Demography, Economic Growth, and Capital Flows

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Introduction[i]

We are living through a demographic revolution. Longevity continues to increase throughout most of the world, at a rate of more than two years a decade. Birth rates continue to fall throughout most of the world, from their global peak in the mid-1960s, but with large differences from country to country. For both quite different reasons, the world population is aging rapidly, with the median age (half older, half younger) rising from 29 years in 2010 to a projected 36 years in 2040. Thus while the world's population grows by an additional 2 billion between 2010 and 2040, its geographical and age structure will change dramatically. Some countries, most notably Russia, Japan, and Germany, are already experiencing a decline in total population, despite increasing longevity. Many others, especially in Europe and East Asia, can be expected to grow only slowly. Some of the poorest countries, particularly in sub-Saharan Africa but also including Afghanistan, Yemen, and Guatemala, continue to grow rapidly in population. Among the rich countries, the USA stands out as experiencing more rapid population growth; and among the emerging markets, China stands out as aging with exceptional rapidity.

What are the possible implications of these changes for economic growth, especially in developing countries? The linkage between demography and growth goes back at least two centuries to Thomas Malthus. Around 1800 Malthus claimed that growth in standards of living could never be more than temporary, since human fecundity would lead to procreation and survival such that the standard of living would be again driven down to bare subsistence, at which deaths would equal births.

Malthus could hardly have chosen a worse time to put forward his pessimistic hypothesis, since the following century, in sharp contrast to its predecessors, experienced a huge increase in income per capita, first in Britain and then in western Europe and North America, by a factor of three in Europe between 1820 and 1913, according to Maddison (2001, p.264). During the 20th century this process of growth spread to most other parts of the world, and the 21st century may see the process become universal.

Where did Malthus go wrong? Arithmetically he went wrong by underestimating the rate of growth of labor productivity, which managed to stay ahead of the rate of population growth. The latter was indeed high, as foreseen by Malthus; Britain's population more than doubled between 1820 and 1913, from 21 to 46 million. But productivity growth was even higher, permitting a continuing rise in per capita output and income, hence in average standard of living. The growth in productivity in turn was due to a very large accumulation of capital (stimulating Karl Marx' major work by the same title),

combined with technical and organizational change. In the world of Malthus (and his friend David Ricardo) a large growth in the ratio of capital to labor would have depressed the return to capital and been self-limiting. But the decline in return to capital was only mild because of improvements in technology (including both new products and improved processes of production) and in organization for the production and distribution of goods. Incomes rose, creating demand for the additional products thus created.

As incomes rose, birth rates eventually fell, defying Malthus' prediction. So while European development was initially accompanied by large increases in population, such growth gradually declined and in a few cases actually became negative, while output continued to grow.

Gabor (2011) has integrated Malthusian population theory with modern growth theory. He emphasizes especially the desire for education in reducing natality. New technology often required skills to function efficiently, raising the demand for education. The need for education increased the cost of large families, producing a smaller desired number of children. This effect was re-enforced by a rise in wages for women, which in turn increased the opportunity cost of having children. After examining the evidence, Gabor minimizes the importance of several other hypotheses for the sharp drop in natality that began in Europe in the late 19th century.

What of the future? This paper will address the implications of projected demographic changes in the coming decades on economic growth under four headings, reflecting four different channels through which demographic changes might influence growth: labor force, savings, investment, and public sector spending.

Labor Force

Output per capita for any country is influenced by what fraction of the population is working and by how productive workers are. The working population in turn is influenced by the age structure of the population, the social role of women, years typically spent in school, and the conventional age of retirement from the labor force. By convention the working age is taken to be aged 15-64, presuming people enter the labor force at age 15 and leave it at age 65. This corresponds roughly to practice in many countries. But with higher incomes young people increasingly stay in school beyond age 14. And with better health and greater longevity, along with less physical exertion in the workplace, many people are able to work beyond age 64, although that is not yet widely practiced.

The ratio of youth plus aged to working age population [(0-14)+(65+)/(15-64)] is often called the dependency ratio, meaning that those of working age must support a larger population including the young and the old. It is possible also to distinguish between young dependents and old dependents, as will be done below. As birth rates drop, the number of children declines relative to the number of adults. If birth rates drop rapidly enough, before the working age population moves into old age, the total dependency ratio will drop and the country experiences a "demographic dividend," meaning that the ratio of the working age population to the total population rises. This process creates the potential

for a rise in output per capita for a given labor force. In addition, participation rates (those who could work who are actually working) could rise, especially women who under the circumstances need to spend less time caring for children. Both of these factors lead to a rise in per capita output (and income). The age profile of a country is often depicted as a pyramid, with young people at the bottom and the oldest people at the top. As birth rates decline, the pyramid eventually becomes an oval, with a bulge of working age people in the middle. As longevity increases and the working age population moves into retirement, the oval eventually comes to resemble a rectangle.

How much difference might such a demographic dividend make? Bloom and his colleagues (2010) have calculated the impact of projected demographic change to 2040 on the world labor force, assuming that age and gender labor force participation rates of 2000 continue to apply in 2040. On this assumption, the world's labor force will rise by 2.1 percentage points of the world's population, from 46.5 percent in 2000 to 48.6 percent in 2040. They further calculate that if income per worker grows at the same rate it did in the period 1960-2000, per capita growth of the world economy (on the basis of 97 countries for which income data are available) will remain unchanged at 1.9 percent. This apparent constancy, however, conceals an important compositional effect. Rich countries (members of the OECD before its recent enlargements) experienced their demographic dividend during the earlier period, growing at 2.8 percent a year. In the period 2000-2040, on the assumptions made regarding growth per worker and labor-force participation rates, they will grow at only 2.1 percent a year. Many developing countries, in contrast, will experience their demographic dividend in the coming period, and therefore can expect to see an increase in growth rates.

Dependency ratios can be expected to decline significantly in many developing countries in the coming years. Basically, all countries are aging, but the decline in natality will outweigh the increase in aged in most developing countries, while the opposite is true in the rich countries. In Latin America and the Caribbean, for instance, the dependency ratio (defined to include persons over 60) reached its peak of 97 dependents per 100 persons of working age in 1965, and declined steadily and prospectively until it reaches 60 around 2020 before rising again as populations age. So much of the demographic dividend in Latin America has already been experienced, with less than a decade to go (Saad in Cotlier, 2011, 59, 63, 67, 73). Crudely, the decline in dependency ratio has added nearly 0.6 percentage points to the economic growth of Latin America over the period 1965-2005. Of course there is much country-by-country variation around this overall pattern, with Cuba (1991) and Brazil (2007) already having passed their low dependency points and Guatemala not expected to do so until after 2050. China, for instance, enjoyed a major demographic bonus over the past three decades, adding about 0.4 percent annually to China's growth rate before allowing for increases in age-specific labor force participation; this came to an end in 2012.

In addition to raising the number of working age adults relative to young and old dependents, demographic change may lead to some changes in behavior. Concretely, women with fewer children may enter the labor force on a full or part-time basis. Bloom et al.(2009) estimate that on average an additional birth reduces a woman's labor supply by almost two years during her reproductive life, with

of course considerable variation across countries and some variation by the age of the mother. Those near traditional retirement age may stay longer in the labor force insofar as they are living longer, healthier lives; and the physical burdens of many jobs decline. Fewer children may permit children to stay longer in school, reducing the labor force on that account, but improving its quality on completion of school. Experience in rich countries suggests that children do spend more time in school (and hence join the labor force at a later age). In general, however, workers have not delayed their retirements. This is partly because in many countries retirement is obligatory to qualify for the national pension, and the pension is sometimes sufficiently generous (after allowance for taxation) that working for pay no longer seems worthwhile. For example, in Germany (where the pension is based on life-time income, with a "replacement ratio" of 71 percent) men in the late 1980s retired on average at age 58.5, despite a statutory retirement age of 65, because it was actuarily attractive to do so, and less than two percent of men worked beyond age 70 (Boersch-Supan in Poterba, p.228). Germany has more recently altered its pension scheme to discourage such early retirement; and average retirement age has risen to 60.

