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Public Age Reallocations for India's Elderly: Evidence Based on National Transfer Accounts

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Projected age structure transition shows a remarkable increase in India's elderly population by 2050 and calls for a larger inter-generational support for consumption needs of elderly population. Using the National Transfer Accounts framework, which is an attempt to introduce age into National Income and Product Accounts, this paper estimates the nature and magnitude of lifecycle deficit (LCD) and public age reallocations for India's elderly population in 2004-05. LCD is estimated by deriving age profiles of labour income and aggregate consumption. Consumption is distinguished by public and private sectors and disaggregated by health, education, and others. Public age reallocations are estimated by public transfers and public asset based reallocations. Public transfers are distinguished by cash and in-kind inflows and tax and non-tax outflows. Estimated lifecycle deficit (LCD) provides with a basis for public age reallocations by transfers and asset-based reallocations. Estimated LCD of elderly is about 27 percent of India's total LCD, or 2.45 percent of India's GDP. Public age reallocations are negative in the form of taxes and savings. Tax outflows are largely explained by direct rather than indirect taxes. This is indirectly contributory for financing elderly consumption by financing the age reallocations from non-dependent adult age groups to elderly. Overall results offer evidence for the importance of public age reallocations in financing elderly consumption and justify for larger role for public sector to support for elderly in future.

Key words: *National Transfer Accounts, Lifecycle deficit, Public age reallocations*

JEL Classification: J14, E01

1. INTRODUCTION

Population ageing is an important consequence of age structure transition with declining share of young-dependent and/or working age population. In general, aged or elderly population is identified with the share of population in age group of 60+ or 65+. Socio-economic and political institutions, such as, family, government, and markets are the bases for economic support systems for elderly. Knowledge of these institutions and experience of different support systems are vital inputs for design and implementation of public policies for elderly population.

Studies on India's age structure transition [e.g., Rajan and Aliyar (2008), Rajan and Mathew (2008), Rajan and Prasad (2008), Asher (2006 and 2008), Chakraborti (2004),

and Rajan et al (1999)] have focused on description of (a) age structure and dependency transitions using descriptive statistics, such as, median age, index of ageing, and dependency ratio and (b) living conditions and limited public policies and programmes for social security for elderly population. In general, the descriptions lead to a major conclusion that India's population ageing is a problem of future; public support of elderly is negligible; and provision of universal social security is challenging. On the other hand, Alam (2006) provides with empirical results on the impact of age structure transition on aggregate private savings in India. Aggregate private savings or savings rate from 1971 to 1991 from the Central Statistical Organization is regressed on young and old-age dependency ratio as separate variables (other variables include per capita income). The estimated coefficient on young (or old-age) dependency variable is negative and significant (or negative and insignificant). This implied a negative impact of an increase in young dependent on household savings. Further, using data from a small sample survey of 1000 households in Delhi, Alam reports, among others, on nature and extent of own sources and transfer incomes to aged. Owned sources include income from work, employers' pension, shared family business, interest earnings, rental income and income from agricultural sources. Transfer income includes financial help received from children and other relatives, social security payments by the Central and State governments and support from Non-Government Organizations.[1] As the amount of this social security expenditure is negligible, public support for aged remains neglected.

In general, the above studies broadly note the relationship between ageing and public support, but no macroeconomic and intergenerational effects of public age reallocations for elderly are quantified. This quantification is relevant and useful to design macroeconomic strategies to meet with long run challenges of population ageing in India.

[1] In addition, Alam (2006) estimates the socio-economic determinants of health status of elderly and accessing and utilization of hospitalization services by aged. These econometric estimations are based on the household level data in the 52nd Round of National Sample Survey of the *Aged in India: A Socio-Economic Profile* in 1995-96. For instance, determinants of health status of elderly (measured by number of diseases suffered by an elderly person), estimated by rural and urban distinctions and in the framework of Count models (i.e. Poisson model and Negative Binomial model), include age, sex, and literacy, availability of drinking water and toilet facility, and household monthly consumption expenditure. In general, results showed that health status is susceptible up to a certain critical age and then taper off; and higher consumption expenditure, literacy, better water and sanitation facilities lowered health risks.

These challenges are best summarized in the context of Asian economies including India by Heller (2007): increasing aggregate income, distribution of income across generations, increase the willingness of younger generations to support the elderly, and create political viability for institutional mechanisms chosen to intermediate intergenerational transfer. At global level, the economic impacts of age structure transition with special reference to ageing are well documented by United Nations (2007a).

This paper argues that public support for aged in India may have to be extended beyond public expenditure on civilian pensions as a form of cash transfers. For instance, public support for aged may broadly include different inflows, such as, in-kind and cash transfers and asset income. At the same time, elderly people pay taxes and save. These are forms of outflows. Other things being equal, an increase in population ageing may need more public resources to meet with these inflows. Thus, an assessment of public resource allocations for elderly population is a new macro economic policy imperative, as it is related to fiscal policy, in India.

This paper is based on the National Transfer Accounts (NTA) methodology, developed by Mason et al (2006) and introduced age into National Income and Product Accounts. It aims at analysis of the nature and extent of allocation of public resources to India's elderly population in 2004-05. These allocations are called public age reallocations in NTA. Using the estimated lifecycle deficit for elderly, public age reallocations are estimated by transfers and asset reallocations, and implications for public support policies to financing elderly consumption are highlighted. However, the application of NTA methodology and empirical results based on this methodology in this paper is new for the Indian economics.

Rest of the paper is organized as follows. Section 2 presents a brief background on policy relevance of population ageing in India with special reference to public economic support for elderly. Section 3 outlines the NTA methodology for estimation of public age reallocation. NTA estimation framework for India is described in section 4. Estimation

results of lifecycle deficit and public sector age reallocations for India's elderly are presented in Section 5. Section 6 concludes the paper with implications.

2. POLICY RELEVANCE OF POPULATION AGEING FOR INDIA

2.1. Age structure transition and ageing

A rising proportion of population at age 60+ is a basic indicator for ageing society. Ageing is measured by the Ageing Index, which refers to the number of persons aged 60 years and above per hundred persons under age 15. India's projected age structure transition from 2007 through 2050 indicates a rising share of aged and value of Ageing Index (**Table 1**). This is accompanied by a declining younger population from 31.2 percent to 18.3 percent, and a stable working population around 61 percent. Further, a disaggregation of aged population at 65+ and 80+ and by gender shows that ageing will increase between 65-80 years and for women.[2]

By percent of population aged 60+, India ranked 90th among 192 countries in 2007. This is low as compared to compared to Japan (1st rank with 27.9 percent aged) and higher as compared to United Arab Emirates (last rank with 1.7 percent aged). In terms of value of Ageing Index (27.1), India is 94th in the world, whereas Japan occupies the 1st rank with Ageing Index equals to 201. Decline in fertility (e.g. Total Fertility Rate is projected to decline from 2.8 during 2005-08 to 1.9 during 2025-2050), increasing growth rate elderly population at 60+, and longer life expectancy at 60+ are the most important reasons for population ageing in India (**Table 2**).

