Date last revised: September 26, 2014

Demographic Dividend, Human Capital, and Saving:

Take it Now or Enjoy it Later?

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Key words: Demographic dividend, economic development, human capital, saving, intergenerational transfers.

Lee's research for this paper was funded by the National Institutes of Health, NIA R37 AG025247. Lee and Mason's research was funded by World Bank.

Abstract prepared for:

Population Association of America
April 30 - May 2, 2015
San Diego, CA

Countries at all levels of development are experiencing or are likely to experience substantial changes in population age structure as a consequence of the demographic transition and its aftermath. The rise in the share of the working-age population has led to the demographic dividend with a direct impact on the availability of economic resources. The deeper impact of the demographic dividend depends, however, on how those resources are used: to meet current material needs, to enhance human capital through spending on education and health, and/or to realize higher rates of saving to meet future needs and to fund much-needed investment.

The goal of this paper is to improve our understanding of the economic implications of the demographic dividend arising through decisions about the allocation of resources between current material needs, enhanced human capital spending, and higher rates of saving and investment. Decision-making about the allocation of resources involves both the public and the private sectors which can vary widely from country to country. This is very apparent in the case of human capital spending, for example. Thus, to understand the impact of population on human capital and other spending decisions, it is essential to explore the effects on the public and private sectors and the interaction between the two.

For the most part human capital spending is funded via transfers – from parents or taxpayers to children. While parents transfer resources to their own children, taxpayers provide support to children in general. Changes in population age structure lead to changes in the relative numbers of givers and receivers of both public and private transfers. By necessity, this leads to changes in the average amount received by receivers and/or the average amount given by givers. A priori, however, it is entirely unclear what choices will be made about public or private transfers and how that might vary depending on the purpose of the transfer: education? Health? Current material needs? Little is known, moreover, about the extent to which public investment crowds out private.

Cross-sectional data suggest a strong shift towards human capital spending as the number of children declines relative to the number of adults. This is consistent with the quantity-quality tradeoff introduced by Becker and Lewis (1973) and employed in some of our earlier work (Lee and Mason 2010). In previous work we have had to rely heavily on cross-sectional data because NTA time series estimates were not yet available. The construction of time series estimates for a number of developing countries, e.g., China, the Philippines, Nigeria, and others provides new opportunities for validating and elaborating on cross-sectional analysis.

The model development for this project has begun with modelling the public sector. As a starting point, the direct effects of age structure on public spending including human capital are captured by the fiscal support ratio or by closely related projections of the impact of population age structure conditional on

age-specific tax and spending profiles. Preliminary results for China illustrate our basic approach to the public sector.

