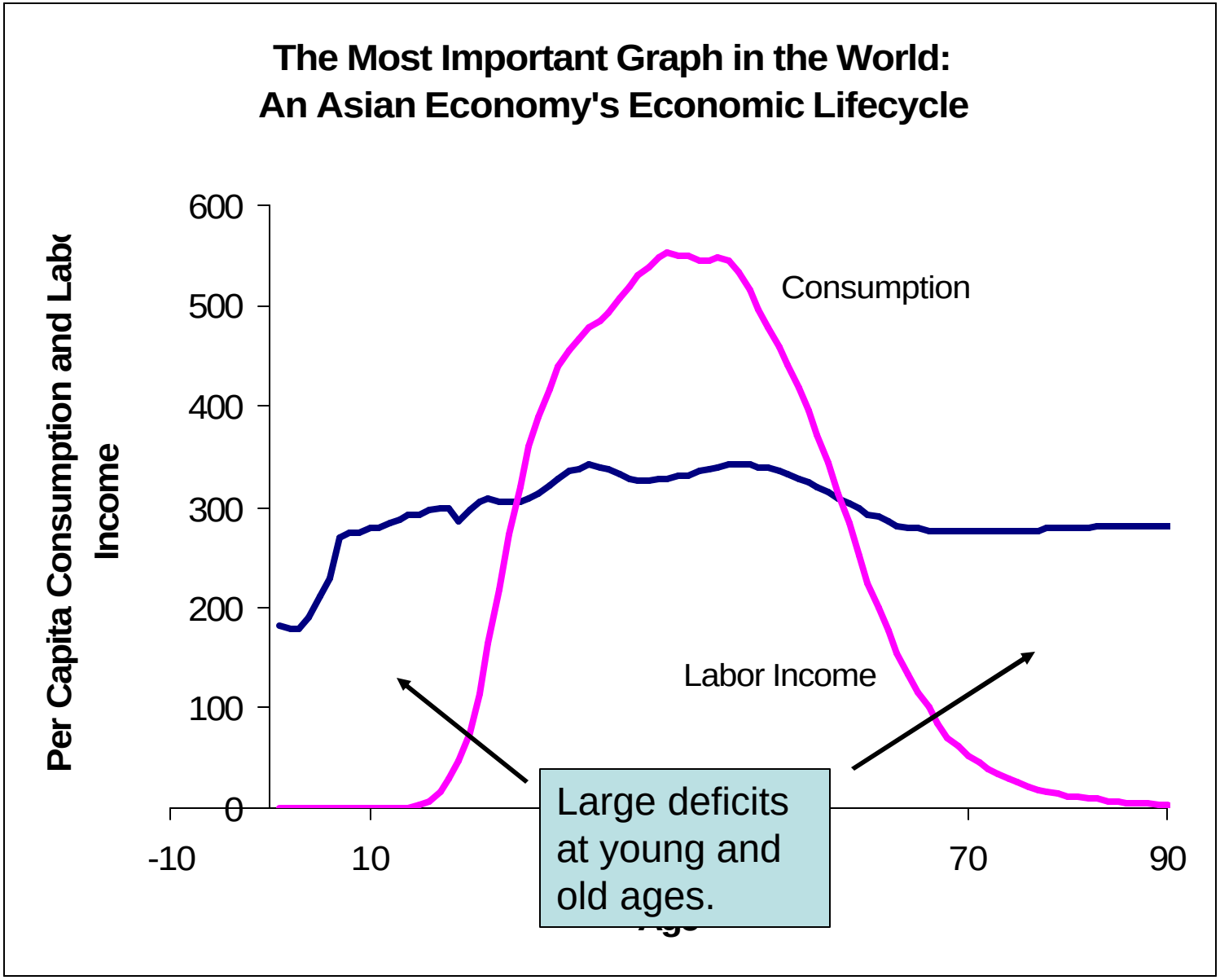
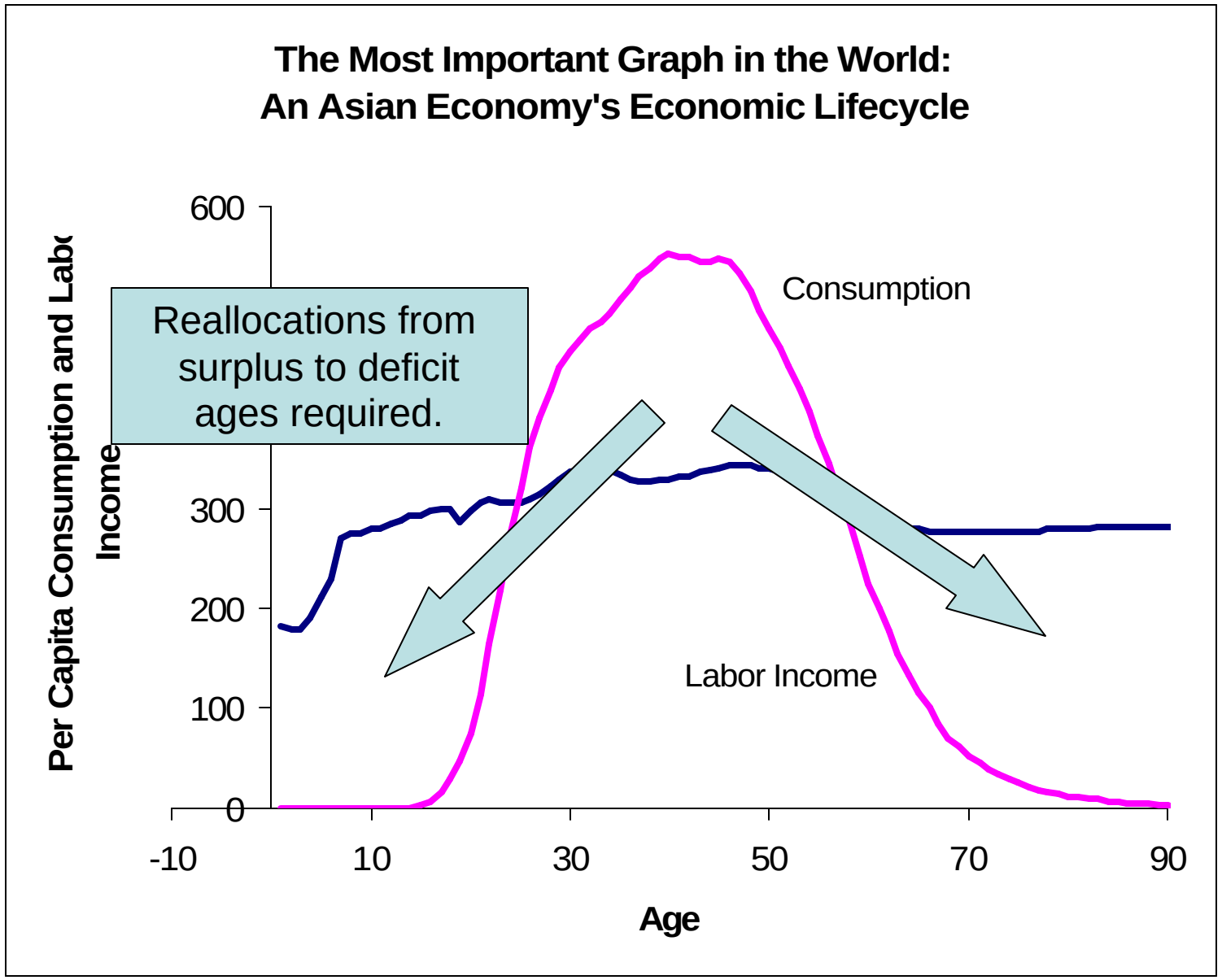
Aging, Intergenerational Transfers, and Economic Growth

Andrew Mason

September 2006


The Most Important Graph in the World:
An Asian Economy's Economic Lifecycle
Per Capita Consumption and Labor Income
600
500
400
300
200
100
0
-10
10
70
90
Consumption
Labor Income
Large deficits at young and old ages.


The Most Important Graph in the World:
An Asian Economy's Economic Lifecycle
Per Capita Consumption and Labor Income
600
300
200
100
0
-10
10
30
50
70
90
Age
Reallocations from surplus to deficit ages required.
Consumption
Labor Income

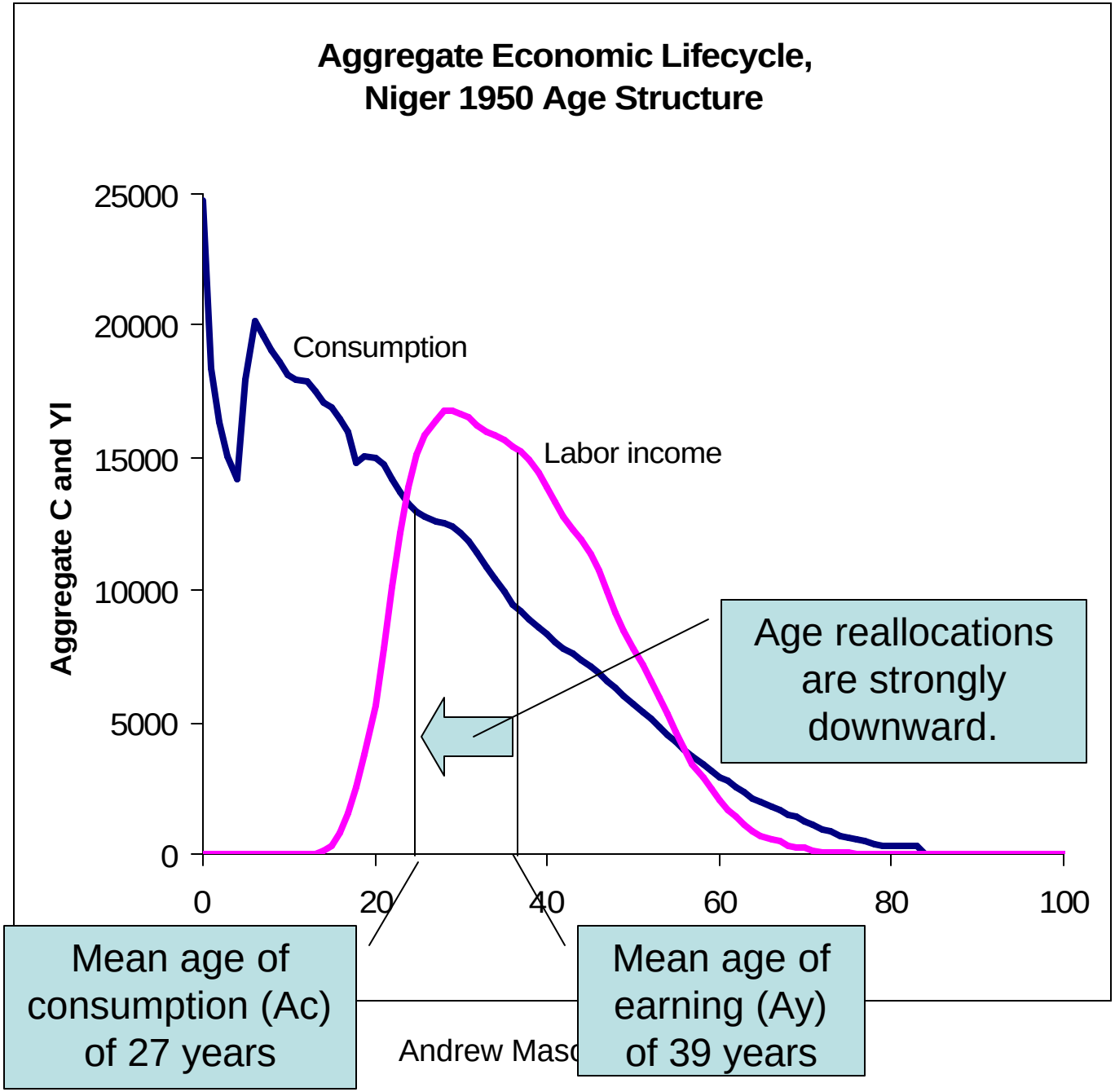
Why is it important?