These demographic changes merely create potential. "Working" implies productive activity. The society and economy must be capable of absorbing the potential additional workers productively. An alternative is unemployment or low-productivity partial employment, such as occurs in many poor countries today. Effective male participation rates vary greatly from country to country, and female participation rates by even more. But output per capita will show some more rapid growth for awhile simply as a result of a decline in birth rates, because income stays on its previous trajectory and population grows more slowly.

Saving

Under the life-cycle hypothesis of income and consumption, individuals and families attempt to smooth their consumption over their lives even while earnings are concentrated during their working lives. This typically implies dissaving while people are young, as children or even as young adults, and in old age, offset by net saving during the years of employment. This hypothesis implies what may be called the plain vanilla effect of the demographic dividend on saving: aggregate saving should rise as the ratio of workers to dependents rises. If this incremental saving is used for productive investment, it represents an additional channel by which demographic change may affect the rate of economic growth.

A word needs to be said about "saving," since several different concepts exist, each valid for certain purposes. "Saving" in the system of national income accounts is defined as the difference between personal disposable income (income after taxes) and household expenditure, augmented by any saving in the business and government sectors of the economy. From a household point of view, saving is money that is put aside available for future use, including any capital gains on investments (corrected for inflation), including housing, which do not enter into national income. From an economist's point of view, saving involves deferring current consumption for the sake of higher future income for one's family, including children. Thus educational expenditures are considered

"consumption" in the national accounts, but often they are the best investment a family can make in the future of its children. Some preventive health expenditures fall into the same category.

With longevity increasing almost everywhere, and with retirement ages changing more slowly or not at all, one would expect saving to increase during working years to provide sustenance for longer periods of retirement. Bloom et al. (2003, 330) have indeed found increased aggregate saving in an analysis of 68 countries over the period 1960-1994, with on average an increase in longevity of 10 years increasing the aggregate savings rate by 4.5 percentage points. Of course older residents may eventually draw on their savings, so this effect might not be present in a stationary population; but it is observable during the long transition while the population is still aging.

There is some empirical support for the life-cycle hypothesis, but it is much looser than the theory would suggest, and in some respects evidence contradicts the hypothesis. Testing it seriously would require data on large numbers of families throughout their life cycle. Such information in general does not exist. Rather, countries carry out income and expenditure surveys of households, noting their differing characteristics, at a particular moment in time, producing a cross-section of information. Such surveys may be repeated over time, although not typically with the same respondents. Not surprisingly, such surveys have been done for a longer period of time in the rich countries, and most of the analysis of households to date is available for the rich countries (see, e.g., Poterba (1994) and Harris (2006)).

With a rapidly changing economic environment, for example brought about through steady economic growth, each age cohort will have experienced different economic circumstances, for example young adults having started with higher incomes and different consumption patterns than their parents and grandparents. It is therefore not possible to infer life-cycle behavior from cross-section data on family incomes, expenditures, and assets, since each age cohort will have different experiences and expectations about the future. Nonetheless, it is the information we have, and we can infer some things about age-related income and expenditure patterns.

Here are some generalizations, drawn largely from detailed studies of Britain, Canada, Germany, Italy, Japan, and the United States found in Poterba (1994). First, as expected, family earned income shows a marked humped pattern as a function of age of the head of household: it rises from young adulthood, peaks around age 50, and declines first gradually and then more sharply as the head of household becomes older, past retirement age. Second, family consumption (defined largely in terms of expenditure, not counting purchases of assets) also shows a marked humped pattern, although less steep than that of income. Thus there is some smoothing of income by age, but much less than the life-cycle hypothesis would suggest. If families are controlled for family size (e.g. as children leave the home, or spouses die), the consumption hump becomes more flat, as expected, but still reveals a hump in middle age. Putting these two generalizations together, saving is not as great in the working years as it might be thought to be, but dissaving in the younger and older years is also less than full consumption smoothing would require.

A third generalization is that dissaving in old age does not, on average, take place. Elders continue to save, that is, they consume less than their disposable income (which by then probably

includes pension income). Nor do they liquate assets. It is unclear whether this is to leave bequests or to support grandchildren, or whether it is precautionary saving given increasing but uncertain longevity and the possible need for large medical expenses in old age. But this fact suggests that aging by itself need not reduce national savings – or at least private savings, not counting the possible burden of age on the public sector.

Not surprisingly, these generalizations are sensitive to income levels. Those in the lowest or even the second lowest income quartile tend to dissave in old age – indeed, in the lowest quartile during much of life, suggesting either that the low income is transitory or that public transfers are significant for this group.

A fourth generalization is that housing practices seem to play an important role in determining savings behavior, and differ substantially from country to country. In Britain, Canada, and the United States, for instance, people tend to buy homes at a relatively young age (late 20s or early 30s) and are supported by a well-developed mortgage market, so they can borrow to cover the purchase. Home ownership is much lower in Germany, where housing is more expensive and tends to be purchased later in life. Italians want home-ownership, but must save much as young adults in order to buy home in their 30s or early 40s. Japanese rely on financial help from older relatives to purchase homes, which are expensive in the major cities; this is one of the motivations for saving late in life. In recently urbanized China there is a new phenomenon: the male-female gender imbalance is so great among young adults (118:100) that choosy females insist that prospective husbands already have a satisfactory place to live. So saving rates are high among young urbanized males (contrary to the life cycle hypothesis), who also may look to relatives for financial assistance (Wei and Zhang, 2009, document the influence of local gender imbalance on household savings rates).

The bottom line is that an increase in the ratio of working age to total population should also increase national savings, and there is evidence that this effect is present in a number of countries, but household savings behavior is influenced by many elements and local factors will be important in determining both the change in magnitude of savings and whether they will be used in growth-enhancing ways, or mainly for housing (which enters as investment in the national accounts, but has low yield as imputed rents).

Investment

Young adults need capital to function in modern society. Apart from education (which is counted as consumption in the national accounts) they need housing for themselves and new family, with its various accessories such as furniture and appliances. Young adults also need to be equipped with capital associated with their employment – structures, equipment, perhaps working capital.

Demand for new housing comes from three sources: replacement of old or obsolete units; new units to accommodate the mobility of the population, especially one that is urbanizing rapidly; and new units to accommodate new family formation. A rapid growth in the number of young adults requires

corresponding additions to the stock of housing, often initially substandard in many developing countries. Timing is influenced inter alia by cultural factors. In Italy, for instance, it is common for young adults to continue to live with their parents until they marry, or even afterward, and to buy housing only when they have saved enough to make large payments.

Urbanization also requires additions to the housing stock, even as some rural housing may be vacated or abandoned. And growth in income leads people to demand more and better quality housing space. Urban construction to satisfy this demand is also an important source of employment, especially for low-skill workers.