[2] Based on Indian census population in 2001, Rajan and Mathew (2008) projected the aged population of India at 301 million (or 17.3 percent of total population) in 2051. This is less than the UN projection in 2050 at 330 million (or 20.7 percent of total population) in 2050 in Table 1. On the other hand, for a brief analysis of India's age structure transition using census data up to 2001, see Central Statistical Organization (2006).

Two important consequences of age structure transition are highlighted below in terms of changes in dependency ratios and economic growth rates.

Dependency is measured by Total Dependency Ratio[(number of persons under age 15 years plus persons aged 65 years or over per 100 persons 15 to 64 years), Youth Dependency Ratio (number of persons 0 to 14 years per 100 persons 15 to 64 years) and Old Age Dependency Ratio (number of persons 65 years or over per 100 persons 15 to 64 years). Old Age Dependency is also measured by Potential Support Ratio (= inverse of Old age Dependency Ratio or number of persons under age 15 to 64 per every person aged 65 or over). India's dependency ratios, consistent with age structure transitions, show increasing (or decreasing) Old Age (or Youth) Dependency Ratio or declining potential support ratio from 2007 through 2050 (**Table 3**). While the decline in total dependency ratio during 2007 to 2005 will be largely contributed by decline in youth dependency, the rise in total dependency ratio during 2025 to 2050 will be the effect of increase in old age dependency ratio.

Growth implications of age structure transition may be explained in terms of growth of per capita income. To illustrate this effect, let Y be the national income, N be the total population, and L be the population in working ages. Then, per capita income [**Y/N = (Y/L).(L/N**)] depends on (a) income per working age member and (b) proportion of population in working ages. (L/N) is called support ratio, or ratio of effective producers to effective consumers. Hence, **g**rowth of per capita income is equal to: **growth (Y/N) = growth(Y/L) + growth(L/N).** This implies that economic growth depends on the growth of productivity and growth of support ratio. Age structure transition leads to large swings in the support ratio. Given the growth of productivity, growth of support ratio increases growth of per capita income. The period during which growth of support ratio leads to increase in economic growth is called First Demographic Dividend [Mason (2005)].[3]

[3] However, impact on changes in age structure can also be captured on consumption, as argued and shown in Mason and Lee (2007).

India's advantages and challenges of age structure transition are highlighted in recent public documents and individual researchers. For instance, the Approach Paper to 11th Five Year Plan [Planning Commission, 2006] highlights the advantages of the transition on economic growth. "*Our dependency rate (ratio of dependent to working age population) is falling….. Properly handled, with an emphasis on human resource development and an economy capable of absorbing them in productive employment, the presence of a skilled young population in an environment where investment is expanding…. would be a major advantage.*" (p.4). On the other hand, the challenges of the transition on social security program are emphasized by Asher (2006): *India's social security system will face huge challenges due to the level and speed of ageing. The life expectancy at age 60 (16 years for male and 17 years for female in 2001) is expected to rise rapidly, requiring a longer period of retirement support for each elderly. As consumption of healthcare resources increases disproportionately with age, retirement financing will need to factor in the healthcare needs.* (p.4638).[4] Thus, economic analysis of age structure transition in general, and population ageing in particular, is of macroeconomic policy relevance and imperative for future India.

2.2. India's public sector and public economic support for aged

In India's National Accounts Statistics (NAS), public sector includes administrative departments, departmental and non-departmental enterprises, and quasi-government bodies. Public sector in NTA refers to the general government and excludes public enterprises. Thus, throughout this paper, by public sector we mean administrative departments and quasi-government bodies. As per the Indian Constitution, public sector activities are divided under the Union List, State List, and Concurrent List. Social sectors, such as, education, health, and social security are included in the Concurrent List. Hence,

[4] Certainly, mortality decline will play an important role in these projections, because the increase in life expectancy at older ages is only half the effect and the rest is the increase in the probability that a worker who enters the labour force at age 20, say, will survive to age 60. The effect of mortality on the old age dependency ratio is equal to the expected person years lived above age 60 divided by the expected person years lived during the working years. I am grateful to Professor Ronald Lee for this technical explanation and importance of mortality decline on dependency ratio.

both the national and sub-national governments have promotional and regulatory functions in these social sectors.

India's macro economy had been undergoing major changes due to the introduction of national economic reforms in July 1991. Over the years, the Reforms have resulted, among others, in bigger role for the private sector. Thus, the Reforms have important implications for public sector's growth, consumption and investment. This is evident by select recent macro-economic indicators of India's public sector in 1999-00 and 2004-05 (**Table 4)**.

Public sector has experienced a steep decline in growth rates by all variables. In the same way, public consumption expenditure has declined as a share in GDP as well as in total (public + private) expenditure. Relative share of education, health, and other expenditures within total public expenditure remained the same between 1999-00 and 2004-05. These trends are of special interest for public age reallocations, because it is determined by income, consumption, capital formation, and savings for elderly population.

India's public support for aged takes several forms.[5] First, pension payments for retired government employees in the Central and state governments, including defense personnel.[6] Second, contribution to social security schemes of employees in the public sector enterprises. Third, expenditure on social security and welfare which includes old age pension for civilians and programmes of affirmative action for socially backward and economically weaker sections of the society. For instance, National Old Age Pension Scheme was introduced in 1995 for destitute individuals of more than 65 years with no source for livelihood under the National Social Assistance Programme. At

[5] No detailed description of social security for India's aged is attempted here as they well documented including for the unorganized sector workers. See, for instance, Asher (2006) for a summary or Chapter 2 in Rajan and Mathew (2008) or Part II in Central Statistical Organization (2006) for detailed descriptions.

[6] In India's NAS, pension for government employees is a part of compensation for employees. Hence, it cannot be included under civilian pensions. For an excellent recent description of India's pension schemes for workers in organized or formal sectors, see, for in stance, World Bank (2008).

present, the extent of monetary assistance is equal to Rs.200 per month per beneficiary. Eligible older persons not covered by this pension scheme are provided with 10 kg of food grains, supplied free of cost, under the Annapurna Scheme 1999. Fourth, non-age specific public expenditure programmes (e.g. poverty alleviation schemes, and affirmative actions). Fifth, welfare programmes by specific departments for senior citizens (e.g. concessions in bus/train fares, and special interest rate on bank deposits.

From 1990-91 through 2006-07, public expenditure on pension payments remained at about 8 percent or less in the total public expenditure (**Figure 1**). On the other hand, share of expenditure on social security and welfare has been at about 2 percent in total public expenditure. However, share of expenditure by Central and State Governments on National Social Assistance Programme (or National Old Age Pension Scheme) was about 0.03 (or 0.028) percent of total public expenditure in 2003-04. Thus, the magnitude of public expenditure on pensions for aged people is negligible in India. This is perhaps the main reason for considering a low public support to the aged in India.[7] However, NTA methodology below aims at public support for elderly beyond civilian pensions in terms of broader public age reallocations.