The interactions among
- the economic lifecycle,
- population age structure, and
- systems for intergenerational support

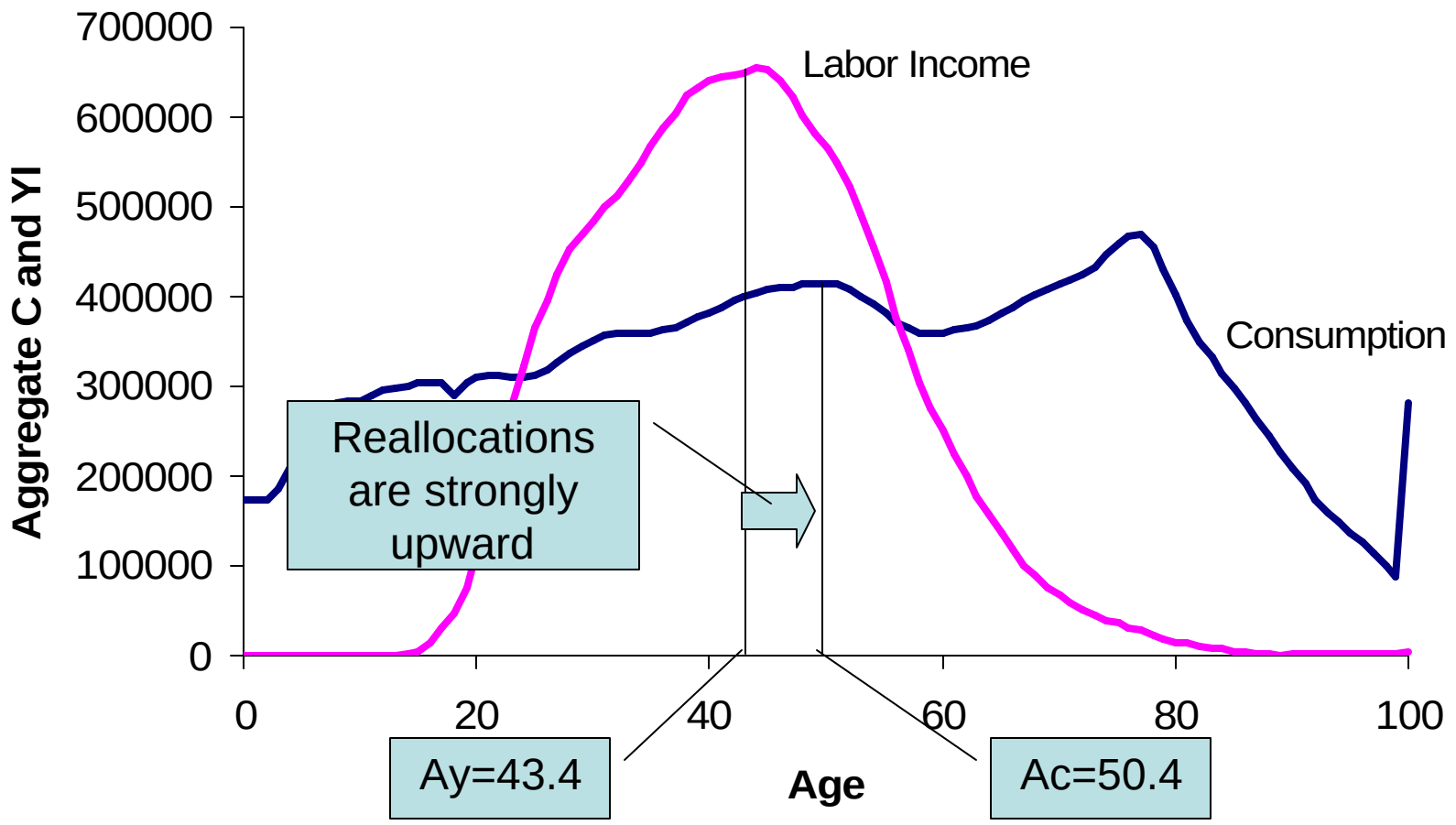
have potentially important implications for
- the accumulation of wealth,
- rates of economic growth,
- interest rates, and
- generational equity.

The Aggregate Lifecycle

- Incorporates the per capita economic lifecycle and the population age structure.
- In a young (low income) population, this leads to large reallocations of resources in a downward direction.
- In an old (high income) population, this leads to large reallocations of resources in an upward direction.

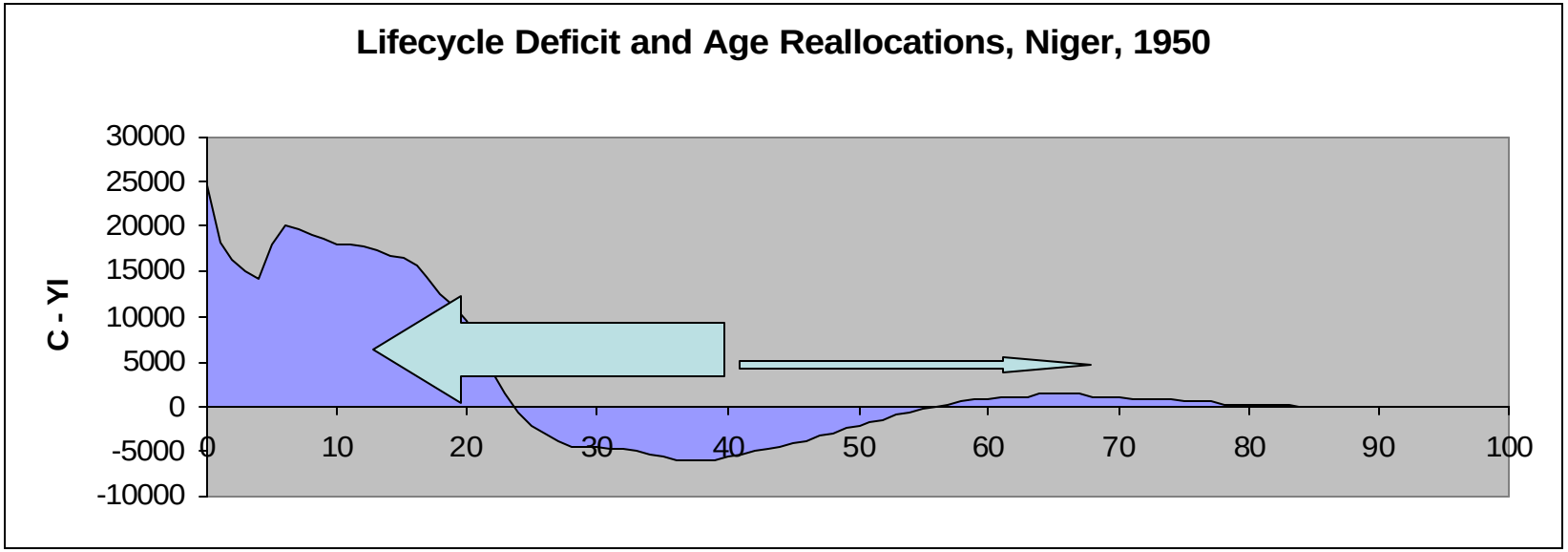

Aggregate Economic Lifecycle,
Niger 1950 Age Structure
Aggregate C and YI
25000
20000
15000
10000
5000
0
0
20
40
60
80
100
Consumption
Labor income
Age reallocations are strongly downward.
Mean age of consumption (Ac) of 27 years
Mean age of earning (Ay) of 39 years

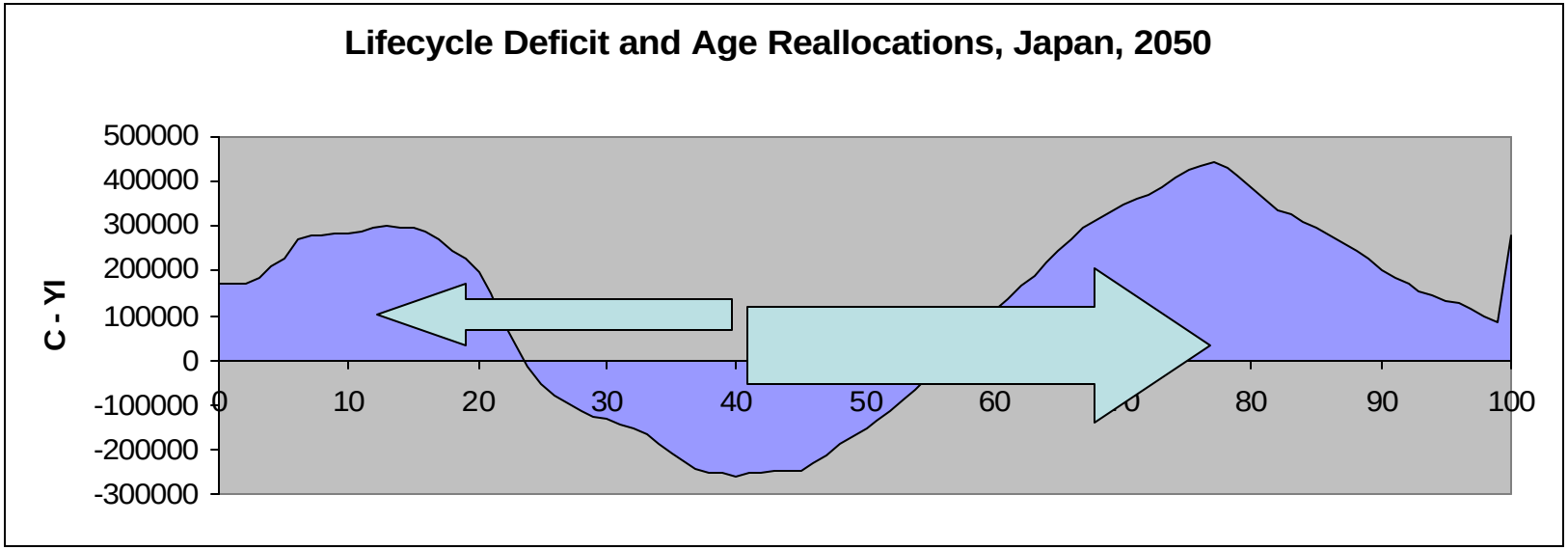
Aggregate Economic Lifecycle, Japan 2050 Age Structure



Downward and Upward Flows

- The net flows summarized by the mean ages of consumption and labor income combine two large countervailing flows:
  - Downward flow from working ages to child ages
  - Upward flow from working ages to old ages
- The relative importance of these two flows changes substantially over the demographic transition.


Lifecycle Deficit and Age Reallocations, Niger, 1950
C - YI
30000
25000
20000
15000
10000
5000
0
-5000
-10000
0
10
20
30
40
50
60
70
80
90
100


Lifecycle Deficit and Age Reallocations, Japan, 2050
C - YI
500000
400000
300000
200000
100000
0
-100000
-200000
-300000
0
10
20
30
40
50
60
80
90
100

Implications for Wealth

Lee has shown that given golden rule steady state growth, the wealth W(z) associated with any flow z across age groups is equal to:

$$W_z = Z\left[A_{\text{inflow}} - A_{\text{outflow}}\right]$$

A_{inflow} – mean age of the inflows ($ weighted)

A_{outflow} – mean age of the outflows ($ weighted)

Z – annual flow of the variable in question.