In emerging markets urbanization and upgrading together account for the majority of demand for new housing. China, for instance, has seen more than 20 percent of its population urbanize over the past 30 years. New household formation has been quantitatively less important. Nonetheless, declining birth rates, with a 20-30 year lag, will result in a declining demand for housing, other things being equal. In a mature economy with sturdy houses and low geographic mobility (think of Germany), a declining number of young adults could conceivably reduce demand for new housing to negligible levels. In reality, not all houses are sturdy, some are torn down to make room for commercial or infrastructure development, and at least some people will want to move. But changes in the number of young adults will in general affect the aggregate investment requirements for housing. Declining birth rates will with a lag result in reduced demand for housing – more than compensated, in many developing countries, by the continued movement from rural to urban areas.

Public Sector

In all rich countries, and increasingly also in emerging markets, governments have undertaken to provide pensions and medical care to old persons, and some provide health care to the entire population. The state also often provides compensation to unemployed persons and welfare in cash or in kind to many poor people. The simple life cycle hypothesis is greatly complicated by these roles of the state, usually extensive but rarely complete. State pensions reduce or even eliminate the need for household saving for retirement during one's earning years; and state health care and medical and welfare programs reduce the need for saving against unforeseen but possibly expensive contingencies, such as a period of unemployment or a medical condition expensive to treat. Of course, such government programs need to be financed and often give rise to special taxes on payroll earnings. So "saving" occurs, but it is compulsory and operates through government budgets, and is not necessarily or even typically translated into real investment. Some programs operate on a pay-as-you-go basis, whereby contributors in any year finance the recipients of payments in that year. Others build up reserves, so a retiree's pension is paid (at least in part) from its own earlier payroll contributions and the earnings thereon. Still others, most notably Singapore, build up individual provident accounts from each resident based on compulsory contributions and the earnings thereon. It is possible, indeed common, that government programs reduce private savings for the reasons above, but do not compensate with corresponding increases in public savings. Baily and Kirkegaard (2009, p.209) report that 79 percent of

cash incomes of those over 65 in 17 OECD countries comes from the public sector, or 65 percent net of taxes, the remainder being from current earnings or private investment income. (These figures do not include provision of medical care, usually in kind.) Financing of future state financial commitments, such as pensions, is often put off until the time for payment arrives.

Putting It Together

Discussion of the influence of age on saving is greatly assisted by the development of an internally consistent system of national transfer accounts (NTA) by Ronald Lee and Andrew Mason (2011). The NTA attempts to record, for a given country and a specific period of time, all the transfers that occur across age brackets, whether through public or private channels. It can thus estimate, for any particular country-year, the net saving by age of the population. They calibrate their various estimates, based largely on applying information from household expenditure surveys to the national accounts of each country, to labor earnings in the 30-49 age bracket, typically the years of highest labor income. This permits comparison of the profiles across countries, where wage levels may be very different.

The starting point is a typical family, where labor income and consumption are recorded by age, resulting in intra-family transfers in every country examined from current wage-earners to children and to elder retirees. Wage earners can also save out of their labor income, purchasing assets of various kinds. All asset ownership is attributed to the head of household, the main wage earner. Assets accrue income (including implicit rent on owner-occupied housing), which can support higher consumption within the family or be saved.

Income and/or expenditure are taxed in all countries, and the revenues are used to provide public goods or transfers to households. (All corporate assets and earnings are imputed to households, which are the fundamental units of society.) Some public expenditures, such as national defense, are not linked to age, and are assumed to be uniformly distributed across ages. Others, such as education and health expenditures, are age-specific, and are designated as public transfers to particular age groups. Taxes are levied mainly on consumption, labor income, and income on assets, and thus can in principle be allocated by age, the bulk of which usually fall on the peak wage years and the assets that are assumed to belong to the head of household. Thus it is possible to build a profile for each country-year of the transfers, positive and negative, across age groups.

This age profile can then be multiplied by the age structure of the population to get aggregate inter-generational transfers, private and public, for the particular country. If we assume that the underlying transfer profile remains constant over time (a strong assumption if the time interval is significant), we can calculate changes in transfers as the age profile of the country changes.

A methodological warning: cross-section data such as appear in the national transfer accounts do not represent cohort panel data, which is of greater interest: how the profile of earnings and consumption change over the life of a particular age cohort, such as all those born in 1950. This potential lack of correspondence will be particularly great if average earnings have risen over time, which has been the case for most countries over the past half century, and if government transfer policies have changed significantly over time, in general becoming more generous to elder people

through pensions and health care. But we can still learn something by comparing the cross-section data across countries with different levels of per capita income.

Lee, Mason, and their associates have estimated the age-transfer profiles in the early 2000s for 23 countries drawn from around the world: Europe, Latin America, Asia, Africa, and the United States. Although countries differ significantly in age structure, in per capita income, and in size and scope of government, some marked similarities can be observed after calibrating to labor income in the peak earning years, ages 30-49. The typical family shows net intra-family transfers from the earnings years (ages 25-59) to younger and older members of the family. These transfers are re-enforced by public transfers in the same direction from wage earners (the prime taxpayers) to the young – mainly through provision of public schooling – and to the old – mainly through public pensions and health care. After a period of young adulthood, household saving falls short of earnings on assets, permitting transfers out of asset income as well as out of labor income. Contrary to the life-cycle hypothesis, while elders consume some earnings on assets, they do not draw down their assets, i.e. dissave. Rather, they continue to save, and in many countries to transfer resources to younger members of the family.

Perhaps not surprisingly, there is greater difference across countries among public transfers than private. Total revenues (relative to GDP) tend to rise with per capita income (the United States is a partial exception). The rise in revenues in turn is associated with a rise in age-related transfers, particularly to the elderly, who tend to live longer but also rely less for sustenance on younger family members than is the case in poorer countries. Brazil is an outlier among emerging markets, with exceptionally large public transfers to the elderly.

Table 1 compares 2010 with projections to 2040 for both ratio of effective number of producers to effective number of consumers (columns 1 and 2) and effective number of taxpayers to effective number of beneficiaries from public programs (column 3, relative to 2010 set at 1.0 for all countries). It can be seen in column 1 that there was considerable variation across countries in 2010, ranging from 0.97 in Indonesia and Thailand to 0.63 in Kenya. Over the next 30 years there is a significant rise in the support ratio in Nigeria (exceptionally high, as many children move into adulthood and birth rates are assumed to decline), Kenya, India, and the Philippines, and a modest increase in Indonesia, Mexico, and Uruguay. All other countries show a decline in support ratio, especially great in Japan, Korea, Taiwan, Austria, Germany, Slovenia, and Spain. The relative fiscal burden is expected to decline in Indonesia, Philippines, and Thailand, and to rise in all other countries, especially great in Japan, Brazil, Chile, Austria, Germany, Slovenia, and Spain.

Investment Again

Lindh and Malmberg (in Clark et al., 2009) have examined the impact of countries' age structures on innvestment for 20 OECD countries over the period 1960-1994, grouping age into five categories. They find that gross investment (as a share of GDP) rises with young adults (ages 15-29), falls with early middle-age (30-49), rises with later middle-age (50-64) and early retirement (65-74), and falls sharply with older retirees (75+) (pp.172-173). Some of their regressions include economic growth,

the relative price of capital goods, and lagged investment as control variables. The pattern described is robust over several specifications for the regressions, but the overall explanatory power is weak, both statistically and economically, except for older retirees. The authors then break down investment into several components, separating housing and inventory accumulation from private business fixed investment. As expected, young adults (ages 15-29) had a positive effect on housing investment, albeit a small one, and old retirees had a strong negative effect (p.174). Late middle age (50-64) had a statistically significant effect on private business fixed investment, perhaps reflecting a relatively larger managerial decision-making class. More surprisingly, young retirees (65-74) had a statistically significant effect on the accumulation of inventories, reflected also in the trade balance (discussed below), perhaps reflecting changes in post-retirement consumption patterns and the associated restocking.