3. METHODOLOGY OF NTA

NTA is a measure of reallocations or shift of resources from one age group to another, or inter-generational transfers at the national level of aggregation. Reallocations occur because consumption and production differ at different ages of individuals (e.g. production exceeds consumption in working age groups, and consumption exceeds production in childhood and old age dependent age groups**).** NTA documents the means by which those with lifecycle deficits (e.g. young and old) draw on lifecycle surplus (e.g. generated during working ages). Individual is the fundamental analytic unit in NTA. All

[7] Most recently, Government of India (2006) summarized the overall social security problem in the following words: *With some exceptions like the National Old Age Pension Scheme, social protection is practically non-existent for a large majority of population. Pension benefits are not available to about 87 percent of the population and 74 percent of the work force, the bulk of who are in the unorganized sector* (p.42).

transactions are treated as flowing to and from individuals and are classified on the basis of age of individuals. Public and private (e.g. families) institutions mediate the individual transactions. Thus, all estimations in the NTA are distinguished by public and private sectors. The entire methodology of NTA is available in NTA (2008). Using this information, an overview of NTA methodology is presented below.

Flow Account measures all income and consumption flows during the prescribed accounting period. Estimation of lifecycle deficit and age allocations is essential for construction of NTA Flow Account. Lifecycle deficit is a measure of total demand for age reallocations. This equals to difference between the value of goods and services consumed by members of an age group [C(a)], and the value of goods and services produced by members of an age group [Y(a)]: LCD = {C(a) – Y(a)}> 0. Age groups with deficit support their surplus consumption by generating age reallocation inflows and those with surplus generate age reallocation outflows.

Age reallocations involve four steps. First, estimation of aggregate control variables (aggregate income and consumption). Second, estimation of age allocation of aggregate control variables. Third, estimation of lifecycle deficit/surplus by age groups and overall age groups. Fourth, estimation of age reallocations by asset reallocations and transfers.

Aggregate controls in NTA are drawn from National Income and Product Accounts (NIPA). Thus, in essence, NTA is an attempt to introduce age into NIPA. This attempt establishes macroeconomic relationships and consistency between NTA and NIPA, and provides with macroeconomic bases for NTA estimations, viz., aggregate controls and age profiles in LCD and age reallocations. Selective adjustment in aggregate controls to derive aggregate and per capita age profiles is an essential feature of NTA methodology.

In formal terms, relationship between NTA and NIPA may be established as follows. To start with, the familiar National Income (NI) identity is as follows.

$$\mathbf{C + I + G + (X - M) = Y_L + Y_A,} \qquad \mathbf{(1)}$$

where **C** is aggregate private consumption expenditure; **I** is aggregate investment expenditure, **G** is total government expenditure, **X** is total exports, **M** is total imports, $\mathbf{Y_L}$ is aggregate labour income and $\mathbf{Y_A}$ is aggregate non-labour or asset income. On the other hand, Flow Account identity under NTA is given below.

$$\mathbf{Y_{L,i} + Y_{A,i} + (T_{f,i}^{+} + T_{g,i}^{+}), = (C_{f,i} + C_{g,i}) + Si + (T_{f,i}^{-} + T_{g,i}^{-}),} \qquad \mathbf{(2)}$$

where $\mathbf{C_{f,i}}$ is private consumption expenditure, $\mathbf{C_{g,i}}$ is public (government) consumption expenditure, $\mathbf{S_i}$ is savings, $\mathbf{Y_{L,i}}$ is labour income, $\mathbf{Y_{A,i}}$ is non-labour or asset income, $\mathbf{T_{f,i}^{+}}$ and $\mathbf{T_{f,i}^{-}}$ are private transfer inflows and outflows respectively, $\mathbf{T_{g,i}^{+}}$ and $\mathbf{T_{g,i}^{-}}$ are public transfer inflows and outflows respectively. Suffix **i** refers to individual or age group. Thus, in (2), LHS shows total inflows and RHS shows total outflows. Rearranging terms in (2), we get:

$$\mathbf{(C_{f,i} + C_{g,i}) - Y_{L,i} = (Y_{A,i} - Si) + (T_{f,i}^{+} - T_{f,i}^{-}) + (T_{g,i}^{+} - T_{g,i}^{-}),} \qquad \mathbf{(3)}$$

The LHS of (3) is LCD. On the RHS, $(Y_{A,i} - Si)$ is asset reallocations, $(T_{f,i}^{+} - T_{f,i}^{-})$ is net private transfers, and $(T_{g,i}^{+} - T_{g,i}^{-})$ is net public transfers. Thus, the RHS is equal to total age reallocations and distinguishable between public and private sectors.[8]

Net exports are introduced to take care of Rest-of-World (ROW) in NTA. Unlike in equation (1), net exports are introduced indirectly into NTA through variables in (3). Net exports (NX) are equal to:

$$\mathbf{NX = Y_{L,ROW} + Y_{A,ROW} + (T_{ROW}^{+} - T_{ROW}^{-}) + S_{ROW}} \qquad \mathbf{(4)}$$

[8] Mason et al (2006) provides with a general framework for derivation of Flow Account of NTA. The basic idea is that, for any period, inflows must be balanced by outflows for any individual, household, age group, or economy. Assuming that the rate of return to capital (K) and credit and land (M) are identical, asset income (Y_A) equal to (Y_K) + (Y_M), and savings (S) equals to $I_K + I_M$. This formulation is equal to equation (3) above.

Where $Y_{L,ROW}$ is net compensation of employees from ROW, $Y_{A,ROW}$ is net property and entrepreneurial income from ROW, $(T_{ROW}^{+} - T_{ROW}^{-})$ is net transfers from ROW, and S_{ROW} is net borrowings from ROW (or net savings). Thus, the variables in (3) are inclusive of ROW for an open-macro economy.

Note that by assuming (S=I) and given that net aggregate transfers: $\Sigma(T_{f,i}^{+} + T_{g,i}^{+}) + \Sigma(T_{f,i}^{-} + T_{g,i}^{-}) = 0$, equation (1) and (3) are equated. This shows the direct relationship between NI in (1) and NTA in (3) in aggregate terms.. From the viewpoint of data, however, $(T_g + T_f)$ and $(C + G + S)$ can be directly drawn from NI. Thus, $(Y_L + Y_A)$ need adjustments for measurement in NTA.

Equation (3) is the basic framework for estimation of inflows and outflows. Age profile (by single year, however) of each variable in (3) is derived by the following steps. (a) Select nationally representative surveys or national administrative records in which data for age allocation of variables are available. (b) Assign values of variables to each individual, using NTA allocation rules. (c) Tabulate the data using survey weights to obtain per capita age profiles for each variable. (d) Smooth per capita profiles to eliminate noise. (e) Multiply per capita profiles by final population estimates to obtain aggregate age profiles. (f) Adjust the aggregate age profiles and unsmoothed and smoothed per capita profiles proportionately to match the aggregate control total. (g) Aggregate individual profiles to obtain profiles for aggregate variables. For instance, aggregate consumption profile is derived by aggregating public and private consumption profiles.

4. ESTIMATION FRAMEWORK FOR INDIA

Estimated lifecycle deficit is the basis for estimation of public age reallocations for elderly. In what follows, we present a framework for estimation of (a) aggregate controls and their age profiles, (b) lifecycle deficits, and (c) public age reallocations by defining

the variables and describing databases. Throughout, all data and estimates are at current prices.

