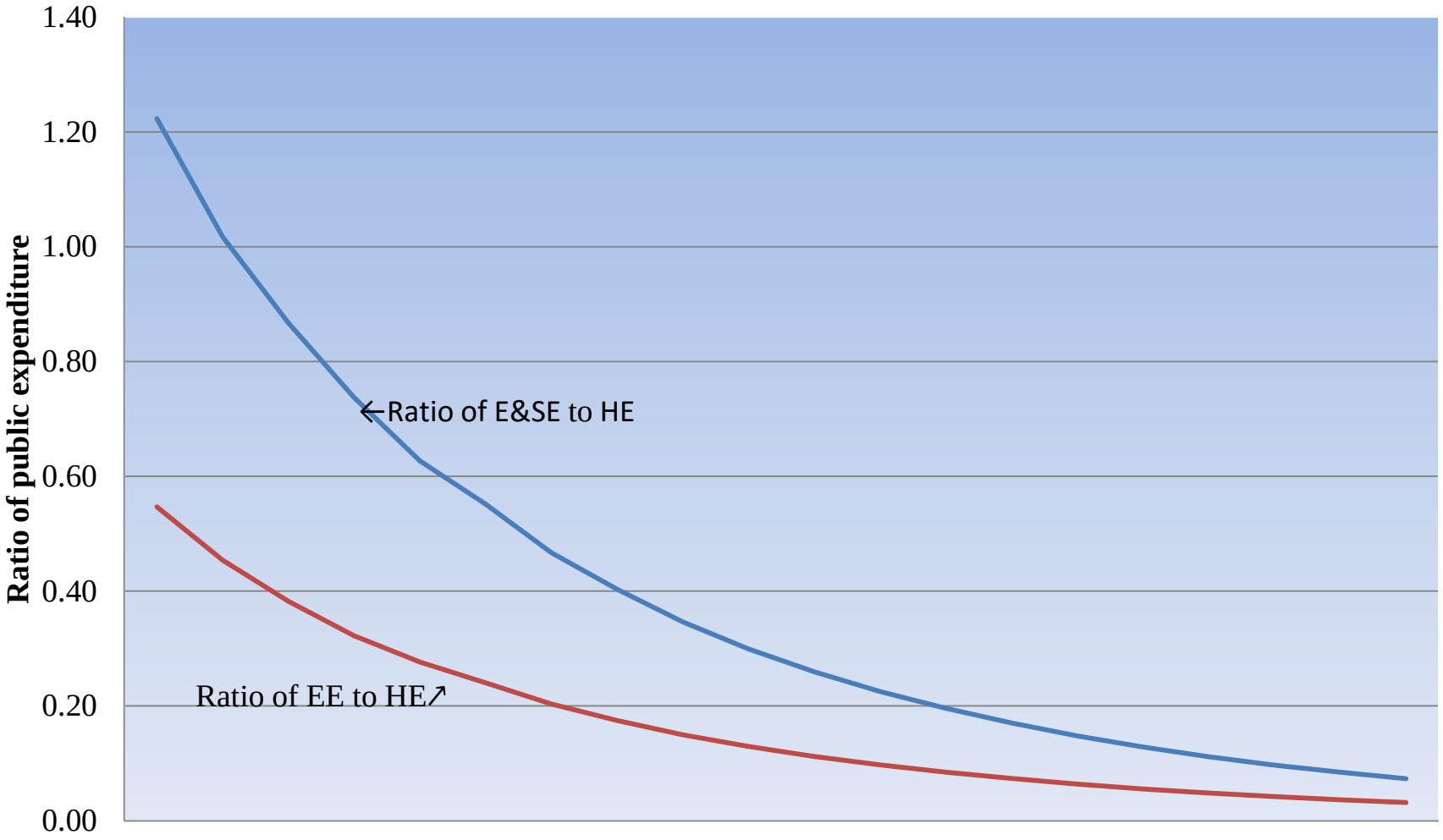
