Economic Consequences of Population Aging in Asia

Colloquium series on the demography and economics of aging in East Asia

Ronald Lee
UC Berkeley
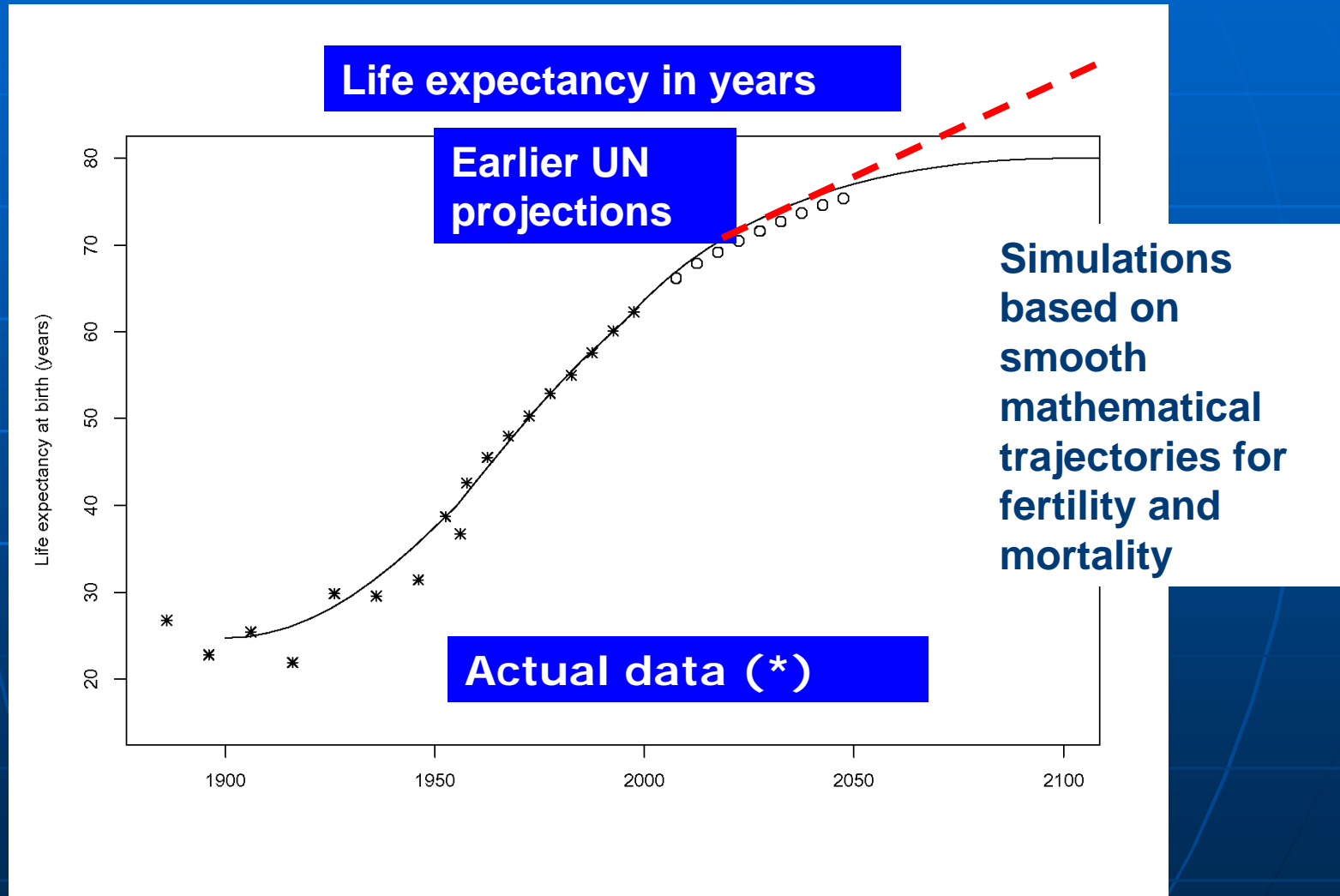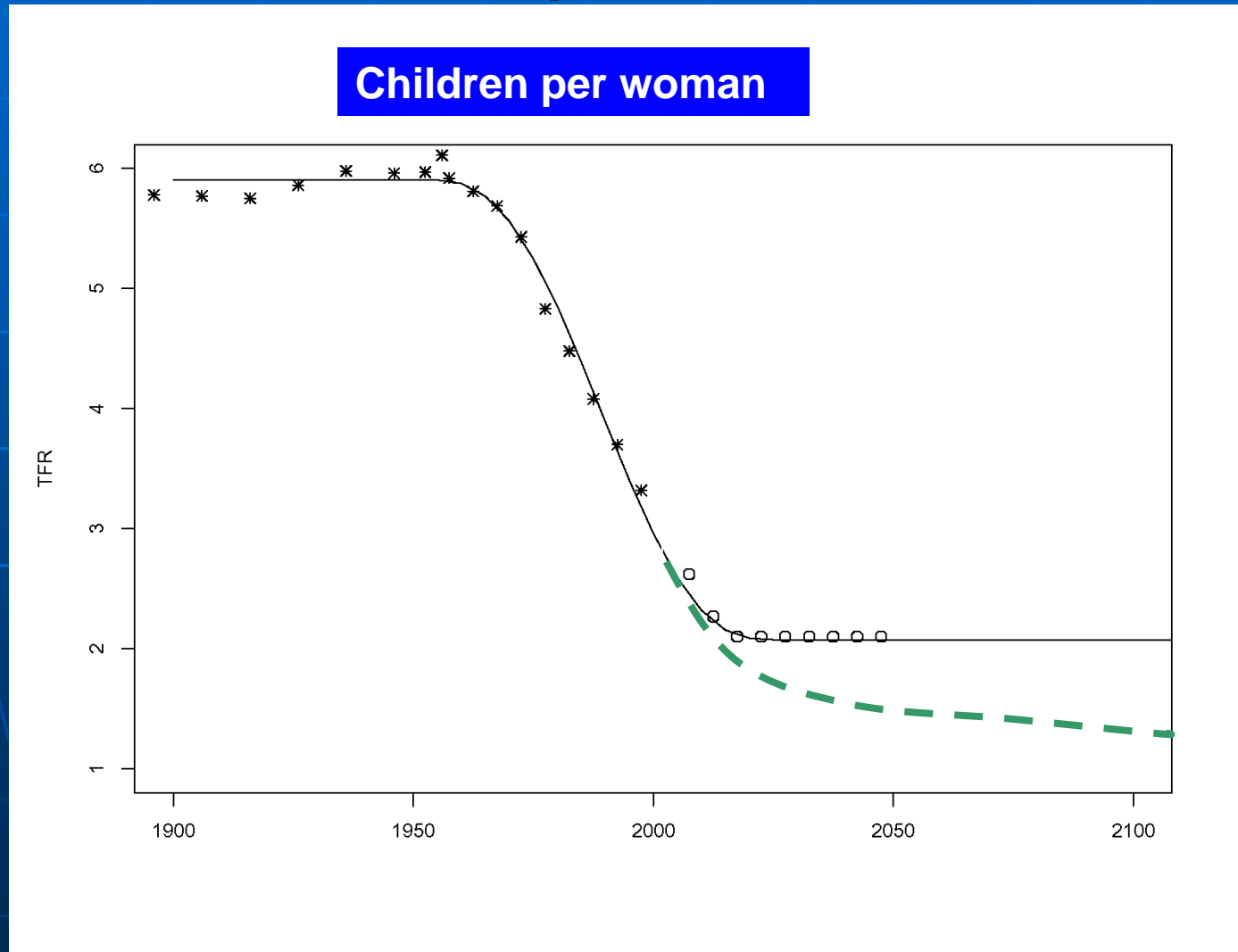November 29, 2007

Consequences of population aging

- Arise from interaction of changing population age distribution with the economic life cycle.

- But economic life cycle also changes shape during the same period.

- Institutions and policies for funding the consumption of children and the elderly also change.

- Difficult to separate cause and effect.

The Demographic transition in INDIA, Actual and simulated

Indian life expectancy began to rise around 1900, here simulated to go from 24 to 80 years.
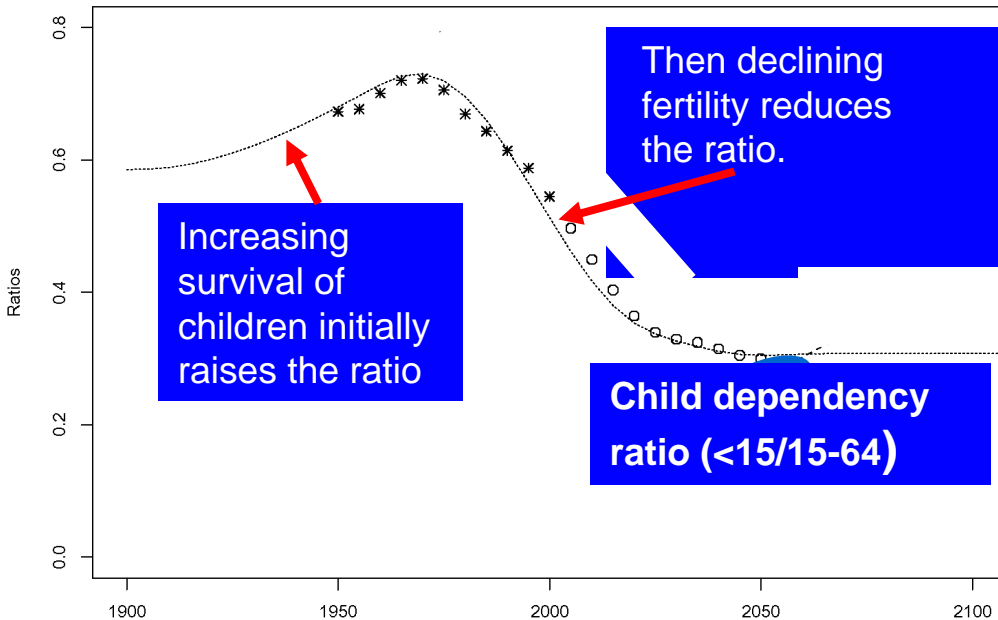

Life expectancy in years

Earlier UN projections

Simulations based on smooth mathematical trajectories for fertility and mortality

Actual data (*)

Indian fertility began to fall around 1960, here simulated to go from 6 to 2.1 births.

Changes in the child dependency ratio

Then declining fertility reduces the ratio.

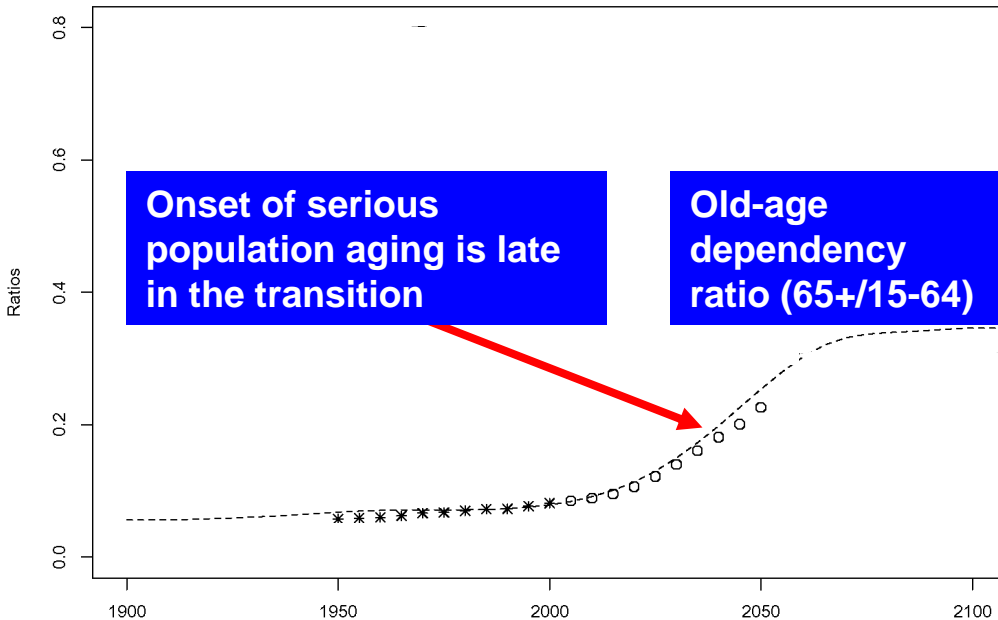Increasing survival of children initially raises the ratio

Child dependency ratio (<15/15-64)

Once fertility begins to decline, the child dependency ratio falls.

Changes in the old-age dependency ratio

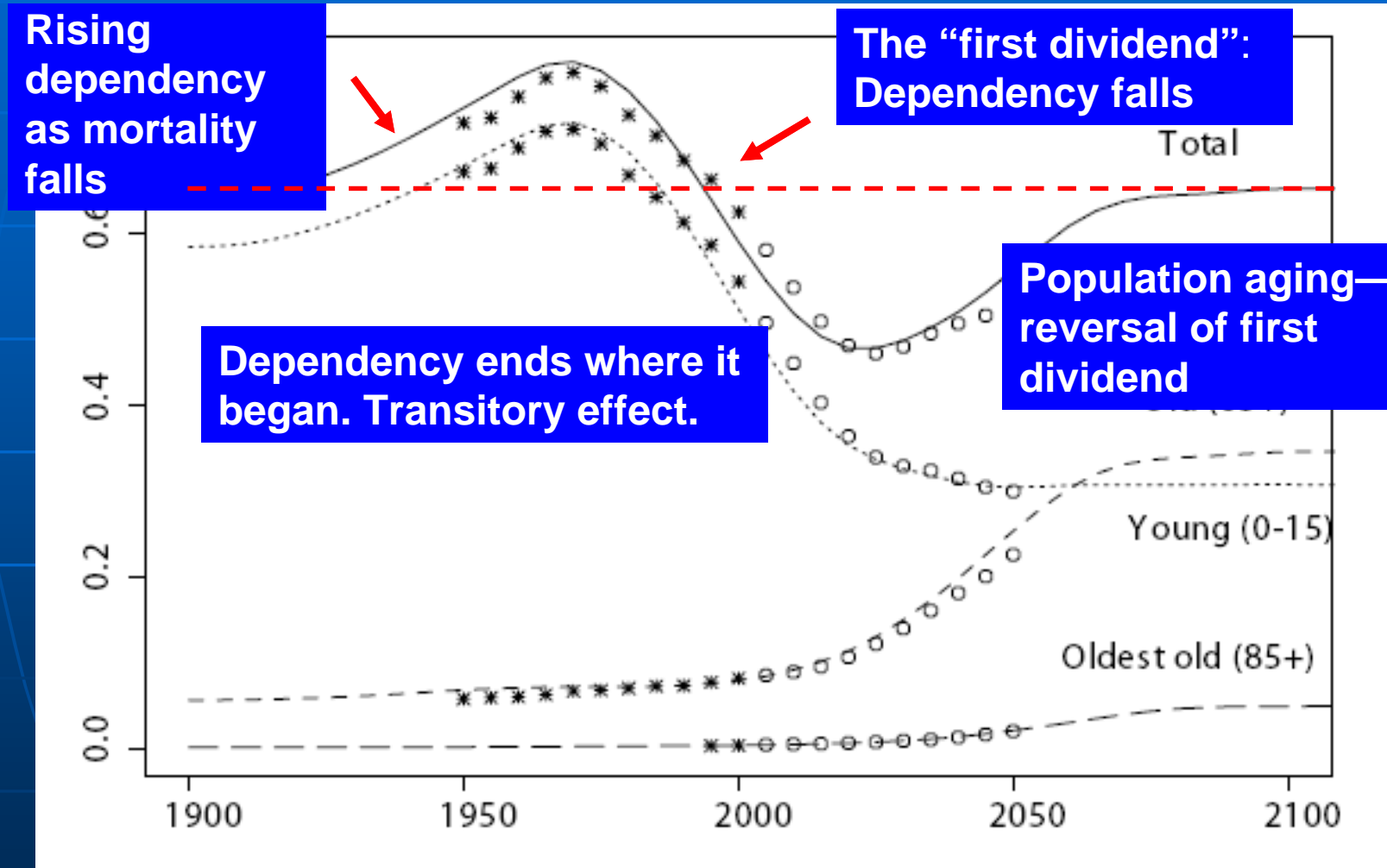**Onset of serious population aging is late in the transition**