4.1. Aggregate controls

Table 5 presents the definition, measurement and data source for all aggregate controls by income and consumption variables. Income is distinguished by labour and asset income. They are constructed under different assumptions of NTA due to adjustments required for (a) labour and capital share of mixed income, and (b) production and consumption share of indirect taxes. Further, aggregate public and private consumption are disaggregated by education, health and other consumptions, because these consumptions are uniquely distinguishable by their age specificity. In addition, private housing consumption is separated within private consumption other. Aggregate control for private housing consumption variable is the net NDP from the ownership of dwelling in the National Accounts Statistics. This is used to measure the imputed value of owner occupied housing. The labour and capital share of mixed income is estimated after deducting the imputed value of owner occupied housing from the mixed income. All the aggregate controls are drawn or constructed by using the National Accounts Statistics 2007 [Central Statistical Organization (2007)].

4.2. Age profiles of aggregate controls

Age profiles of the above aggregate controls are derived by using different databases in 2004-05. First, UN projected population by single years in 2004 is used for all age profile estimations. Second, India Human Development Survey 2005 [Desai et al (2008)] is the micro data on households and individuals from a nationally representative sample of 41,554 households spread over 1503 villages and 971 urban neighborhoods. This data is available in the public domain from the Inter-University Consortium for Political and Social Research. Using this data, the following age profiles for labour income private consumption are derived.

(a) Labor income based on individual income from wage and salary and self-employment (i.e. income from business, agriculture and non-agriculture), and asset income based on individual income from property (i.e. rent and interest income).

(b) Private education consumption, using regression model. Regression model is: $CFE_j = \sum\alpha(a).E_j(a) + \sum\beta(a).NE_j(a)$, where CFE_j is household private consumption expenditure of education, $E_j(a)$ is number of enrolled members in each age group [a], and $NE_j(a)$ is number of not enrolled members.In the absence of educational spending on non-formal education system, $CFE_j = \sum\alpha(a).E_j(a)$. Hence, using the estimated coefficients (*), $CFE_{ij} = [\{\alpha^*(a)/\sum\alpha^*(a).E_j(a)\}.CFE_j]$ is the allocation rule for *ith* enrolled member in the *jth* household.

(c) Private health consumption by using the using regression model). The model is: $CFH_j = \sum\beta(a).M_j(a)$, where CFH_j is household private consumption expenditure of health, and $M_j(a)$ is number of household members in each age group (either single year or broader age group). The estimated regression coefficients [$\beta(a)^*$] are used to allocate the health expenditure for *ith* member of *jth* household as follows. $CFH_{ij} = [CFH_j.\beta(x)/\sum\beta^*(a).M_j(a)]$, where x is age of *ith* household member.

(d) Private consumption other by using Equivalence Scale). The equivalence scale is equal to 1 for adults aged twenty or older, declines linearally from age 20 to 0.4 at age 4, and is constant at 0.4 for those age 4 or younger. That is, $\lambda(a) = (1\text{-}0.6)$, $(a \leq 4)$; $\lambda(a) = 1 - [0.6.(20\text{-}a)/16]$, $(4<a<20)$; and $\lambda(a) = 1$, $(a \geq 20)$. Using the above formula, intra-household allocation of private other consumption is equal to: $CFX_{ij} = [CFX_j.\lambda(x)/\sum\lambda(a).M_j(a)]$, where x is the age of the *ith* household member.

Age profile for public consumption variables are derived by using multiple sources as given below.

i. The 60^{th} .Round of National Sample Survey on Healthcare, Morbidity and Conditions of aged in India [(NSSO (2004)] provides information on utilization of

public health facilities. This data is used for drawing age profile for public health consumption.

ii. Age profile of public education is derived by using the following estimated enrolment rates and public expenditure by level of education.[9] First, using estimated attendance data from the 61st Round of National Sample Survey Organization (July 2004 June 2005) on *Status of Education and Vocational Training in India 2004-05,* share of attendance in public institutions by levels of education is computed. This share is applied for total enrolment data in the Government of India's *Education Statistics 2004-05* to obtain attendance in public institutions. For primary and middle school education, public included attendance in government, local body and private aided institutions. For secondary and higher education public included government and local body institutions. Second, using Government of India's *Indian Public Finance Statistics 2006-07*, revenue expenditure on education by all levels of governments (including non-education departments) is obtained. Using the enrolment data in public institutions, per student expenditure is computed by different levels of education. This is interpreted as unit cost. Unit cost is uniform with each level of education. Third, public education consumption is presumed to be proportional to revenue expenditure by levels of education. Per student public education consumption is obtained by using enrolment data in public institutions. Fourth, expenditure on adult education and training is allocated on per capita basis for age group 30-60.

iii. Age profile of public other consumption is based on its per capita allocation.

[9] Published education data suffers from three major gaps in formal education (from primary through higher education) at national level: First, no enrolment data by public and non-public institutions. Second, no public consumption of education by levels of education. Third, no unit cost data by levels of education. Thus, the following approximations are attempted for generation of enrolment data for public institutions, used in the estimation of publication education consumption.

5. ESTIMATION RESULTS

5.1. Lifecycle deficit (LCD) for elderly

Estimated LCD for India's elderly in 2004-05 is presented in **Table 6.** The numbers in second column are equal to estimated aggregate controls and refer to all ages. LCD for elderly is restricted for age group 65+. About 27 percent of India's LCD in 2004-05 is accounted for elderly population.[10] This equals to 2.45 percent of India's GDP. Health consumption is the largest of all sources of public as well as private consumption. Surprisingly, share of elderly in other consumption is about 6 percent in both public and private consumption. Within total consumption of elderly, private consumption accounts for 86 percent. This underlines the importance relative size of private consumption in elderly consumption.

5.2. Public age reallocations

Public sector age reallocations for elderly population comprise (a) public transfers and (b) public asset reallocation. These reallocations are separately analyzed below.

5.2.1. Public transfers

Public transfers are distinguished between inflows and outflows. Inflows are equal to in-kind transfers and cash transfers. In-kind transfers are the same as public consumption in estimation of LCD. Cash transfers include civilian pensions. Outflows are equal to taxes and non-tax revenues. By definition, net transfers (inflows minus outflows) are zero at the aggregate.

[10] From the estimated LCD for non-elderly age groups, three results are evident. First, working population in the age group of 30-49 years and 50-64 years generate surplus. Second, the highest LCD is evident for young age dependents (age group 0-19 years), about 8 times higher than for the elderly.

In India's NAS, cash transfers (or other current transfers from the general government) includes civilian pensions for old age and destitute, maternity benefits and other transfer payments to households, and grants in aid to private institutions [Central Statistical Organization (2007)] In the absence of data on the composition and age of beneficiaries, all cash transfers are allocated on per capita basis. Thus, except for public education and health consumptions, all other public sector inflows are allocated for all ages on per capita basis. As elderly consumption of public education is zero, the shape of the age profile of public sector in-kind transfers for elderly is determined by the age profile of public health consumption. Thus, the standard deviation of per capita public transfer inflows (=7.637) coincides with the standard deviation of per capita public health consumption These features of public sector inflows are evident in per capita age profiles of public sector inflows in **Figure 2**.