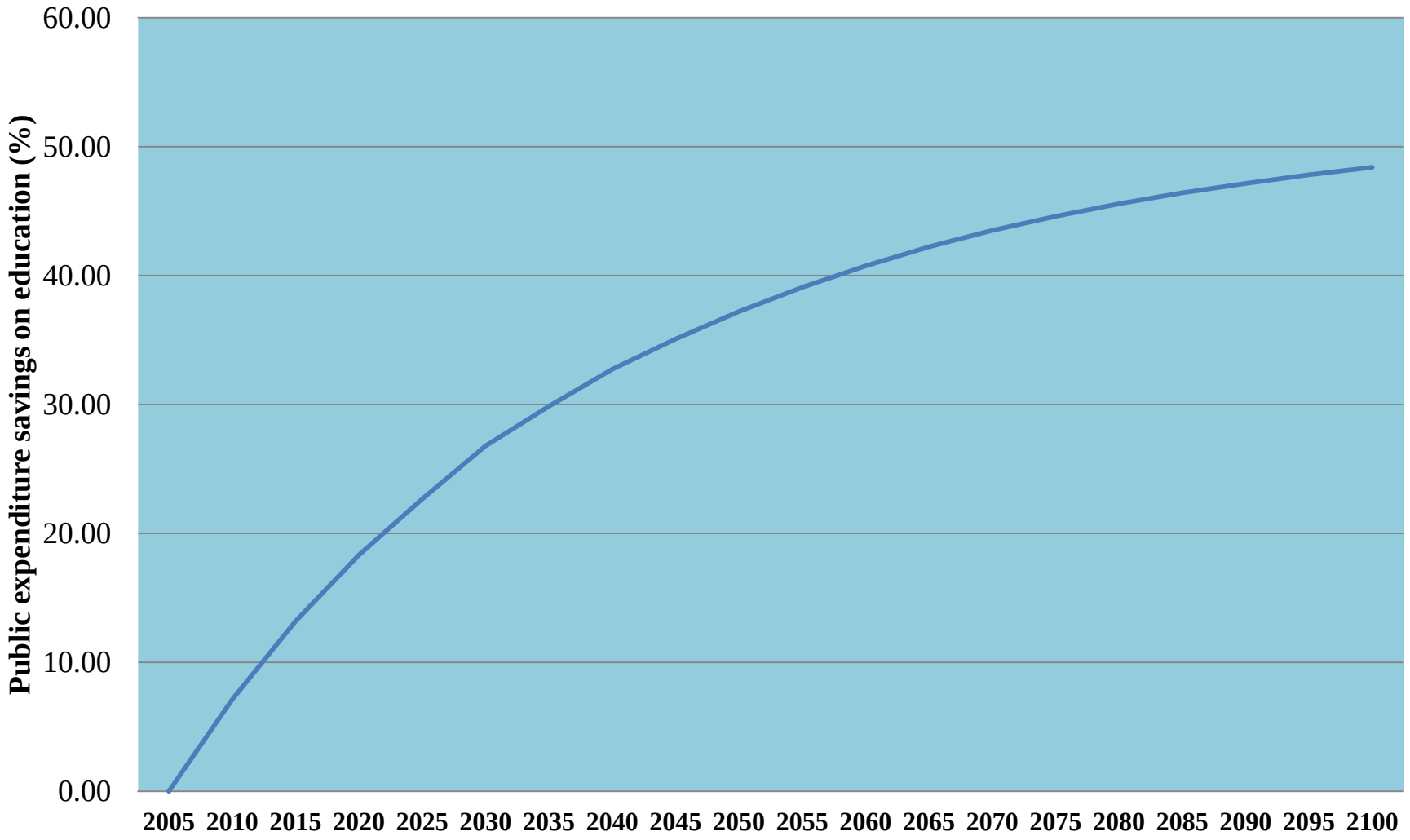