Old-age dependency ratio (65+/15-64)

- Serious population aging begins more than a century after the transition starts.
- The old-age dependency ratio rises rapidly, by a factor of six.
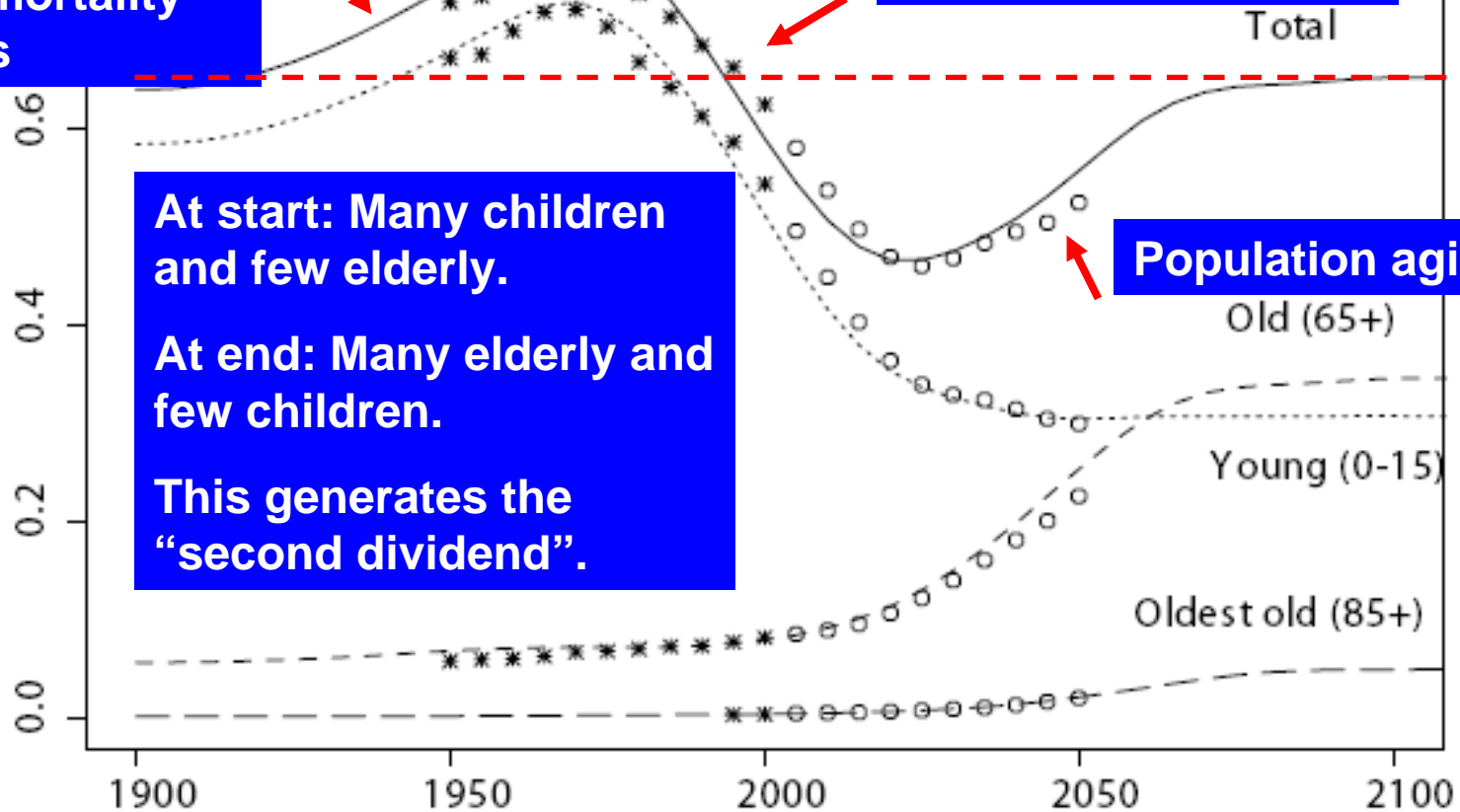
Variation in the total dependency ratio

Rising dependency as mortality falls

The "first dividend": Dependency falls

Dependency ends where it began. Transitory effect.

Population aging—reversal of first dividend

Total

Young (0-15)

Oldest old (85+)

Variation in the total dependency ratio

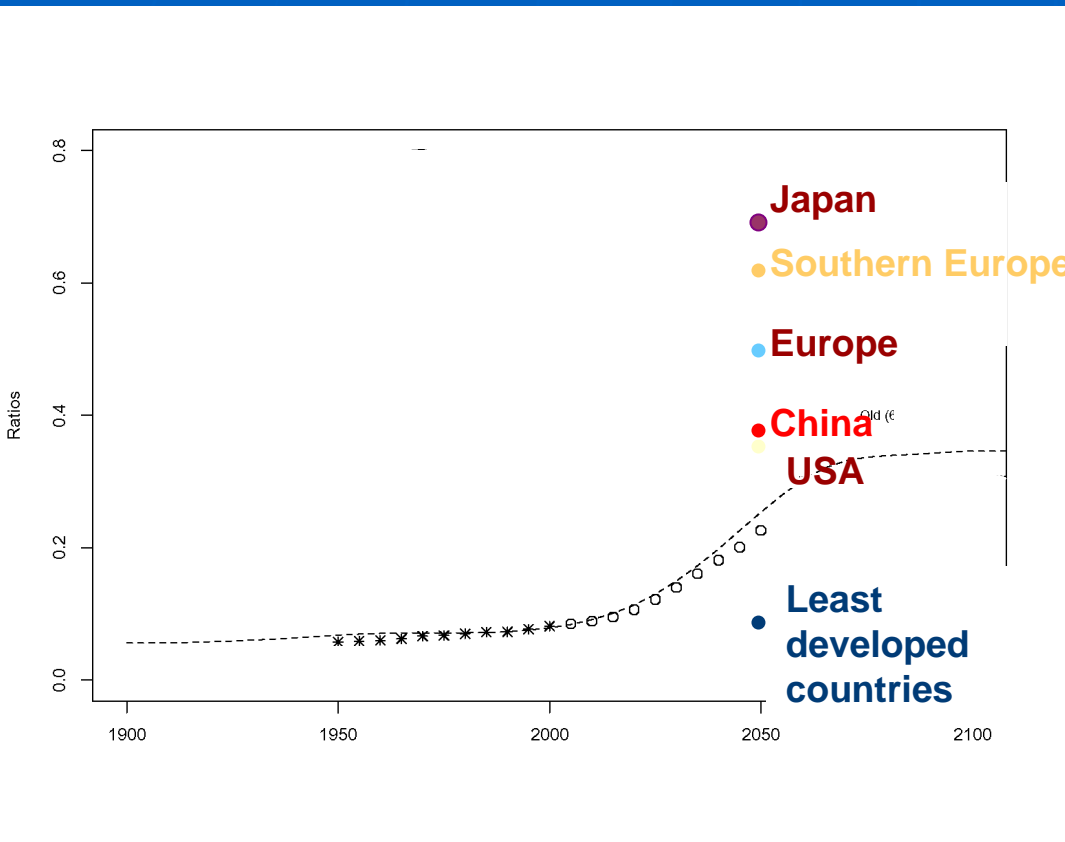**Rising dependency as mortality falls**

The "first dividend": dependency falls

At start: Many children and few elderly.

At end: Many elderly and few children.

This generates the "second dividend".

Population aging

Total

Old (65+)

Young (0-15)

Oldest old (85+)

There is great variation in projected old age dependency ratios for 2050

- **Ratio in Japan projected to be 6 times as high as in the least developed countries.**

- **Differences are due to position in transition, baby booms and busts, and fertility below replacement.**
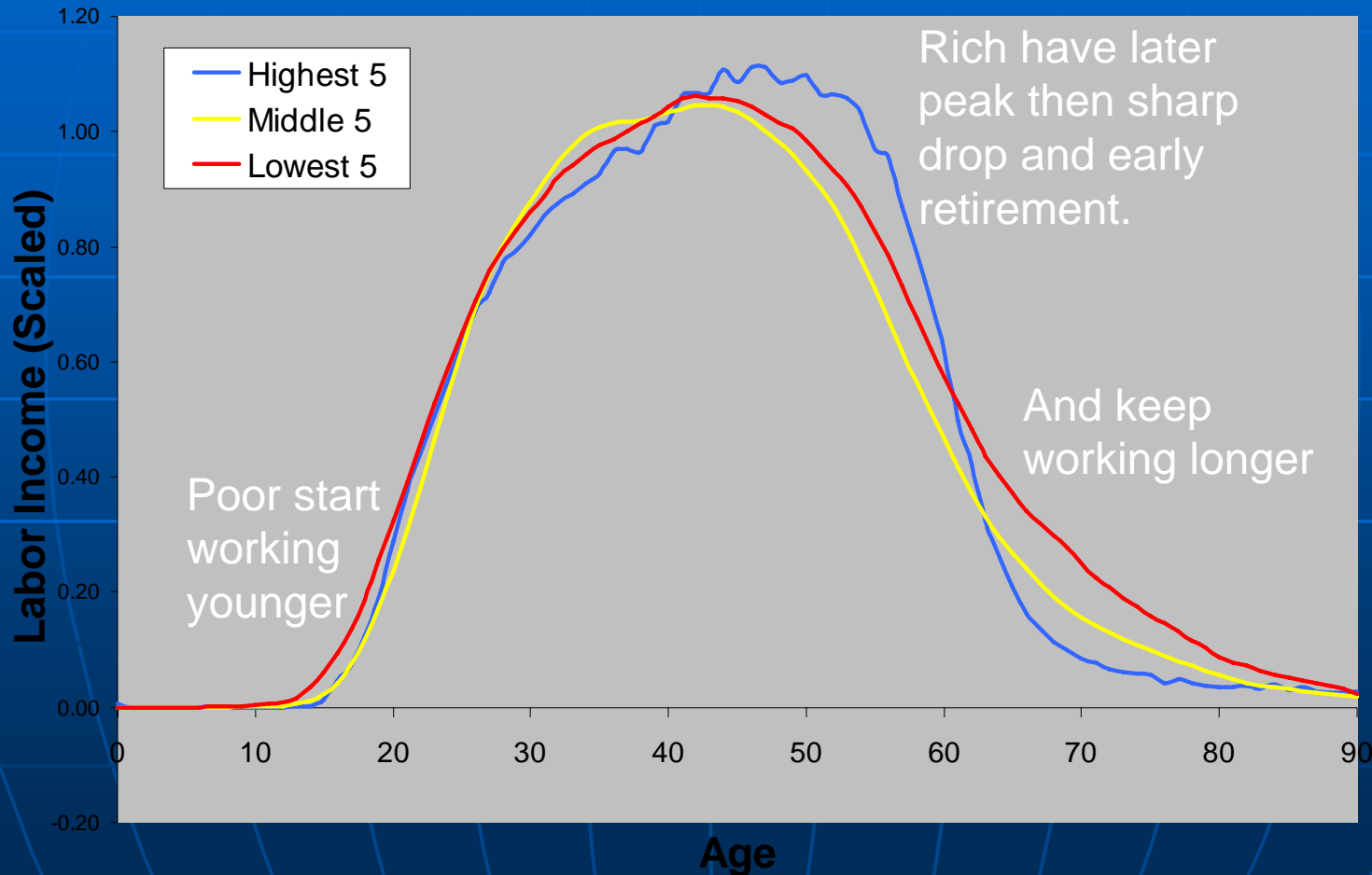
Dependency ratios are abstract; flesh out with some real data