Lifecycle Child Wealth (W_k)

- Average age of inflow (perhaps 10) is well below the average age of the outflow (perhaps 40). Hence, child lifecycle wealth is negative and large in Niger 1950.
- This value is the debt that people who are currently alive “owe” to those who have not yet been born.
- The debt is overwhelmingly in the form of an unfunded obligation to make transfers to unborn children.

Lifecycle Pension Wealth (W_p)

- Average age of inflow (perhaps 80) is well above the average age of the outflow (perhaps 50). Hence, lifecycle pension wealth will be positive and large in Japan in 2050.
- This is the wealth on which the 2050 population will rely during its retirement years.
- It comes in two forms: transfer wealth and capital.

$$W_p = T_p + K.$$

- Transfer wealth is the present of value of net transfers, e.g., from Social Security. It is the flip side of the implicit debt imposed on future generations.
- Capital is growth enhancing.

Implications

- Depending on the features of the economic lifecycle, population aging will lead to an increase in lifecycle pension wealth.
- Depending on the features of the support system, this will lead to some combination of
  - an increase in capital (and National Income) and/or
  - an increase in transfer wealth, i.e., the implicit debt imposed on future generations.
- Based on golden rule growth will all its limitations.

The Simulation Model

- Small open economy
- Labor-augmenting technological growth with age-varying productivity that does not change over time.
- Consumption
  - Varies by age reflecting tastes, needs, etc., including altruism.
  - No bequests.

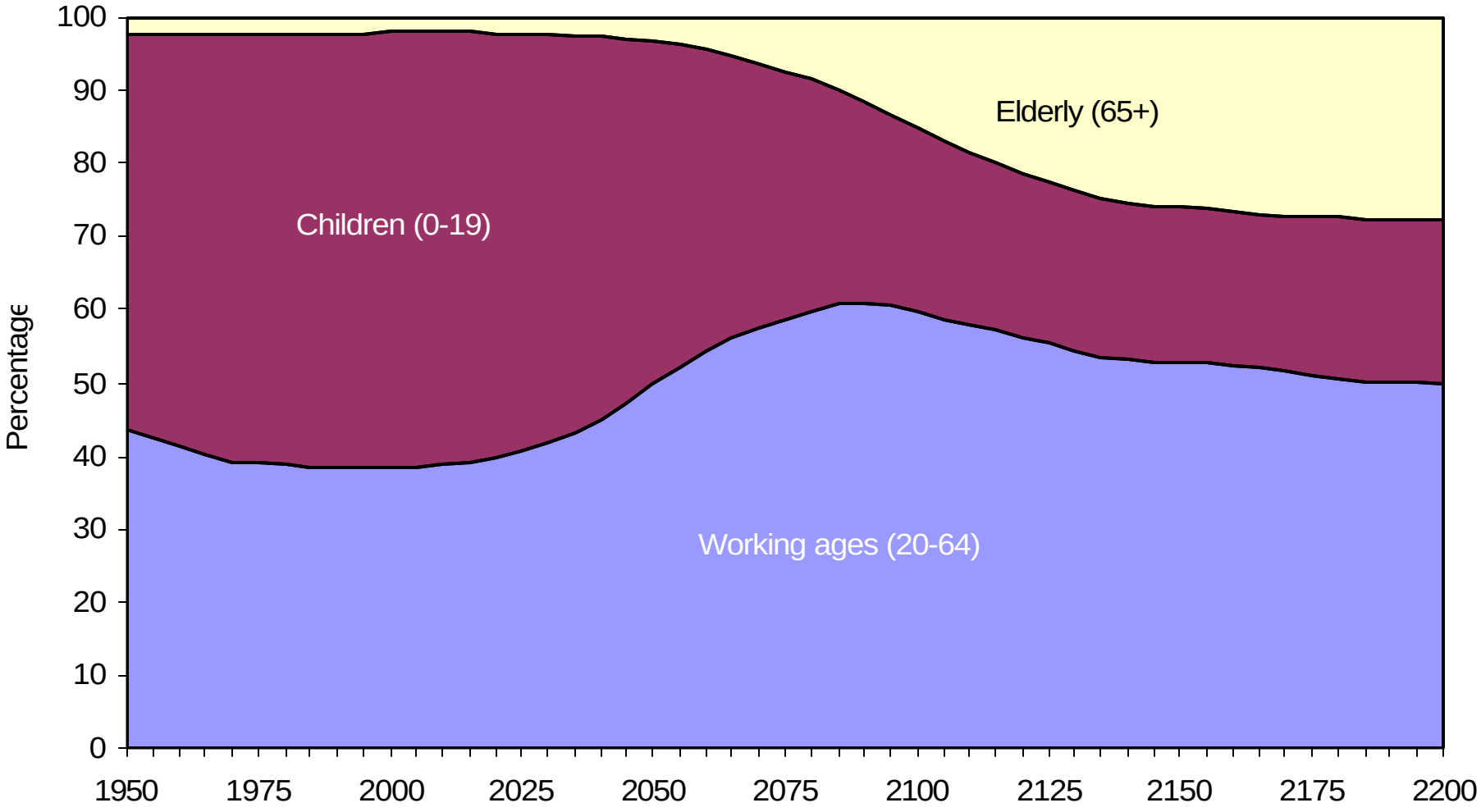
The Simulation Model (II)

- Reallocations to children consist of
  - Private transfers from parents
  - Public transfers from taxpayers (tax on labor income).
- Reallocations to old age consist of
  - Transfers
  - Asset-based reallocations (i.e. saving)
  - Assume that old-age transfer wealth is a constant fraction of lifecycle pension wealth.

Simulating a Demographic Transition

- Population of Niger 1950 – 2300
  - Highest TFR in the World in 2000 (7.9) declining to replacement in 2080
  - Life expectancy at birth: 36.2 in 1950-55; 44.3 in 2000-2005; 61.4 in 2045-50; 90 in 2300.
  - Lets us see the entire demographic transition

Figure 3. Age Distribution of Niger's Population, 1950-2200



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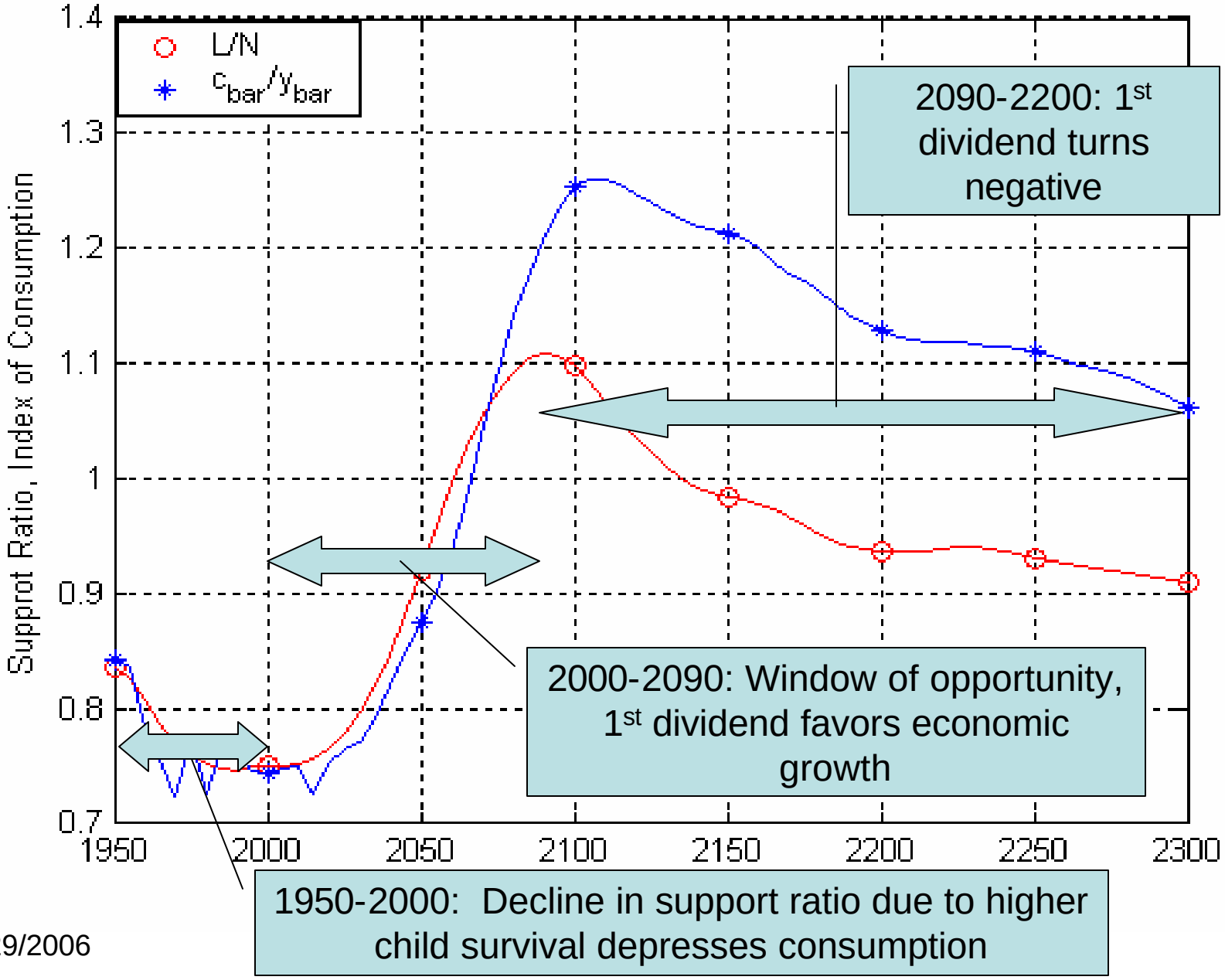
Baseline Assumptions

Productivity growth	1.5%
Depreciation rate	3.0%
Discount rate	3.0%
Interest rate	6.0% → 4.2%
Age profiles	Taiwan 1977
Familial share of transfers to children	0.67
Pension transfers as a share of pension wealth	0.35

Source: Mason and Lee 2006.