The Lindh-Malmberg results run only through 1994. I have updated their empirical work through 2008, but dropped the 1960s both for practical reasons (ease of data availability) and for conceptual reasons (extensive controls on capital movements during the 1960s in most OECD countries). The results show a significant rise in explanatory power (e.g. the adjusted R2 rises from 0.26 to 0.62 for the key result), a general rise in the magnitude of the estimated coefficients, and a shift from young retirees as the most important age group for investment to later middle age (the managers). Table 2 reports the key results.

Lindh and Malmberg do a comparable estimation for national saving. They find that the strongest and most statistically significant group for saving, not surprisingly, is the late middle-aged, while young retirees make a negative contribution. But surprisingly (in the perspective of the life-cycle saving hypothesis), young adults and old retirees are also significant savers. But the explanatory power is very low.

Results for the period 1970-2008 have much greater explanatory power. Young adults add significantly to national savings, as do late middle-agers in lesser degree, while retirees, both young and old, detract from national savings, as shown in Table 2.

Current Account

The difference between national saving and domestic investment is the current account – current transactions with the rest of the world. To the extent there are regular relationships between age groups and savings and investment, there will also be a regular relationship between age groups and the current account. Lindh and Malmberg estimates suggest such a pattern (p.179). There is no net impact on the current account by young adults (investment effects just offsetting savings effects), a modest positive impact for early middle age (when saving exceeds investment), disappearing by late middle age, becoming negative in young retirement (as investment exceeds savings) and positive in late retirement.

Re-estimating for the 20 OECD countries over the period 1970-2008 confirms the negligible impact on the current account (strictly, the balance on goods and services) of the share of young adults, but also finds a negligible effect for young middle age (30-49) and old retirees. In contrast, age groups

50-64 and 65-74 have a strong and statistically significant negative impact on the current account, especially the former group, as shown in Table 3.

Comparable estimates for more recent periods (1980-2008; 1990-2008) show a similar pattern, albeit with less statistical significance, except for young adults, who now produce a positive effect on the current account, although not significant at the 5 percent level, as shown in Table 3. To sum up, there is no age-related statistical significance for 1990-2008 – the period of highest globalization and large inter-country capital movements. And there is a negative impact on the current account of the ages 50-74 over the entire period, due to the disproportionate influence of these groups on investment (exceeding the rise in savings for late middle-agers).

These results seem to contradict – or at least do not support – those of Speller et al. (2013), who claim that current account positions for the G20 countries most closely vary with savings (rather than investment) and that the strongest demographic influence on savings is the share of the population in the age bracket 40-59 (the "prime savers"). They claim this age bracket has already peaked for the USA, Germany, the UK –and China; but the peak comes around 2025 for Japan and later still for emerging markets other than China. Other things being equal, this suggests a future rise in the current account position of many emerging markets, and a fall in that of rich countries other than Japan.

A recent paper by Gundmundsson and Zoega (2014) approach the same issue in a somewhat different way. They first do simple correlations between age-group shares (at five year intervals) and the current account positions for 1995-2009 across 57 countries, including rich and poor. The peak correlation is 0.3 for the age group 35-39. The lowest correlations are -0.15 for ages 20-24 and -0.08 for 65+, suggesting that on average a high ratio of young adults or of retirees lowers the current account, while a high ratio of early middle-agers raises it. A high ratio of children (0-14) or of older middle-agers (55-59) leaves the current account unchanged, with more-or-less smooth lines connecting these points at five-year intervals.

Gundmundsson-Zoega then run regressions for 1980-2009 for the 57 countries, but with only three age groupings: 0-24; 25-64; 65+. They get results of high statistical significance but low explanatory power (adjusted R2 = .13-.22) unless fixed country effects are introduced, which raises the R2 above 0.5. High ratios of both young and old reduce a current account surplus or increase a deficit. Table 4 reports the results of their regressions. They then use their estimated coefficients to adjust actual current account positions (relative to GDP) in 2005-2009, the era of large "global imbalances". This exercise of course assumes all countries would be on the estimated regression line. Table 5 reports the indicated changes, measured in percentage points of GDP, for ten countries that ran current account surpluses in 2005-2009 and for ten countries that ran deficits. A negative number in the column of surplus countries signifies that the country would have run a lower surplus once allowance is made for its age structure. Similarly, a positive number in the column of deficit countries signifies that the deficit would have been lower. Interestingly, both Japan and Germany, two countries with large current account surpluses, would have run even larger surpluses if they had had a more typical age structure, that is, fewer persons over age 65, whereas China's surplus would have been 5.37 percentage points

lower. The large US deficit would have been over two percentage points lower if it had had a typical age structure.

An Illustrative Simulation

The discussion above suggests that there are many channels through which demographic change can influence a country's growth rate – by affecting the quantity and quality of its labor force, and by affecting saving, investment, government expenditure, and the current account. A number of the effects point in opposite directions: some clearly tend to increase growth, others tend to reduce it (at least for awhile), and still others have an ambiguous effect. The net outcome will therefore depend not only on identifying the channels of influence, but also their relative magnitudes.

Such an exercise has been undertaken by Ashraf, Weil, and Wilde (AWW, 2011). Their results will be summarized here, since they capture well both several channels of influence and (on their assumptions) their relative magnitudes. They start with a notional self-contained Nigeria (a country with a relatively high birth rate of over 5 children per woman in 2010) and postulate that through some kind of intervention the birth rate is lowered by one child per woman, spread over her reproductive life, and held at the lower level indefinitely. An alternative simulation follows the lower UN projection of Nigeria's population, which postulates a birth rate lower by 0.5 child per woman than in the UN medium projection, which itself assumes declining natality. On their base case the economically active population (ages 15-64) rises in steady state (reached after about 80 years) from 55.5 percent of the population to 59.2 percent, after rising irregularly higher during the transition to steady state. The young population (ages 0-14) falls from nearly 41 percent to 35.5 percent in steady state.

AWW postulate a standard Cobb-Douglas production function with constant returns to scale, three identified factor inputs (capital, quality adjusted labor, and a fixed factor "land"). The capital stock evolves from a fixed saving rate out of total national income less depreciation at a fixed rate. Household saving thus continues so long as a person has income, and does not follow the life cycle hypothesis. The quality-adjusted labor force reflects both formal education and work experience, and is drawn from the active population by age-specific participation rates. The economy is closed and has no public sector.

The channels whereby a decline in birth rate can influence per capita income in this simulation are increases in the number of potential workers per capita (lower dependency rates), higher participation rates of those workers (affected here by reduction in duties of child care as well as by higher average age), increases in average education of the labor force as schooling becomes more affordable for fewer children, increases in experience of the labor force as its average age rises, increases `in the capital stock per worker, and lower diminishing returns to the fixed factor of production.

Lower birth rates are assumed to reduce child care and allow increased participation by women in the labor force, assumed to be by half a year per marginal child in the simulation (an approximation based on empirical data from the Philippines); age-specific labor force participation rates are drawn

from Nigerian data. Lower birth rates will also permit more education. Based on empirical data from Bangladesh, AWW assume that following a drop in fertility of one child per woman, educational attainment will rise by 0.65 years and that each additional year of schooling will increase output per worker by 10 percent a year on the assumption that the average level of schooling is between 5 and 8 years.