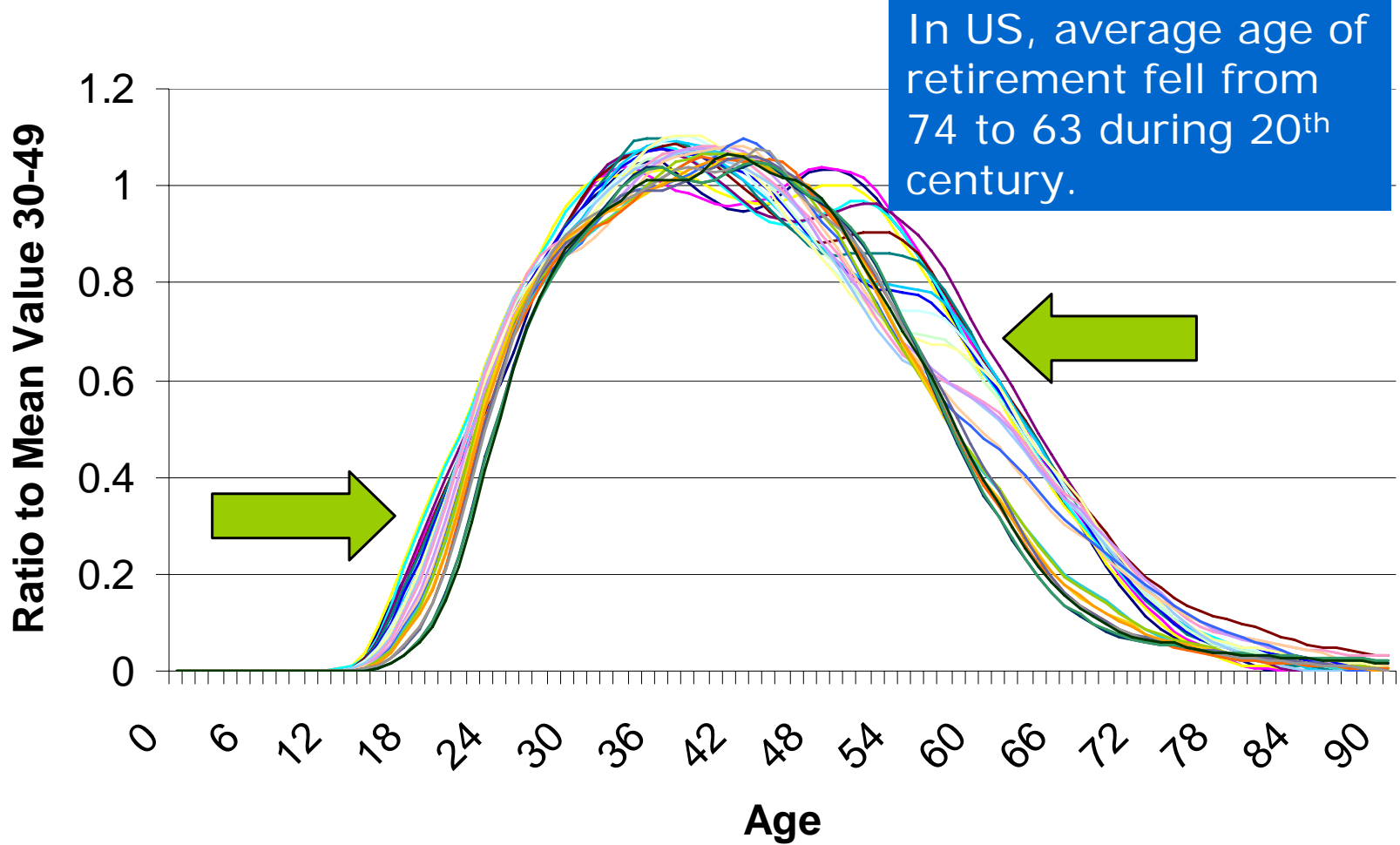# II. How labor income and consumption vary by age

- To understand economic implications of age structures, we need to know how labor income and consumption vary with age.

- The National Transfer Accounts project (NTA) is estimating these for many countries
  - (Andy Mason and I co-direct this NIA funded project.)

- NTA measures labor income as average income at each age, whether the individual is working or not.
- Averaged across men and women.
- It includes fringe benefits and the labor share of self employment income.

Average Labor Income Profiles Grouped By GDP Per Capita

Per Capita Labor Income Over Time
(Taiwan, 1977-2003)

In US, average age of retirement fell from 74 to 63 during 20th century.

Ratio to Mean Value 30-49

1.2
1
0.8
0.6
0.4
0.2
0

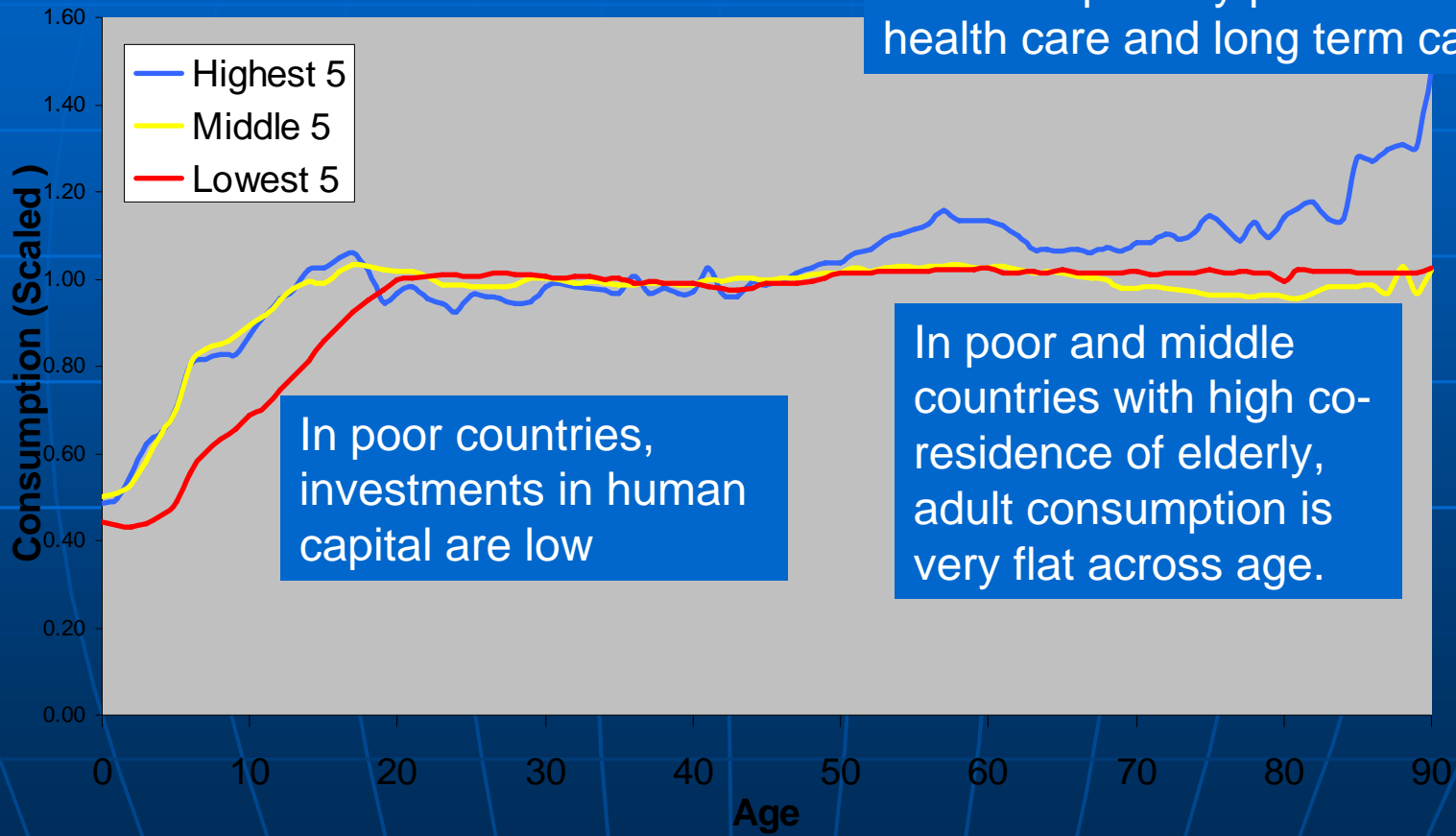0 6 12 18 24 30 36 42 48 54 60 66 72 78 84 90

Age

Consumption by age

- NTA includes private consumption for individuals in households and also publicly provided education, health care, and other items.

Average Consumption Profiles (scaled) Grouped By GDP Per Capita

In rich countries the elderly consume publicly provided health care and long term care
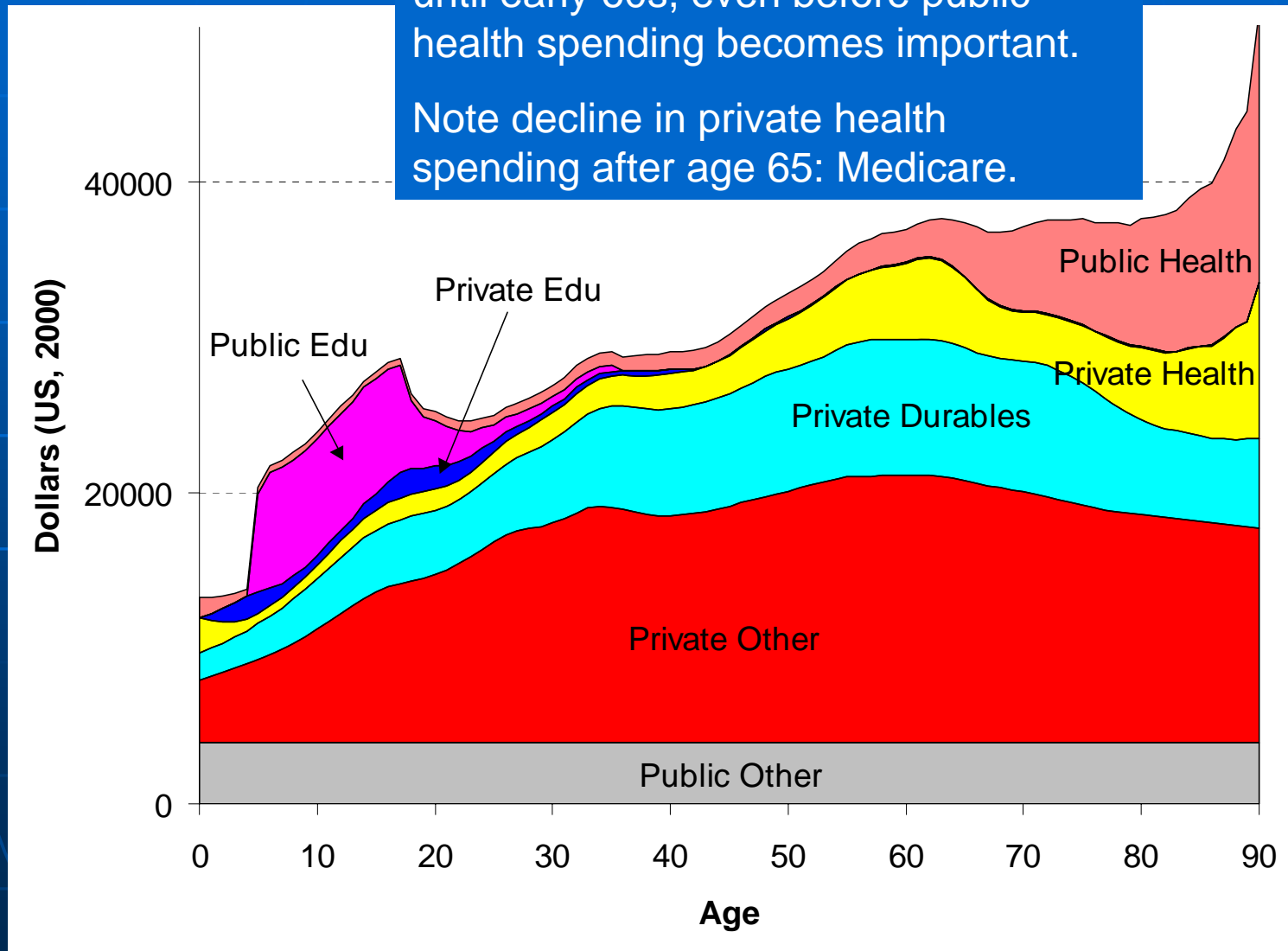
In poor countries, investments in human capital are low

In poor and middle countries with high co-residence of elderly, adult consumption is very flat across age.

On average, the elderly appear to consume an amount similar to other adults outside the richest countries

- How do they consume more than their labor earns?
  - Transfers from adult children with whom they often live
  - Transfers from public sector
  - Income from assets
- Will it be true for rural Chinese elderly who had few children and whose promised public sector support vanished? Unanticipated change
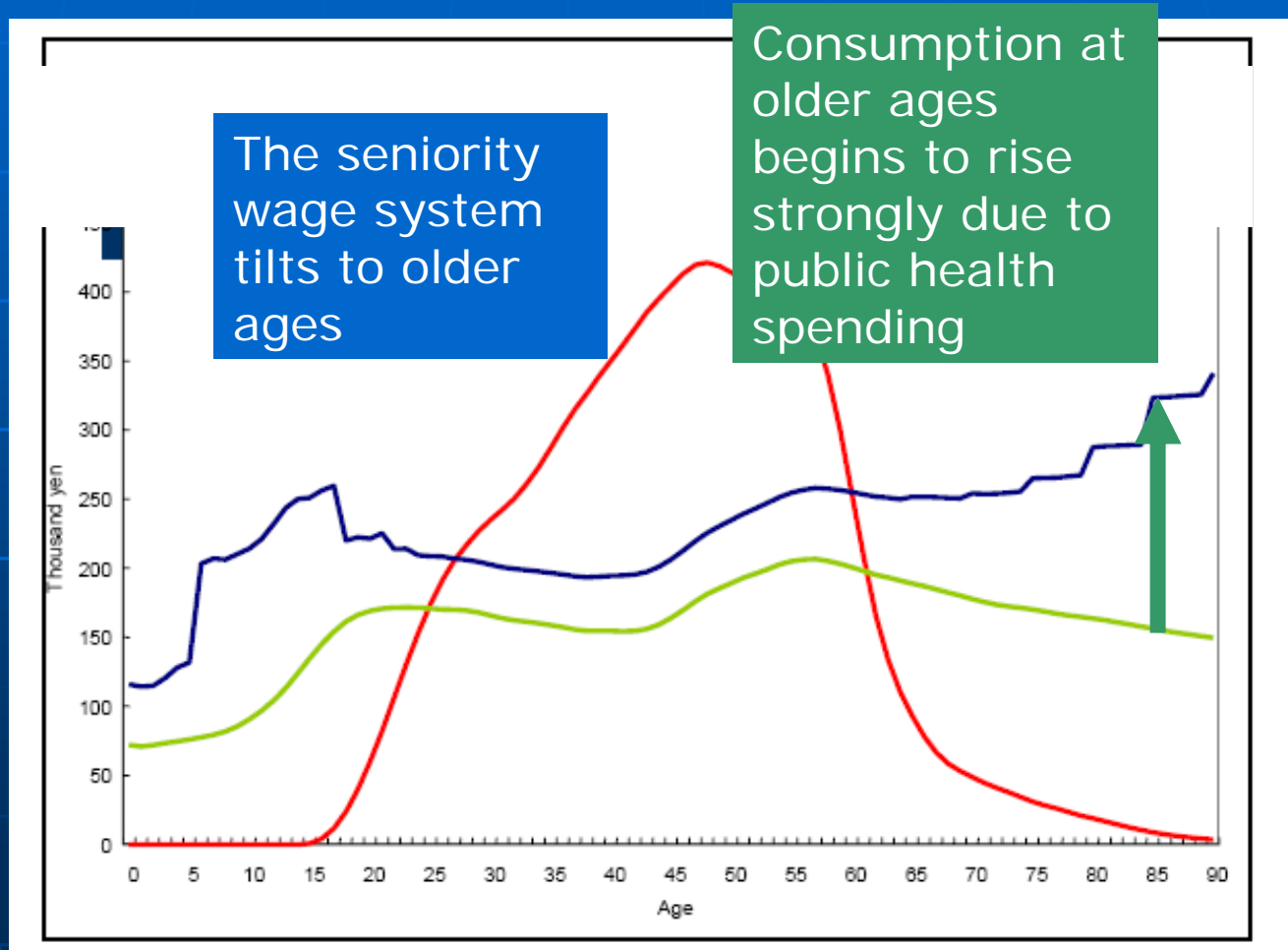
Components of US Consumption. 2003

Private consumption is rising with age until early 60s, even before public health spending becomes important.

