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National Transfer Accounts:

A tool for analyzing population dynamics and their policy implications

Macroeconomic policy analyses by using National Transfer Accounts: New evidence for India

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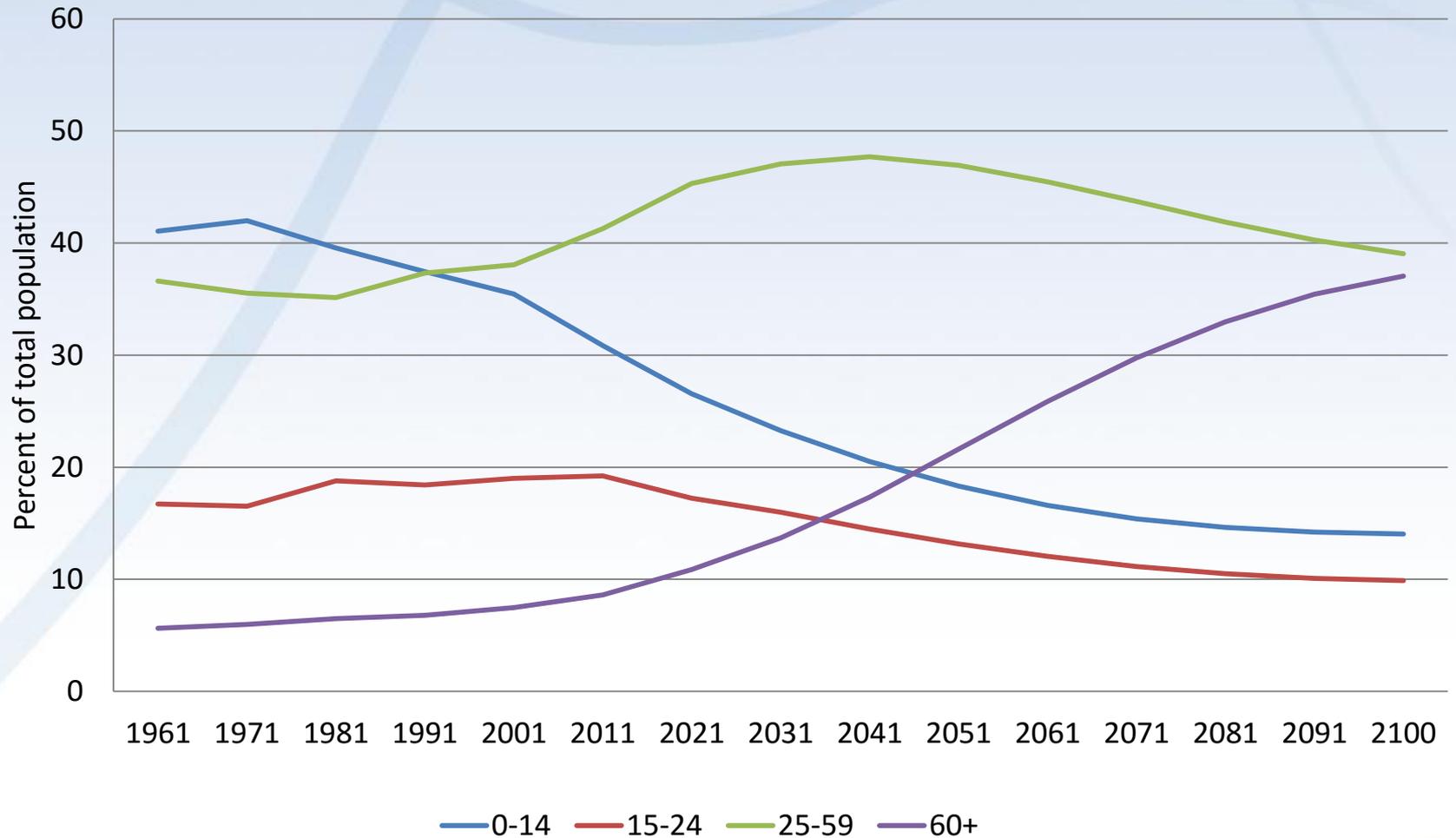