Figure 7: Resource savings in education sector, India, 2005-2100- Simulation result



Key results

Under the conditions postulated:

- Public education expenditure as a percentage of GDP declines from 2.65% in 2005 to 2.11% in 2020, 1.50% in 2050 and 1.31% in 2100.
- Resource saving in total public education expenditure (relative to 2005 level) is remarkable: 18% in 2020; 37% in 2050; and 48% in 2100.
- Public expenditure on EE (6-13) declines over time – given inflation rate and fixed expenditure profile, the decline is attributable to age structure transition

Simulation results

- Public expenditure on SE (14-17) declines over time – but remains higher than EE – mainly due to higher cost than EE and higher growth of expenditure linked to g(L)
- Public expenditure on HE (18-24) increases over time due to increasing HE going age population , higher cost and higher growth rate linked to g(L)
- Thus, more resources are expected to be available within the education for quality improvement and, hence, higher human capital investments within the sector

2. Determinants of economic growth

•Much is already known on determinants of economic growth – saving or investment rate, capital/output or capital/labour ratio, population growth, technical progress, total factor productivity
•NTA adds to this knowledge by distinguishing the sources of growth by productivity growth and age structure transition through economic support ratio (ESR)
• ESR shows the importance of both production and consumption in growth

NTA-based growth model

National income per capita

$$Y(t)/N(t) = \{Y(t)/L(t)\}\{L(t)/N(t)\} \quad (1)$$

In terms of growth rate:

$$g[Y(t)/N(t)] = g[Y(t)/L(t)] + g[L(t)] - g[N(t)] \quad (2)$$

Where

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

$N(t) = \sum\varphi(a)P(a,t)$ = 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).***