Note decline in private health spending after age 65: Medicare.

By real GDP pc

US   France   Sweden   Austria   Japan

Slovenia   Taiwan   S. Korea   Chile   Uruguay

Costa Rica   Thailand   Philippines   Indonesia   India

Japan 2004: Labor income, total consumption, and private cons

The seniority wage system tilts to older ages

Consumption at older ages begins to rise strongly due to public health spending

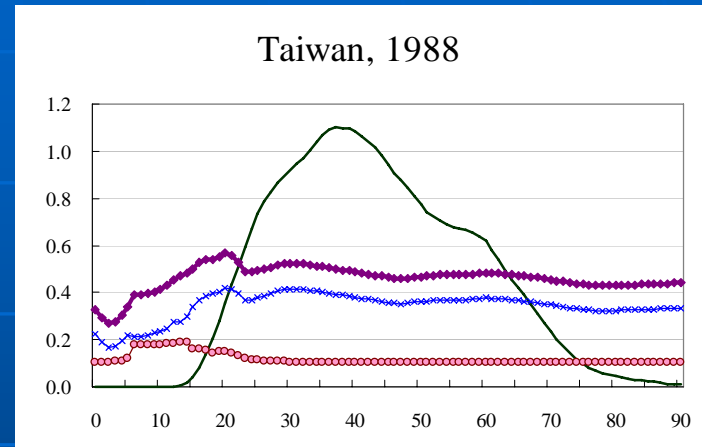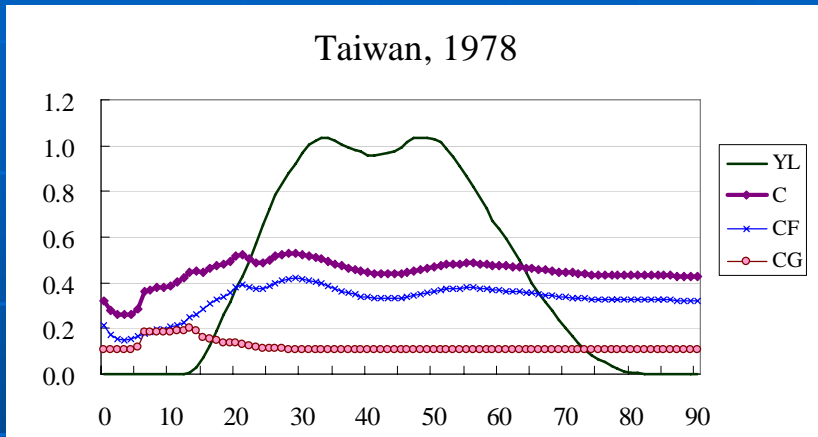Slide from Naohiro Ogawa and Rikiya Matsukura, Tokyo NTA conference presentation

The way old age consumption is funded in Japan has changed

Average Per Capita Consumption Finance (Age 65+)
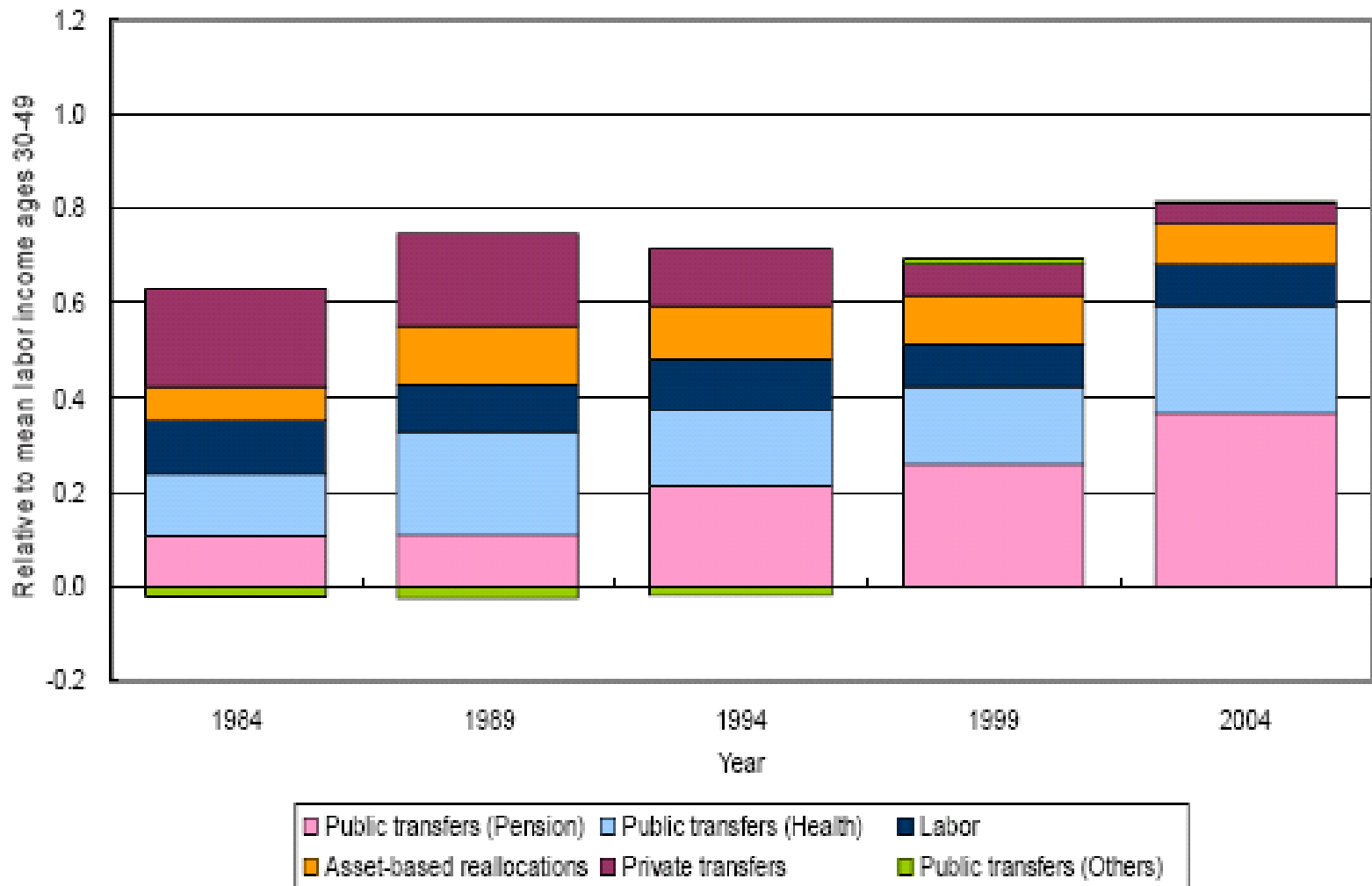
From Naohiro Ogawa and Rikiya Matsukura presentation, Tokyo NTA conference

In Taiwan, investment per child in human capital has risen dramatically: 1978, 1988, 1998, 2003
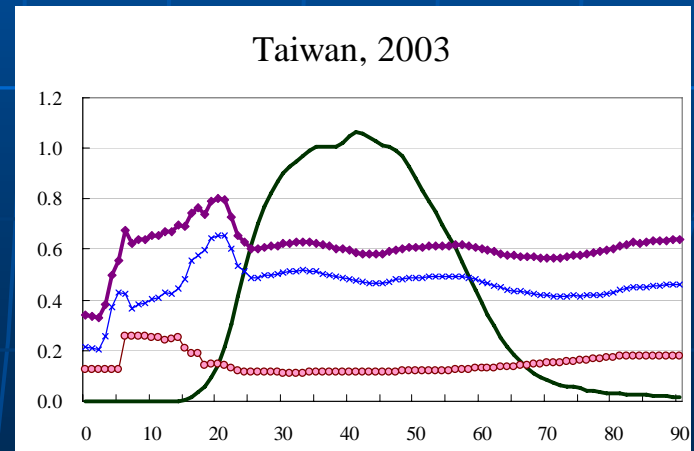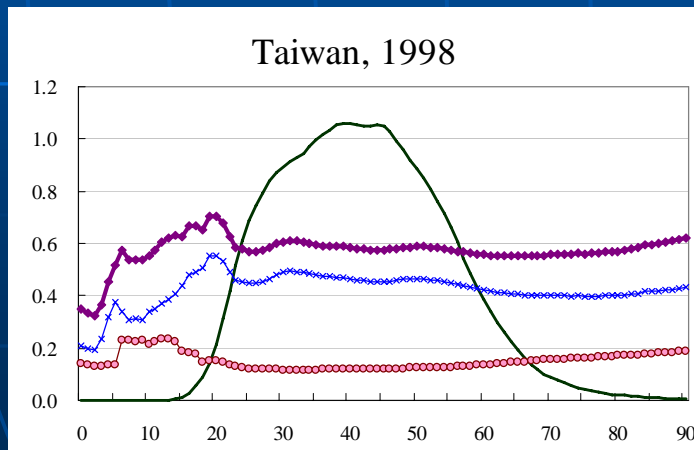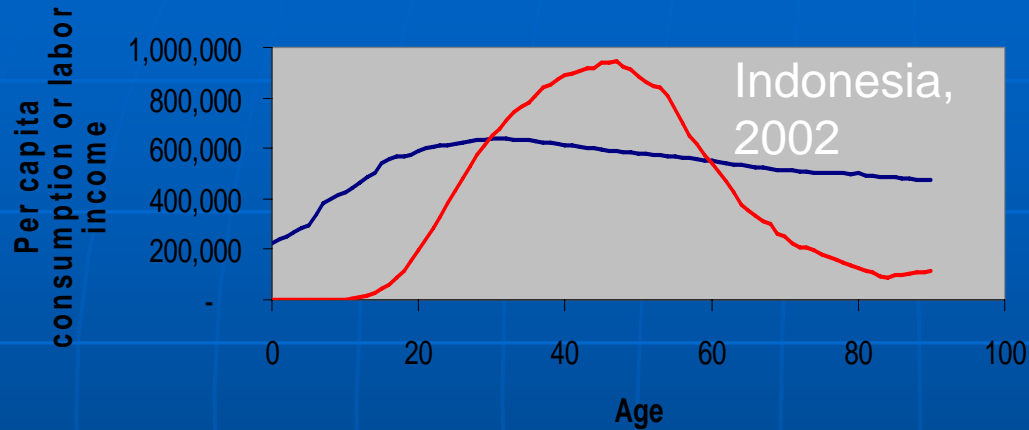
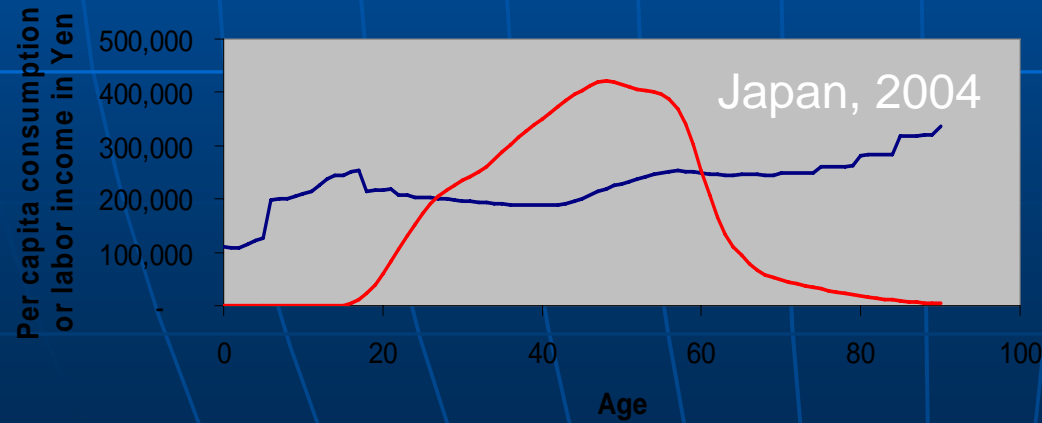Now look at the interaction of changing age distributions with changing economic life cycles