Gratitude

- 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;
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- UNFPA (India Office, New Delhi) for funding research project on **Universal Old Age Pension for India: Estimates of public cost and fiscal sustainability**, under *Building Knowledge Base on Aging in India: Increased Awareness, Access and Quality of Elderly Services in India* .
- Professor L. Ladusingh at International Institute for Population Sciences at Mumbai (India) for research collaboration on India-NTA

Age structure transition, India

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



Focus of presentation

How to assess the impact of India's age structure transition on economic growth and distribution?

New macroeconomic methodology based on **National Transfer Accounts** – www.ntaccounts.org

1. Growth effects of age structure transition through *First Demographic Dividend*
2. Evaluate proposals for public-funded universal old age pension schemes as India experiences population ageing
3. Determine fiscal sustainability of proposals in (2)

Expected new evidence-based policy implications

- a) Productivity improvement through human capital investments
- b) Public-expenditure switching and generosity policies to meet with additional public resources requirements for implementation of universal old age pension schemes, and
- c) Overall fiscal policy adjustments to achieve a long term inter-generational equity.

Demographic dividend

If productively employed and contributory to savings and investments (physical and human), a relatively higher share of working population is expected to provide a boost to productivity and age structure transition induced economic growth. This demographically induced opportunity for economic growth is called the “**demographic dividend**” by Bloom et al.

- India’s 12th Five Year Plan (FYP) aims at 8% economic (or real GDP) growth rate over the plan period (2012-2017). This macroeconomic framework has identified the following as one of the key determinants: *benefits of a demographic dividend because the age structure of the population ensures that the labour force will be growing in India.*
- Nevertheless, no quantitative estimates available on demographic dividend for policy makers. NTA is useful to fill in this policy gap.

Methodology of NTA

- The Flow Account Identity, (suffix “f” stands for private sector, “g” for public sector and “i” refers to individual or age group).