Figure 3: Dependency ratio and Economic Support ratio, India, 2005-2050

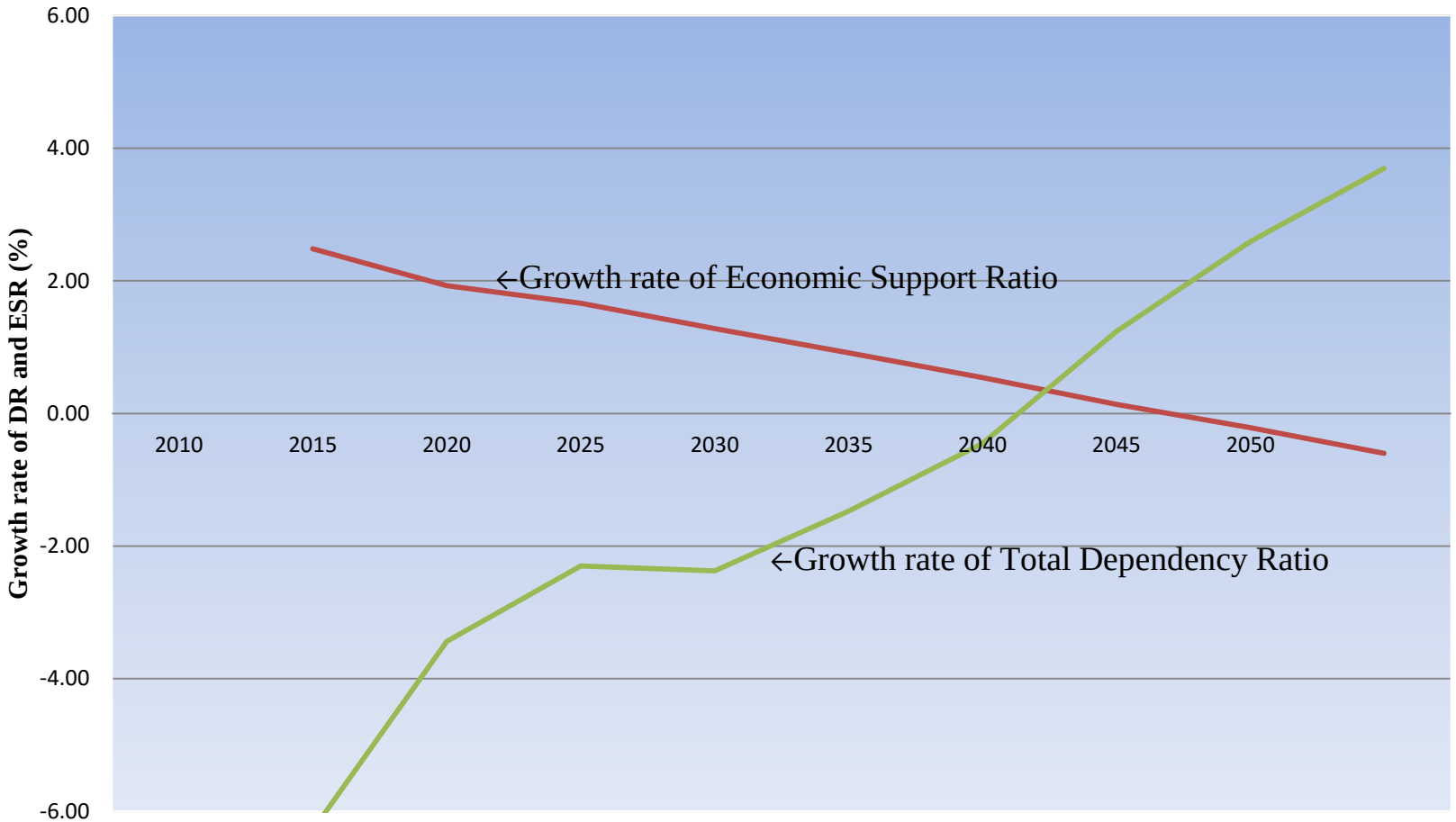


Table 1: Aggregate growth effects of age structure transition, India, 2005-2050

Year	Annual growth rate (%)				
	Economic Support Ratio	Effective number of producers	Effective number of consumers	Labor productivity	Per capita income (or national income per effective consumer)
2005-2010	0.410	2.072	1.572	3.01	3.420
2010-2015	0.383	1.793	1.405	3.01	3.393
2015-2020	0.330	1.557	1.223	3.01	3.340
2020-2025	0.255	1.333	1.075	3.01	3.265
2025-2030	0.182	1.097	0.913	3.01	3.192
2030-2035	0.108	0.881	0.772	3.01	3.118
2035-2040	0.028	0.650	0.622	3.01	3.038
2040-2045	-0.043	0.434	0.477	3.01	2.967
2045-2050	-0.120	0.231	0.352	3.01	2.890

Introduction of labour productivity by sectors

Consider that labour productivity is different between informal and formal economy. This difference may be represented by distinguishing the total labour productivity [Y(t)/L(t)] by relative productivity between sectors and absolute productivity in informal sector – Narayana (2015)

$$Y(t)/L(t) = [\{Y(t)/L(t)\}/\{Y_{IF}(t)/L_{IF}(t)\}]\{Y_{IF}(t)/L_{IF}(t)\} \quad (3)$$

Inserting (3) into (2),

$$g[Y(t)/N(t)]=$$
$$g[\{Y(t)/L(t)\}/\{Y_{IF}(t)/L_{IF}(t)\}]+g\{Y_{IF}(t)/L_{IF}(t)\}+g[L_F(t)+L_{IF}(t)]-g[N(t)] \quad (4)$$

Economic growth is sum of growth of relative labour productivity and absolute labour productivity in informal sector, growth of effective number of producers in formal and informal sectors and growth of effective number of consumer.

Figure A2.1. Age profile of per capita labor income in formal sector: India and select Asian countries