The simulation shows that income per capita rises by 30 percent 75 years after the reduction in natality, or by 0.35 percent annually over this period. The relative importance of the different channels varies over time. The rise in per capita income begins soon after the natality "shock," as does increased labor force participation by women. The reduced dependency ratio accounts for 90 percent of the impact in the first 15 years. The other channels take effect more gradually, as the new-borns move into the labor force and as growth in capital stock becomes significant with higher income. After 50 years, the reduced dependency ratio accounts for 35 percent of the gain in per capita income, increased capital per worker for 23 percent, increased schooling for 19 percent, and the decline in diminishing return to the fixed factor (the Malthus effect) for 10 percent. On the assumptions made in the simulation, increased experience and changes in participation rates of the economically active population have small effects, possibly because the labor force remains quite youthful even after the postulated decline in birth rates. Per capita income continues to grow over time thanks to continued capital accumulation and diminished Malthus effect: after 100 years per capita income will rise about 20 percent, with capital accumulation accounting for 26 percent of the increase and the Malthus effect for 22 percent, while the reduced dependency ratio accounts for 25 percent and increased schooling for 15 percent.

The simulation results of course depend on the particular quantitative assumptions made. The long-term results not surprisingly are quite sensitive to the assumption made about savings out of incremental income (which in a closed economy are assumed to lead to capital formation), to the initial share of the fixed factor ("land") in factor incomes, and to the possibilities for substituting labor or capital for the fixed factor over time. Higher savings will lead to greater capital accumulation and higher per capita income. A higher share of income going to the fixed factor will imply more sharply diminishing returns, and hence higher gains resulting from a decline in fertility. And greater substitution possibilities for the fixed factor will reduce the gains from lower fertility. These varying Malthus effects only show up significantly after fifty years or so after the fertility shock. The income shares of non-reproducible factors of production (agricultural land and subsoil resources) are typically under ten percent for rich countries (resource-rich Australia, Canada, and Norway are exceptions), but they are often above 20 percent in developing countries (Caselli and Freyer, 2007), suggesting a larger long-term impact than in the base case simulation, which assumes an income share of 10 percent for the fixed factor.

Opening the economy to international borrowing or lending at a fixed world interest rate would increase the rise of per capita income in the early years following the fertility shock, as additional labor force participation could be accommodated by imported capital, but would be reduced relative to the base simulation in the longer run as the domestic returns to capital declined to the world level and the additional savings would be exported rather than lead to higher domestic capital formation.

This simulation is highly stylized, postulating an instantaneous drop in fertility from 5.3 to 4.3 children per woman of reproductive age, distributed by age of the Nigerian female population, compared with a population of constant fertility, age structure, and mortality. It permitted isolation and quantification of various channels of influence of fertility on per capita output and income. An alternative simulation takes as its base line UN population projections to 2050, where in the medium variant total fertility is assumed to decline gradually from 5.3 to 2.4 children per reproductive woman, and compares with it the UN low fertility variant, which assumes a greater but gradual decline in fertility, reaching 1.9 children per reproductive woman by 2050, assumed by AWW to be constant thereafter. Thus in contrast to the main simulation, this one assumes a baseline of declining fertility, on which is superimposed an even steeper decline in fertility that reaches 0.5 child per woman after 40 years. The results are qualitatively similar to those of the main simulation. Per capita income after 40 years is 12 percent higher with the lower fertility, just under 0.3 percent a year. Because the incremental fertility decline is spread over several decades, the change in dependency ratio is a relatively more important part of the story than in the main simulation, as are the gains from child-care reduction. As in the main simulation, the relative importance of reduced dependency declines over time and yields primacy in the longer run to increased capital stock.

These simulations assume that the decline in fertility is exogenous, unrelated to changes in other economic and social variables. But in fact there are important linkages and feedbacks. One of the most important ones is the relationship between declining fertility, rising per capita income, increased education (particularly for women), leading in turn to a further decline in fertility. Lutz and Samir (2011) report that in 29 developing countries for which they have data, lower birth rates are clearly associated with more education of mothers, the only exception being Indonesia, where children per woman were slightly higher for mothers with primary education or secondary education than for those with no education. Infant mortality also declines significantly when mothers have more education.

This simulation has the great merit of indicating how complex the influence of changes in natality on growth can be, and how their relative influence can vary over time. It would be a mistake, however, to generalize from a simulation based on Nigeria, a country where reducing the high birth rate leads to higher income, to other countries. China, for instance, has a much lower birth rate, indeed below replacement rate, thanks to the policy of one-child only. It is quite possible that raising China's birth rate would increase growth, since female labor force participation is already high (children are often cared for by grandparents) and where an ongoing current account surplus would easily permit the additional domestic investment required to supply an increased labor force with capital.

Summary and Conclusions

There are theoretical grounds for expecting a country's age structure to influence its current account, and its growth rate, through its influence on savings, investment, and the labor force. There is some empirical support for influence on the current account, but it is simply one of many influences and is often overwhelmed by other factors. Moreover, any country's current account position is determined by developments in all countries, so demographic developments in one country alone can never be decisive. This fact makes projecting the outlook over several decades extremely difficult; in principle it

would require a full-fledged model involving the age-specific influence on savings and investment in each country and their interactions. Mutatis mutandis is much different from ceteris paribus.

With a globalized capital market, saving can and often does take place outside the originating country. But when saving is motivated by the need for future income, preservation of principal usually takes precedence over yield. Therefore savings often flow to countries with demonstrated strong property rights and fair settlement of disputes, even when expected yield is lower than it might be elsewhere. And of course central banks invest in the United States or in the Eurozone insofar as they wish to augment their official reserves of dollars or euros. Institutional factors thus play an important role in the allocation of savings and investment.

What can be said about the future of international capital flows, given the differential demographic changes of the next few decades? Unfortunately, little with confidence. The empirical evidence on past influences of demographic change on national savings and investment, hence on net international capital flows, is too weak and even contradictory to permit confident projections. We can say with reasonable plausibility that the trade balance of Japan, as the world's most aged society, will decline and even become negative. But its current account balance will remain positive for some years thereafter, because of the earnings on large net claims on foreigners built up over several decades. Eventually that also will probably become negative, and Japanese will begin to liquidate their foreign claims. But that time may be long in coming, since saving often continues into old age.

More generally, rich countries are aging more rapidly than poor countries. (The United States is an exception among rich countries, but is a low saver. China is an exception among poor countries, but is a high saver.) A conventional view is that as this happens poor countries will become net savers in the coming decades, while rich countries will become net dissavers, leading to net capital flows from poor countries to rich countries. We have already seen some of that happen, although the picture is mixed on both sides of the ledger. But systematic empirical support for this view is weak and contradictory. Old societies do not always dissave, and countries enjoying the peak of their demographic dividend, and even a large number of prime savers, where an increase in saving is typically observed, may also experience extensive investment, absorbing the higher national saving and even more, resulting in net capital inflows. And of course, as already noted, what actually happens to any country depends not only on its circumstances, but also on developments in its trading partners.

With respect to economic growth, the safe statement to make is that countries entering a period of demographic dividend, when the potential labor force grows relative to the total population, have the possibility for a modest increase in their rate of economic growth for a period of time. Whether they convert this potential into reality depends on their ability to mobilize efficiently the prospective new workers and provide them with the wherewithal for productive work.

Appendix

A four-generation model of demographic change and its economic implications

Much economic theorizing uses the so-called over-lapping generations model. Unfortunately, this two-generation model is too simple to reveal a number of economic implications of demographic change as it is occurring in the world. We therefore postulate a stable population involving four different segments, or age cohorts: Children, Parents, Middle-aged, and Seniors. Population at time t = C + P + M + S, all measured at time t. For concreteness, think of each age cohort as being 20 years, and mortality occurs for all only at the end of the Senior period. Thus Children are those aged 0-20, Parents aged 21-40, Middle-age from 41 to 60, and seniors (who may be retired) from age 61-80. Initially assume that the population is stable and that all age cohorts are equal in size. The net reproduction rate (p), the number of daughters to each woman of child-bearing age (21-40 here) in this stable population is unity.