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

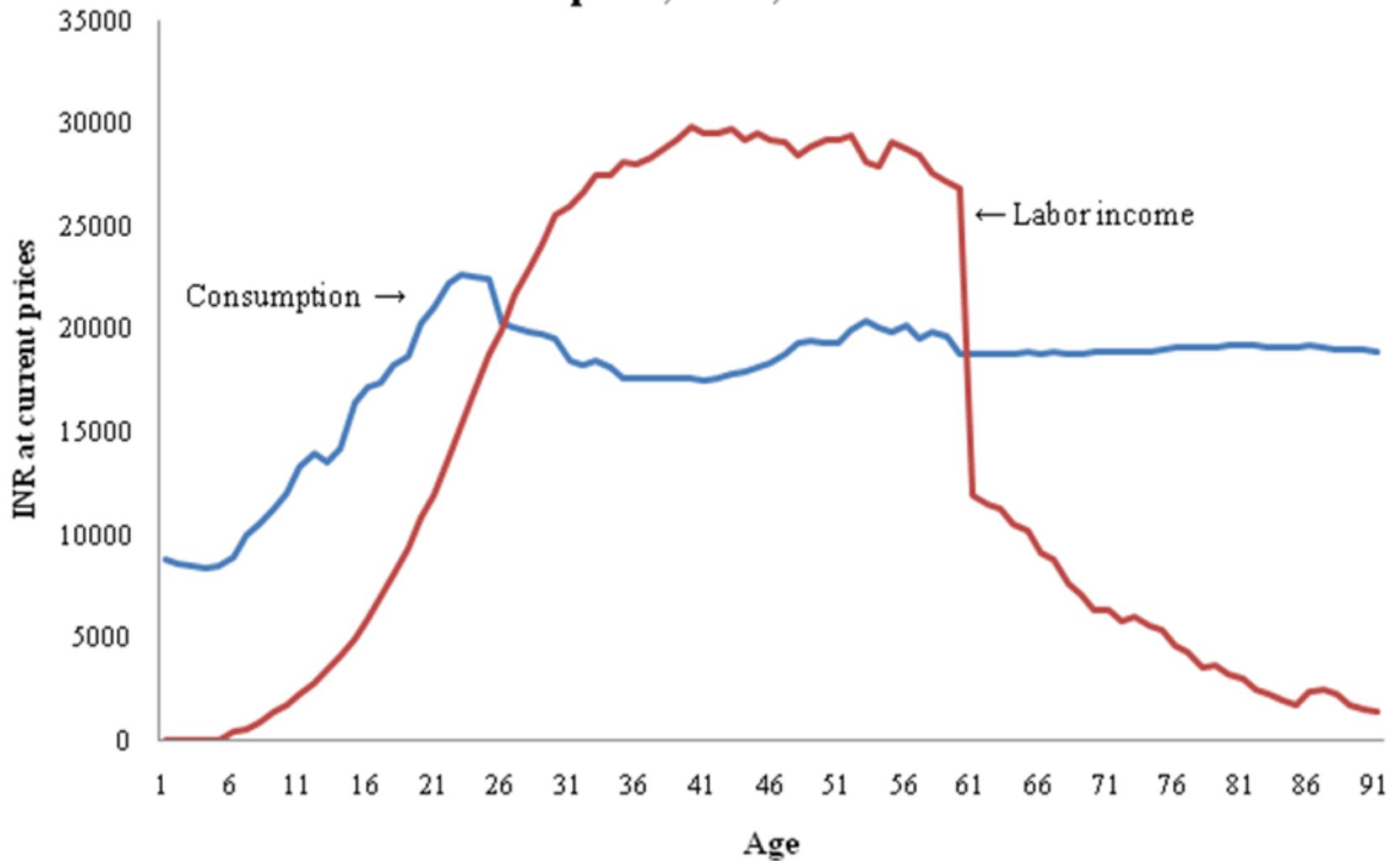
- Flow Account is use to calculate the lifecycle deficit (LCD).

$$LCD_i = (C_{f,i} + C_{g,i}) - Y_{L,i} \quad (2)$$

LCD is the difference between total value of goods and services consumed and produced by an age group .

- This shows which age group/s has/have surplus ($LCD_i < 0$) or deficit ($LCD_i > 0$) in an accounting year.
- Useful basis to develop instruments to financing LCD by age reallocations through public and private transfers and asset reallocations.
- Thus, calculation of age profiles of variables in (1) is essential for construction of NTA.

Figure 2: Age profile of per capita labor income and consumption, India, 2004-05



Key results

- The vertical difference between income and consumption profiles is a measure of LCD at particular ages.
- Aggregate LCD is equal to Rs.2602.65 billion with the following share of different age groups: Young (156.03 percent), Youth (195.67 per cent), Working (-195.75 per cent) and Elderly (34.06 per cent).
- The results offer the following new insights.
- First, LCD is evident for all age groups except for working population (25-59).
- Second, LCD is highest for young (0-14) rather than elderly (60+). For instance, the computed LCD for young (or youth) is about 5 (or 3) times bigger than for the elderly.
- Third, elderly earn labour income by 4.26 per cent of aggregate labour income. In the absence of this income for elderly, the entire aggregate consumption of elderly would be equivalent to their LCD and share of elderly in the aggregate LCD would have gone up by about 48 per cent.

Growth effects of age structure transition: NTA-based model of First Demographic Dividend

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** 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).*

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.