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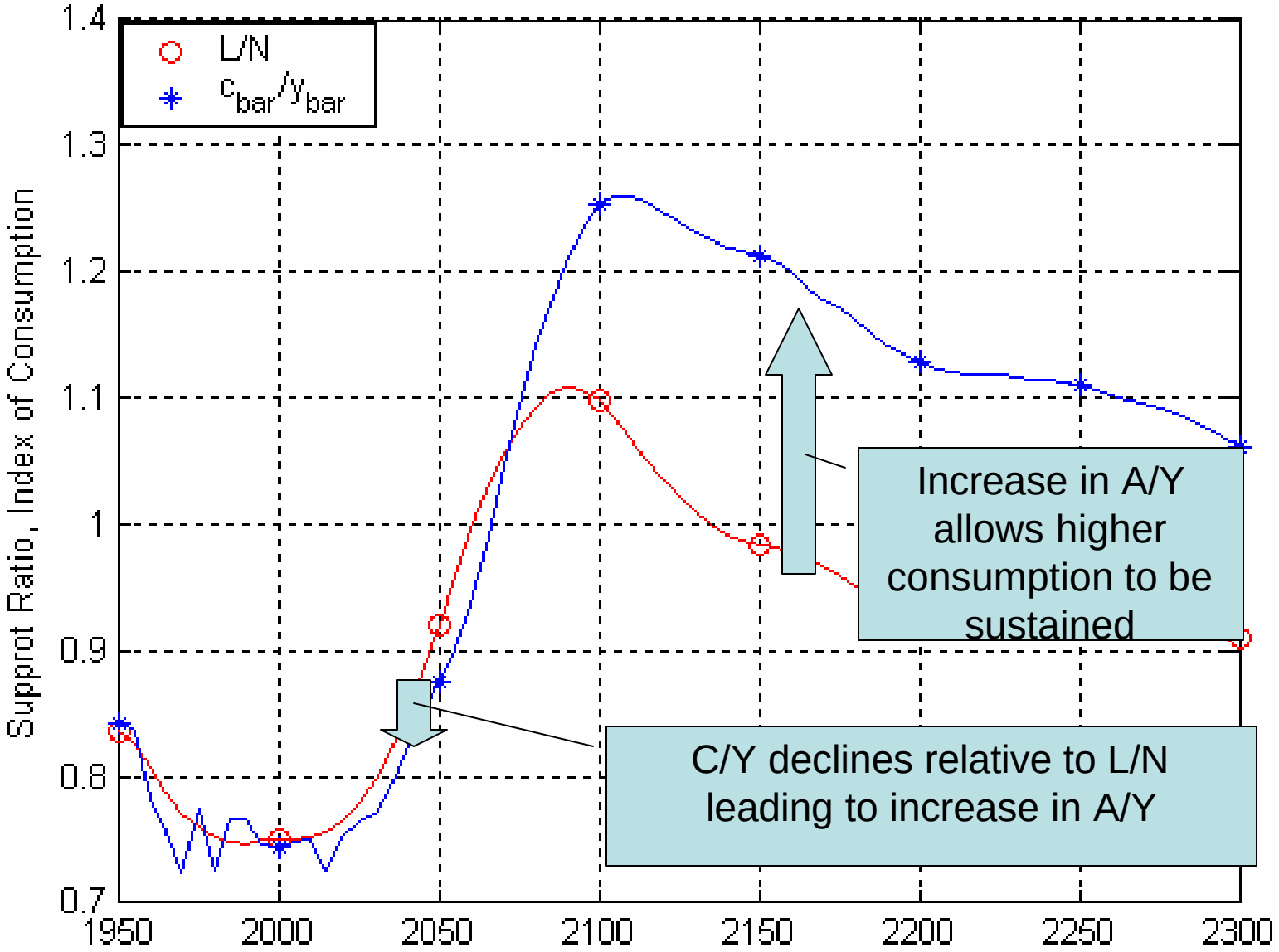

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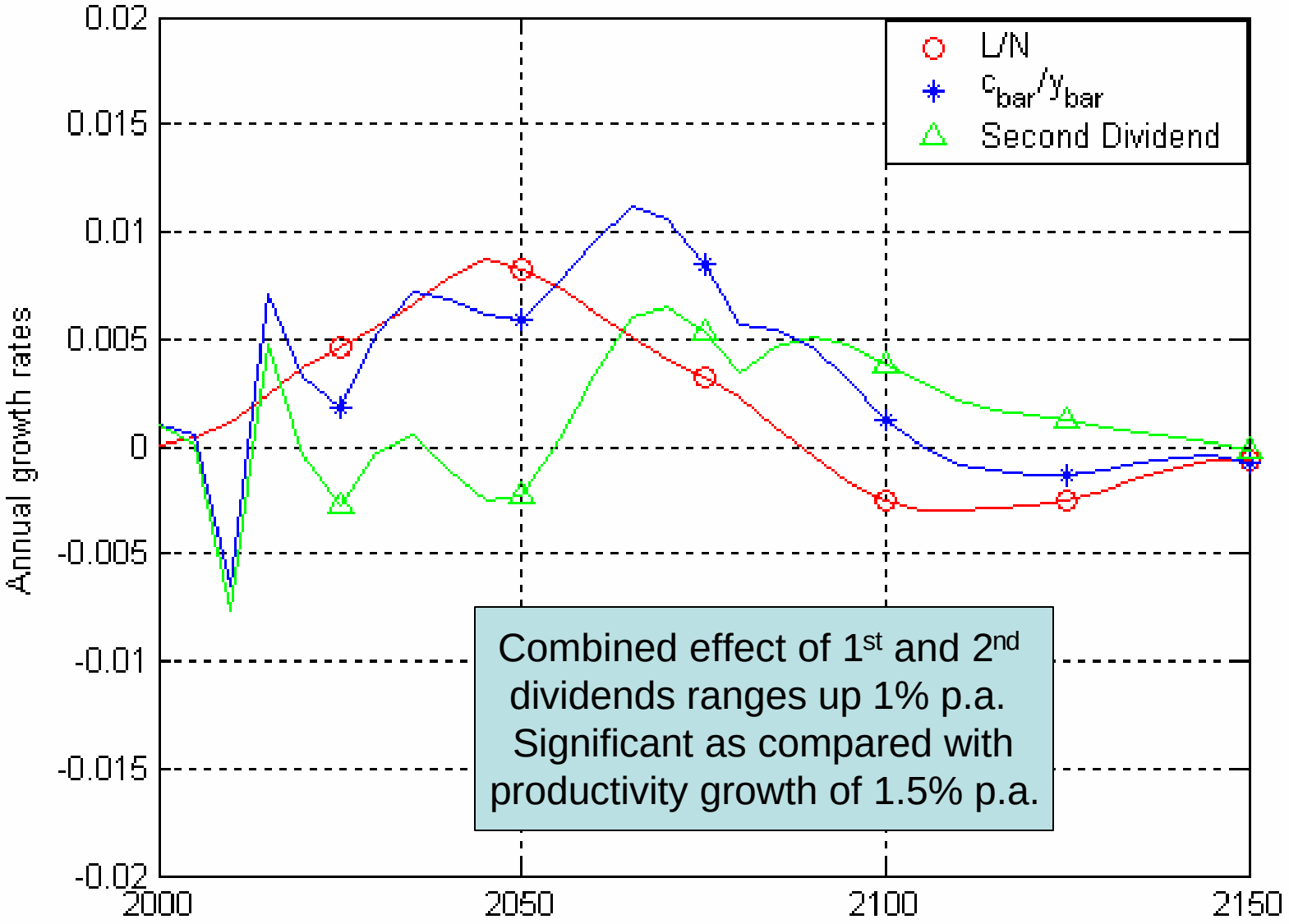

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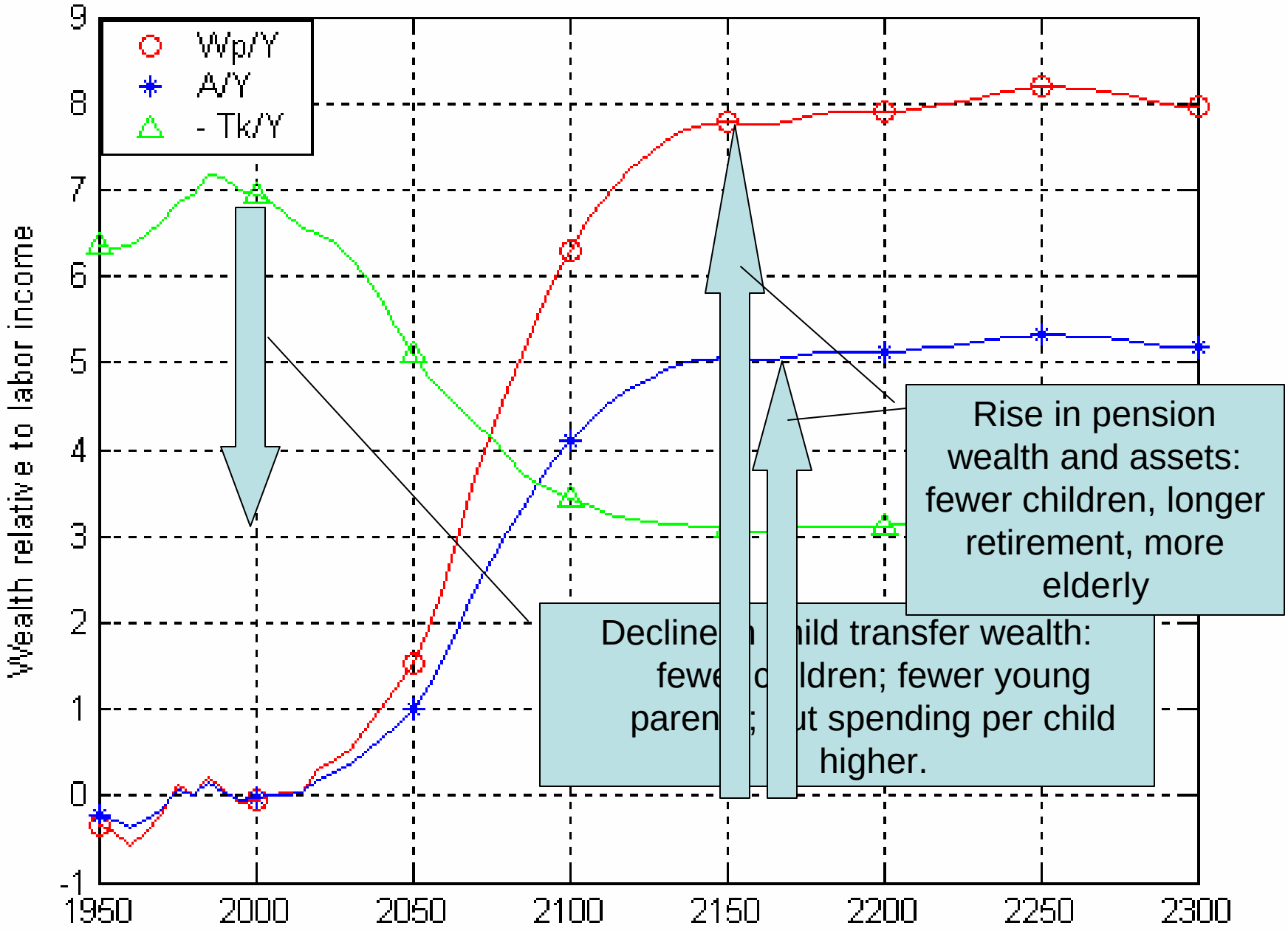