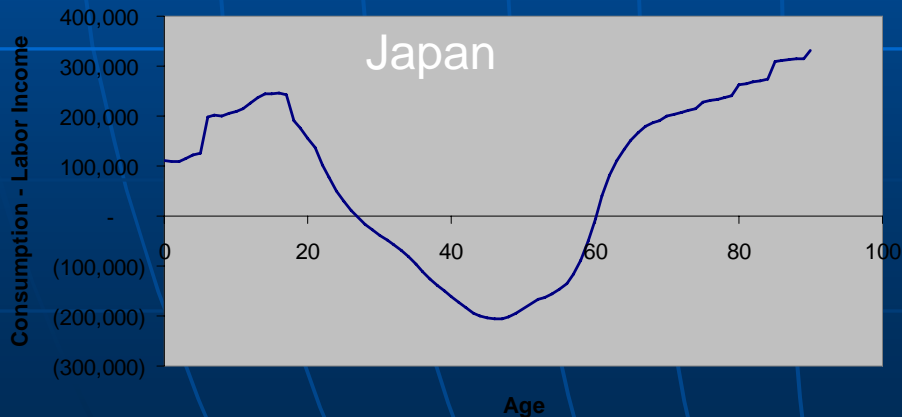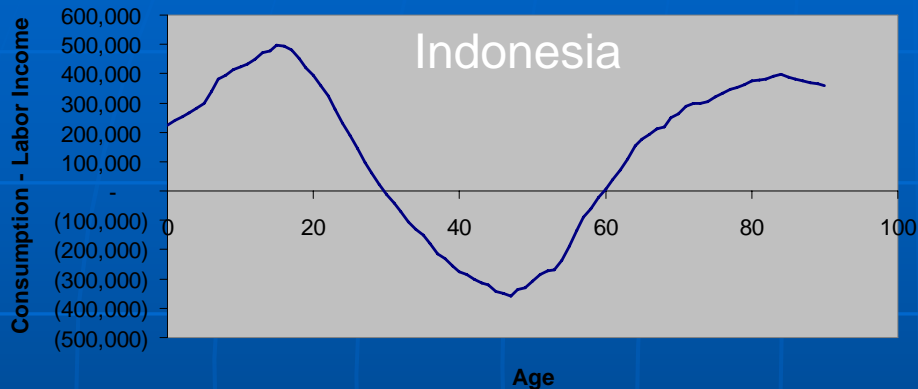# Per capita consumption and labor income by age for Indonesia and Japan
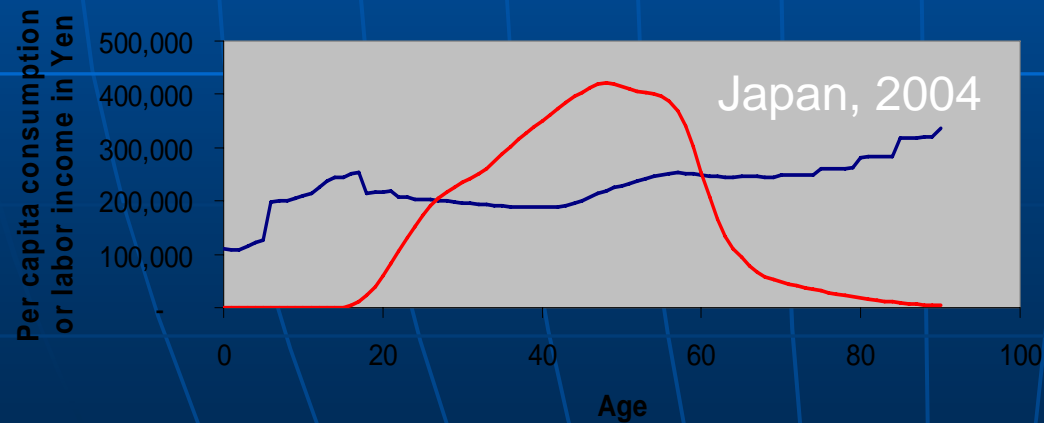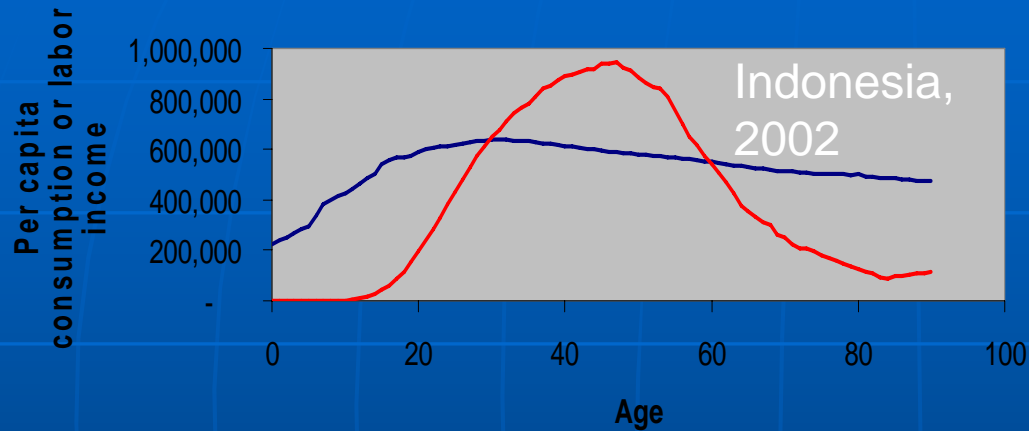
Periods of consuming more than labor income in childhood and old age

Indonesia, 2002

Japan, 2004

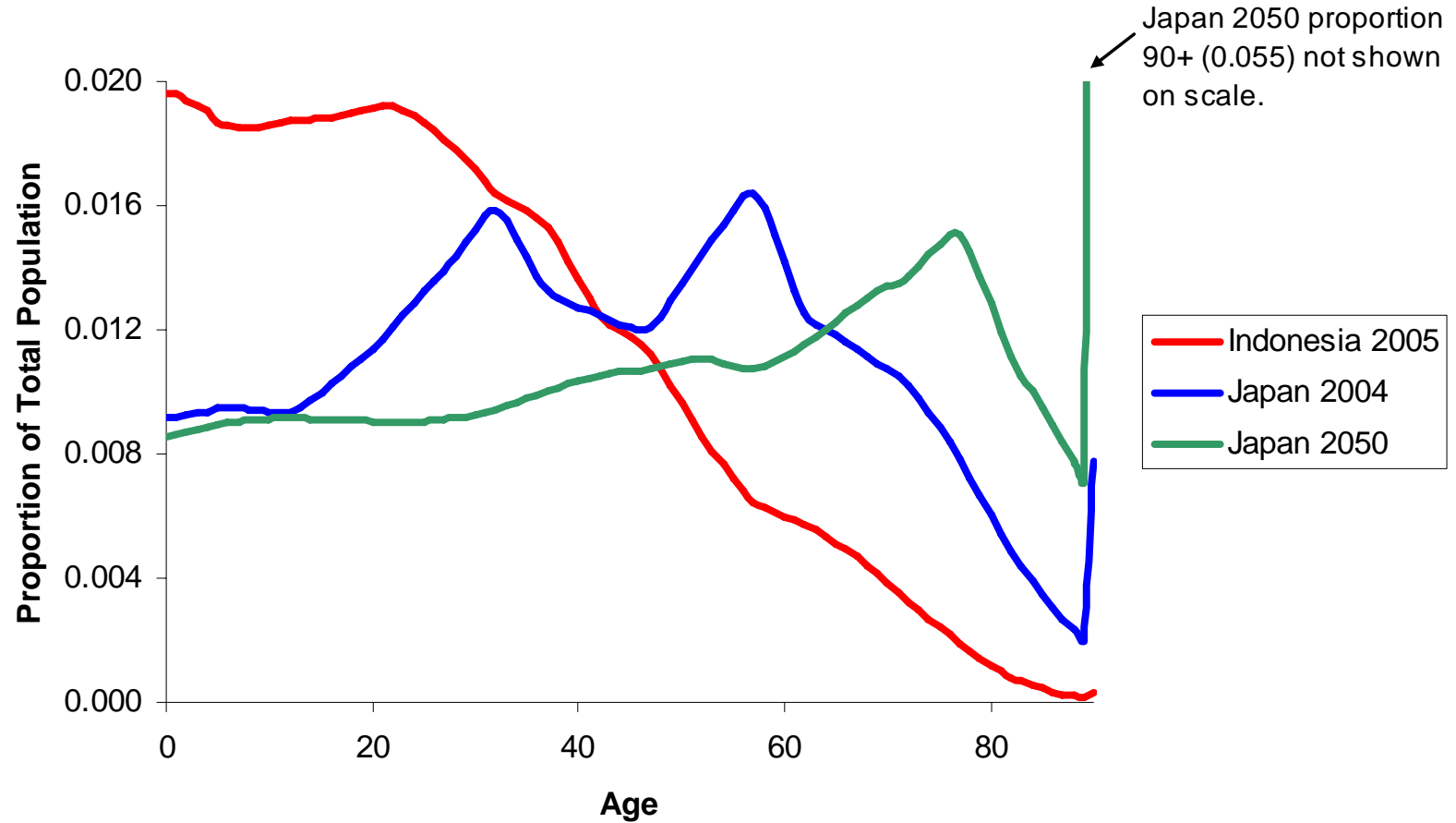- The difference c(x) − y$_l$(x) is called the "Life Cycle Deficit".

Per Capita Life Cycle Deficit: c(x)-y$_l$(x)

Indonesia

Japan

- The life cycle deficit patterns look remarkably similar
- Japan's becomes more extreme at very old ages.
- Because these are per capita, they don't convey the macro patterns of flows.
- To appreciate the full implications, we must take the population age distributions into account.

Population Age Distributions

Japan 2050 proportion 90+ (0.055) not shown on scale.

Proportion of Total Population

Age

Indonesia 2005
Japan 2004
Japan 2050

Aggregate Life Cycle Deficits (Age profiles weighted by actual population by age)

Indonesia '02

Japan '04
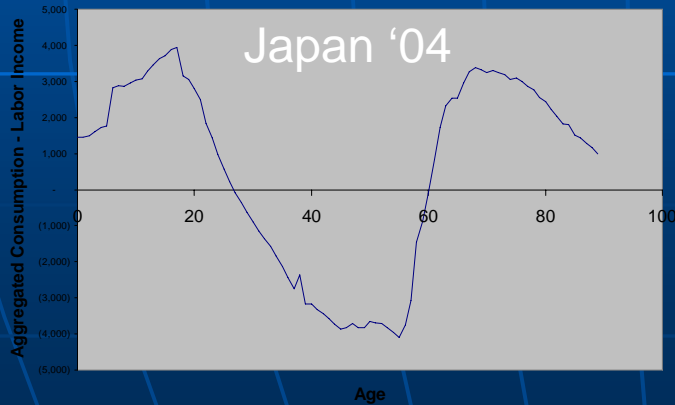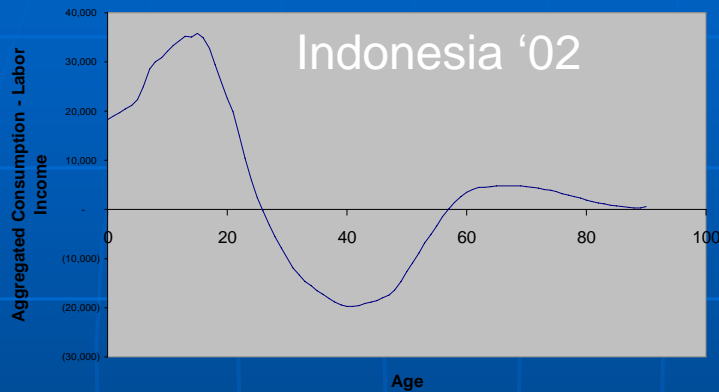
- The graphs show the total amount consumed by all people at a given age minus the total amount of labor income earned.
- The area above the line is the amount that must be covered by funds other than labor income.
- The area below the line is labor income that is not consumed at that age.

Reallocations to the young dominate in Indonesia and are roughly equal to young and old in Japan

Aggregate Life Cycle Deficit for Indonesia (2005) in Rupiah

Aggregate Life Cycle Deficit for Japan (2004) in Yen
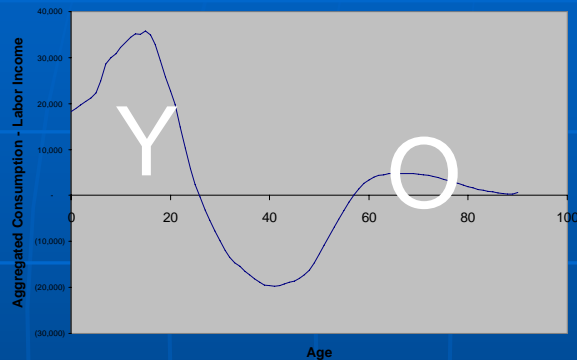
- in Indonesia O/Y is only .15.
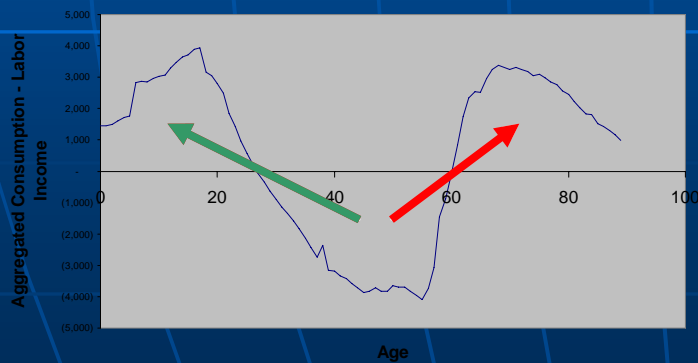- In Japan, O/Y is 1.12.

Consumption at these deficit ages is funded partly by transfers from the surplus labor income

Aggregate Life Cycle Deficit for Indonesia (2005) in Rupiah

Aggregate Life Cycle Deficit for Japan (2004) in Yen
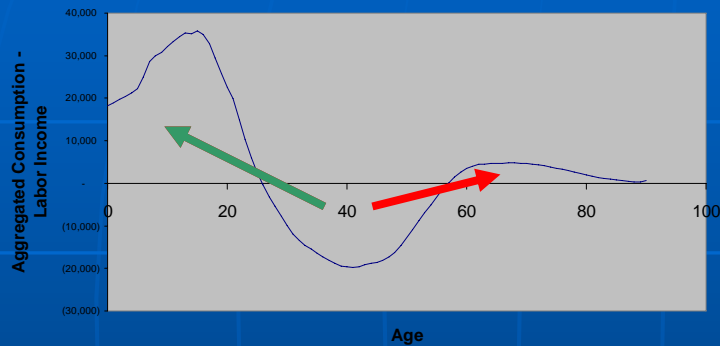
- Green arrows show transfers downward to youth
- Red show transfers upward to elderly.

This huge change in the balance of reallocations to young and to old may lead to differences in investment patterns.

- First, consider investment in children
  - Aging is caused mostly by low fertility.
  - Low fertility is associated with increased in investment in the human capital of each child.

Ln Total Human Capital Spending per Child vs. Fertility (Health and Education only, up to 18 and 26, respectively)
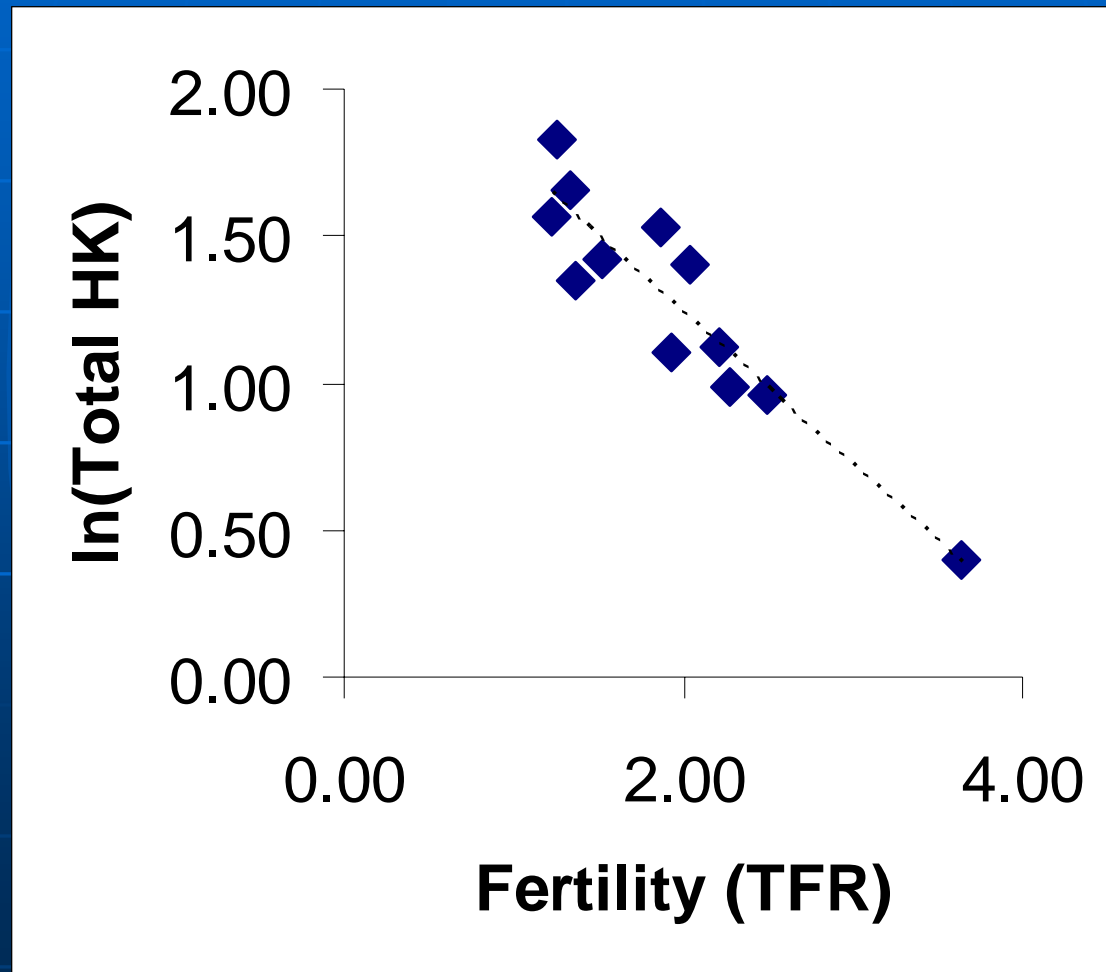
The quantity-quality tradeoff in fertility

- Causal story behind chart is not clear.