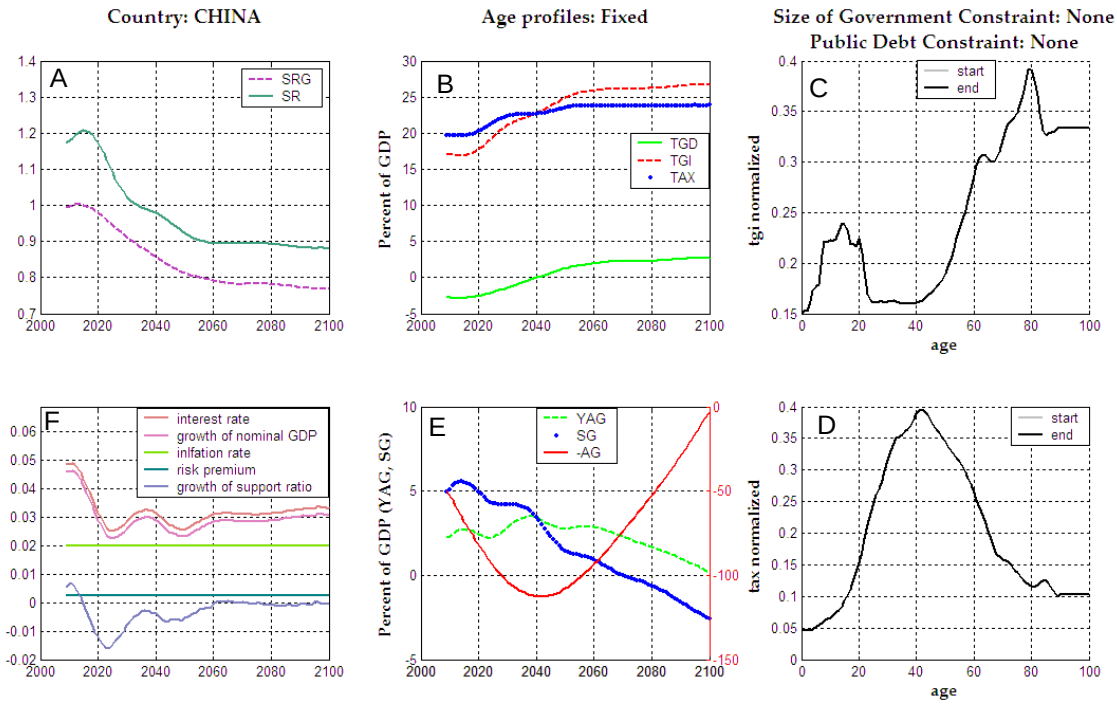

Figure 1. Preliminary results of public sector projections for China, 2009 to 2100. Moving clockwise from the NW panel, the panels show: (A) support ratio (SR) and fiscal support ratio (SRG); (B) total public transfer inflows or benefits received (TGI), taxes (TAX), and their difference (TGD) as a percentage of GDP; (C) per capita public transfers inflows (benefits) normalized on labor income for those 30-49; (D) per capita tax payments normalized on labor income for those 30-49; (E) public saving (SG), public asset income (YAG), and public debt (-AG) as a percentage of GDP; (F) annual growth rates of prices, nominal GDP, and the support ratio; the public sector interest rate and the risk premium.

This is the simplest projection of the public sector that we undertake. Per capita age profiles of public transfer inflows and taxes are held constant at the base year value (panels C and D). The medium fertility scenario from the UN population projections is used which leads to substantial deterioration in the support ratio and fiscal support ratio (Panel A). Currently, China's public sector is in excellent condition with a primary budget surplus (TGD < 0) and very large net assets. Under these conditions, China will continue to accumulate net public asset until 2040 and will not reach net assets of zero until 2100 despite very rapid aging.

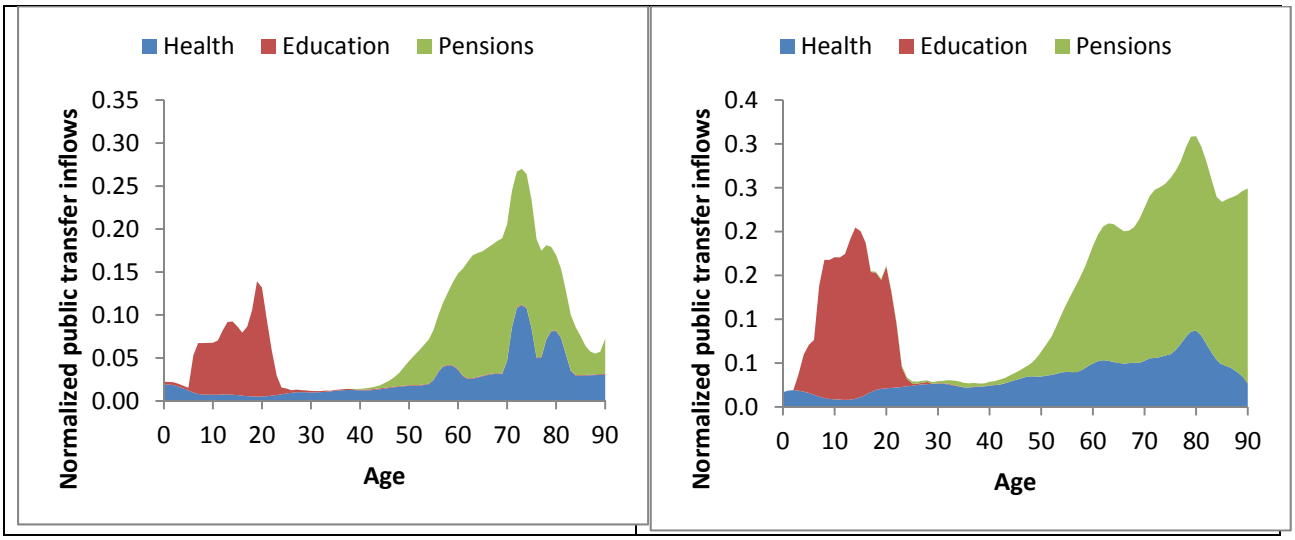

Figure 2. Public spending on health, education, and pensions by age, 2003 (left panel) and 2010 (right panel). Values normalized on average labor income of person 30-49.

China has the fiscal space to expand public sector spending on education, health, and pensions as circumstances require. China has been taking such steps as can be seen in Figure 2 which shows spending by age normalized on per capita labor income. We control directly for the level of development by normalizing spending on the average of per capita labor income of persons 30-49. It is quite apparent that spending on education and pensions have risen substantially more rapidly that labor income in China. Clearly China exploited its demographic dividend in part by increasing spending on human capital particularly in the form of education and by expanding social insurance for the elderly by increasing pensions.

