

# A global overview of population aging and intergenerational transfers, and some implications for economic growth

Ronald Lee (UC Berkeley)

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NIA R37-AG025488 and MEXT.ACADEMIC  
FRONTIER to NUPRI in Japan

Deep thanks to NTA country teams, Gretchen  
Donehower, and Andy Mason.

# Plan of talk

- Consider some economic consequences of the demographic transition, including population aging.
- Draw on results of the National Transfer Accounts project (NTA) for 23 countries.
- Focus on Latin America.

# Latin American NTA Country Teams — many members are at this meeting.

- Brazil
  - Lanza, Queiroz, Bernardo
  - Marri, Izabel
  - Renteria, Elisanda Perez
  - Turra, Cassio
- Chile
  - Bravo, Jorge
  - Holz, Mauricio
- Costa Rica
  - Collado, Andrea
  - Rosero-Bixby, Luis
  - Zuniga, Paola
- Mexico
  - Ivan Mejia
  - Félix Vélez Fernández-Varela
  - Juan Enrique
- Uruguay
  - Bucheli, Marisa
  - Gonzalez, Cecilia

# 1. Changing population age structure across the demographic transition: the case of Mexico, 1900-2100

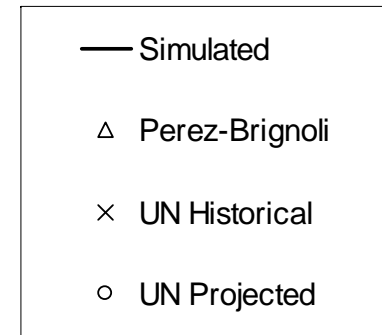
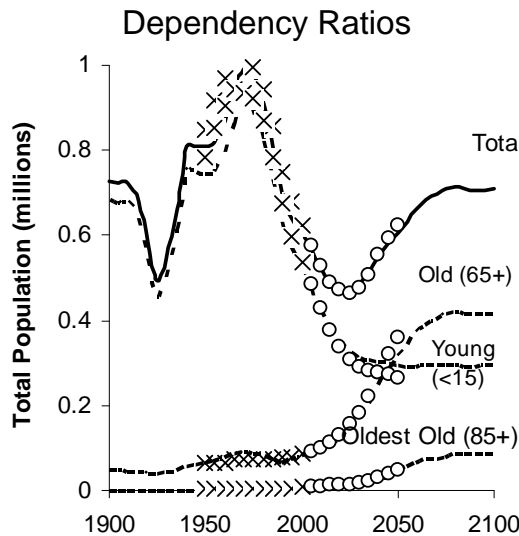
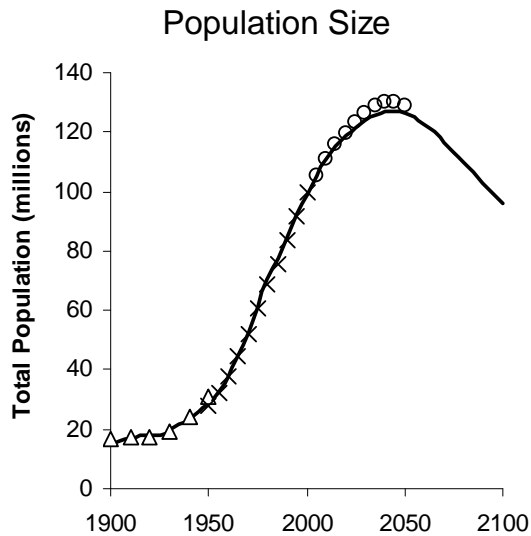
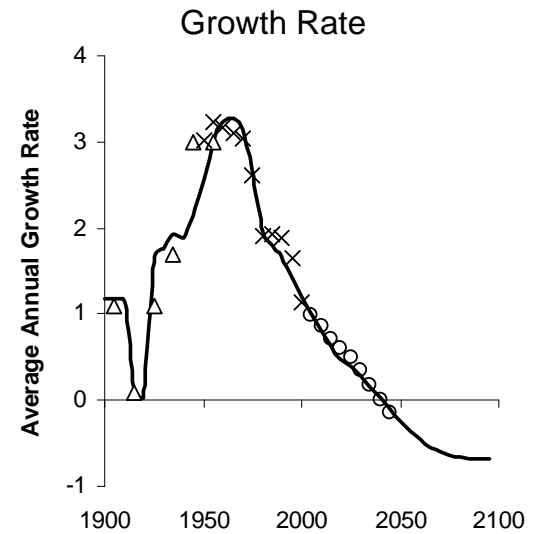
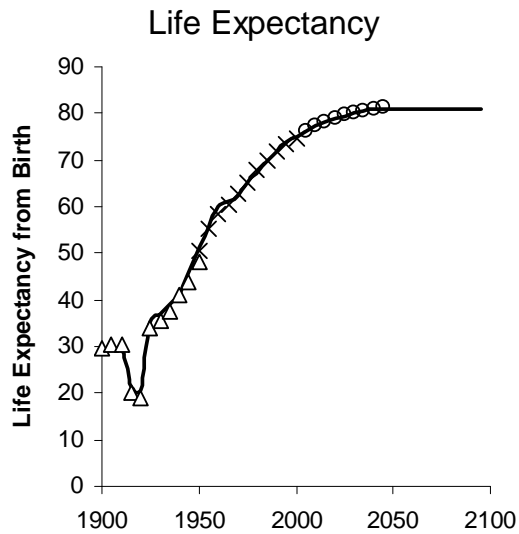
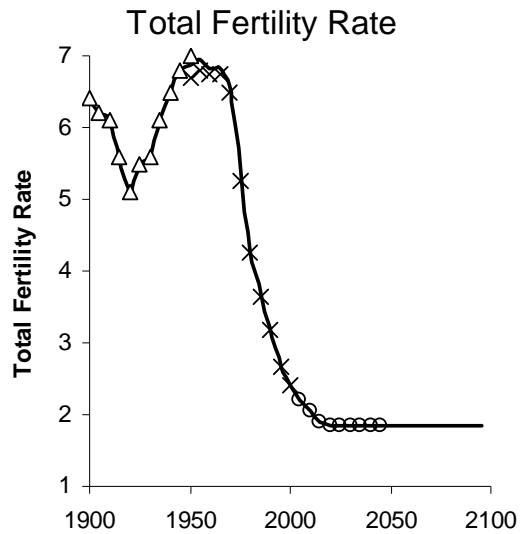
- Demographic transition is process of moving from initial high fertility and high mortality to low fertility and low mortality, and the accompanying changes in population size and age composition.
- Most transitions follow a classic pattern, but Latin America has many exceptions.

- In most Third World countries fertility decline started around 1965 or later.
- Fertility decline started much earlier in some Latin American countries
  - E.g. in 1900 or earlier in Argentina, Uruguay, Cuba, Chile.
  - These declines stalled at mid century, contrary to classic pattern.
- Mortality decline more typical, starting sometimes before 1900, some times later.
- Diversity, no single pattern in Latin America.