Tax outflows are equal to direct and indirect taxes. Separate profiles are derived for direct taxes by individual income tax (based on proportion of total labour income of individuals) and corporate income tax (based on proportion of total asset income of individuals). All indirect taxes are allocated based on age profile of private other consumption. Other revenues (also called public sector surplus) are allocated based on combined tax profiles of direct and indirect taxes. Age profile of per capita outflows by direct taxes, indirect taxes, and non-tax revenues are presented in **Figure 3**.

It should be emphasized that the estimated age profile of total public transfer outflows includes all ages. This is because of two reasons. First, indirect taxes are allocated based on private consumption other, and private consumption other is allocated according to equivalent scale for all individuals including children. Second, allocation of other revenues is dependent on age profiles of both direct and indirect taxes. Thus, the age profiles in figure 3 reflect these features of age allocation rules for public sector outflows.

Net transfers (inflows minus outflows) of public sector are a useful representation of beneficiaries and payers of public transfers in India. Age profile of per capita net inflows is shown in **Figure 4**. Net transfers are negative for all elderly. This implies that

outflows (i.e. tax and other payments) are higher than inflows (i.e. in-kind and cash transfers). A plausible explanation for this surprising result is evident in Table 7 below.

Table 7 presents the estimated aggregate public transfers for elderly. Largest outflows are evident for direct taxes in general, and corporation or asset-based taxes in particular. This is contrary to the presumption that tax incidence in a developing country like India is largely in the form of indirect or consumption taxes for elderly. Thus, the main explanation for negative net inflows for elderly is (a) larger outflow in the form of asset-based direct taxes and (b) non-elderly specific inflow of public consumption other and cash transfers.

A simple measure of determining the burden of financing public transfers is the ratio of net public transfers to labor income for the surplus age groups. This equals to -2.23 percent on those aged 30-49 and -6.19 percent on those aged 50-64 for India. The nature of this burden corresponds to US in 2000, but opposite to Taiwan in 1998, as reported in Mason et al (2006).

5.2.2. Public asset-based reallocations

Public asset-based reallocation is the difference between public asset income and public savings. Public asset income is sum of public capital income, net public interest and nets other public property income. All public assets are assigned to age groups based on general tax profile. Following Mason (2008), age allocation rule for public assets is as follows. Let Tax(x,t) be per capita general tax payment by persons of age x in year t; N(x,t) be the population age x in year t; $A_g(x,t)$ be the value of public assets at the end of period t. Then, $A_i(x,t) = [Taxshare(x,t).A_i(t)]$, where $Taxshare(x,t)=[Tax(x,t).N(x,t)/Tax(t).N(t)]$. Now, $A_g(x,t)$ is determined by relationship between assets and savings as given below. $A_g(x,t) = [A_g(t-1) + T_g^A(t) + S_g(t) + X_g(t)]$, where $A_g(t-1)$ is value of public assets at the end of period t, $T_g^A(t)$ is public asset transfers during the period, $S_g(t)$ is net public savings during the period, and $X_g(t)$ is

other economic flows during the period. Public asset transfers include foreign aid received for acquiring or building capital. Other economic flows consists holding gains (e.g. arising due to changes in prices and exchange rates) and other volume changes (e.g. due to natural disasters).

Table 8 presents the estimation results for aggregate public sector age reallocations for India in 2004-05. All age allocations are negative and indicate excess of savings over asset income. This result is sensitive to age profile of general taxes (i.e. combined age profile of direct and indirect taxes), because all variables in public asset-based reallocations are age-allocated based on age profile of general taxes. This is reflected in age profiles of per capita public asset based-reallocations in **Figure 5**.

5.3. Financing elderly consumption

Table 9 summarizes the instruments of financing elderly consumption by labor income and public age reallocations. This result is useful to distinguishing the relative importance of different instruments for financing elderly consumption in India. Most important, elderly consumption is financed by transfer outflows (about 19 percent) and savings (about 10 percent). This result is interpreted that lifecycle savings and taxes indirectly financing the consumption of the elderly by financing age reallocations from middle-age adults to their elderly parents [Mason et al, (2006)]. At the same time, financing of elderly consumption by positive instruments, such as, labour income (32.47 percent) and private sector age reallocation (96.80) cannot be ignored.

6. CONCLUSIONS AND IMPLICATIONS

Using the NTA's framework of Flow Accounts, this paper quantified the effects of public age reallocations for India's elderly in 2004-05. Major conclusions from analysis of the estimation results are as follows. First, the effects are captured by the estimated

nature and magnitude of public age reallocations, and its financing consumption of lifecycle deficit for elderly age group (65+) by transfers and asset allocations. Both the instruments of public age reallocations offer evidence for negative age reallocations. This implies that outflows in the form of taxes and non-taxes and savings are indirectly contributory for financing elderly consumption by financing the public transfers and asset-based reallocations from non-dependent adult age groups to elderly. Second, direct taxes in general and asset-based taxes in particular explain for the largest public transfer outflows for elderly. This indicates that ownership of taxable assets is held by elderly, perhaps as a source of income security in old ages. Nevertheless, this result is surprising for a developing country like India where consumption-based, indirect taxes are presumed to be a major outflow because of its largest share in total tax revenue. Third, public transfers have a larger indirect impact on elderly consumption than public-asset based reallocations. This underlines the important role of public transfers for attainment of intergenerational equity in terms of reducing elderly LCD. These results are useful for fiscal policy analysis for population ageing in India.

The above results above offer insights into the role of public sector in financing consumption of the aged in India. These insights are missed by policy makers in the absence of estimates of lifecycle deficits and public age reallocations for elderly, as provided by the NTA. Thus, NTA is a useful policy framework to single out the public instruments of economic support for the aged in India.

The descriptions in this paper show that population ageing does matter for future India. At the same time, India will have the advantage of a large share of working age population up to the middle of this century. This working population, if educated, skillful, and gainfully employed, will constitute the effective producers and may offer economic support for effective consumers. This may be contributory for reaping underlying demographic dividends in India's age structure transition over next 50 years. Estimation of such dividends is an important extension of this paper. In addition, this paper is extendable in many others ways. First, a new estimation, prior to 2004-05, will be useful for comparative purposes and for analysis of transition path of public age reallocation

effects on elderly. This is especially relevant due to declining share and growth of public sector in income generation, consumption expenditure, and capital formation. Second, international comparison of India's results with other developing countries in Asia and Africa will be useful to single out the unique similarities and essential differences. Third, replication of the estimations with a larger database (e.g. National Sample Survey data from 61st Round in 2004-05) will be useful to establish the generality of results.

The results of this paper are preliminary and merely indicative. International research on NTA methodology is evolving, especially in regard to age reallocations. Availability of new databases would be useful to draw more precise age profiles of aggregate controls. These limitations qualify the results, conclusions and implications of this paper.