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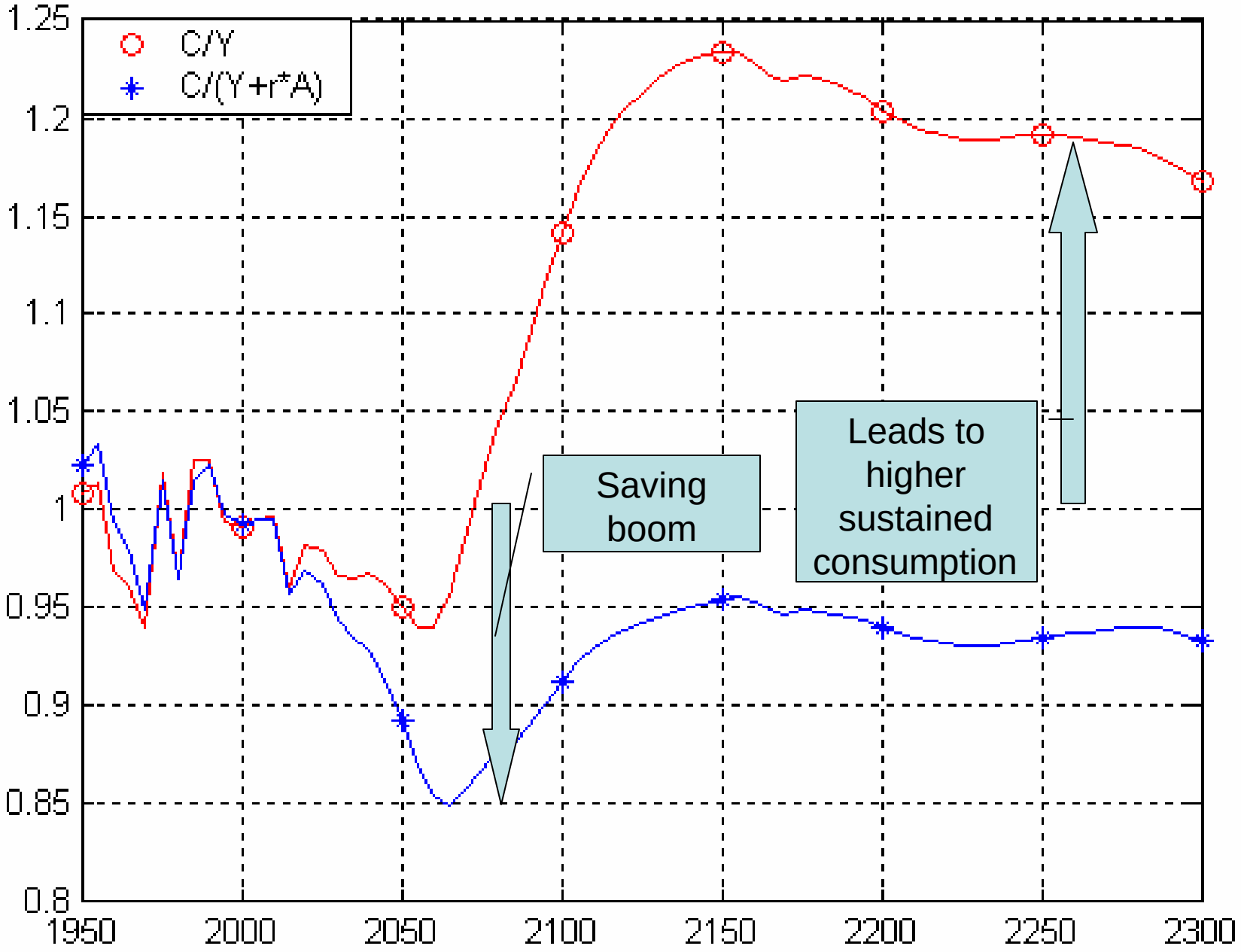


The Demographic Dividends

- First Dividend
  - Leads to 50% increase in consumption per equivalent adult
  - Dividend period (window of opportunity) lasts for 70 years
  - First dividend is ultimately transitory – by 2200 support ratio is only 10% above its 1950 level

The Demographic Dividends

- The Second Dividend
  - First dividend is being capitalized: consumption depressed by about 5% until near the end of the first dividend period
  - Adds almost 20% to consumption at the peak and thereafter
- Combined effect of the two dividends: explains 25% of growth from 2030-2090.

Sensitivity Analysis

- US economic lifecycle leads to greater assets, higher consumption in the short-run, but lower consumption in the long-run
- Increase in pension transfer wealth has a very large effect, more than proportional, on wealth and adversely affects consumption.

Effects of Aging Depend on Two Features of the Economy

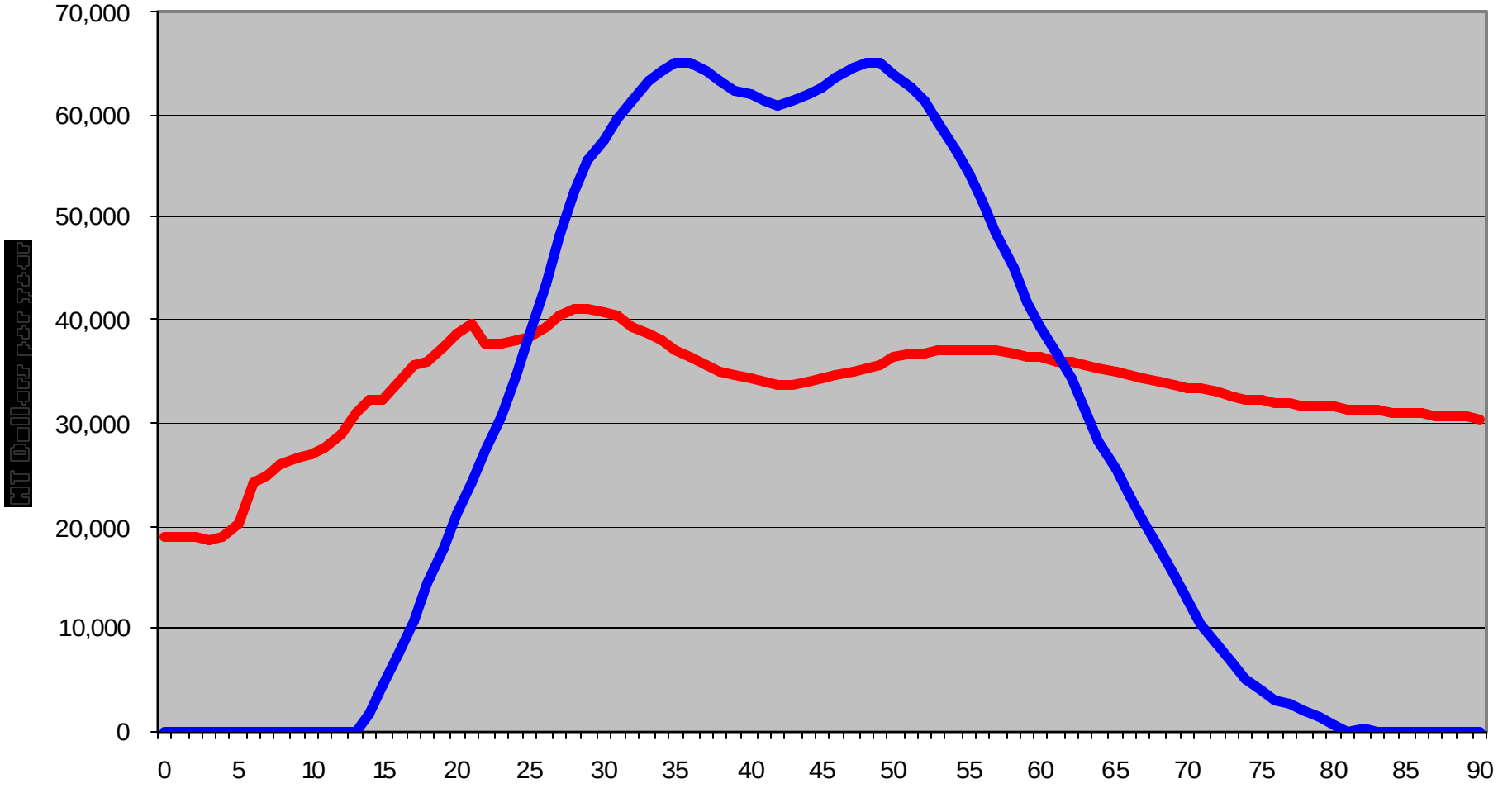
- Economic Lifecycle – extent to which economic resources are reallocated from prime adult ages to young and old ages.
- Reallocation System – the economic mechanisms used to shift resources across the lifecycle.

National Transfer Account Project

- Objective is to develop and apply a comprehensive system of accounts that measures the economic lifecycle and the economic support system.
- Conceptual foundation: Lee (1994) but also Samuelson (1958), Diamond (1965), and Willis (1988).
- Core project is collaboration between Hawaii and UC-Berkeley; funding from National Institute of Aging. Other countries funded from diverse sources.

How does the economic lifecycle vary across societies and over time?

Figure 1B. Per Capita Labor Income and Consumption, Taiwan (1977)



Source: See Lee, Lee and Mason (2005) for methods and data sources for these estimates.

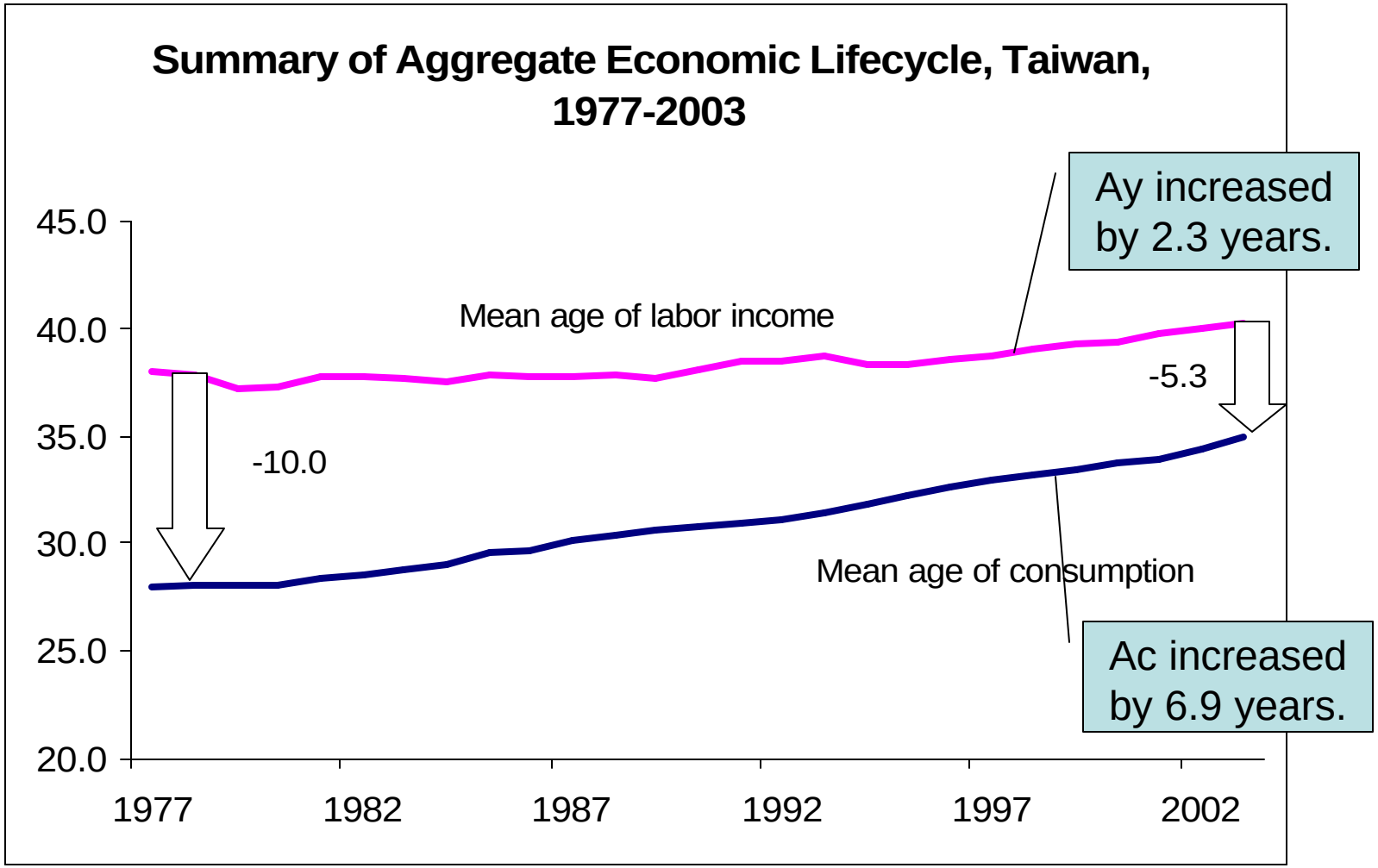
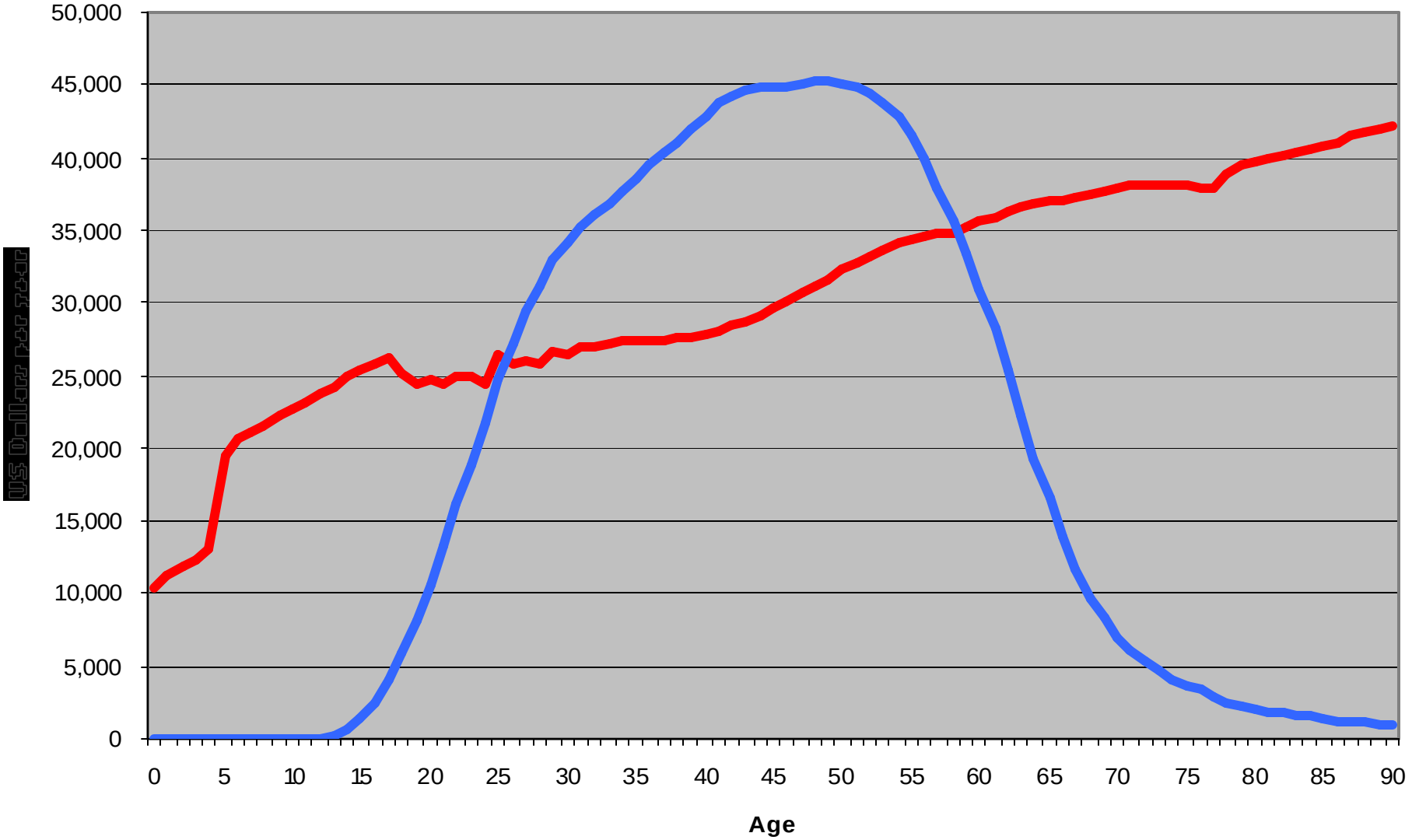