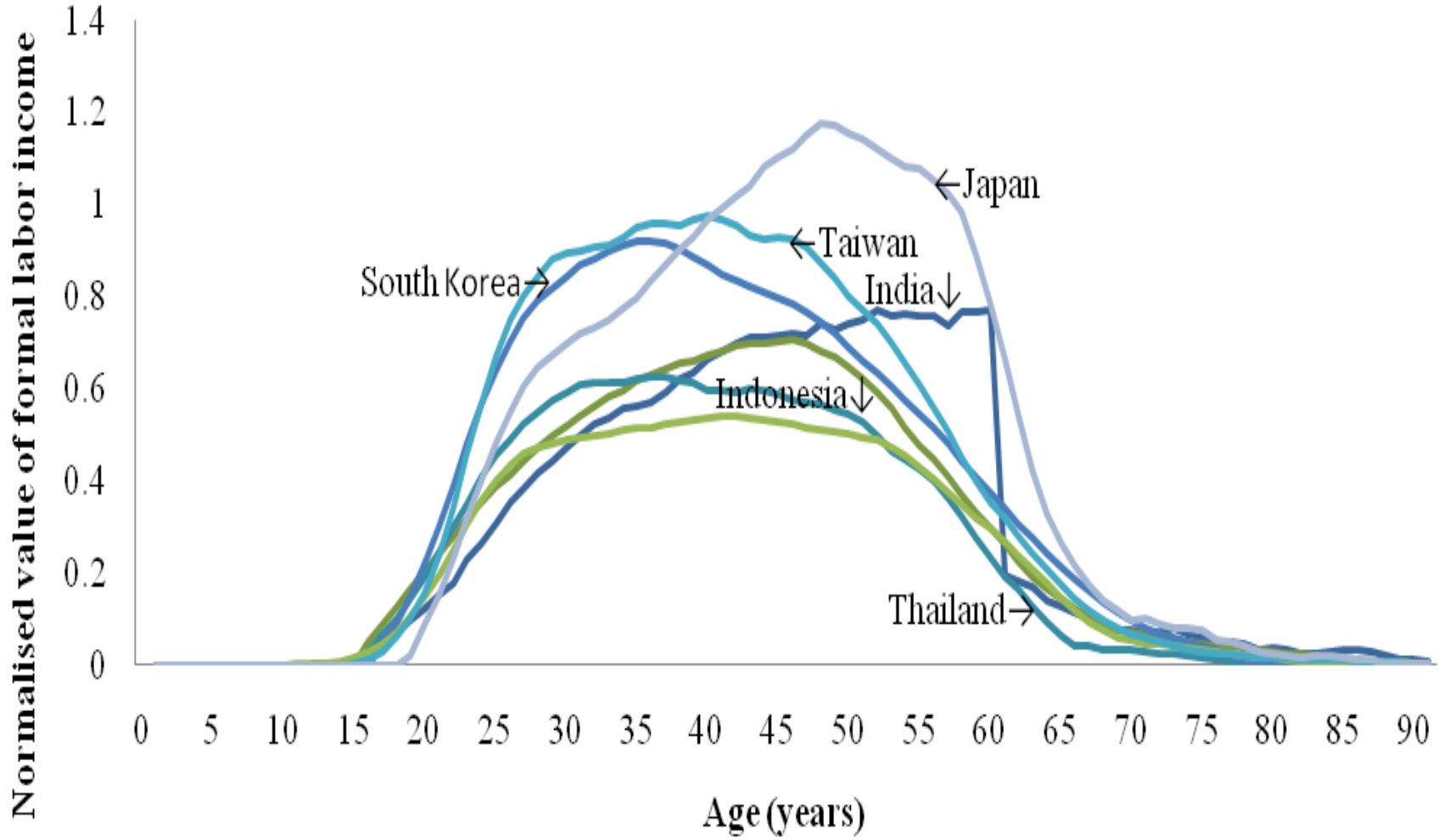


Figure A2.2. Age profile of per capita labor income in informal sector: India and select Asian countires