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Table 1: Age structure transition and ageing in India: 2007-2050

Indicators	2007	2025	2050
1.Total population (millions)	1134	1395	1593
2. Age structure	Percent of total population		
• 0- 14	31.2	24.5	18.3
• 15-59	60.7	63.5	61.0
• 60+	8.1	12.0	20.7
3. Ageing Index	26.1	49.2	113.0
4. Ageing by gender	Percent of population within age groups		
Total			
• 60+	8.1	12.0	20.7
• 65+	5.4	8.1	14.8
• 80+	0.8	1.3	3.3
Female			
• 60+	8.8	12.8	22.0
• 65+	5.9	8.7	16.1
• 80+	0.9	1.6	3.9
Male			
• 60+	7.5	11.4	19.4
• 65+	4.9	7.5	13.6
• 80	0.7	1.1	2.8

Source: United Nations (2007b).

Table 2: Determinants of ageing: 2007-2050

Indicator (average)	Age	2005-10	2025-30	2045-50
Growth rate (%)	Total	1.4	0.8	0.3
	60+	2.8	3.2	2.4
	65+	2.8	3.6	2.6
	80+	4.3	3.9	3.7
Life expectancy (years)				
• Total	Birth	64.9	71.3	75.9
	60	17.9	19.7	21.4
	65	14.5	16.1	17.6
	80	7.1	7.7	8.4
• Female	Birth	66.7	73.5	78.1
	60	18.9	21.1	23.1
	65	15.3	17.2	19.0
	80	7.3	8.1	9.1
• Male	Birth	63.2	69.5	73.8
	60	16.9	18.6	19.9
	65	13.7	15.1	16.3
	80	6.8	7.4	7.9

Source: United Nations (2007b)

Table 3: Dependency ratios for India: 2007-2050

Dependency indicators	2007	2025	2050
1. Dependency Ratio			
• Total	57.8	48.2	49.6
• Youth	49.2	36.3	27.4
• Old Age	8.6	12.0	22.2
2. Potential Support Ratio	11.7	8.4	4.5

Source: United Nations (2007b)

Table 4: Macroeconomic indicators of India's public sector: 1990-00 and 2004-05

Indicators	1999-00	2004-05
1. Public sector as a percent of		
1.1. GDP	10.6	9.5
1.2. Gross domestic capital formation	8	10.1
1.3. Gross domestic savings	-20.6	-8.3
2. Public consumption expenditure as percent of GDP		
2.1. Total	10.88	8.70
2.2. Health	0.69	0.54
2.3. Education	1.85	1.48
3. Public consumption expenditure as percent of total (public and private) consumption expenditure		
3.1. Total	13.38	11.93
3.2. Health	18.36	14.51
3.3. Education	58.10	49.71
4. Percent within public consumption expenditure		
4.1. Health	6.35	6.17
4.2. Education	16.97	16.99
4.3. Others	76.68	76.84
5. Annual growth rate (%) of public sector's	1993-94 to 1999-00	1999-00 to 2004-05
5.1. GDP	18.62	6.31
5.2. Gross Domestic Capital Formation	13.40	12.56
5.3. Gross Domestic Savings	-23.31	-6.95
5.4. Total consumption expenditure	16.77	4.32
5.5. Health expenditure	16.51	3.84
5.6. Education expenditure	19.40	4.34

Notes: (a) All indicators are constructed at current prices. (b) Annual growth rate refers to compound average annual growth rate.
Source: Central Statistical Organization (2005 and 2008).

Table 5: Measurement of aggregate controls for income and consumption

Aggregate controls	Measurement of aggregate variables Database for all variables: **National Accounts Statistics**
1. Aggregate income	
1.1. Labour income	Compensation of employees + (2/3) of mixed income + net compensation of employees from ROW
1.2. Asset income	Operating surplus of non-household sector + (1/3) of mixed income of household sector + net property and entrepreneurial income from ROW + net indirect taxes (Capital share of indirect taxes – subsidies)
2. Aggregate consumption	
Public	Government Final Consumption Expenditure (GFCE)
Private	Private Final Consumption Expenditure (PFCE)
2.1. Education consumption	
Public	Expenditure on education services under GFCE
Private	Expenditure on education under PFCE
2.2. Health consumption	
Public	Expenditure on health and other services under GFCE
Private	Expenditure on medical care and health services under PFCE
2.3. Consumption Other	
Public	Expenditure on non-education services, and non-health and other services, under GFCE
Private	Expenditure on non-education, and non-medical care and health services, under PFCE

Notes: (1) Public consumption other includes general public services; defense; social security and welfare services; housing and other community amenities; cultural, recreational, and religious services; economic services (e.g. agriculture, mining, transport, and communication). (2) Private consumption other includes food and beverages, clothing and footwear; fuel and power; furniture, furnishing, appliances; transport and communication; and recreation and cultural services.
Source: Compiled and constructed from Central Statistical Organization (2008).

Table 6: Estimated aggregate lifecycle deficit for India's elderly in 2004-05

LCD, income and consumption indicators	Total – All ages (INR in crore)	Elderly population (Age group: 65+) (INR in crore)	Share of elderly in LCD, consumption, and labour income (%)	Consumption share of elderly by components (%)
Lifecycle deficit (LCD)	260265	70175	26.96	
Consumption	1844800	103921	5.63	100.00
Public consumption	342542	14138	4.13	13.60
• Education	58795	0	0.00	0.00
• Health	22805	1347	5.91	1.30
• Other	260942	12791	4.90	12.31
Private consumption	1502258	89783	5.98	86.40
• Education	34507	0	0.00	0.00
• Health	94156	9202	9.77	4.78
• Housing	94314	4971	5.27	8.85
• Other	1279281	75611	5.91	72.76
Less: Labour income	1584535	33747	2.13	

Note: INR refers to Indian rupee. One crore is equal to 10 million.
Source: Author.

Table 7: Estimated public transfers for elderly in India, 2004-05

Public age reallocations	Total – All ages (INR in crore)	Elderly population (Age group: 65+) (INR in crore)	Share of elderly population in inflows and outflows income (%)
Public net transfers	0	-19542	0.00
Inflows	445888	19276	4.32
• In-kind transfers	342542	14138	4.13
• Cash transfers	103346	5138	4.97
Outflows	-445888	-38818	8.71
• Taxes	-504622	-43704	8.66
➢ Direct taxes	141235	22227	15.74
▪ Income tax	49268	1050	2.13
▪ Corporation tax	91967	21177	23.03
➢ Indirect taxes	363387	21704	5.97
• Other revenues	58734	4886	8.32

Notes: (a) One crore is equal to 10 million. (b) Net transfers refer to inflows minus taxes.
Source: Author.