These results are very preliminary but illustrative of the kind of approach we will take to the public sector. The private allocation of resources among competing uses is also important and influenced by age structure. The effects are more complex, however, because the private effects of age structure arise primarily through changes in dependency operating at the family level, not at the societal level. Of course, the effects of age structure on private decisions differ from those of public decisions because the public and private sectors play different roles in human capital spending. In particular, families in all societies are heavily involved in support of children but in some societies may provide less financial support for elderly parents. Thus, aging may have a much greater budgetary impact on the public sector than it does on the private sector. Private spending will be influenced, however, by changes in public spending. A general increase in public spending will shift resources out of the private sector and reduce spending in general and potentially for human capital purposes. Moreover, to the extent that public and private human capital spending are substitutes, an increase in public spending may "crowd out" private spending.

The analysis will make use of National Transfer Account (NTA) data and the conceptual framework that governs the construction of NTA. A distinguishing feature of the model is its comprehensive and consistent treatment of public and private intergenerational transfers in the presence of changing

population age structure. The model will be applied to 8 to 12 countries with different economic systems, demography, and levels of development.

Data and Methodology

The analysis will be carried out using data and the conceptual framework of National Transfer Accounts. The approach can be explained by referencing two macroeconomic conditions that must hold at any point in time. The first condition is that for every age group, total inflows must equal total outflows:

$$YL_e(x,t) + YA_e(x,t) + TI_e(x,t) = C_e(x,t) + TO_e(x,t) + S_e(x,t) \quad (1)$$

The left-hand side is equal to the inflows or resources available to each age group *x* during any time period *t* consisting of income from labor (YL) from assets (YA) and from public and private transfer inflows (TI). On the right-hand-side we find outflows or the uses to which resources can be put consisting of consumption (including spending on human capital), public and private transfer outflows, and saving.

Population is explicitly introduced by representing each of the components as the product of population *N(x,t)* and the per capita value of each age-specific flow. Labor income of age group *x* in year *t*, for example, is equal to the population of age *x* in year *t* times the per capita labor income of age *x*.

Changes in population age structure upset the balance between inflows and uses in equation 1. Consider an increase in the number in the working ages, holding other ages constant, as we might observe during the demographic dividend. An increase in the working-age population leads to greater aggregate labor income for those in the working ages inducing some combination of three responses: (1) an increase in their own consumption, (2) higher saving, or (3) increased net transfers to other age groups, perhaps children and the elderly. The resources available to other age groups will be influenced by changes in net transfers and members of these age groups must in turn adjust their own uses, raising consumption and saving or, perhaps, increasing their own net transfers to other age groups.

Of great importance to economic development is how resource use responds to changes in age structure. For this purpose, distinguishing human capital spending from other forms of "consumption" is critical. An increase in the number in the working ages may lead exclusively to a rise in consumption (excluding human capital spending) raising current standards of living. But additional resources may be devoted to development ends by raising saving (and investment) or by raising human capital spending.

Implicit in the discussion of the inflow/outflow constraint is a second condition that must be met: transfers given must equal transfers received. This is true in the aggregate and can be represented by:

$$\sum_x TI_e(x,t) = \sum_x TO_e(x,t) - TROW(t)$$
$$TI_e(t) = TO_e(t) \quad (2)$$

where $TROW(t)$ is net transfers to the rest of the world. Moreover, in the case of private transfer inflows and outflows, TFI and TFO, respectively, private transfer inflows received by age group x from age group y must equal private transfer outflows given by age group y to age group x:

$$TFI(x,y,t) = TFO(y,x,t). \tag{3}$$

These transfer conditions are central to understanding generational squeezes that occur over the demographic transition and improved understanding of them will be one of the most important contributions of this research.

Model development

The simulation model is under development. Population and labor income are exogenous with population based on UN population projections and labor income determined by changes in the working-age population and labor income by age shifting based on exogenous productivity growth. Taxes and public transfer inflows for education, health, pensions, and other publicly provided goods and services are policy variables influenced by changes in response to fiscal conditions and policy reform driven by growing income and changing demographic conditions. Asset income evolves over time determined by rates of return and public and privates assets, determined in turn by public and private saving. Consumption, with health, education and other distinguished, saving and private transfers are endogenously determined. The methods for doing this are currently being tested.

Data

For population data we rely on the most recently published estimates and projections from the United Nations Population Division's World Population Prospects. National Transfer Accounts data will be used for all age specific economic flows: labor income, asset income, consumption by purpose (health, education, and other), public transfer inflows and outflows by purpose (health, education, pensions, and other), private transfer inflows and outflows, public and private saving. More information about NTA is available in Lee and Mason (2011) and United Nations Department of Economic and Social Affairs: Population Division (2013) or from the National Transfer Accounts website, www.ntaccounts.org.

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