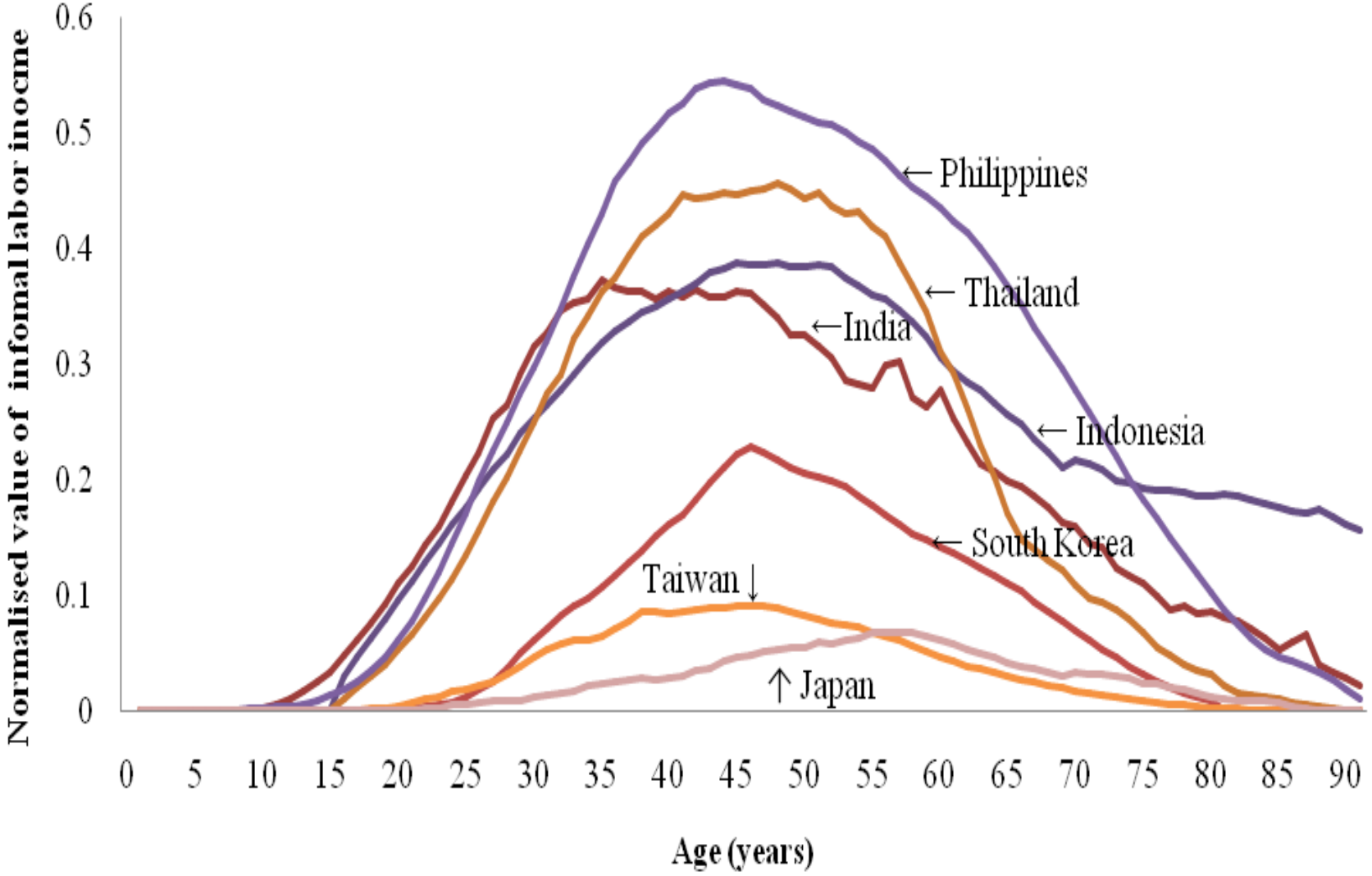


Table 2: Aggregate growth effects of age structure transition by sectors, India, 2005-2050

Year	Annual growth rate of labor productivity (%)		Annual growth rate of effective number of producers (%)		Annual growth rate of effective number of consumers	Annual growth rate of national income per consumer	Annual growth of ESR (%)
	Relative productivity	Absolute productivity	Formal sector	Informal sector			
2005-2010	3.38 (50.41)	0.89 (13.27)	2.18 (32.51)	1.83 (27.25)	1.57 (23.45)	6.71 (100.00)	2.44
2010-2015	3.38 (53.51)	0.89 (14.09)	1.841 (29.15)	1.61 (25.49)	1.41 (22.25)	6.32 (100.00)	2.05
2015-2020	3.38 (55.98)	0.89 (14.74)	1.63 (27.00)	1.36 (22.54)	1.22 (20.26)	6.04 (100.00)	1.77
2020-2025	3.38 (59.09)	0.89 (15.56)	1.39 (24.30)	1.14 (19.93)	1.08 (18.88)	5.72 (100.00)	1.45
2025-2030	3.38 (62.25)	0.89 (16.39)	1.16 (21.36)	0.91 (16.76)	0.91 (16.76)	5.43 (100.00)	1.16
2030-2035	3.38 (66.02)	0.89 (17.38)	0.92 (17.97)	0.7 (13.67)	0.77 (15.04)	5.12 (100.00)	0.85
2035-2040	3.38 (70.42)	0.89 (18.54)	0.64 (13.33)	0.51 (10.63)	0.62 (12.92)	4.80 (100.00)	0.53
2040-2045	3.38 (74.94)	0.89 (19.73)	0.39 (8.65)	0.33 (7.32)	0.48 (10.64)	4.51 (100.00)	0.24
2045-2050	3.38 (79.53)	0.89 (20.94)	0.16 (3.76)	0.17 (4.00)	0.35 (8.24)	4.25 (100.00)	-0.02