Summary of Aggregate Economic Lifecycle, Taiwan, 1977-2003
45.0
40.0
35.0
30.0
25.0
20.0
1977
1982
1987
1992
1997
2002
Mean age of labor income
Mean age of consumption
-10.0
-5.3
Ay increased by 2.3 years.
Ac increased by 6.9 years.

Figure 1A. Per Capita Labor Income and Consumption, US (2000)



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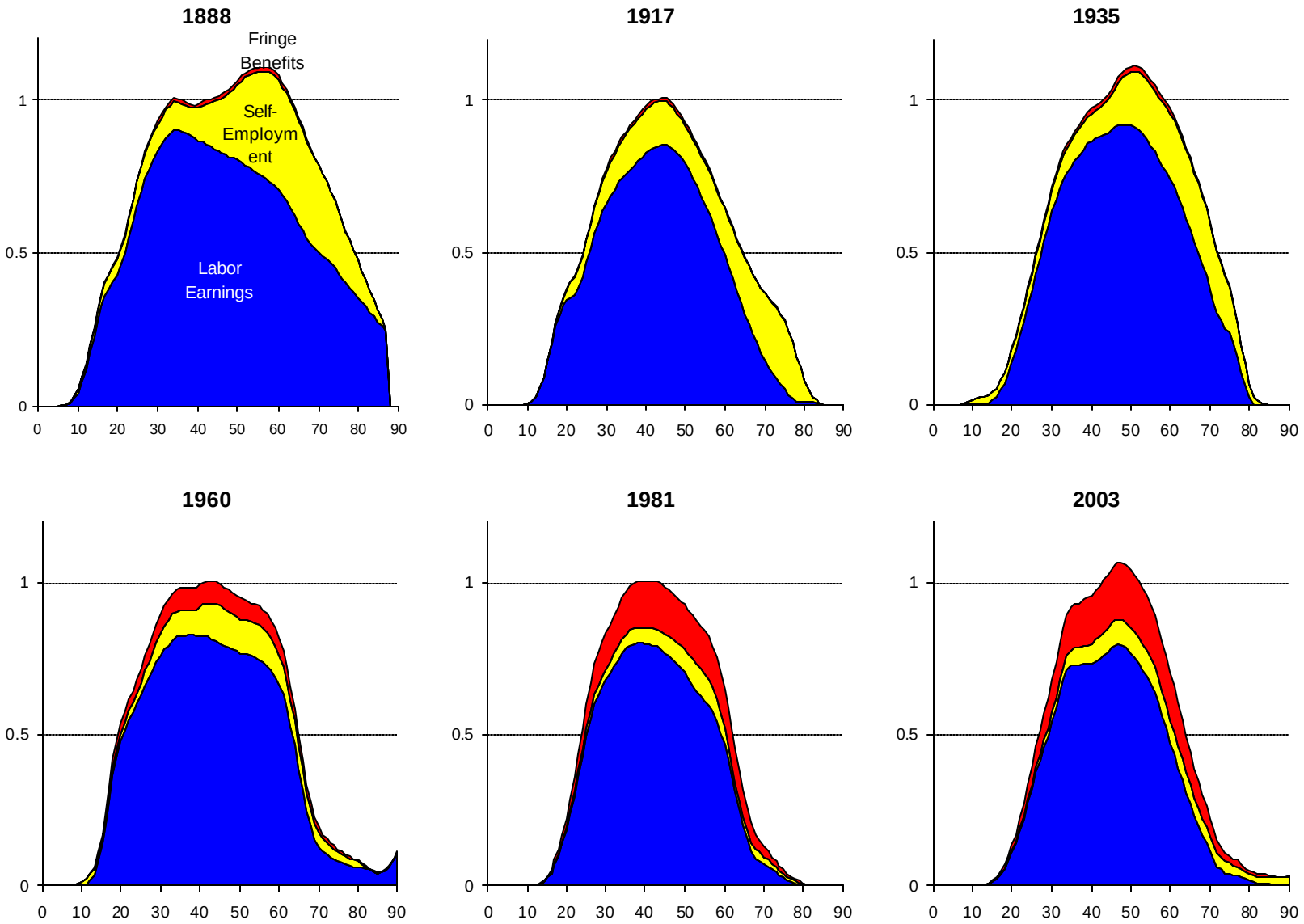
Components of US Labor Income



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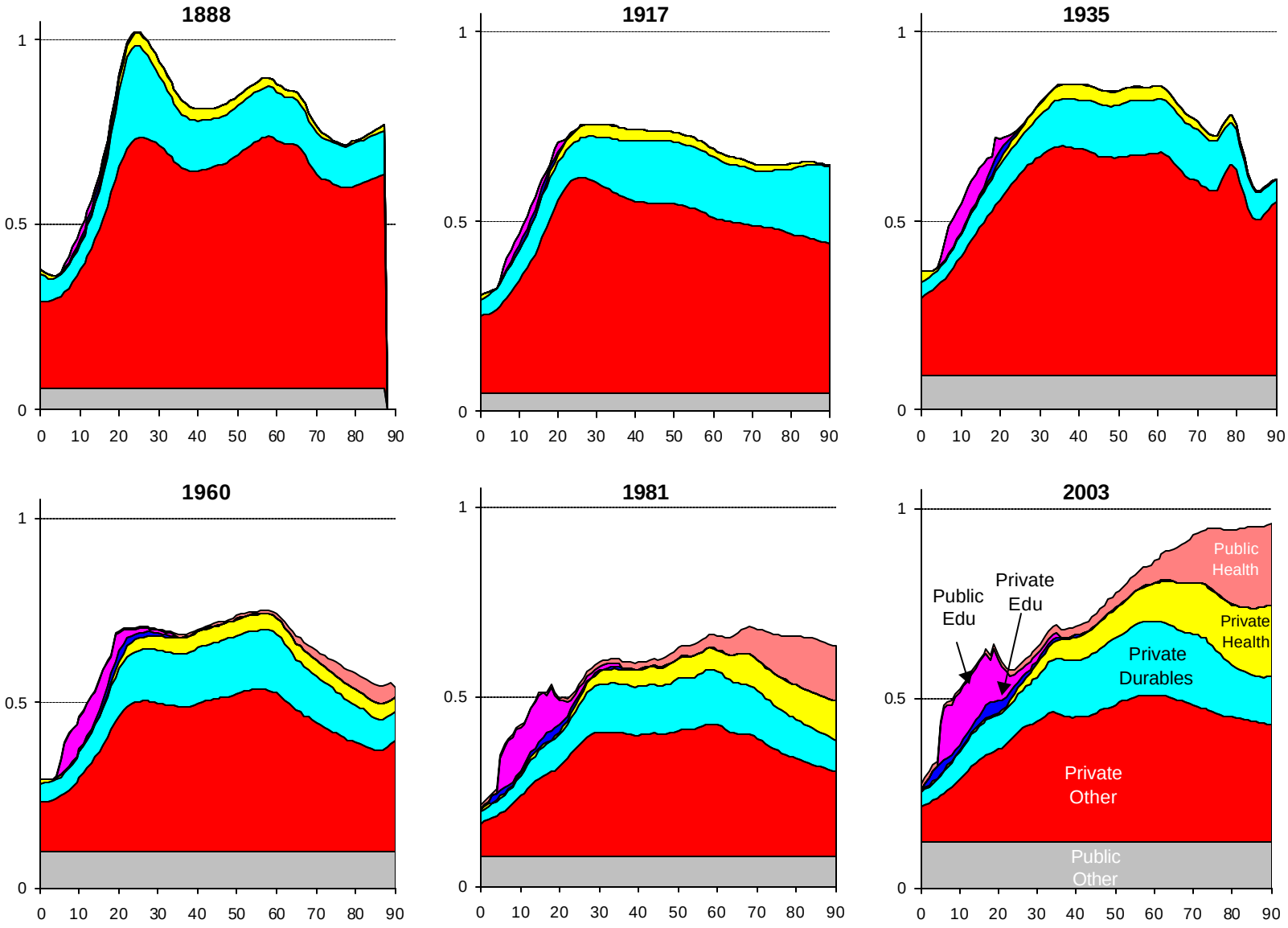
Source: Gretchen Donehower (2006); Lee et al.