# Mexico, 1900-2100

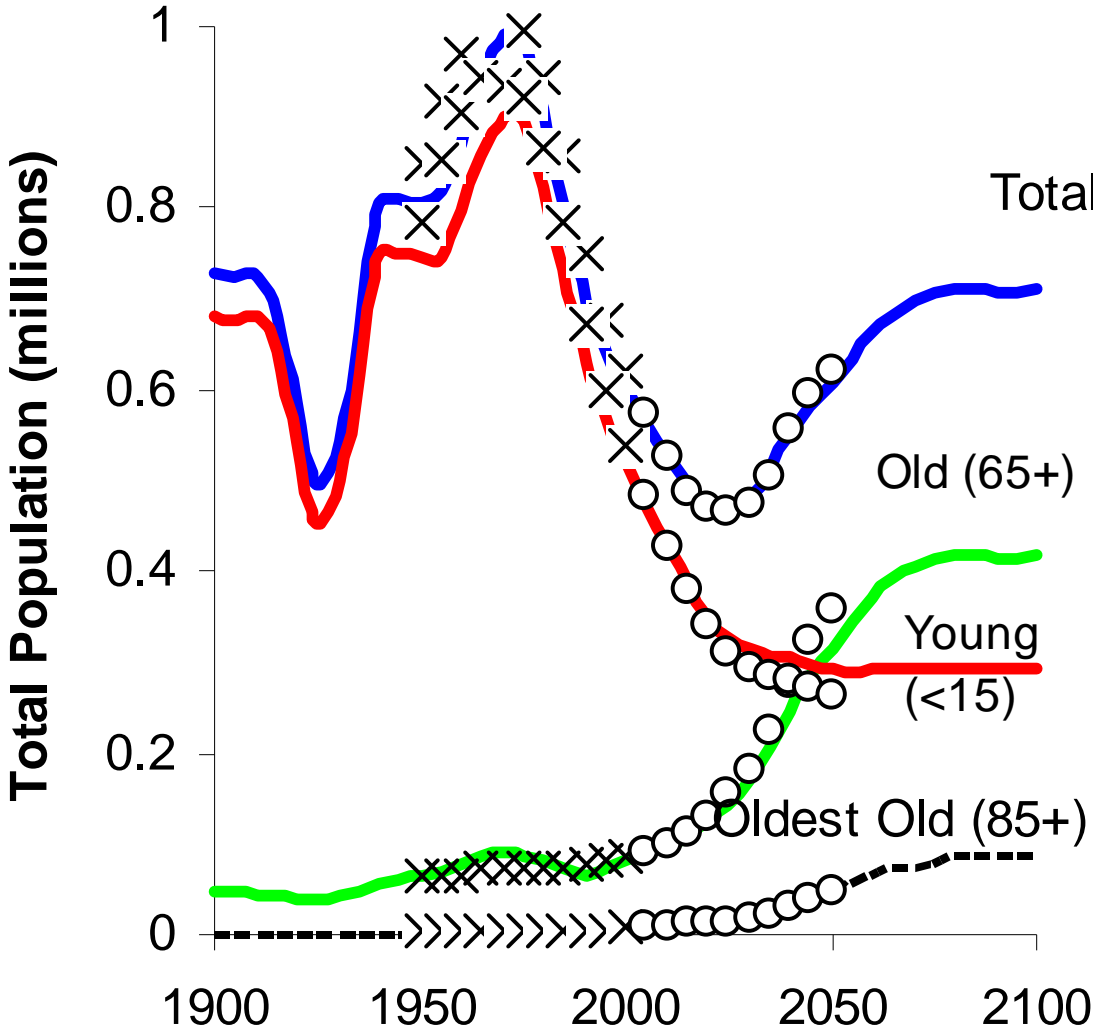
- In some respects classic
  - Mortality decline preceded fertility decline by many decades
  - Fertility declined steadily to near replacement (TFR=2.3) and life expectancy is high (75 years)
- In other respects, not typical
  - Mexican Revolution perturbed fertility and mortality in early 20<sup>th</sup> century.
  - High net outmigration (not so unusual).
- Transition data based on Perez-Brignoli (2009) reconstruction and on UN data.

# The demographic transition in Mexico



Note that simulation includes assumption of net outmigration by ages 15-64 of approximately 0.6% per year from 1980. (Data driven to match observed population sizes.)

# Dependency Ratios



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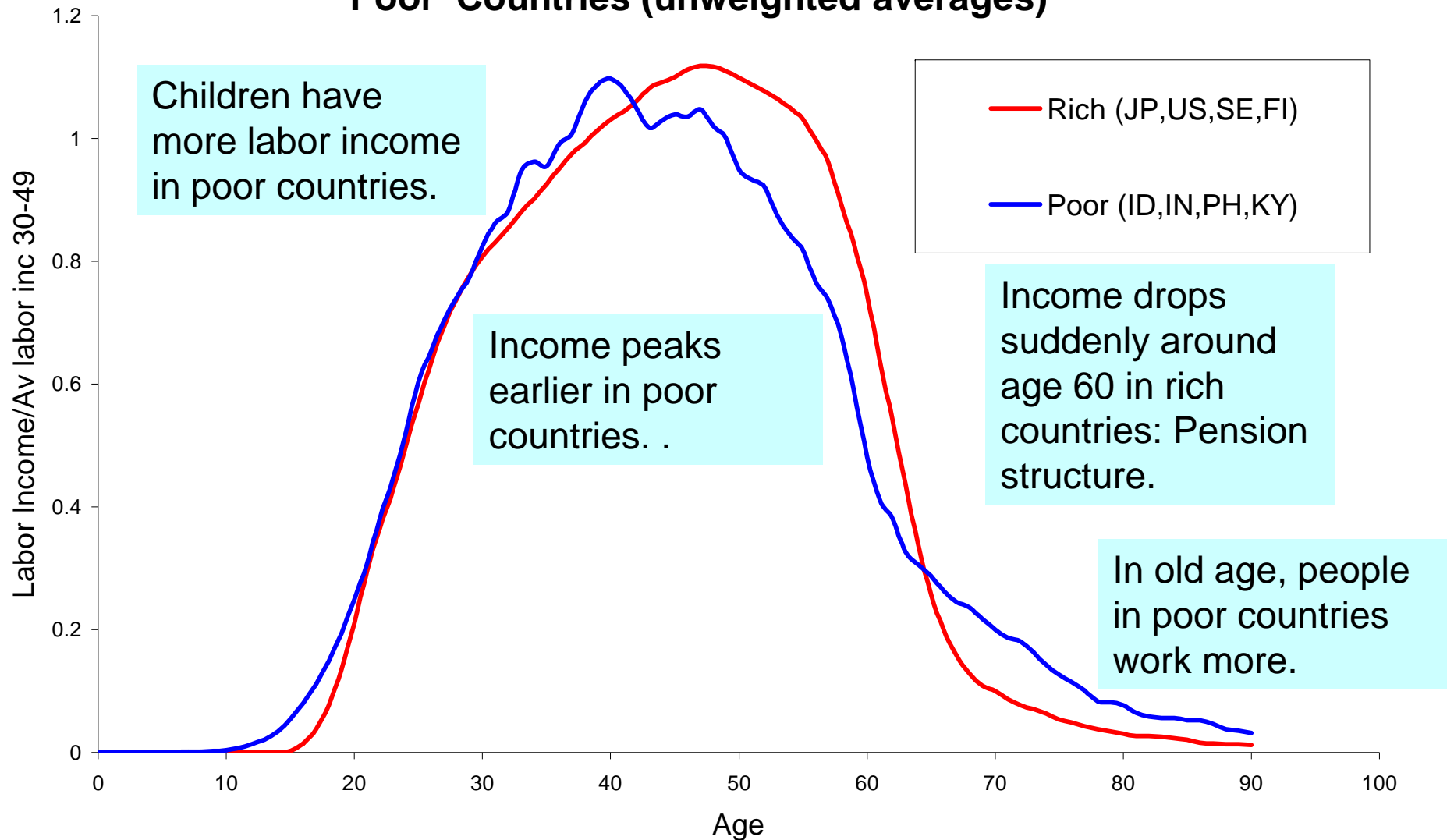
## 2. Economic behavior varies across the life cycle – dependency and surplus production

- The economic life cycle starts with child dependency and ends with old age dependency.
  - Children consume much more than they produce, particularly if enrolled in school.
  - Elderly consume much more than their labor earnings.
- NTA estimates patterns of labor income and consumption over the life cycle.