Table 8: Public asset based reallocations for elderly in India, 2004-05

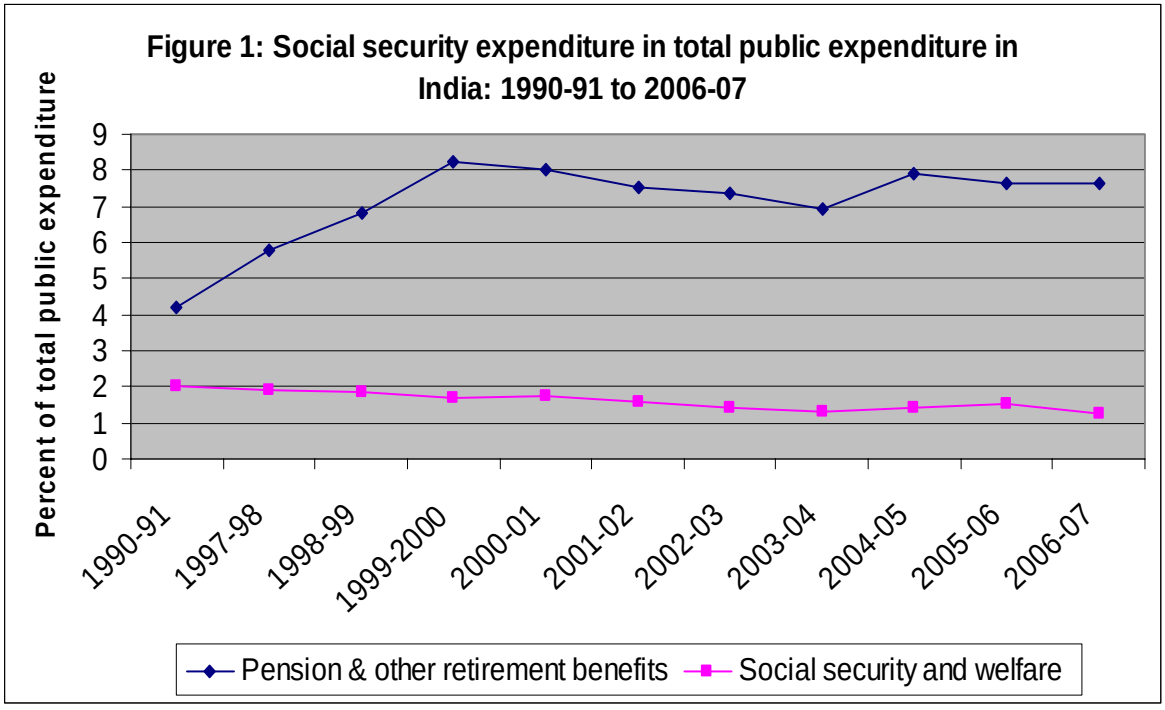
Public age reallocations	Total reallocations– All ages (INR in crore)	Reallocations for elderly (INR in crore)	Share of elderly reallocations in total reallocations (%)
Asset-based reallocations	-132335	-10878	8.22
• Income on Assets	-242575	-19940	8.22
• Less: Saving	-110240	-9060	8.22

Notes: (a) One crore is equal to 10 million.
Source: Author.

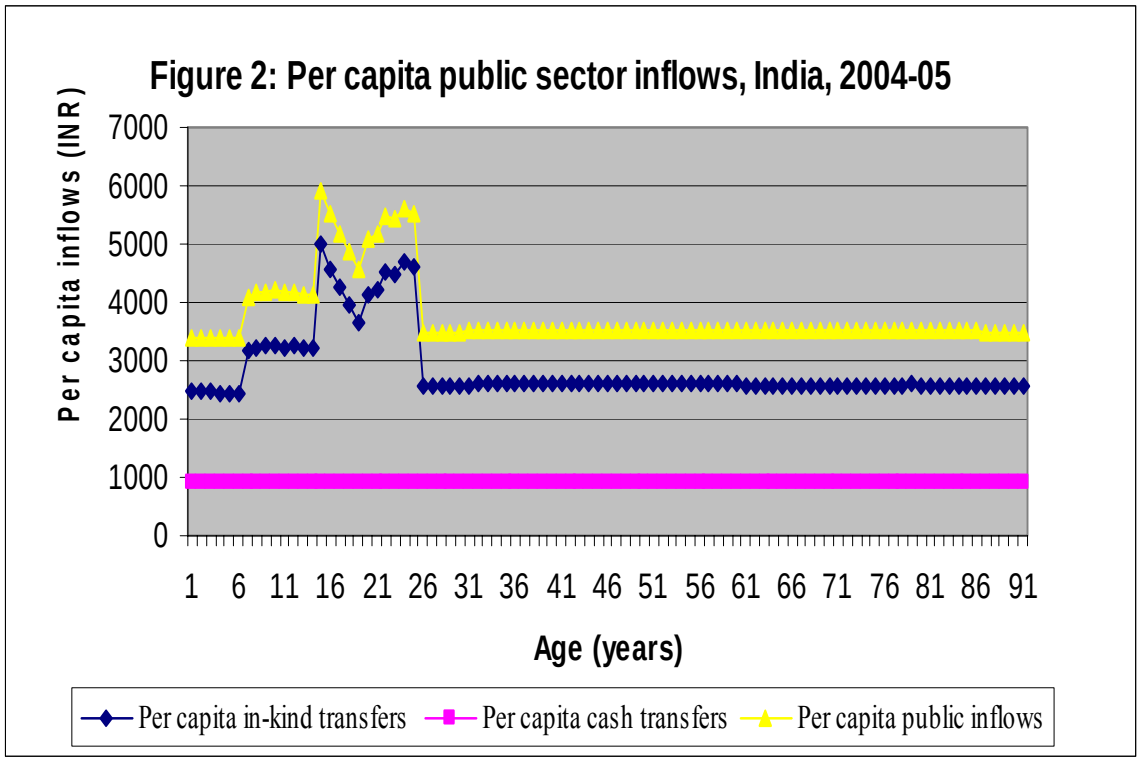
Table 9: Financing consumption for deficit age groups in India, 2004-05

Sources of finance	Extent of financing consumption for elderly (%)
1. Labor income	32.47
2. Public sector age reallocations	-29.27
• Public transfers	-18.80
• Public asset-based reallocations	-10.47
3. Private sector age reallocations	96.80

Source: Author



Source: Constructed by using data the data in Government of India (2007).