- Desire to invest more per child may cause fertility decline.

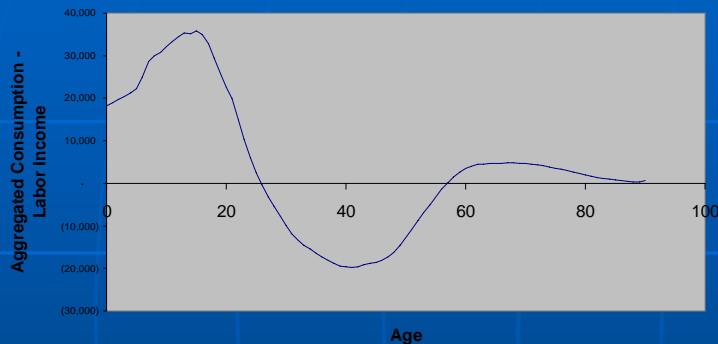- Desire to have fewer children may enable increased investments in each.

Next, consider investment in capital and financial assets

Assets from earlier saving can be used to fund old age deficits (life cycle saving).

Aggregate Life Cycle Deficit for Indonesia (2005) in Rupiah

Aggregate Life Cycle Deficit for Japan (2004) in Yen
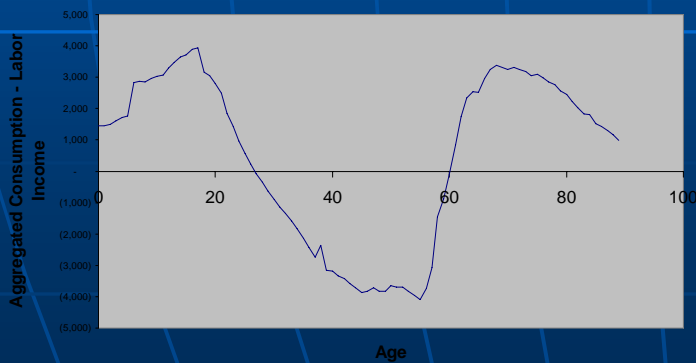
- The need to fund the old age deficit is a strong motivation for workers to save.
- Because population aging raises the old age deficit it may raise capital per worker.
- This is the "second dividend"

However, if working age people expect to fund their old age consumption through transfers from family or public pensions, they may save less

Aggregate Life Cycle Deficit for Indonesia (2005) in Rupiah

Aggregate Life Cycle Deficit for Japan (2004) in Yen
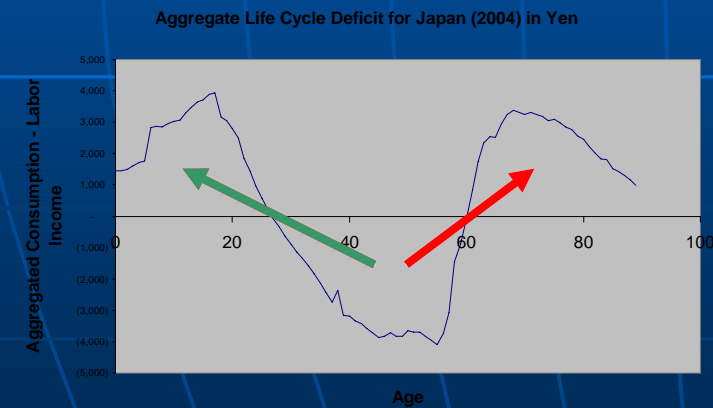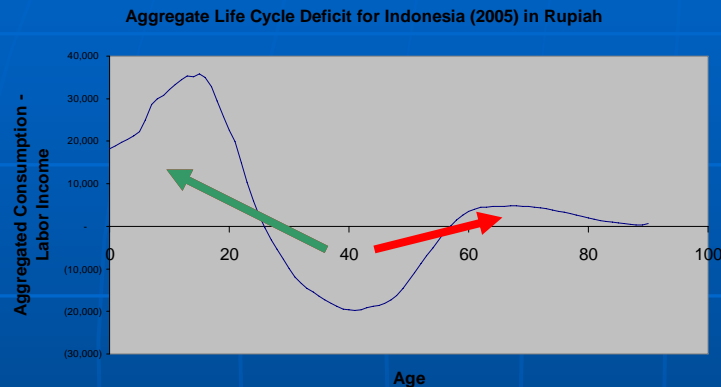
- The present value of expected future net transfers (received minus given) is "transfer wealth".

- Transfer wealth substitutes for assets in life cycle planning.

III. Economic Consequences of Age Distribution: Support ratios

- The balance of workers and consumers for the whole population is summarized by the support ratio
  - Add up population times labor income at each age
  - Add up population times consumption at each age
  - Ratio of labor to consumers is the "support ratio".

- A high support ratio is favorable.
- The increase in the support ratio in the middle of the demographic transition is the "demographic dividend".
- Here are examples for some LDCs at different stages of their transitions.

Support Ratios for Five Less Developed Countries, 1950-2100, Based on UN population projections and average LDC age profiles from NTA

Support Ratios for Five Less Developed Countries, 1950-2100, Based on UN population projections and average LDC age profiles from NTA

Support Ratios for Five Less Developed Countries, 1950-2100, Based on UN population projections and average LDC age profiles from NTA

S. Korea

China

India

Brazil

Niger

2007
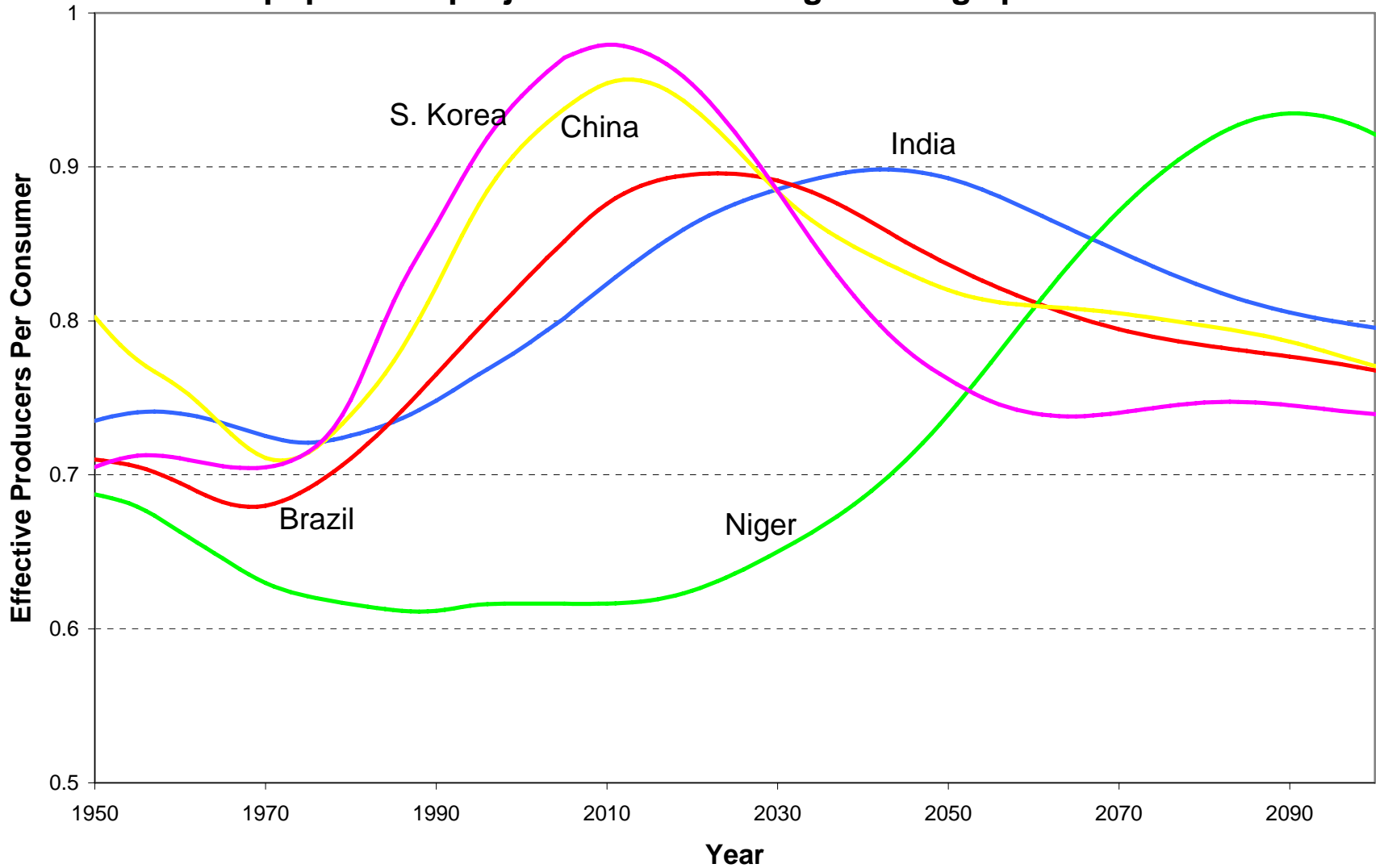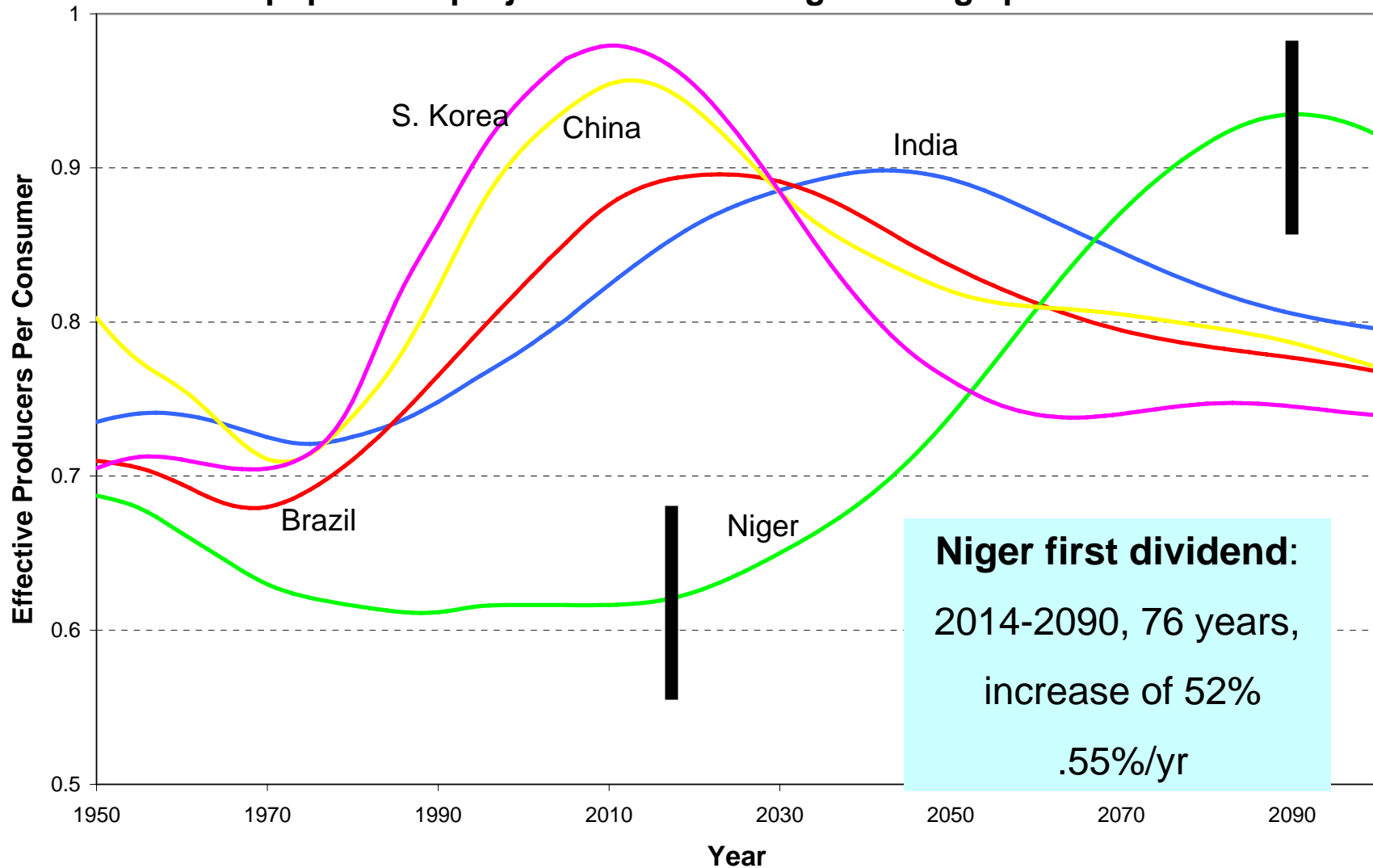
First dividends for China and S. Korea are about finished.