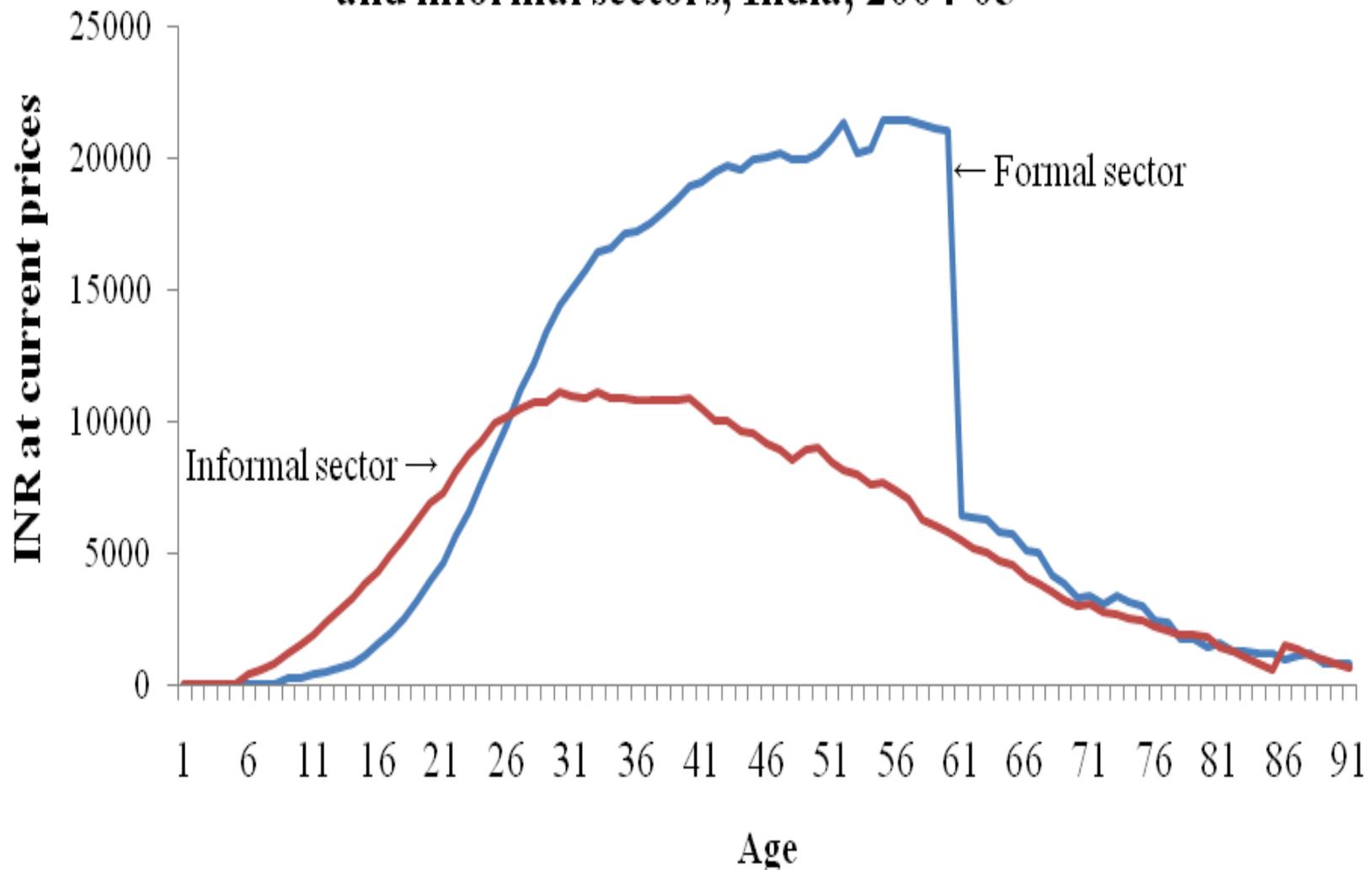
$$Y(t)/L(t) = [\{Y(t)/L(t)\}/\{Y_{IF}(t)/L_{IF}(t)\}]\{Y_{IF}(t)/L_{IF}(t)\} \quad (3)$$