We will "shock" this stable population by postulating an exogenous "baby boom," whereby the number of children grows by 10 percent (i.e. a transitory rise in p to 1.1, after which it returns to 1.0), and trace through the implications of such a baby boom for population, labor force, economic output, consumption, saving (= output less consumption, by cohort), and current account balance. To do this we will have to postulate a simple economy. Suppose that the labor force $L = \ell_1 C + \ell_2 P + \ell_3 M + \ell_4 S$, where ℓ indicates the fraction of the age cohort that is in the labor force. We will assume that $\ell_1 = \ell_4 = 0$, so $L = \ell_2 P + \ell_3 M$. We will further assume that $\ell_3 = 1$ (that is, all those in middle age are in the labor force) and that $\ell_2 = (1 - p/4)$, which allows for some mothers to be out of the labor force to care for children. Total output is simply proportional to the labor force by a factor β, such that output = βL.

With the above assumptions, we can trace through the implication of a baby boom on the population, labor force, and economic output over time, as the baby boomers age, become parents themselves, move into middle age and senior status, and finally die. It will take four periods (a notional 80 years) for this sequence to complete, and as we will see under some circumstances there may be important economic consequences beyond the four periods.

Chart A1 traces the consequences of a ten percent increase in children in the first period through subsequent periods, for dependency ratio [=(Children+Seniors) divided by Parents+Middle-aged] and labor force L (output is proportional to L), taken out 10 generations. It can be seen there that L falls initially, since parents must spend more time with their additional children, but then rises in subsequent generations as the larger number of children move into adulthood. The dependency ratio initially rises because of the additional children, but then falls as the children become adults but before seniors rise in number, and eventually returns to its initial level as the baby boomers become seniors.

Chart A2 traces dependency ratio and labor force on two alternative assumptions about the net reproduction rate, p. The first alternative assumes that p remains at 1.1 indefinitely, not just in the first period, such as might occur if the baby boom were due to a decline in child mortality. The second

assumes that p falls to 0.9 and remains there indefinitely. As can be seen from the chart, seemingly small changes in p can have radically different implications for the subsequent path of labor force (and output) and dependency ratios.

With more mouths to feed, total consumption may be presumed to rise as a result of the baby boom. But how much, and how will it affect saving? We assume that initially all adults consume the identical amount, c, and that children consume half this amount. (On these assumptions and those about labor force participation, $\beta = 2c$ for p=1 in the closed economy.) We further assume that c is sufficiently above subsistence that it can if necessary be reduced. We postulate initially two different consumption/saving regimes: pay-as-you-go (paygo), in which all contemporary cohorts share in any adjustments that may need to be made; and a regime in which each cohort looks after its interests independently of the other cohorts (except that parents must look after their children). Below we will further assume a small open economy in which cohorts can borrow from or lend to the rest of the world at a fixed rate of interest.

During the baby boom, only the number of children increases. But they must be fed and clothed. Parents have responsibility for their children, and some must drop out of the labor force to look after their children. But in a pay-as-you-go system they will be helped by socially provided children's allowances. In this regime, children's total consumption in the first period would rise by ten percent, or 1.43 percent of total consumption. If this increase in consumption is shared by the entire population, consumption by all adults must decline by approximately 2.8 percent, since output has declined by 1.4 percent. If in contrast parents must bear the full burden of their additional children, parents' consumption must decline by 6.5 percent after allowing for their lower earned income. Alternatively, they may choose to borrow to cover the additional consumption, either from those in middle-age or (in an open economy) from the rest of the world. In this case they incur debt that must be repaid, with interest, in the next period.

In the second period, the baby boom children become parents. As parents, they have additional children at the rate p. They also join the labor force at the rate assumed to be $1 - p/4$, thus augmenting the total labor force and adding correspondingly to output. The parents of the first period move into middle-age, where they must repay any debt they acquired in the first period, which of course will reduce their consumption possibilities. If p reverts to 1, as we initially assume, the number of children in the second period will equal the number of parents in the second period, which by assumption equals the number of children in the first period, that is, a ten percent increase on the number of parents in the first period. Output of the parental cohort will thus rise by 13.8 (from $1.65/1.45 - 1$) percent to take account of the fact that parents can spend more time in the labor force. While the number of children remains high, the number of seniors has not yet risen. Thus total the "dependency ratio" (= C + S divided by P+M) has fallen. Output has risen relative to consumption at initial consumption levels, allowing for increased consumption all around in a paygo regime or for parents and children in a regime in which each cohort is on its own. Concretely, consumption in a paygo regime may rise for all by 2.8 percent, and for children and parents in a non-paygo regime by 7 percent.

In the non-paygo regime, parents of the baby boomers, now in middle age, must repay any borrowing they did when they were parents, and must save for their consumption when they become seniors and (by assumption) are out of the labor force.

In the third period, the baby boom children move into middle age, and their parents become seniors. Since all M are assumed to be in the labor force, this represents the period of maximum earning power, and also when saving must take place for the subsequent period in which they will become seniors. Children of the baby boomers, equal to them in number on the assumption p = 1, now become parents and have an equivalent number of children. The labor force has now reached its maximum (in this thought experiment), but the number of seniors continues at its original level, so the dependency ratio reaches its minimum: output is high relative to initial consumption, and aggregate saving is also at its highest level, since there are more middle aged people, who save, than seniors, who only consume.

In an open economy P and M can borrow or lend at the world interest rate r, which for convenience we will assume is 3.5 percent per annum, which has the convenient property that over 20 years the accumulated interest is roughly equal to the principal, i.e. the value of a foreign investment or debt doubles. If the middle-aged want to consume the same amount (per capita) when they are seniors as when they are middle aged, under these assumptions they will consume two-thirds of their disposable income in their M period and will save one-third, which will double in value by the time they become seniors. "Disposable income" is their earnings less repayment of any debt they incurred when they were parents.

In an open economy, net saving or borrowing is represented by the current account position, assumed to be zero before the baby boom. To avoid confounding the effects of demographic change with those of moving to an open economy, we must assume that the economy was open before the baby boom occurred. In steady state, it must have accumulated some foreign assets in the past to permit payment of interest to seniors on an ongoing basis; as seniors draw on interest and accumulated capital, middle-aged replenish the capital. To keep the main points of the example clear, parents are assumed not to borrow before the baby boom, but do so to sustain per capita consumption during the boom. Hence the rise in consumption in middle age. Thus total consumption can exceed total output by virtue of the earnings on the accumulated foreign investment. On the parameters that have been assumed here, initial domestic output is 3.5 (= 1.5 from parents plus 2.0 from middle-aged) and the foreign earnings augment that by about 19 percent, so that GNP is that much higher than GDP. Our country in steady state runs a trade deficit exactly offset by earnings on foreign investments, resulting in balance in the current account. See Table A1.

Now postulate a baby boom occurs in this open economy. In the first period if parents borrow to cover the additional consumption by their baby boom children and their foregone income, our country will run a current account deficit amounting to 2.9 (from 0.1/3.5) percent of total output. In the second period, when the baby boom parents move into middle age, that borrowing is repaid. The new parents are ten percent more numerous but the birth rate (by assumption) has dropped back to 1.0, so they will have enough income plus pre-boom borrowing to provide for their children. The

current account thus moves into surplus, as the repayment occurs and the enlarged number of middle-aged persons save for their retirement. However, since they had to repay their outstanding loans they have less to consume (per person) now and in retirement if they want their retirement consumption to equal their pre-retirement consumption. (Note: we assume that this drop in consumption is not anticipated by the baby-boom parents, who borrow to cover the consumption they had before the baby boom. If they anticipated the later drop in consumption, they would borrow less, but the results would be qualitatively similar.)