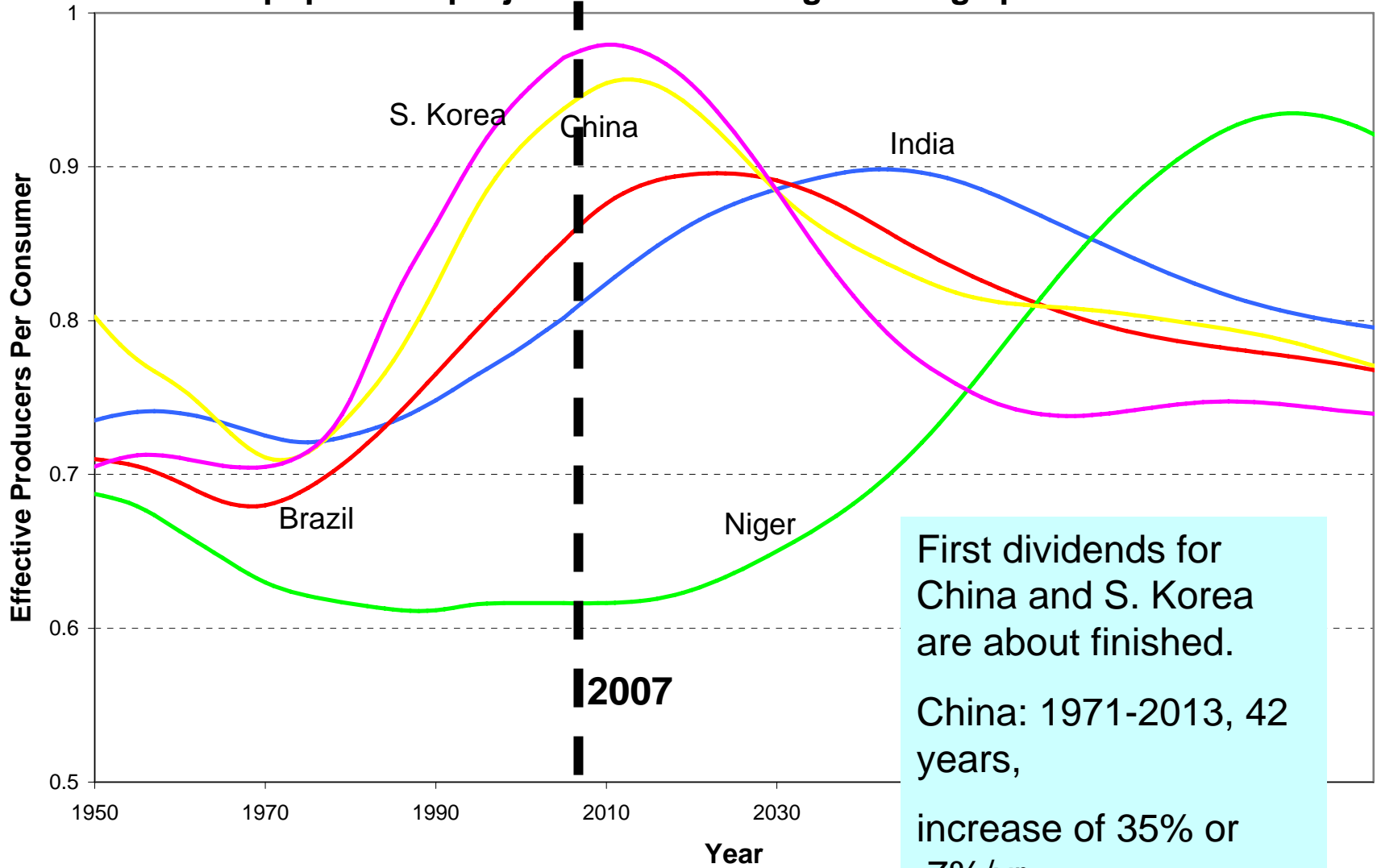China: 1971-2013, 42 years,

increase of 35% or .7%/yr

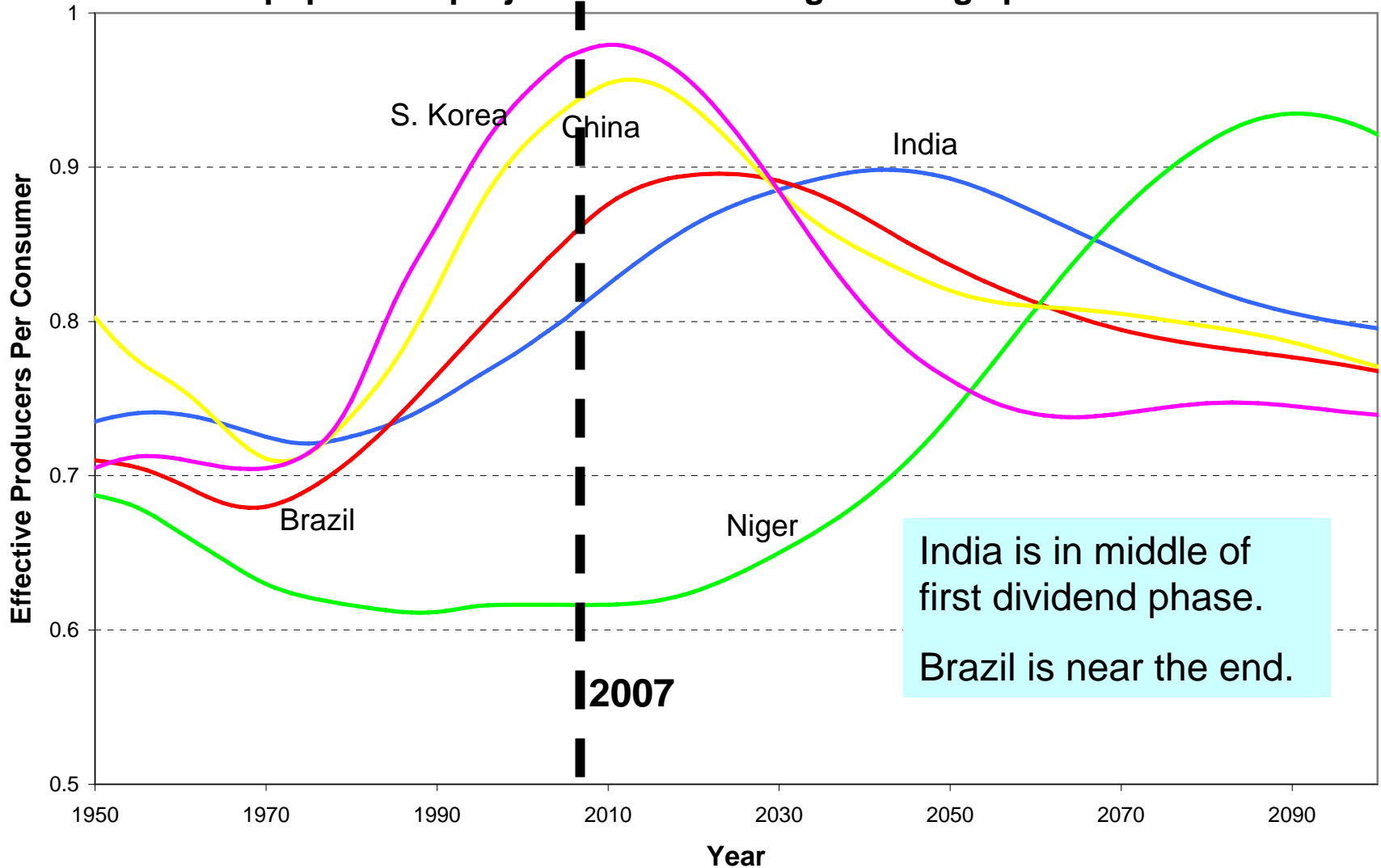**Support Ratios for Five Less Developed Countries, 1950-2100, Based on UN population projections and average LDC age profiles from NTA**

Support Ratios for Five More Developed Countries, 1950-2100, based on UN long term population projections and the NTA age profile for the US.

Support Ratios for Five More Developed Countries, 1950-2100, based on UN long term population projections and the NTA age profile for the US.

Spain

US

Germany

Italy

Japan

Italy,
Low Fert.
Spain,
Low Fert.

For Japan, Spain, Italy, and Germany, the support ratios drop substantially by 2050.

For US, less so.

Effective Producers Per Consumer

0.8

0.7

0.5

1950   1970   1990   2010   2030   2050   2070   2090

Year

Proportionate Changes in the Support Ratio from 2007 to 2050 for Selected Countries

Proportionate Changes in the Support Ratio from 2007 to 2050 for Selected Countries

Proportional Change in Support (y-axis: 0.3, 0.2, 0.1, 0, -0.1, -0.2, -0.3, -0.4)

MDCs

LDCs from lowest to highest current fertility.