# Cross-sectional NTA estimates of labor income by age.

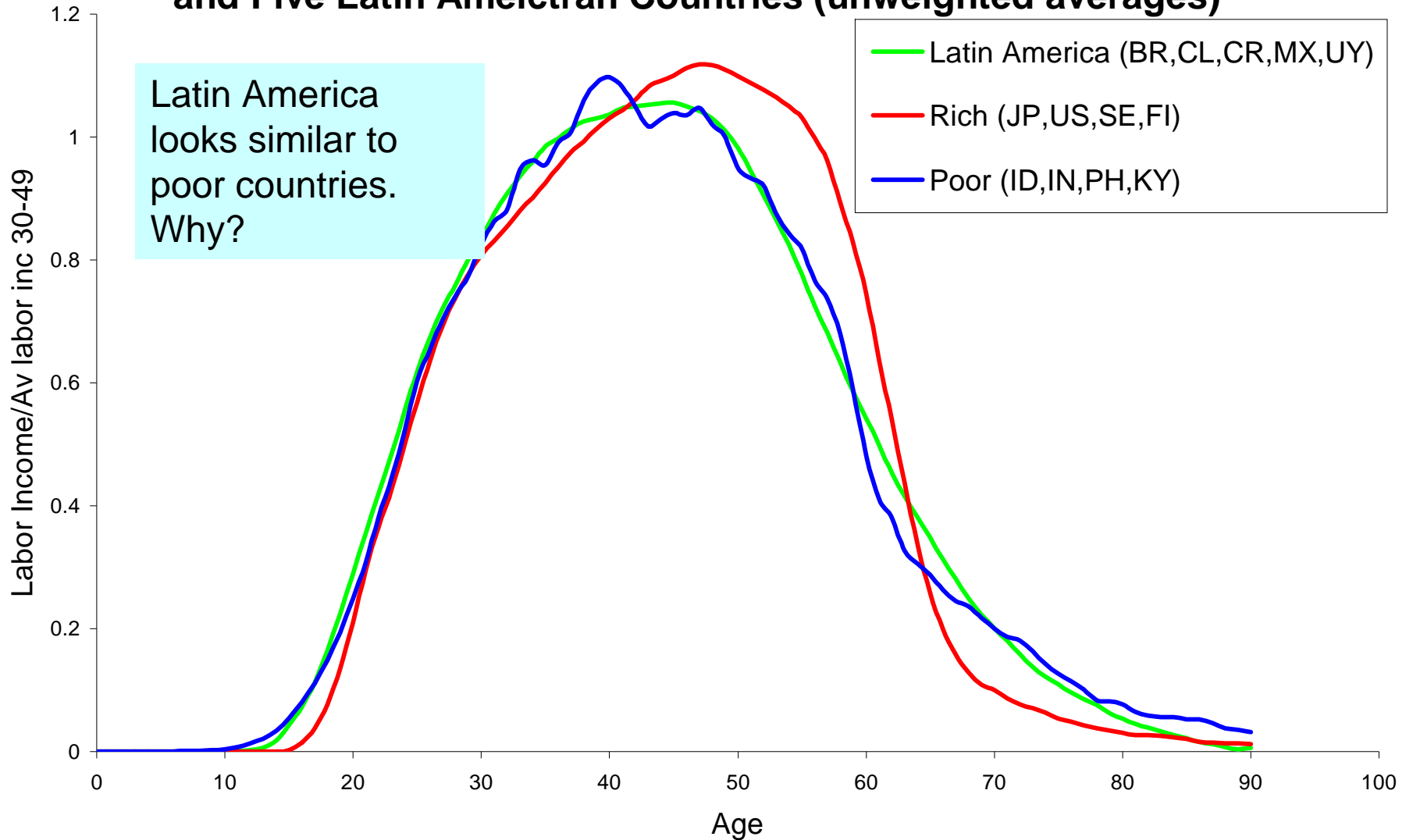
- Averaged across all people of given age
  - male and female
  - Employed, self-employed, fringe benefits
  - Formal or informal sectors.
  - in labor force or not.
- Divided by average labor income for age 30-49 in each country to standardize.

## NTA Age Profiles of Labor Income for Four Rich and Four Poor Countries (unweighted averages)



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# NTA Age Profiles of Labor Income, for Four Rich, Four Poor, and Five Latin American Countries (unweighted averages)

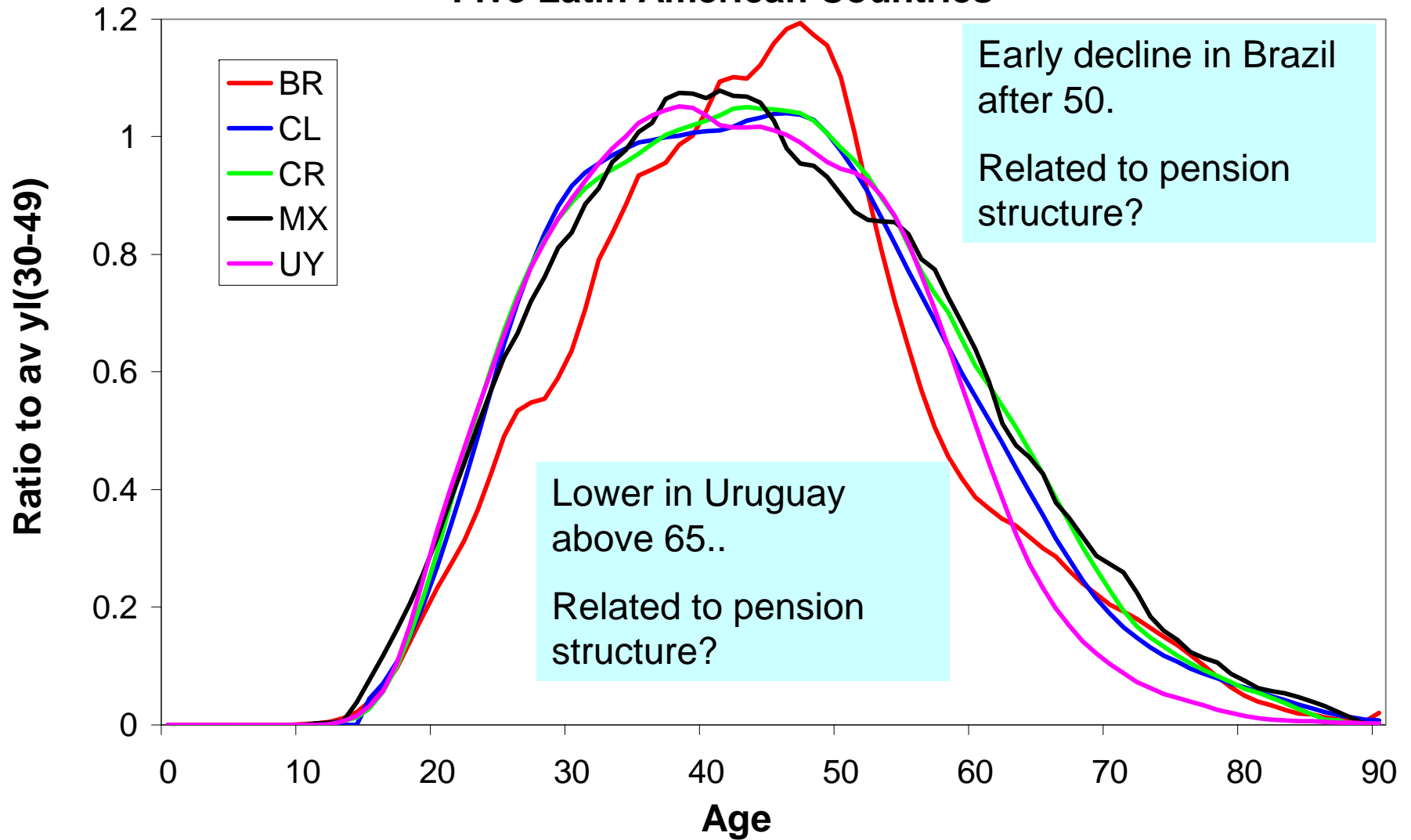


Latin America looks similar to poor countries. Why?