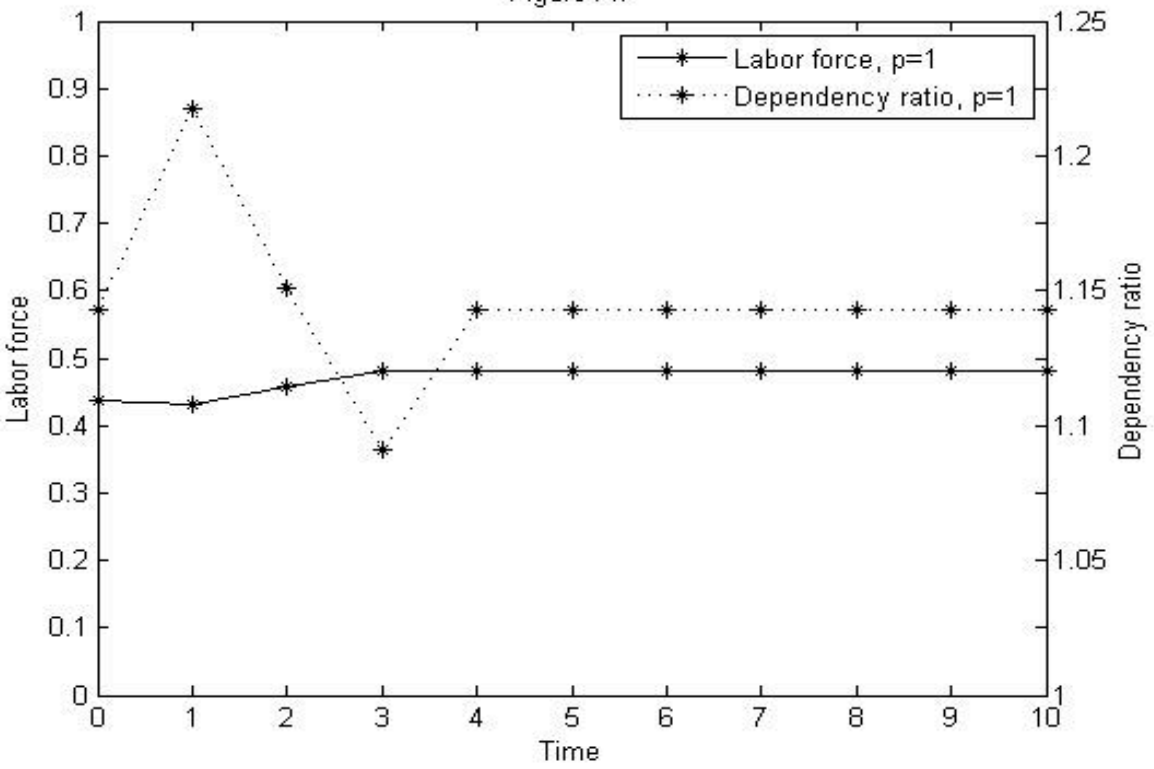
In the third period, when the baby boom children move into middle age, total output and saving both rise further, but as parents this group did not have to borrow extra, so they can consume more than their predecessors, and save more for retirement. The current account surplus remains, at 3.5 percent of the still higher output, because of higher investment by the more numerous middle-aged, in anticipation of becoming seniors.

In the fourth period, the baby boomers move into old age and their parents die. On the assumption p = 1, the total population is now ten percent higher than it was before the baby boom, and the labor force and output are also ten percent higher; the initial stable state has been re-established, but with a higher population, output, and total consumption. Net saving from output returns to zero. But the stock of outstanding claims on the rest of the world is larger, yielding returns which provide income to the enlarged number of Seniors, so the current account returns to balance. The trade balance remains indefinitely in deficit by the earnings on the foreign investments made anew by M in each subsequent period, even while foreign investments by previous M are liquidated to support consumption by Seniors, and indeed has grown by ten percent due to the larger population.

Table A1

	Percapita	Consumption following baby boom in period 1					
Economy,Period	Children	Parents	Mid-Aged	Seniors	Total C	Production	Current Accoun
Closed, paygo	0.5	1	1	1	3.5	3.5	n/a
1	0.486	0.972	0.972	0.972	3.45	3.45	
2	0.5	1	1	1	3.65	3.65	
3	0.514	1.028	1.028	1.028	3.85	3.85	
4	0.5	1	1	1	3.85	3.85	
Closed, non-paygo	0.5	1	1	1	3.5	3.5	n/a
1	0.468	0.935	1	1	3.45	3.45	
2	0.5	1	1	1	3.65	3.65	
3	0.5	1	1.1	1	3.85	3.85	
4	0.5	1	1	1	3.85	3.85	
Open, non-paygo	0.5	1	1.33	1.33	4.17	3.5	0
1	0.5	1	1.33	1.33	4.22	3.45	-0.1
2	0.5	1	1.2	1.33	4.15	3.65	0.167
3	0.5	1	1.33	1.2	4.32	3.85	0.134
4	0.5	1	1.33	1.33	4.58	3.85	0

Figure A1


Labor force, p=1
Dependency ratio, p=1
Labor force
Dependency ratio
Time
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1
1.05
1.1
1.15
1.2
1.25
0
1
2
3
4
5
6
7
8
9
10

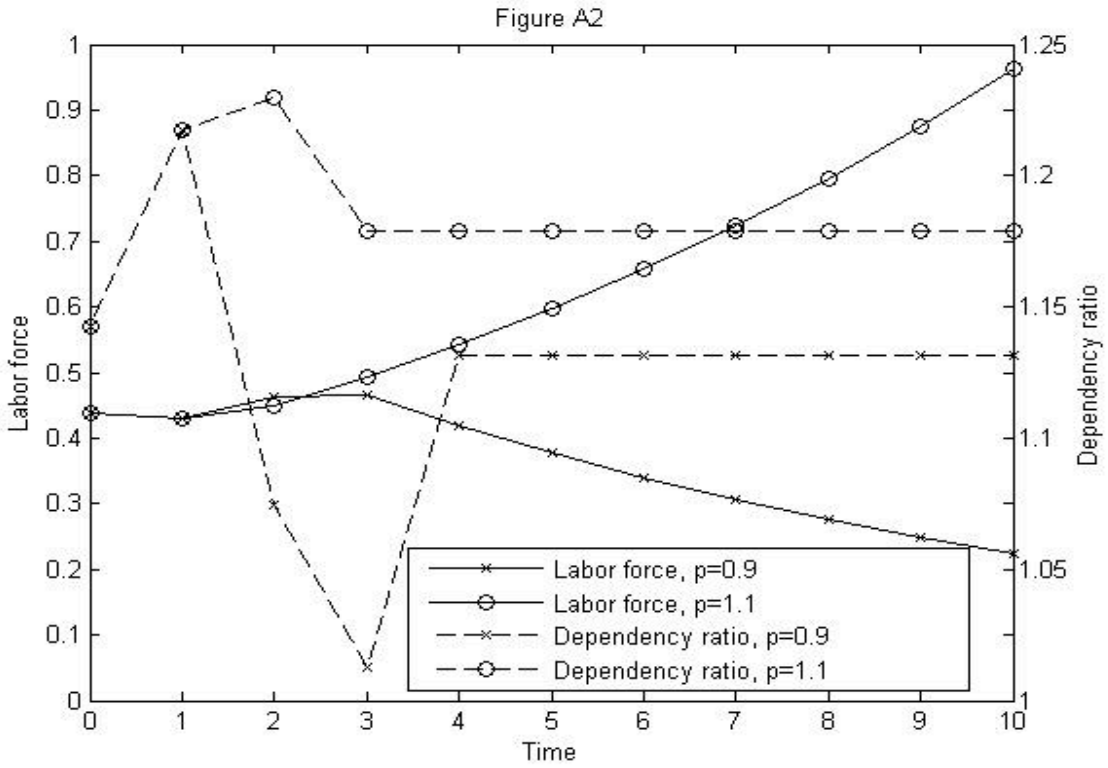


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Table 1
Economic and Fiscal Support Ratios