Components of US Consumption



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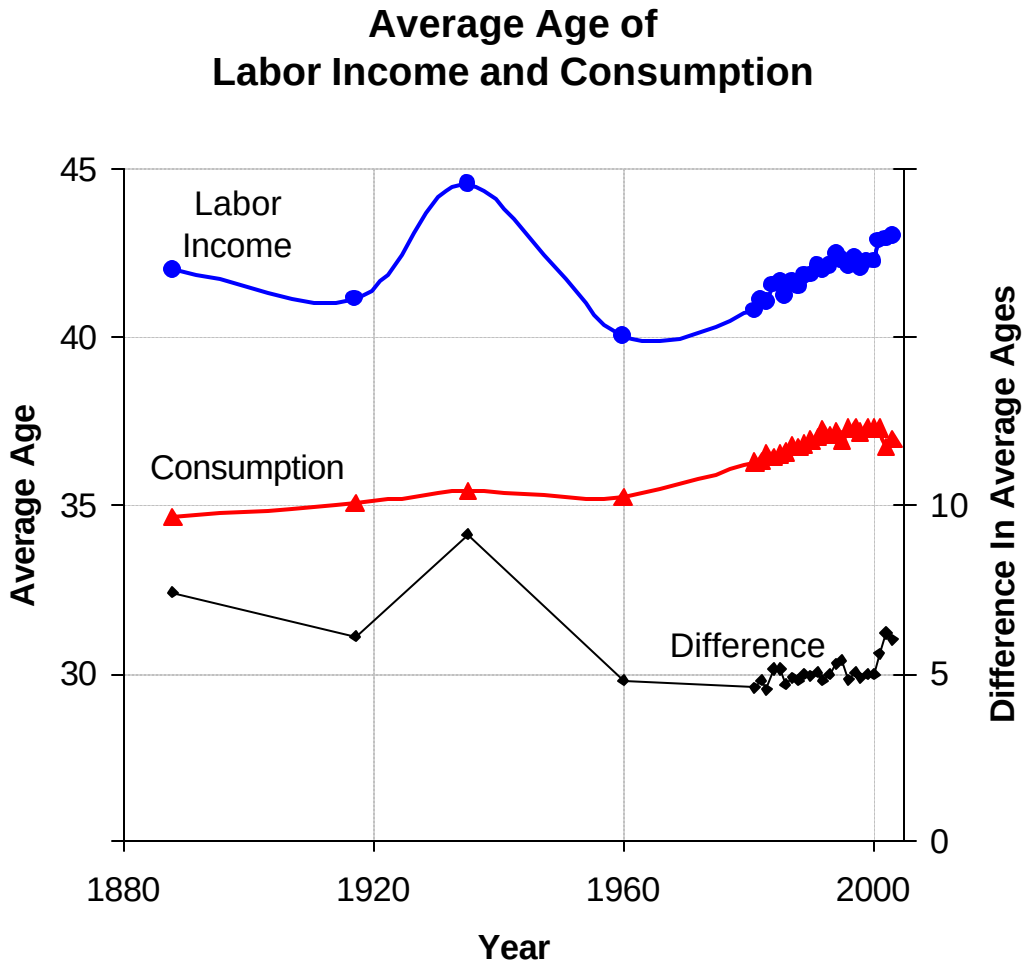
Source: Gretchen Donehower (2006); Lee et al.

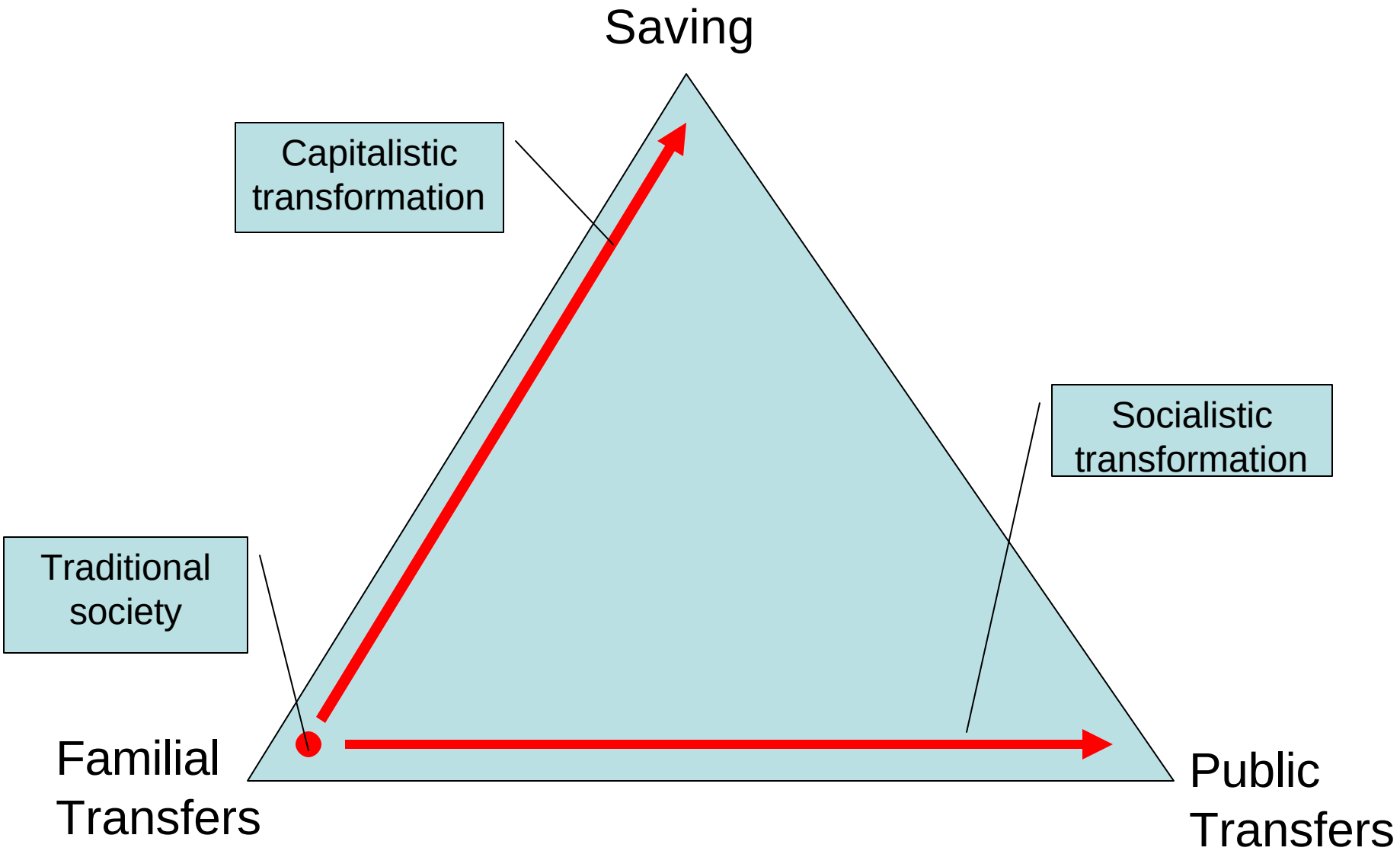
Summary Measures: Average Age of Profile

- Constant age distribution (US 1950 is used here)
- Recent strong increases in average ages of consuming AND producing.

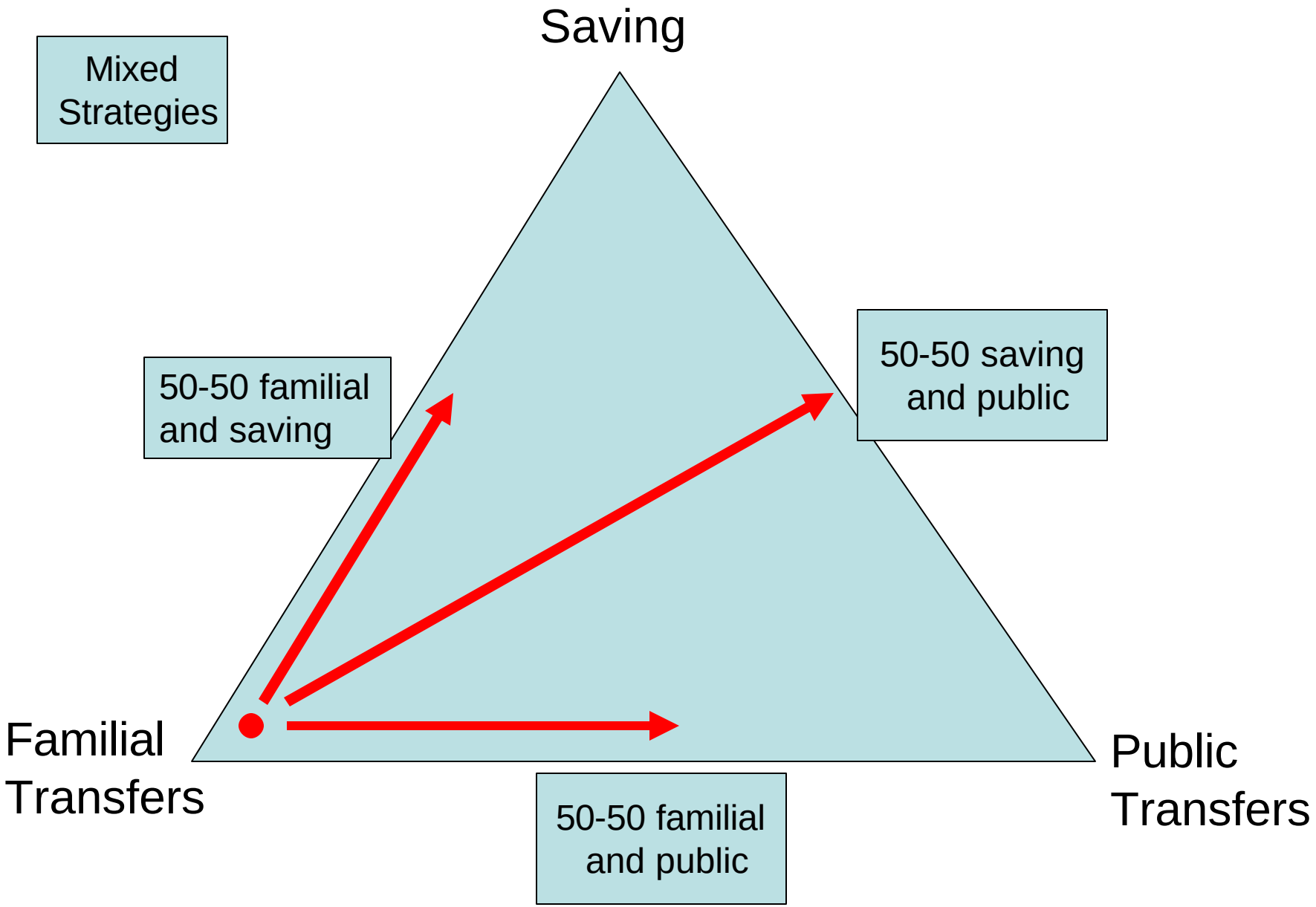


Source: Gretchen Donehower (2006); Lee et al.