- Latin America (BR,CL,CR,MX,UY)
- Rich (JP,US,SE,FI)
- Poor (ID,IN,PH,KY)

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# Age Profiles of Labor Income Five Latin American Countries



Early decline in Brazil after 50.

Related to pension structure?

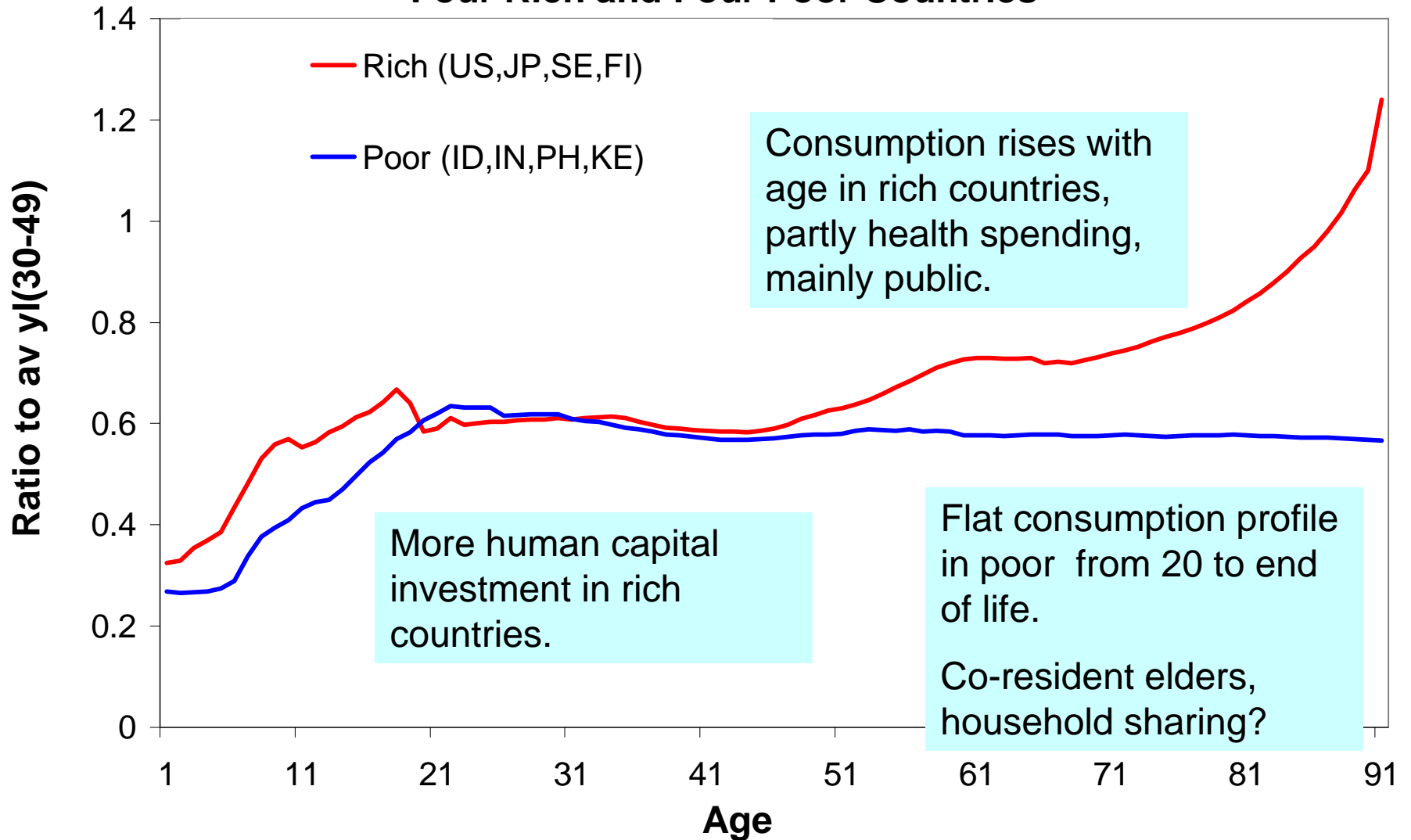
Lower in Uruguay above 65..

Related to pension structure?

# Consumption (cross-sectional NTA estimates)

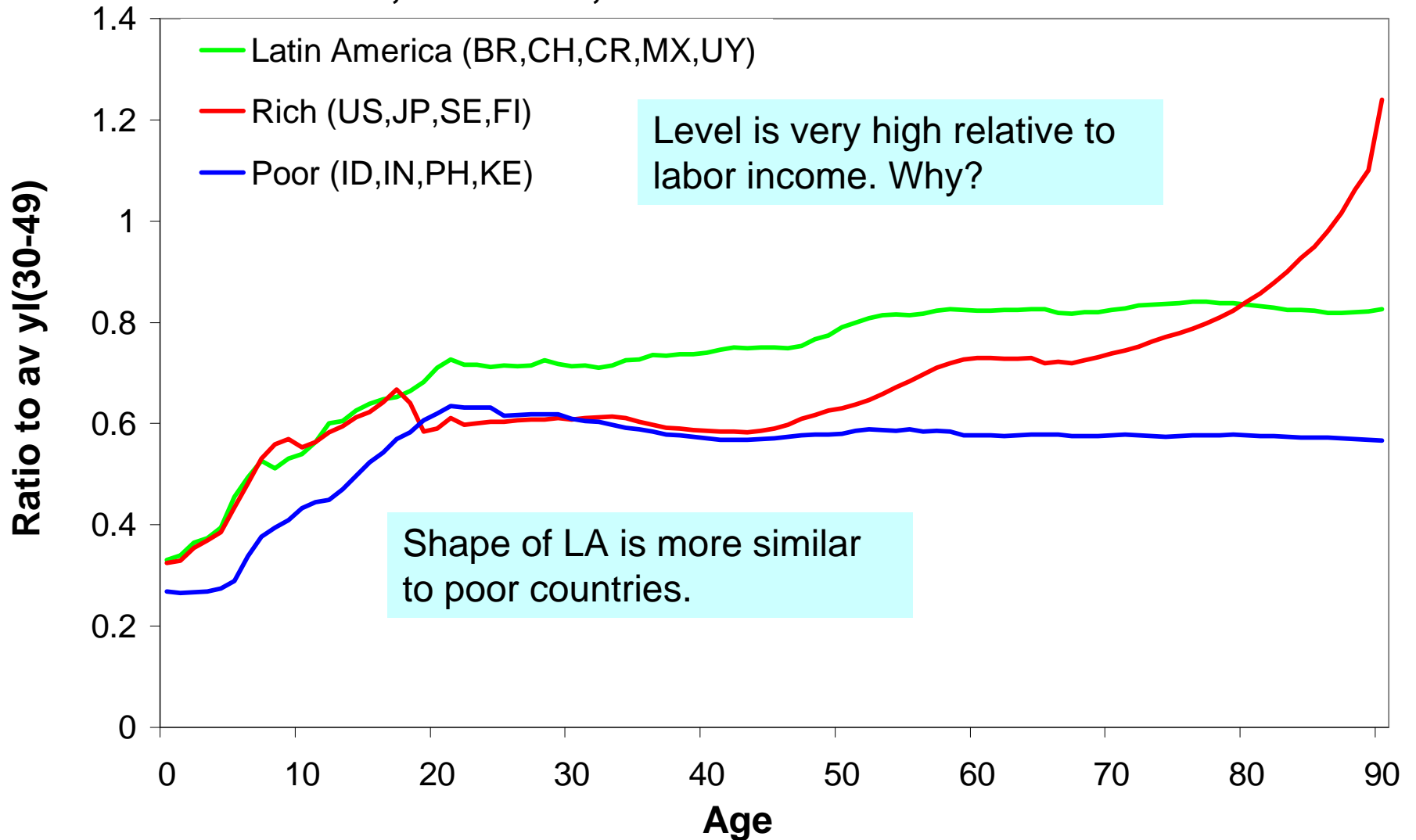
- Average for all people of given age
- Includes
  - Private expenditures by households, allocated by age within the household (private health and education estimated separately).
  - Public in-kind transfers (e.g. education, health care, long-term care).
- Standardized by dividing by average labor income of each country.