Country	**2010**		**2040**		**2040**
	Economic		Economic		Fiscal (2010=1.0)
Africa					
Kenya	0.63		0.75		u
Nigeria	0.69		0.87		u
Asia					
Japan	0.78		0.64		0.79
China	0.94		0.83		0.83
India	0.88		0.97		u
Indonesia	0.97		1.01		1.09
Philippines	0.83		0.94		1.14
S. Korea	0.94		0.76		0.83
Taiwan	0.92		0.73		0.84
Thailand	0.97		0.87		1.04
Latin America					
Brazil	0.84		0.83		0.77
Chile	0.94		0.88		0.77
Costa Rica	0.93		0.91		0.83
Mexico	0.95		0.98		0.92
Uruguay	0.85		0.87		0.95
Europe and USA					
Austria	0.90		0.73		0.78
Finland	0.82		0.72		0.85
Germany	0.83		0.66		0.79
Hungary	0.86		0.77		0.83
Slovenia	0.76		0.59		0.75
Spain	0.90		0.71		0.78
Sweden	0.78		0.70		0.88
USA	0.89		0.81		0.90

Economic support ratio is the ratio of effective producers to effective consumers.
Fiscal support ratio is the ratio of effective taxpayers to public program beneficiaries.
u= unavailable

Source: Lee and Mason (2011), Tables A2-A3.

Table 2							
	Gross investment rate				National saving rate		
	1970-2008				1970-2008		
Gross investment or saving rate	1	2	3		1	2	3
Growth		**0.31**	**0.4**			**0.383**	**0.281**
		4.71	10.95			5.32	7.4
Relative price of investment		0.027	0.008			-0.031	-0.013
		1.4	1.57			1.71	1.94
Lagged investment rate			**0.881**				**0.853**
			39.85				33.2
Age share 15-29	**0.351**	0.2	0.009		**0.352**	**0.43**	0.019
	2.1	1.06	0.19		2.36	3.02	0.43
Age share 30-49	**0.538**	0.355	0.019		0.04	0.124	-0.057
	2.39	1.53	0.35		0.18	0.55	0.86
Age share 50-64	**0.596**	**0.582**	**0.161**		0.276	0.298	-0.012
	2.18	2.13	2.65		1.07	1.17	0.15
Age share 65-74	0.296	0.37	0.043		**-0.575**	**-0.495**	**-0.184**
	1.3	1.67	0.75		2.23	1.99	2.24
Age share 75+	-0.214	-0.256	0.098		**-1.41**	**-1.227**	-0.074
	0.59	-0.69	1.1		4	3.81	0.78
Adjusted R-square	0.604	0.618	0.922		0.767	0.782	0.94
chi(5) test of age variable	2.17	1.95	2.5		12.3	11.64	2.23
p-value	0.056	0.085	0.029		0	0	0.049
Note: Fixed country and fixed time effects. T-ratios are below estimated coefficients.							

Table 3									
	1971-2008			1980-2008			1990-2008		
Trade balance/GDP	1	2	3	1	2	3	1	2	3
Growth		-0.067	**-0.157**		0.243	**-0.169**		0.38	-0.1
		0.31	2.76		1.19	2.56		1.71	1.51
Relative price of investment		-0.062	**-0.023**		-0.061	-0.015		0.008	-0.026
		1.25	2.39		1.03	1.33		0.1	1.53
Age share 15-29	-0.127	0.194	0.057	0.495	0.746	0.641	1.078	0.94	0.202
	0.3	0.45	0.74	0.93	1.35	0.7	1.4	1.15	1.18
Age share 30-49	-0.611	-0.285	-0.023	-0.648	-0.317	-0.102	-0.495	-0.419	0.228
	1.11	0.53	0.25	1.04	0.48	0.9	0.49	0.37	0.75
Age share 50-64	**-2.176**	**-2.089**	**-0.31**	-1.361	-1.307	**-0.426**	-1.383	-1.188	-0.134
	2.29	2.18	2.43	1.51	1.48	2.94	1.04	0.94	0.34
Age share 65-74	**-1.433**	**-1.464**	0.236	-1.525	-1.578	0.355	1.14	1.52	0.819
	2.06	2.02	1.19	1.71	1.72	1.36	0.93	1.25	1.46
Age share 75+	-0.424	-0.231	-0.164	-0.348	-0.123	-0.198	0.535	0.326	-0.026
	0.47	0.24	1.15	0.41	0.14	1.11	0.61	0.33	0.15
Lagged trade balance			**0.937**			**0.975**			**1.026**
			22.22			32.67			22.76
Adjusted R-square	0.285	0.277	0.919	0.26	0.266	0.912	0.549	0.552	0.939
chi(5) test of age variable	2.21	2.09	1.72	1.5	1.55	2.01	2.33	2.6	2.92
p-value	0.052	0.065	0.129	0.187	0.173	0.076	0.042	0.025	0.014
Note: Fixed country and fixed time effects. T-ratios are below estimated coefficients.									

Table 4
The curent account and the age structure

	1	2	3	4	5	6	7
	<---------- Pooled---------->				<----------Fixed---------->		
Young (0-24)	-0.51	-0.51	-0.48	-0.49	-0.62	-0.6	-0.53
	3.92	3.64	3.20	3.20	3.44	3.33	2.79
Old (65+)	-1.08	-1.1	-1	-0.98	-1.37	-1.42	-1.39
	3.38	3.24	2.7	2.72	2.8	2.68	2.9
Growth per capita		7.28	5.41	-25.34		59.75	52.54
		0.17	0.13	0.6		1.5	1.4
Growth Young		-0.25	-0.15	0.78		-1.24	-1.02
		0.27	0.16	0.81		1.25	1.06
Crisis			2.63	2.56			2.81
			2.35	2.49			2.02
Oil				6.14			
				4.29			
Constant	31.5	31.83	29.08	28.95			
	3.57	3.42	2.81	2.8			
Avg. fixed effect					38.96	38.7	34.77
					3.29	3.08	2.76
R2	0.13	0.14	0.16	0.22	0.55	0.56	0.57
F-stat.	24.25	12.22	12.18	14.84	5.58	5.38	5.53
Obs.	319	318	318	318	319	318	318

T-ratios are included below the values in each column.
Source: Gudmundsson and Zoega

Table 5
Effects of Age on Current Account, 2005-2009

Surplus Countries			Deficit Countries	
	Percent of GDP			
Japan	2.22		Greece	6.21
Germany	1.31		Portugal	5.8
Indonesia	-1.38		Australia	5.16
Korea	-2.01		Poland	4.61
Sweden	-3.24		United States	2.25
Netherlands	-4.37		United Kingdom	2.23
China	-5.37		Spain	2.15
Saudi Arabia	-5.56		Pakistan	1.26
Switzerland	-6.97		Ireland	-0.86
Russia	-7.27		Colombia	-2.16

Source: Gudmundsson and Zoega, 2013