Inserting (3) into (2),

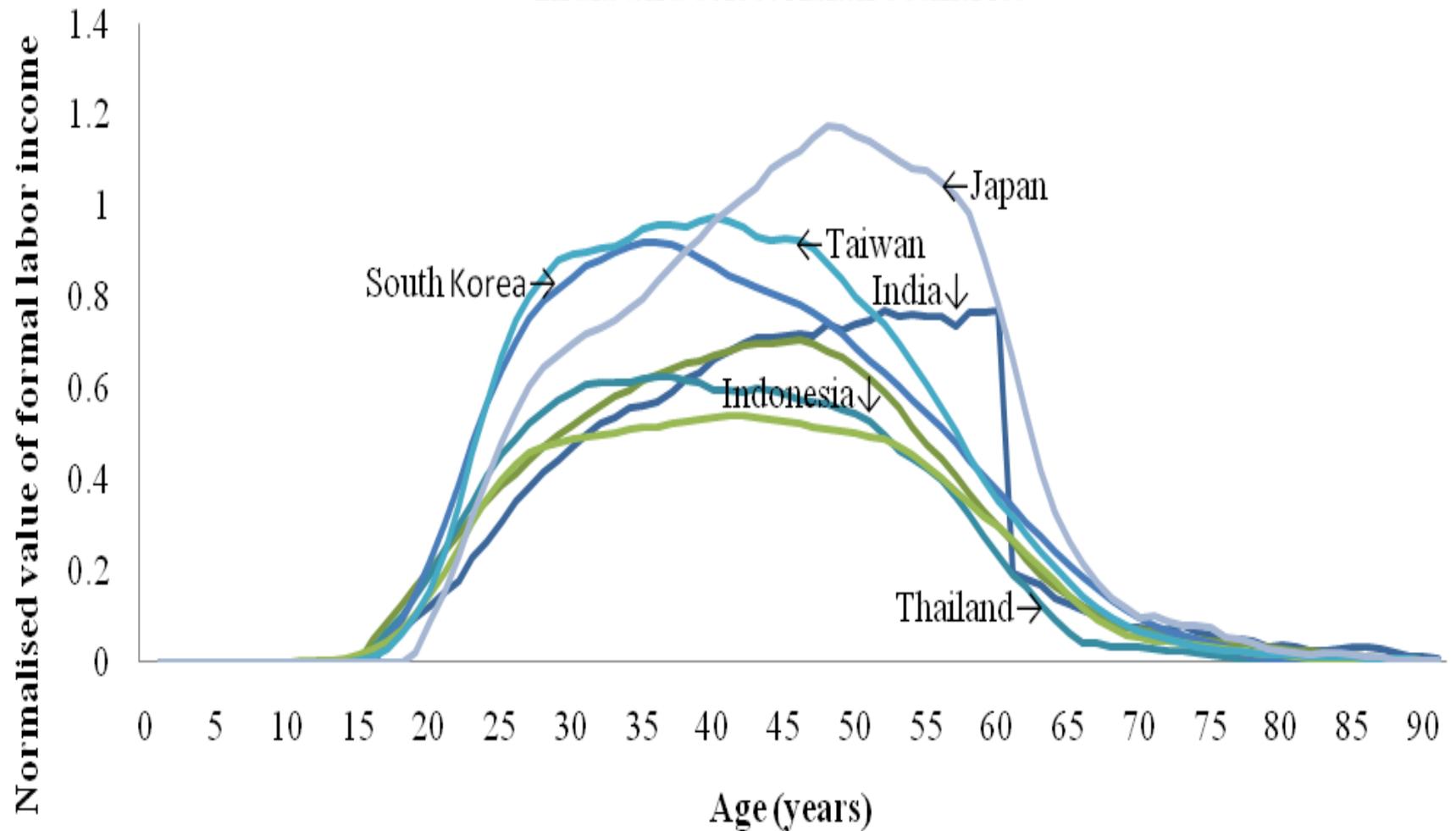
$$g[Y(t)/N(t)] = g[\{Y(t)/L(t)\}/\{Y_{IF}(t)/L_{IF}(t)\}] + g\{Y_{IF}(t)/L_{IF}(t)\} + g[L_F(t) + L_{IF}(t)] - g[N(t)] \quad (4)$$

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 3: Age profile of per capita labor income by formal and informal sectors, India, 2004-05