## NTA Age Profiles of Labor Income and Consumption for Four Rich and Four Poor Countries



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## Age Profiles of Labor Income and Consumption for Four Rich, Four Poor, and Five Latin American Countries



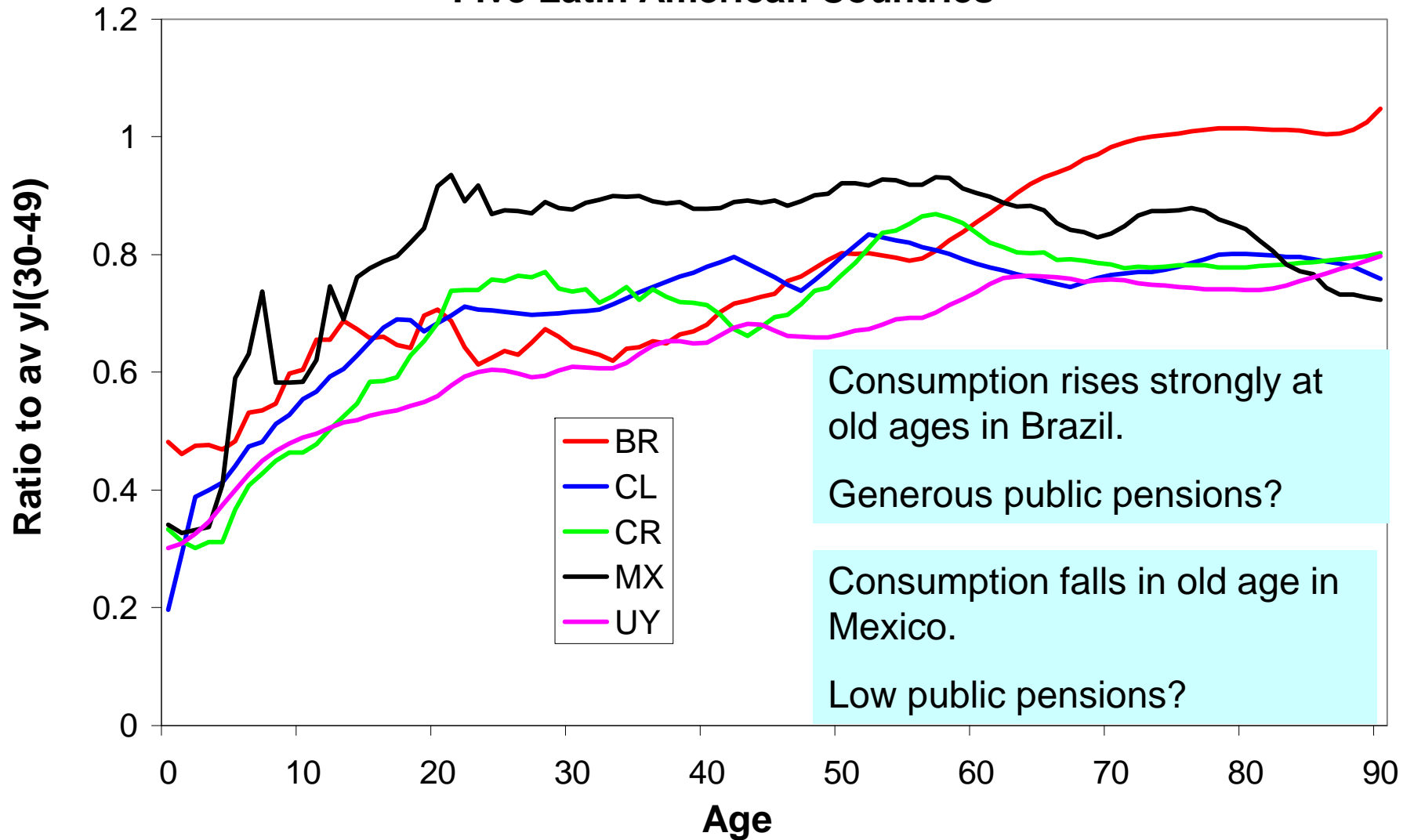
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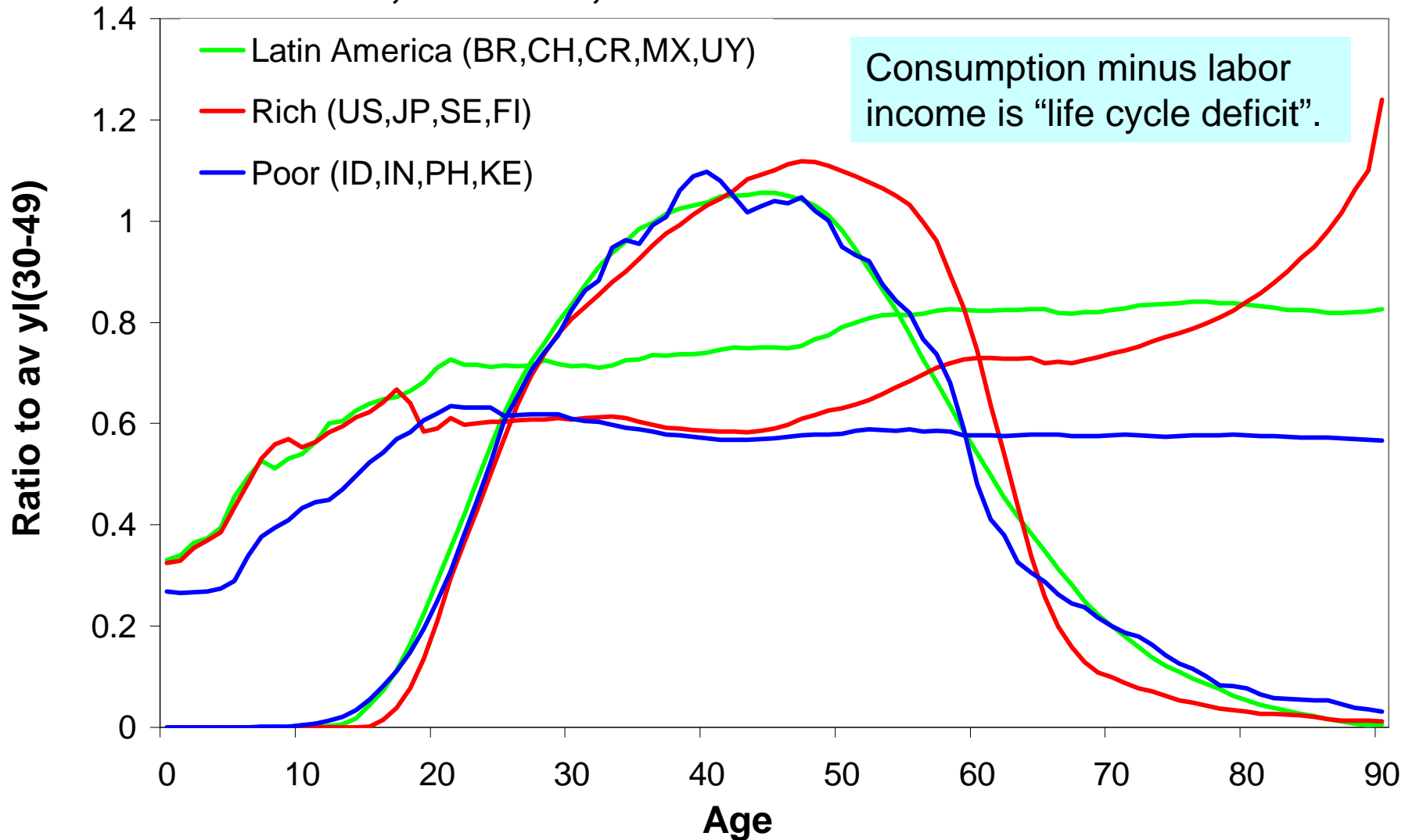
# Why is the Latin American consumption so high relative to average labor income?