Bars: US, Spain, Italy, Japan, Germany, S. Korea, China, Brazil, India, Niger
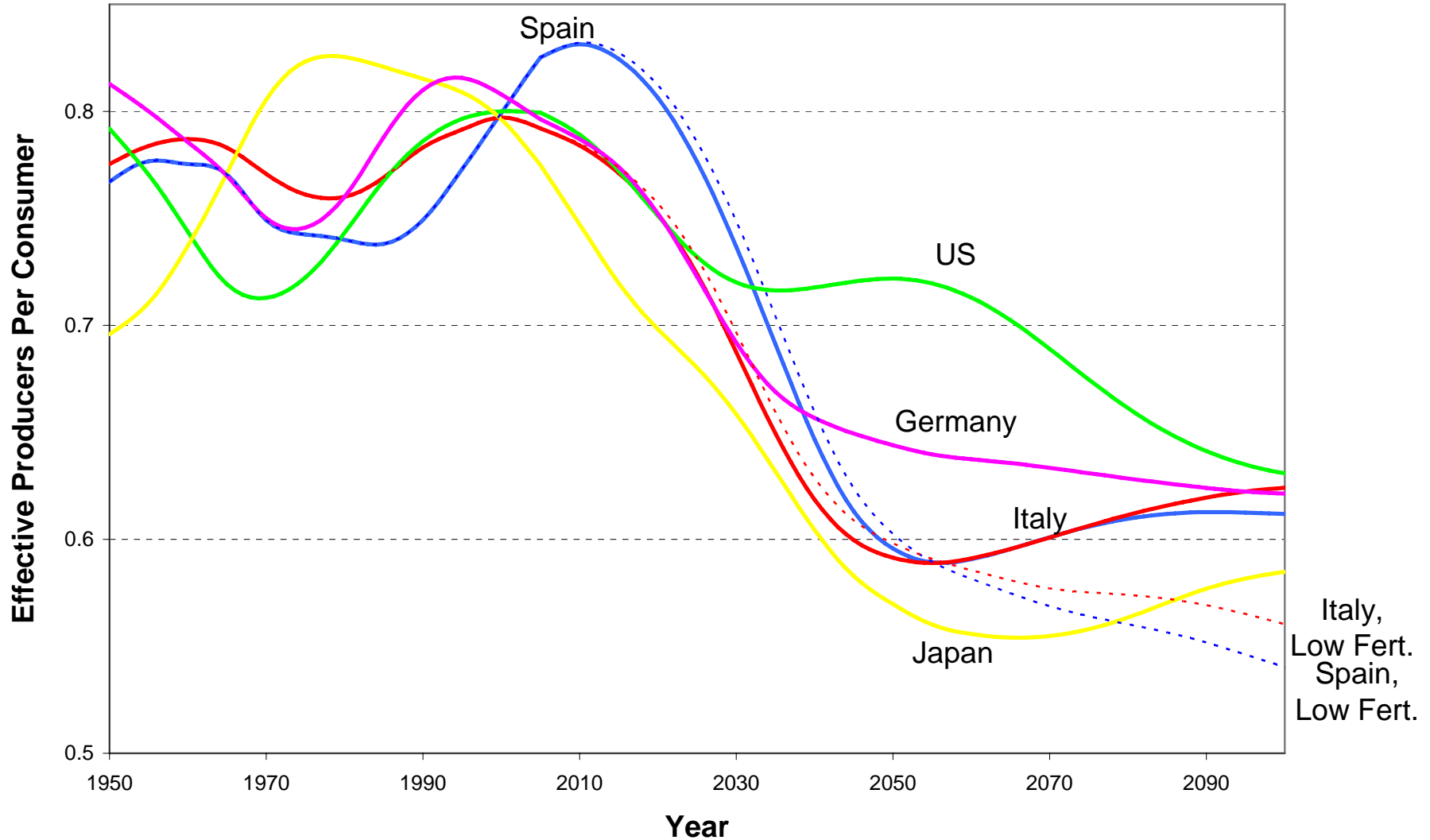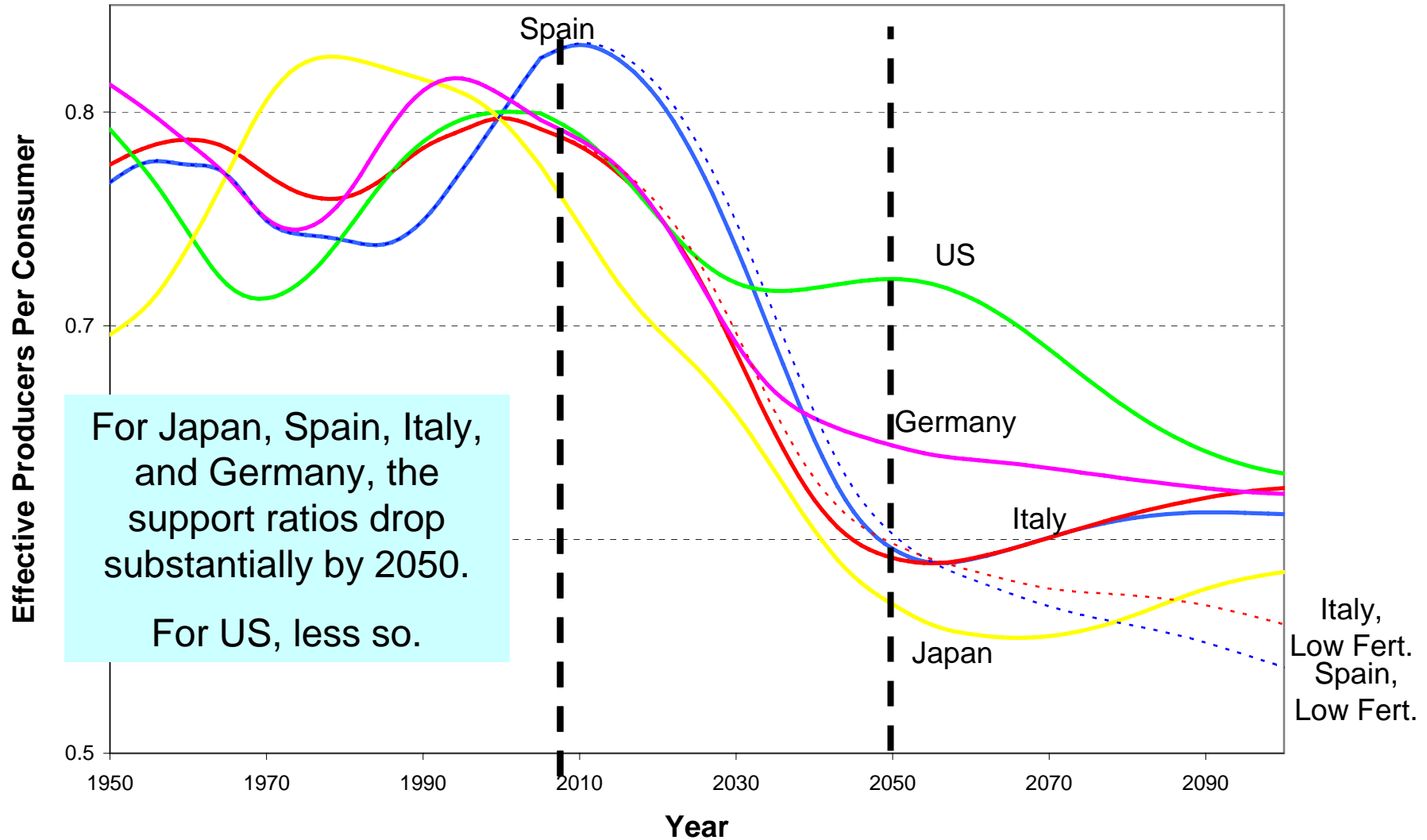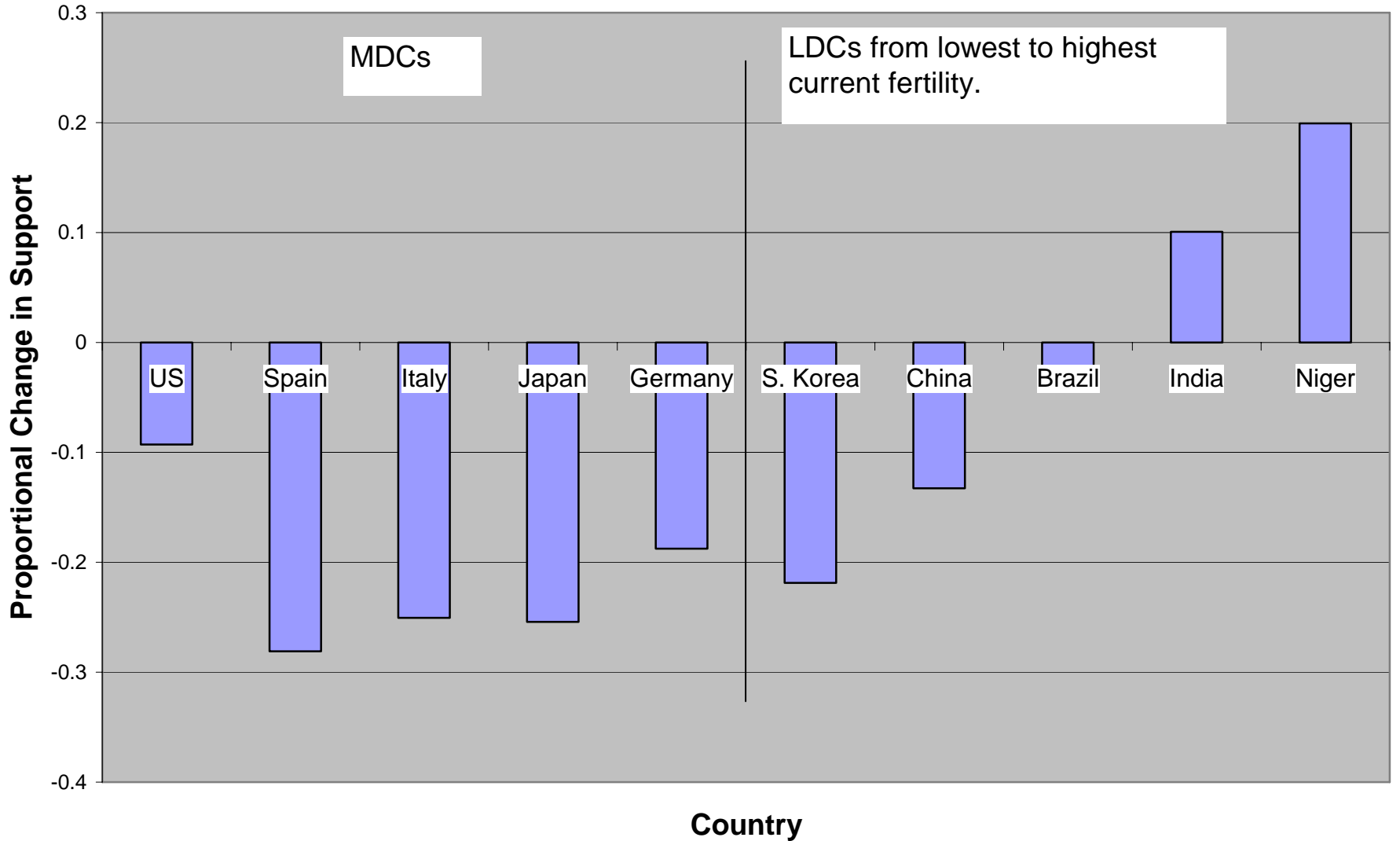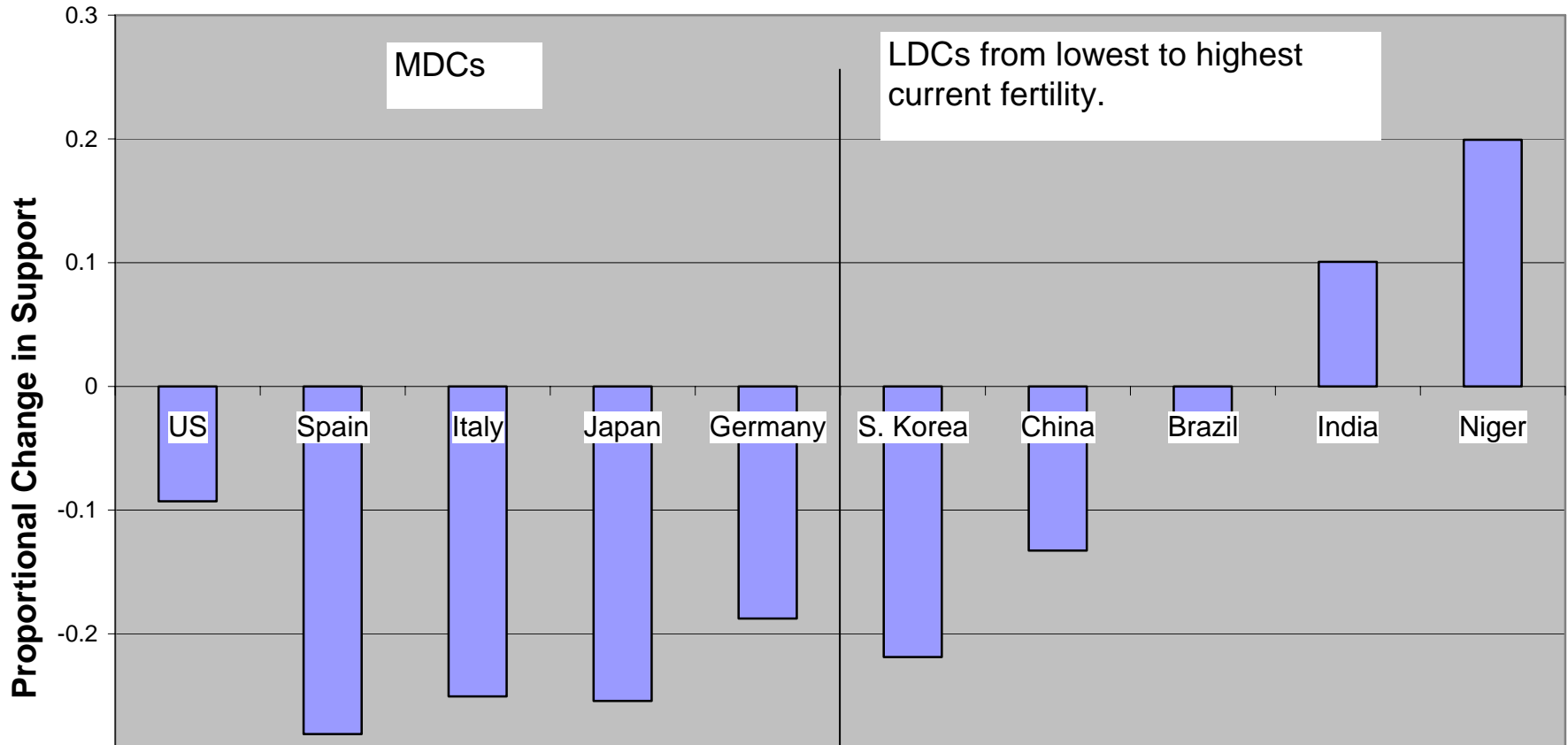
For MDCs other than the US, this is an annual decline of .5 to .8%.

Compared to expected productivity growth of perhaps 1 to 2% per year, this is significant.

IV. Population change, saving, and capital

- *The first demographic dividend is transitory.*

- *Given the right policies, age structure changes can produce a second demographic dividend which is permanent.*

The second demographic dividend

- *Typically, adults accumulate assets over their life cycles.*

- *Thus elderly hold more assets than others.*

- *Population aging raises the population share of elderly, and therefore raises the average amount of wealth and asset income.*

- *More capital per worker also raises labor productivity.*

- *This is the second dividend.*

The second dividend may be reinforced by demographic change

- *Longer life requires increased saving for retirement.*

- *Lower fertility may mean higher saving by parents with fewer children.*

- *For these reasons, elderly may accumulate even more wealth and the second dividend may be larger.*

This does not mean the aggregate saving rate will rise with aging

- *Aggregate saving is likely to fall with population aging.*
- *The second dividend still occurs, because with slower labor force growth, even lower saving can raise capital per worker.*

However, this second dividend depends on institutions and policies.

- *If workers expect to be supported by their adult children, then they save less and hold less wealth when old.*

- *Similarly if they expect to be supported by public pensions then they save less and hold less wealth.*

- *In both cases the second dividend is reduced.*

National Transfer Account data on how old age consumption is financed in four countries
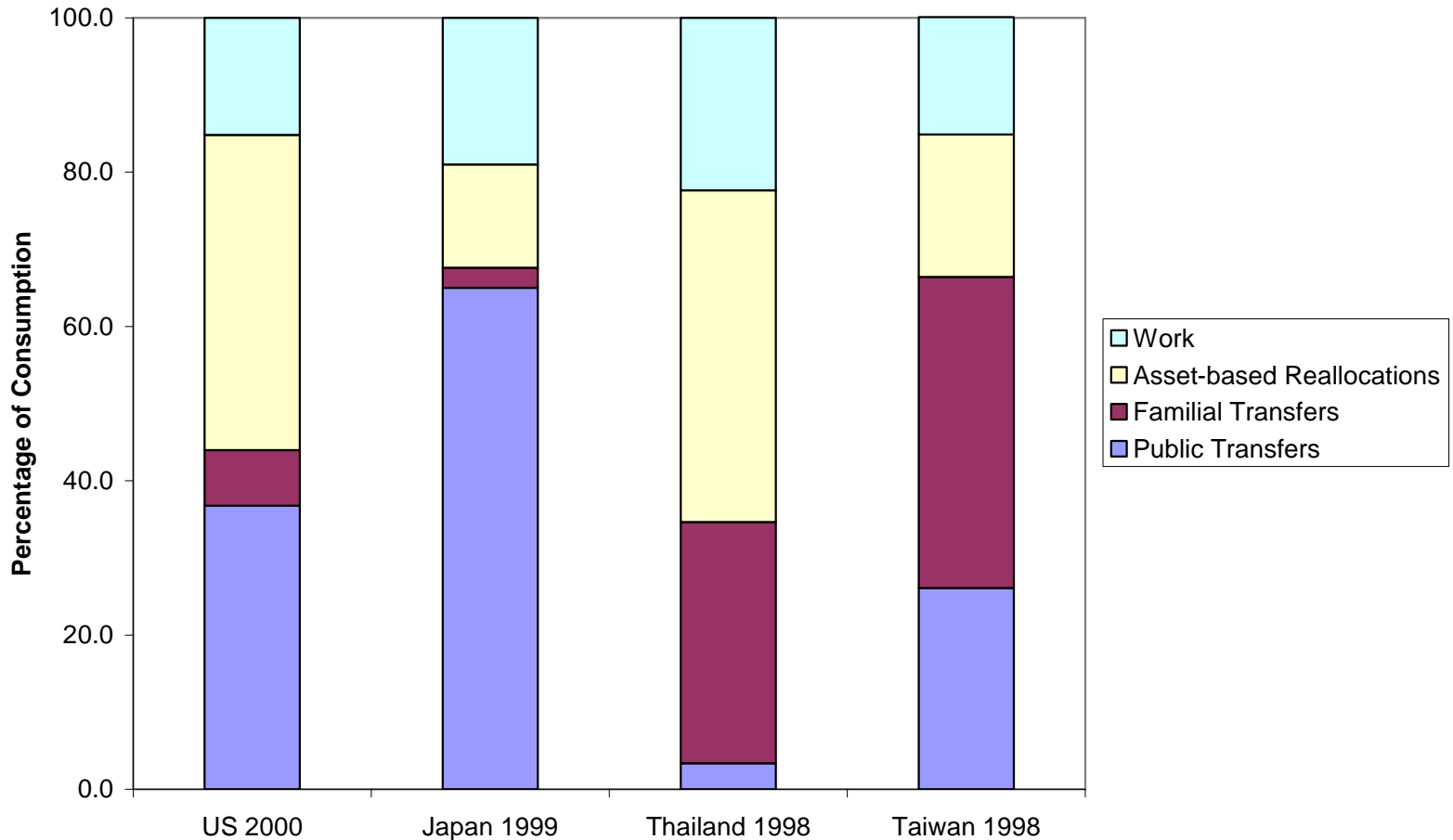
Important differences across these four countries

- *Assets fund more than 40% of old age consumption in Thailand and the US, but only 13% in Japan.*

- *With these arrangements, the second dividend will be substantial in Thailand and the US.*

- *In Japan, population aging will just raise the transfer burden on the working age population.*

What should be done?

- Make sure that costs of aging do not crowd out investments in kids.
- Make public pension benefits actuarially fair
  - people can choose to retire early but at appropriately reduced benefit levels.
  - Those levels should be lower than they now are in many countries.
- Encourage saving and asset accumulation in industrial nations through funded add-on public programs.
  - Too costly to prefund ourr PAYGO systems
  - Third World countries should think carefully before starting PAYGO public pensions.
  - May realize the second dividend.
- Cost of health care for the elderly is a great problem, exacerbated by cost of long term care. Solution is not apparent.

Easy to exaggerate the problem

- Rising dependency costs of population aging (falling support ratios) are relatively modest.

- Induced capital accumulation with population aging may offset to some degree.

- Biggest aging problem in industrial nations is probably health care.