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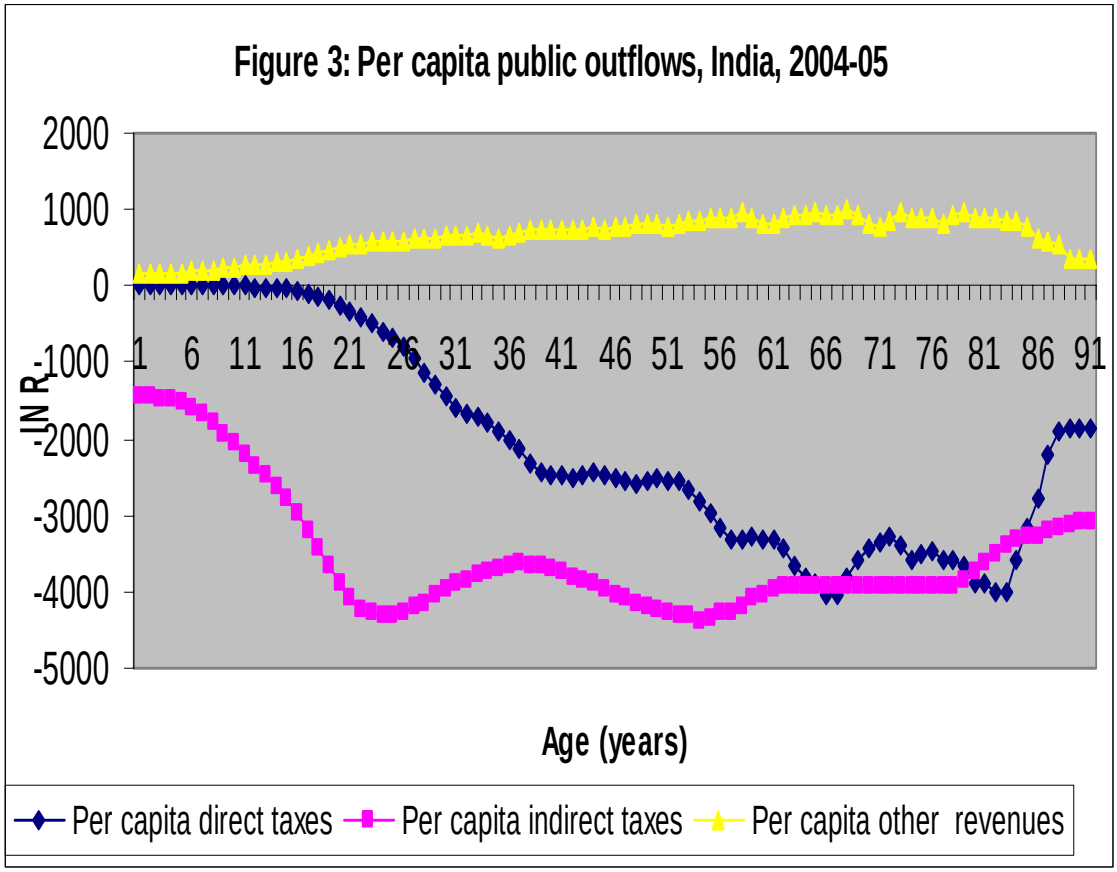

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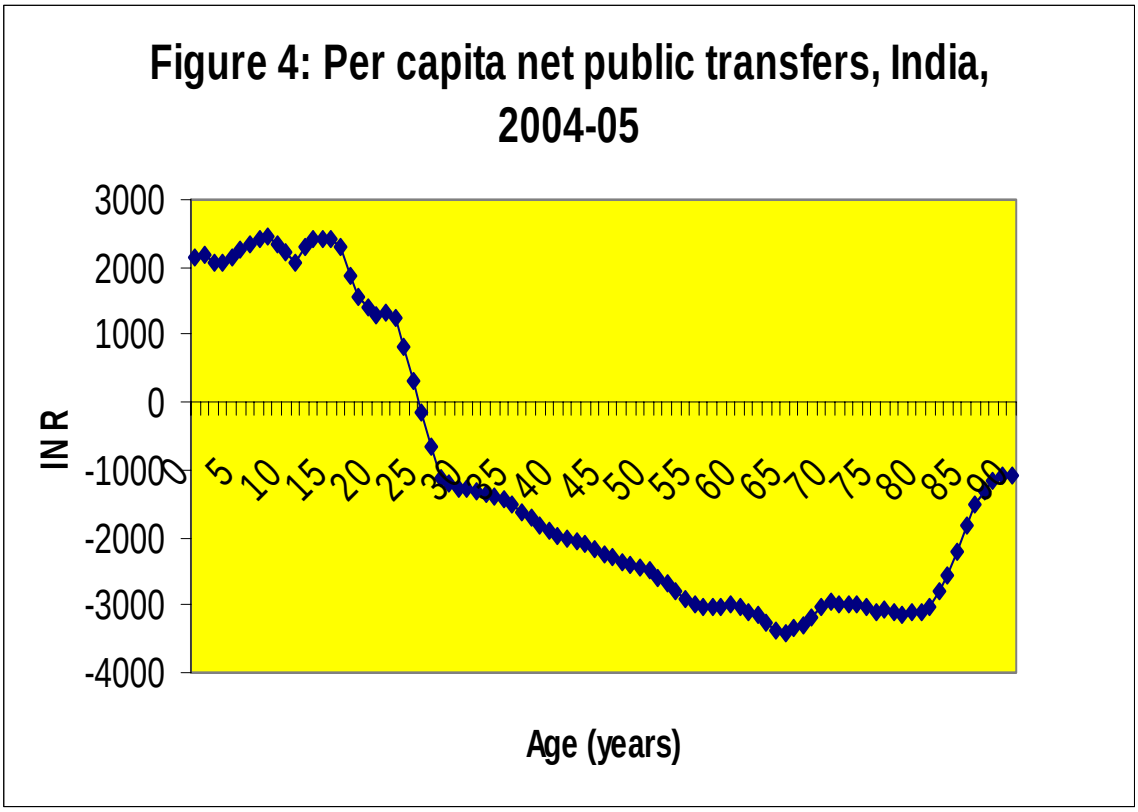

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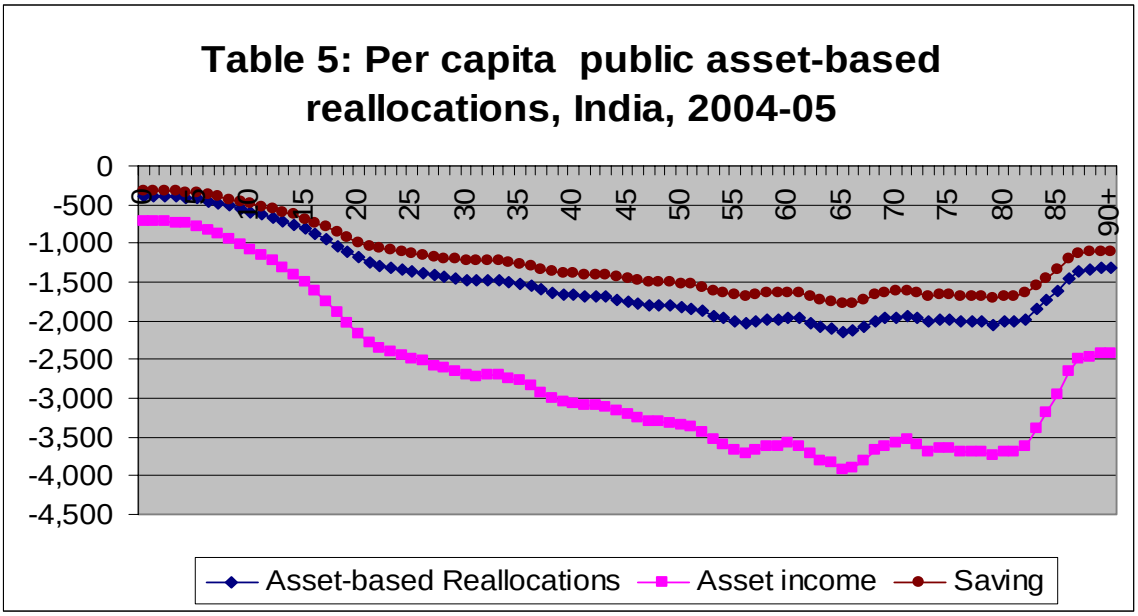

Source: Author