**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 countries**

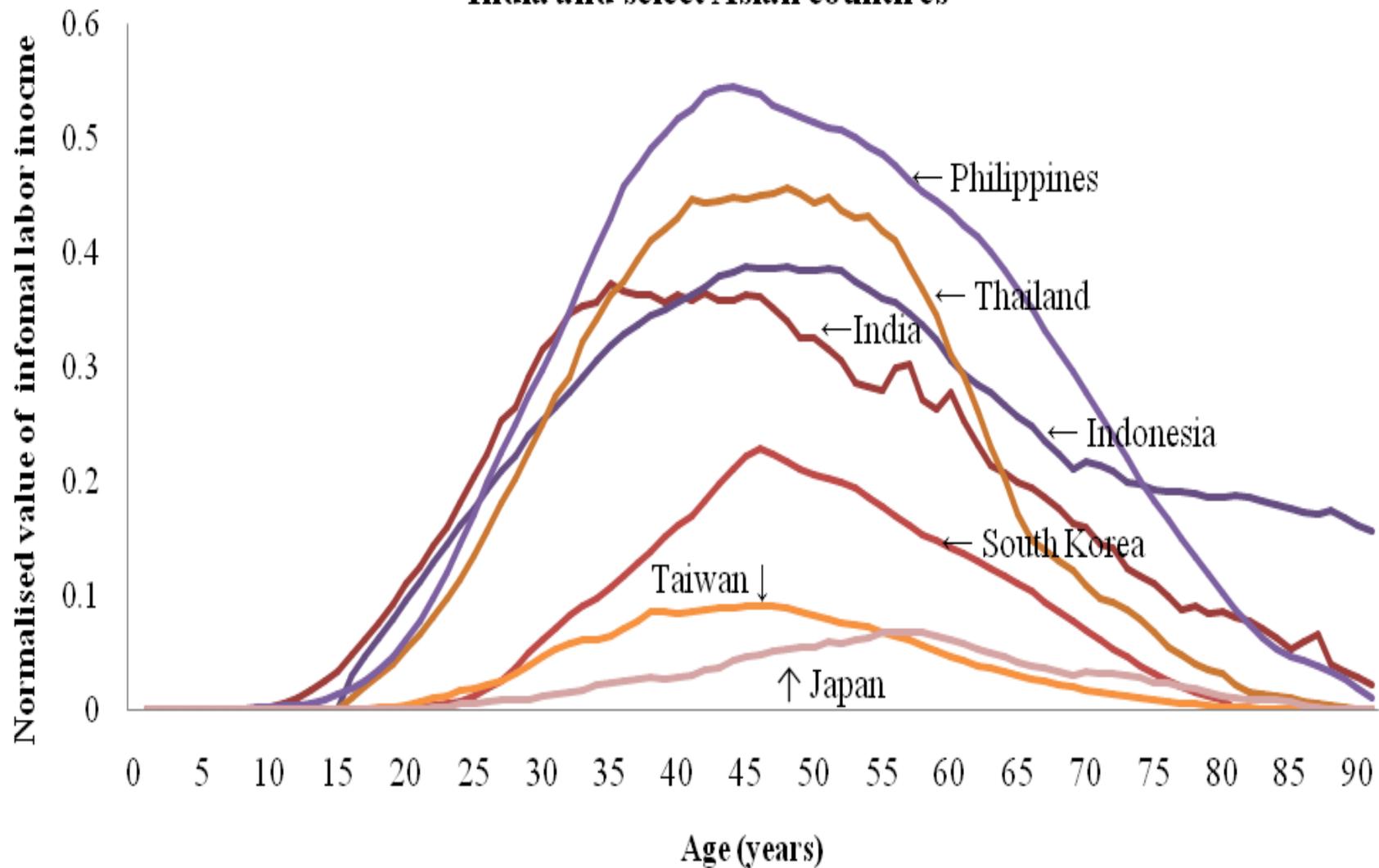


Table 1: Aggregate growth effects of age structure transition, India, 2005-2050

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	3.510
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

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

Growth effects of productivity and age structure transition

Case 1: Benchmark: Growth rate of relative productivity is 3.38% and absolute productivity in informal sector is 0.89%.