Table 3: Growth effects of age structure transition by non-constant productivity age profiles in formal and informal sector, India, 2005-2050

Year	Growth rate (%) by using productivity profile in formal sector						Growth rate (%) by using productivity profile in informal sector					
	Japan			Taiwan			Philippines			Indonesia		
	SR	EP	Per capita income	SR	EP	Per capita income	SR	EP	Per capita income	SR	EP	Per capita income
2005-2010	0.538	2.235	6.505	0.359	2.017	6.542	0.579	2.277	7.155	0.544	2.235	7.113
2010-2015	0.553	1.902	6.172	0.403	1.750	6.225	0.705	2.125	6.831	0.627	2.045	6.751
2015-2020	0.537	1.657	5.927	0.366	1.484	5.892	0.671	1.911	6.588	0.594	1.832	6.509
2020-2025	0.525	1.446	5.721	0.314	1.233	5.563	0.577	1.669	6.249	0.516	1.608	6.188
2025-2030	0.450	1.188	5.461	0.213	0.949	5.219	0.477	1.408	5.928	0.448	1.379	5.899
2030-2035	0.360	0.939	5.212	0.105	0.682	4.882	0.363	1.152	5.572	0.360	1.149	5.569
2035-2040	0.263	0.670	4.940	0.046	0.453	4.613	0.282	0.921	5.211	0.285	0.924	5.214
2040-2045	0.181	0.409	4.681	0.004	0.232	4.352	0.204	0.700	4.880	0.215	0.711	4.891
2045-2050	0.113	0.180	4.452	-0.017	0.050	4.140	0.125	0.497	4.577	0.151	0.523	4.603

Results of NTA-based growth model

- NTA is useful to calculate the nature and magnitude of long term impact of age structure transition on economic growth through demographic dividends. This approach is useful to distinguish the growth effects of age structure transition and productivity and draw implications for improvements in skills and productivity (also emphasized in 12th FYP).
- India's growth effects of productivity are stronger than the age transition
- Sources of lower and slower economic growth are attributable to lower productivity levels, growth rates of productivity and growth rate of effective number of producers in informal sector.
- A higher growth rate of relative and absolute productivity of labor may complement the overall growth effects of age structure transition.

3. Social pension for India's elderly individuals

Current and proposed schemes

At present, elderly individuals aged 60 and above are eligible for the IGNOAPS. The extent of benefit per month per elderly individual is INR200 for those in the age group of 60-79 years and INR500 for those at age 80 years and above.

Overall, 16.40 percent of India's elderly (at age 60 years and above) are covered by the IGNOAPS.

The first proposal is the UOAPS (Baseline) scenario. Here, costs and financing options are calculated if the existing provisions and benefits of IGNOAPS by the Government of India are extended to all elderly individuals in the country.

The second proposal is the UOAPS (Proposed) scenario where the public costs and financing options are calculated if the *Pension Parishad's* proposal of old age pension of INR2000 per month per individual is extended to all elderly individuals in the entire country.

Policy-related questions

1. What are public costs of such a pension scheme?
2. How can the scheme be publicly financed through fiscal instruments? (Rise taxes, cut other benefits or borrow more or increase debt/GDP ratio)
3. Can current fiscal policies be sustainable in the presence of a UOAPS and population ageing?