- Ratio of aggregate consumption to aggregate labor income in National Income and Product Accounts is very high in Latin America (5 out of top 7 among NTA countries).
  - Nonlabor income like remittances and natural resources.
- Probably reflects very low national saving rates in the region.
- Why is saving low? See Mario Gutiérrez (2007) CEPAL study on this question.
- Could it be linked to generous public pensions?

## Age Profiles of Consumption for Five Latin American Countries

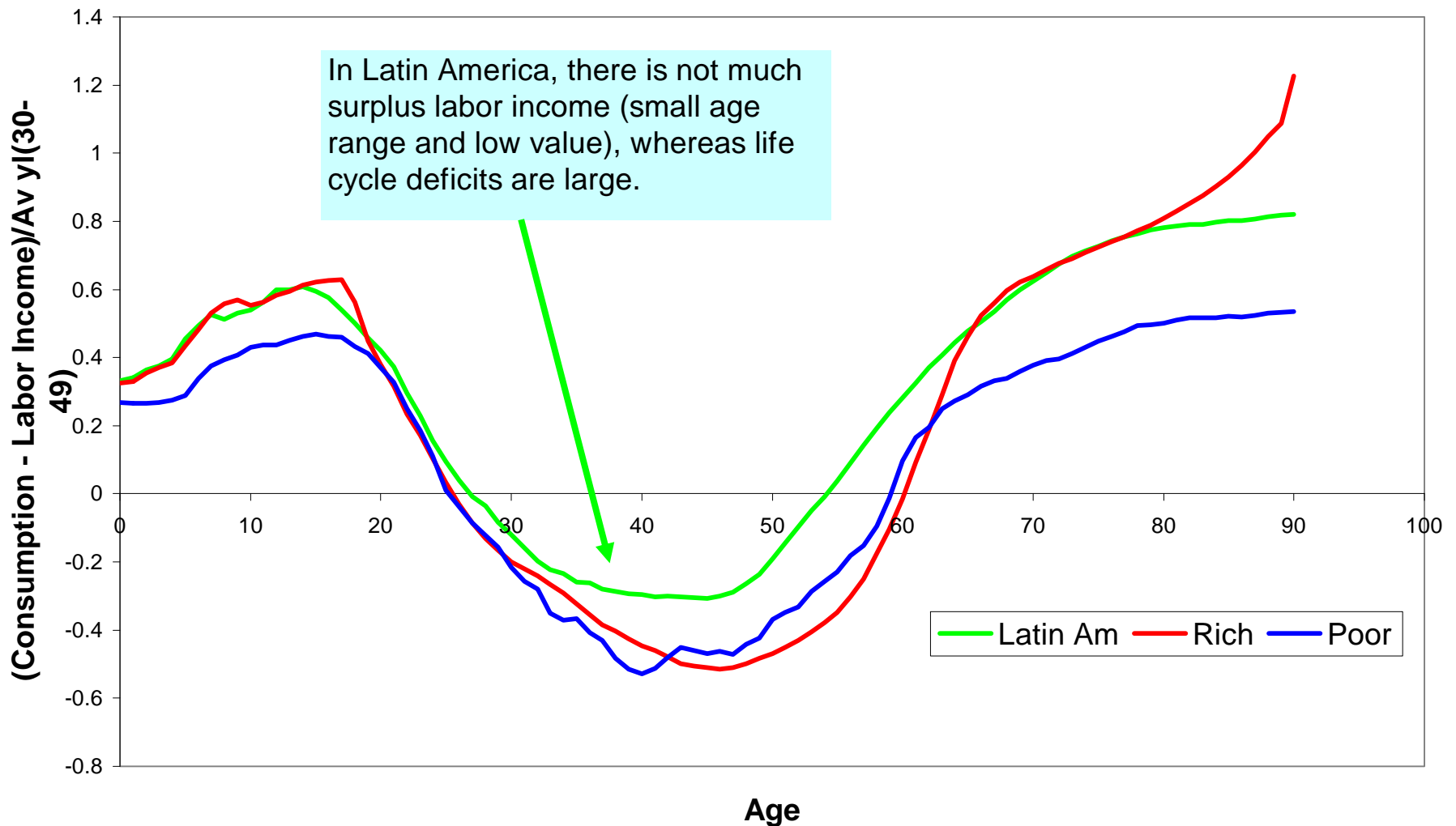


## Age Profiles of Labor Income and Consumption for Four Rich, Four Poor, and Five Latin American Countries



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## The Life Cycle Deficit (consumption - labor income) in rich, poor, and Latin American countries