Case 2: Growth rate of relative productivity is equalized: Growth rate of relative productivity is 1% and the absolute productivity is 5.50%.

Case 3: Output is doubled in formal sector: Growth rate of relative productivity is 10.04% and the absolute productivity is 0.89%.

Case 4: Output is doubled in both formal and informal sectors: Growth of relative productivity is 1.15 and the absolute productivity is 15.89%

Case 5: Output is doubled in informal sector: Growth rate of relative productivity is 0.74% and growth rate of the absolute productivity is 15.89%

Year	Annual rate of economic growth (%)				
	Case 1	Case 2	Case 3	Case 4	Case 5
2005-2010	6.71	8.94	16.37	19.48	19.07
2010-2015	6.32	8.55	15.98	19.09	18.68
2015-2020	6.04	8.27	15.70	18.81	18.40
2020-2025	5.72	7.95	15.38	18.49	18.08
2025-2030	5.43	7.66	15.09	18.20	17.79
2030-2035	5.12	7.35	14.78	17.89	17.48
2035-2040	4.80	7.03	14.46	17.57	17.16
2040-2045	4.51	6.74	14.17	17.28	16.87
2045-2050	4.25	6.48	13.91	17.02	16.61

Conclusions and implications of NTA-based growth effects

- 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.
- If India's age profile of labor productivity in formal (and informal) sector were to have the shape of Japan (and Philippines or Indonesia), growth effects of age structure transition can be maximized throughout the projection period due to extended window of opportunity.
- A higher growth rate of relative and absolute productivity of labor may complement the overall growth effects of age structure transition.

Universal Old Age Pension: Proposals and NTA-based

Motivation

- To date, India does not have a universal old age pension [Civilian pension] scheme
- Why India did not have the scheme before? **Strong familial support in past**
- Why does India need the scheme now? **Recent decline in familial support**

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?

Current status and proposals for public-supported and national level Old Age Pension Scheme in India

India's public support or expenditure on old age pensions is of two types: (a) pension and retirement benefits to government employees and (b) old age pension for civilians under the Indira Gandhi National Old Age Pension Scheme (IGNOAPS).

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.

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

Table 5: Sensitivity of pension expenditure for inflation rates

Year	Public pension expenditure as percent of GDP: Sensitivity to inflation rates								
	Baseline scenario			UNOAPS (Baseline) scenario			UOAPS (Proposed) scenario		
	1%	5%	10%	1%	5%	10%	1%	5%	10%
2004-05	0.03	0.04	0.05	0.58	0.67	0.98	5.81	6.67	9.79
2005-06	0.03	0.04	0.05	0.52	0.60	0.88	5.23	6.00	8.82
2006-07	0.06	0.07	0.10	0.46	0.53	0.78	4.62	5.30	7.79
2007-08	0.06	0.07	0.10	0.41	0.47	0.69	4.09	4.69	6.88
2008-09	0.08	0.09	0.14	0.37	0.43	0.63	3.72	4.27	6.27
2009-10	0.08	0.09	0.14	0.33	0.38	0.56	3.33	3.82	5.61
2010-11	0.07	0.08	0.11	0.29	0.33	0.48	2.87	3.29	4.83
2011-12	0.07	0.08	0.12	0.29	0.33	0.49	2.57	2.95	4.34
2012-13	0.08	0.09	0.13	0.27	0.31	0.45	2.39	2.74	4.02
2013-14	0.08	0.09	0.14	0.25	0.29	0.42	2.21	2.54	3.73

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 $GI < 0$.

Sensitivity of sustainability is explored for alternative assumptions on income elasticity of public expenditure on cash transfers including civilian old age (e1) pension scheme and public health expenditure (e2).

**Table 6: 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 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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THANK YOU