Table 4: Financial implication of current and proposed pension schemes

Year	IGNOAPS			UOAPS (Baseline) scenario			UOAPS (Proposed) scenario		
	Total amount (INR crore)	As percentage of total revenue expenditure	As percentage of GDP	Total amount (INR crore)	As percentage of total revenue expenditure	As percentage of GDP	Total amount (INR crore)	As percentage of total revenue expenditure	As percentage of GDP
2004-05	1032	0.15	0.03	18651	2.66	0.58	186508	26.63	5.75
2005-06	1190	0.15	0.03	19132	2.42	0.52	191316	24.24	5.18
2006-07	2490	0.27	0.06	19655	2.13	0.46	196547	21.34	4.58
2007-08	2890	0.29	0.06	20176	2.00	0.40	201758	19.95	4.05
2008-09	4500	0.35	0.08	20730	1.61	0.37	207297	16.06	3.68
2009-10	5155	0.33	0.08	21366	1.39	0.33	213656	13.86	3.30
2010-11	5162	0.29	0.07	22115	1.24	0.28	221150	12.39	2.84
2011-12	6596	0.33	0.07	25891	1.28	0.29	229571	11.38	2.55
2012-13	7885	0.34	0.08	26988	1.16	0.27	238940	10.26	2.36
2013-14	9112	0.34	0.08	28130	1.06	0.25	249018	9.41	2.19

Fiscal sustainability of UOAPS

Using the age profiles of NTA and the standard Generational Accounting framework, sustainability of India's current fiscal policies in the context of UOAPS is determined for the bench mark year, 2004-05.

Sustainability is measured and evaluated by Generational Imbalance (GI). Fiscal policy is sustainable if GI<0.

Using the framework in Narayana (2014), sensitivity of sustainability of UOAPS scenarios is explored for alternative assumptions on income elasticity of public expenditure on cash transfers including civilian old age (e1) pension scheme and pubic health expenditure (e2).

Table 5: Fiscal sustainability of pension expenditure: Results of Generational Accounting

Generosity of the pension scheme [e1 (e2) = Income elasticity of social welfare (health) expenditure]	Value of Generational Imbalance		
	IGNOAPS	UOAPS (Baseline)	UOAPS (Proposed)
1. Generous pension scheme			
• e1=1; e2=1	11	19	261
1. Less generous pension scheme			
• e1=0.9; e2=1	9	17	242
• e1=0.6; e2=1	6	13	214
• e1=0.3; e2=1	5	12	203
• e1=0.1; e2=1	4	11	199
1. Generous pension scheme with expenditure switching policy			
• e1=1; e2=0.9	-11	-6	60
• e1=1; e2=0.6	-32	-31	-19
• e1=1; e2=0.3	-38	-38	-33
• e1=1; e2=0.1	-14	-4-	-37
1. Less generous pension scheme with expenditure switching policy			
• e1=0.9; e2=0.9	-12	-8	56
• e1=0.6; e2=0.6	-34	-33	-22
• e1=0.3; e2=0.3	-41	-40	-36
• e1=0.1; e2=0.1	-43	-42	-40

Major conclusion and implication of fiscal sustainability of proposed UOAPS for India

(a) Proposals for UOAPS are fiscally sustainable (or Generational Imbalance is negative) if policy makers can have flexibility in setting income elasticity to suggested ranges to incorporate both generosity in pension payments and public expenditure switching in health expenditure

(b) This conclusion implies that the proposed UOAPS is implementable without sacrificing the fiscal sustainability as India experiences population ageing from 2005 through 2100.

Select reference

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Gratitude

- Professor Ronald Lee (University of California at Berkeley) and Professor Andrew Mason (University of Hawaii at Manao) for inventing the methodology of National Transfer Accounts (NTA); training the scholars from more than 40 countries representing all continents; and offering continuous guidance and encouragement;
- Professor Sang-Hyop Lee (University of Hawaii at Manao) and Professor Naohiro Ogawa (University of Tokyo, Tokyo) for leading and promoting the NTA research in Asia;
- Professor Young Jun Chun for all technical help for application of GA;
- East-West Centre (Honolulu) and UNFPA (APRO at Bangkok) funding my presentation and participation in this Conference;
- Dr Nicholas McTurk (Population and Development specialist, UNFPA, APRO at Bangkok) for excellent support and encouragement for NTA research; and
- Professor L. Ladusingh at International Institute for Population Sciences at Mumbai (India) for research collaboration on India-NTA

THANK YOU