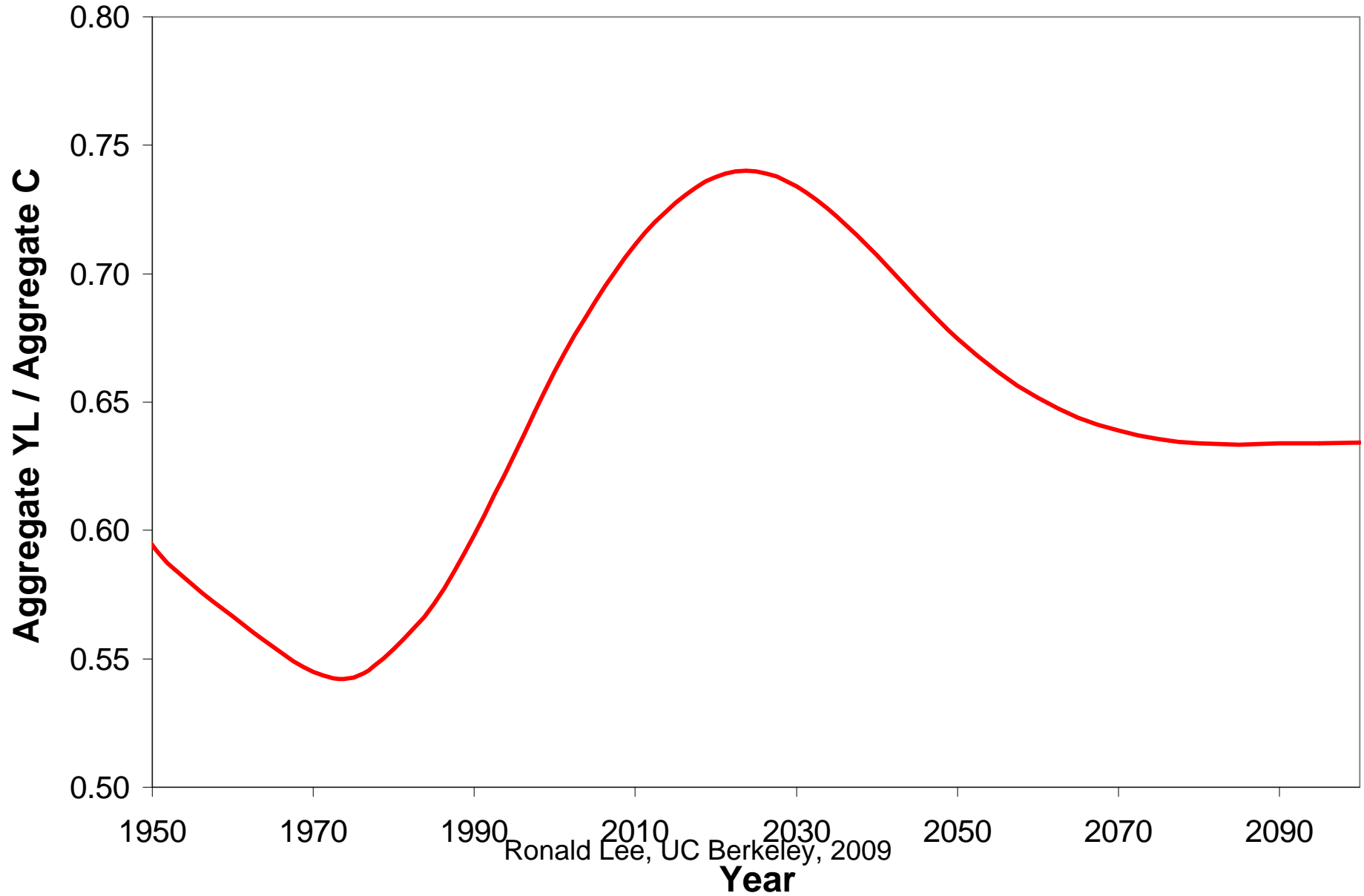


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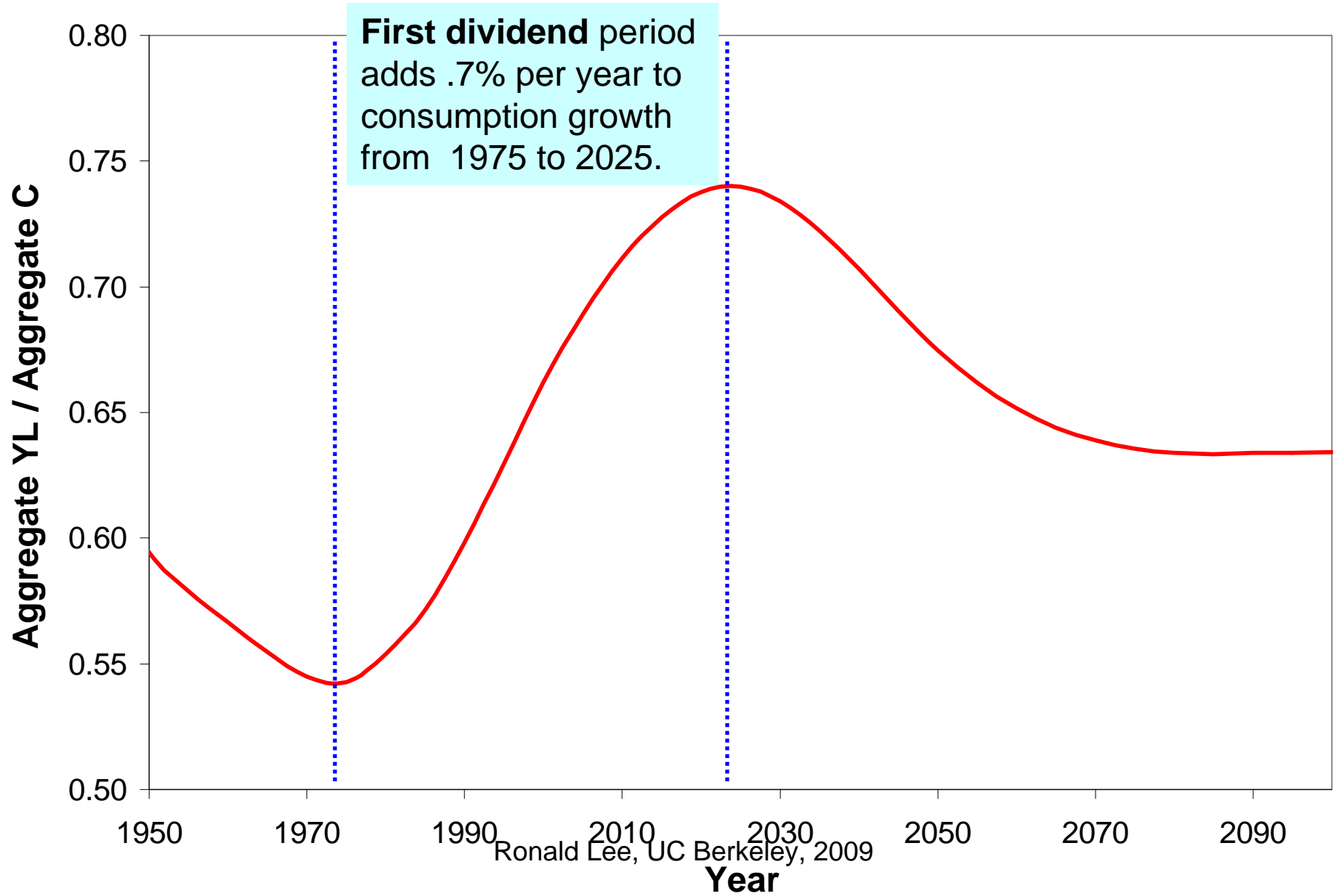
### 3. Age structure and economic behavior: support ratios

- “Effective labor” is sum over age of population times labor income.
- “Effective consumers” is similar.
- “Support Ratio” is ratio of effective labor to effective consumers.
- Other things equal, consumption per effective consumer is proportional to the support ratio.
  - Similarly for per capita income.