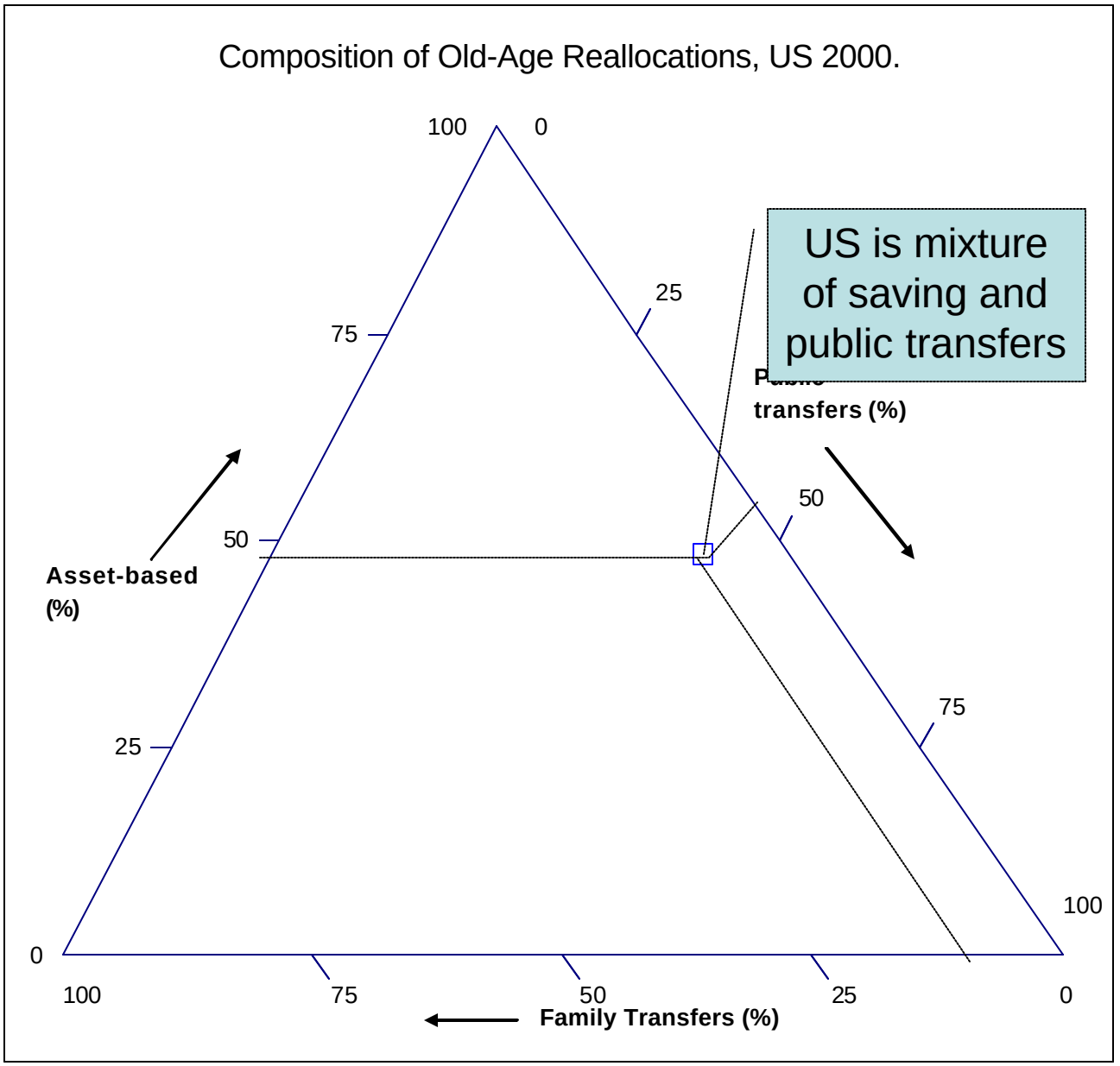
How do the economic support systems vary across societies and over time?



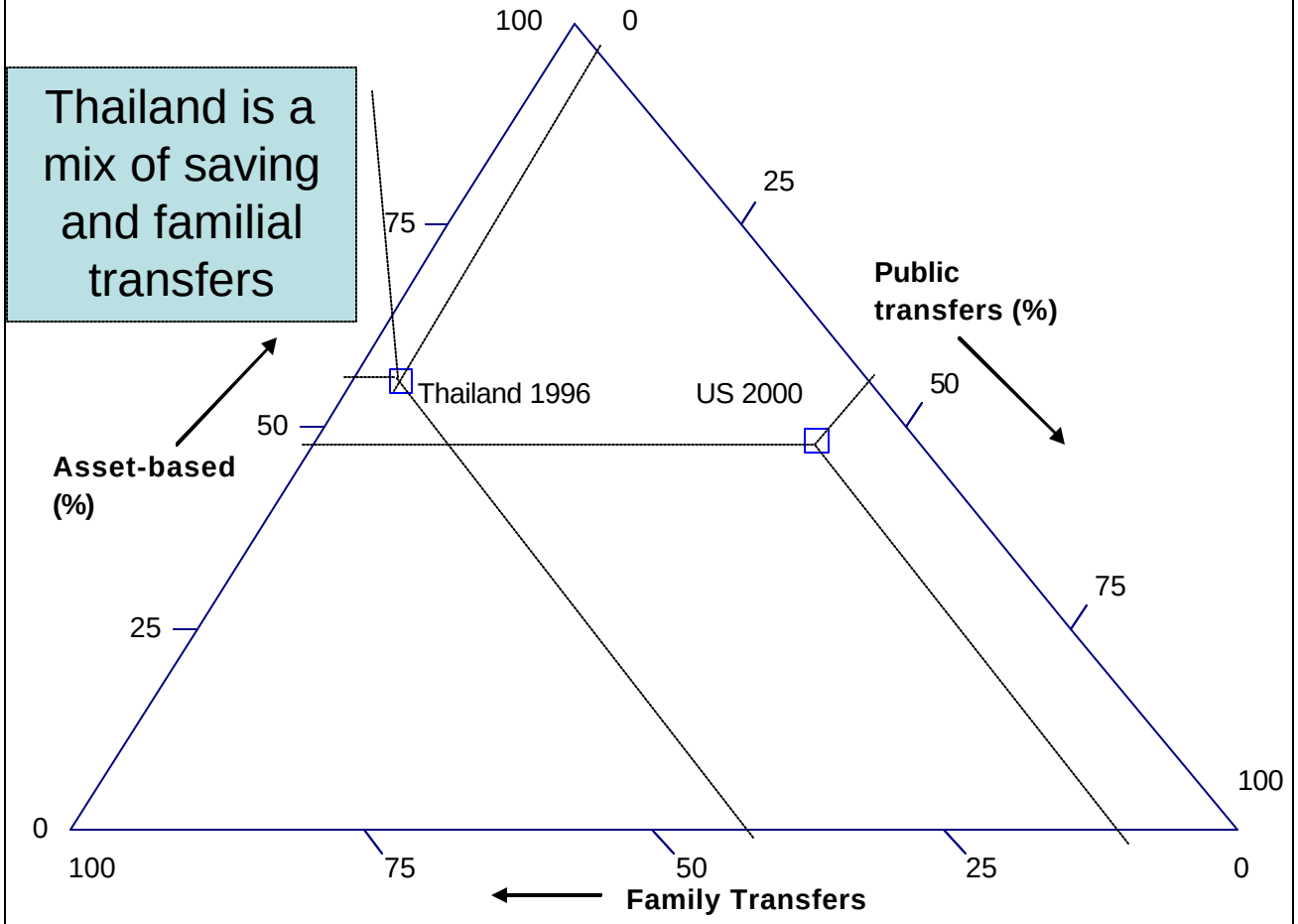
Old-Age Reallocation Systems

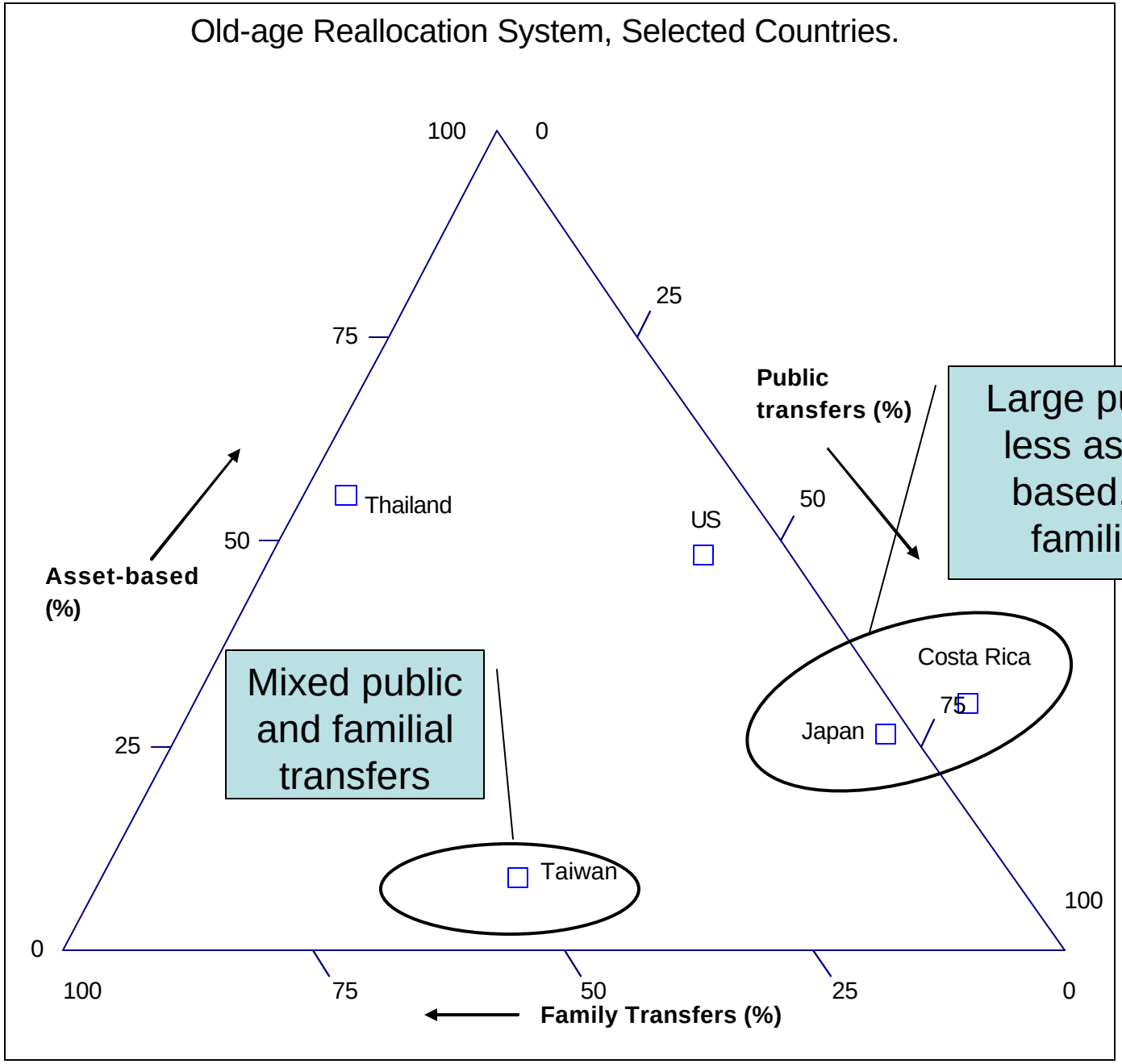


Old-Age Reallocation Systems


Composition of Old-Age Reallocations, US 2000.
100
0
25
75
50
50
75
25
100
0
100
75
50
25
0
Asset-based (%)
transfers (%)
Family Transfers (%)
US is mixture of saving and public transfers

Old-Age Reallocations, US & Thailand.




Old-age Reallocation System, Selected Countries.
100
0
75
25
50
50
25
0
100
75
50
25
0
Asset-based (%)
Public transfers (%)
Family Transfers (%)
Thailand
US
Japan
Costa Rica
Taiwan
Large public, less asset-based, no familial.
Mixed public and familial transfers

Work is preliminary

- Important changes in economic lifecycle but we have not yet investigated why.
- Large variation in the old-age asset reallocation system. Understanding this better is clearly a priority.

US

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Support: National Institutes of Health

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