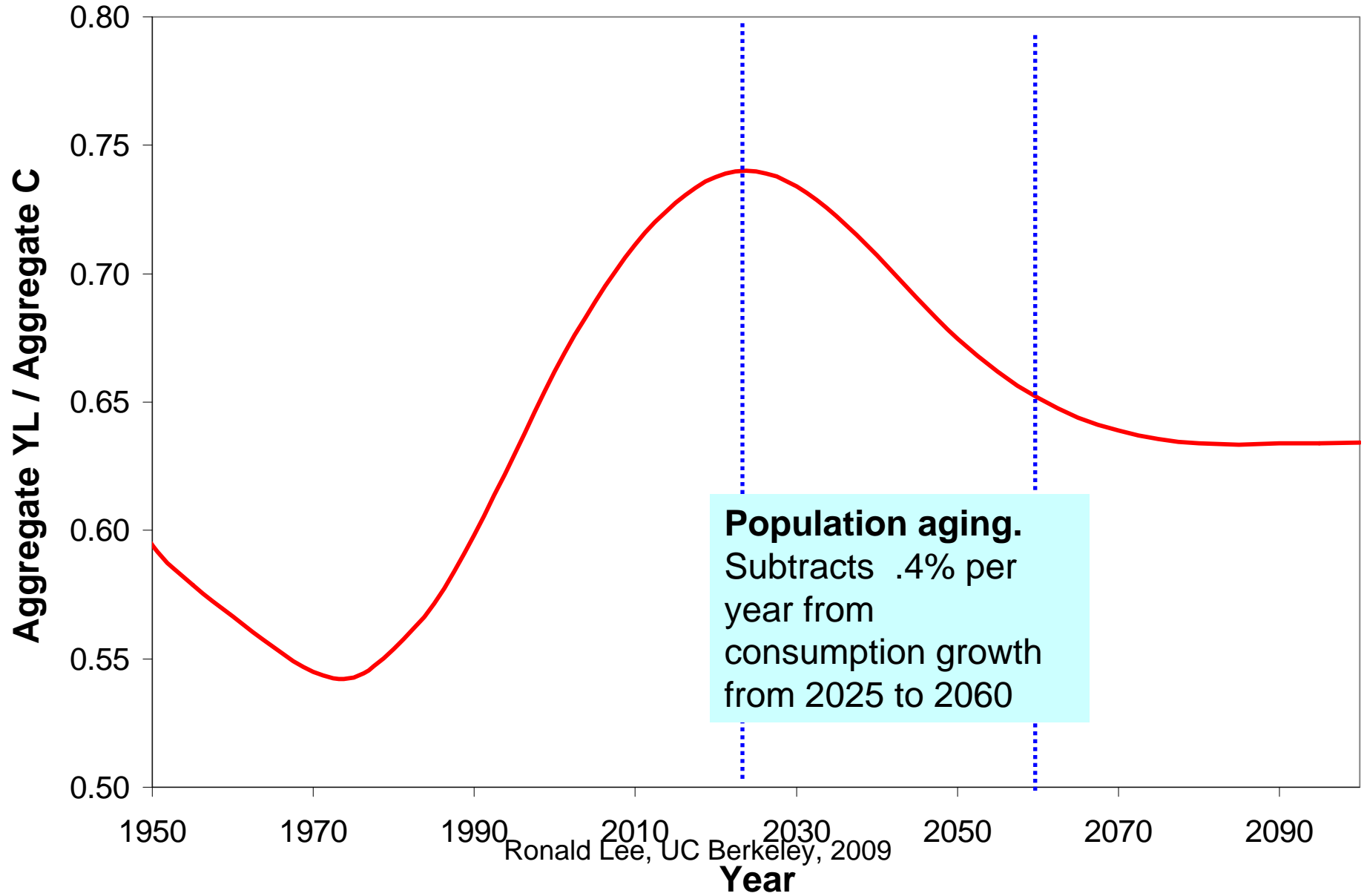
**Support Ratios for Mexican Population (simulations and UN projections, with average of 5 Latin American country profiles)**



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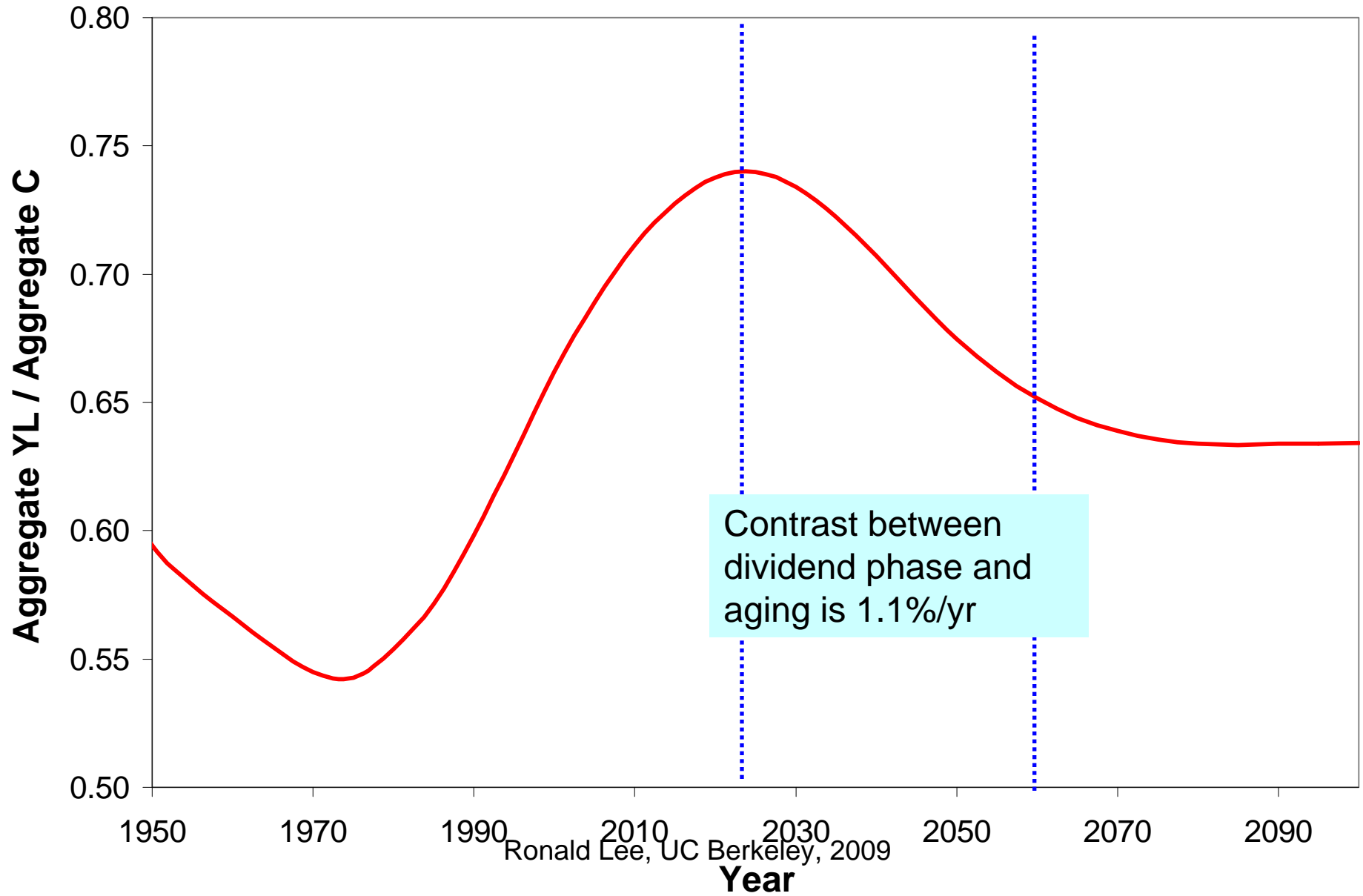


# Support Ratios for Mexican Population (simulations and UN projections, with average of 5 Latin American country profiles)



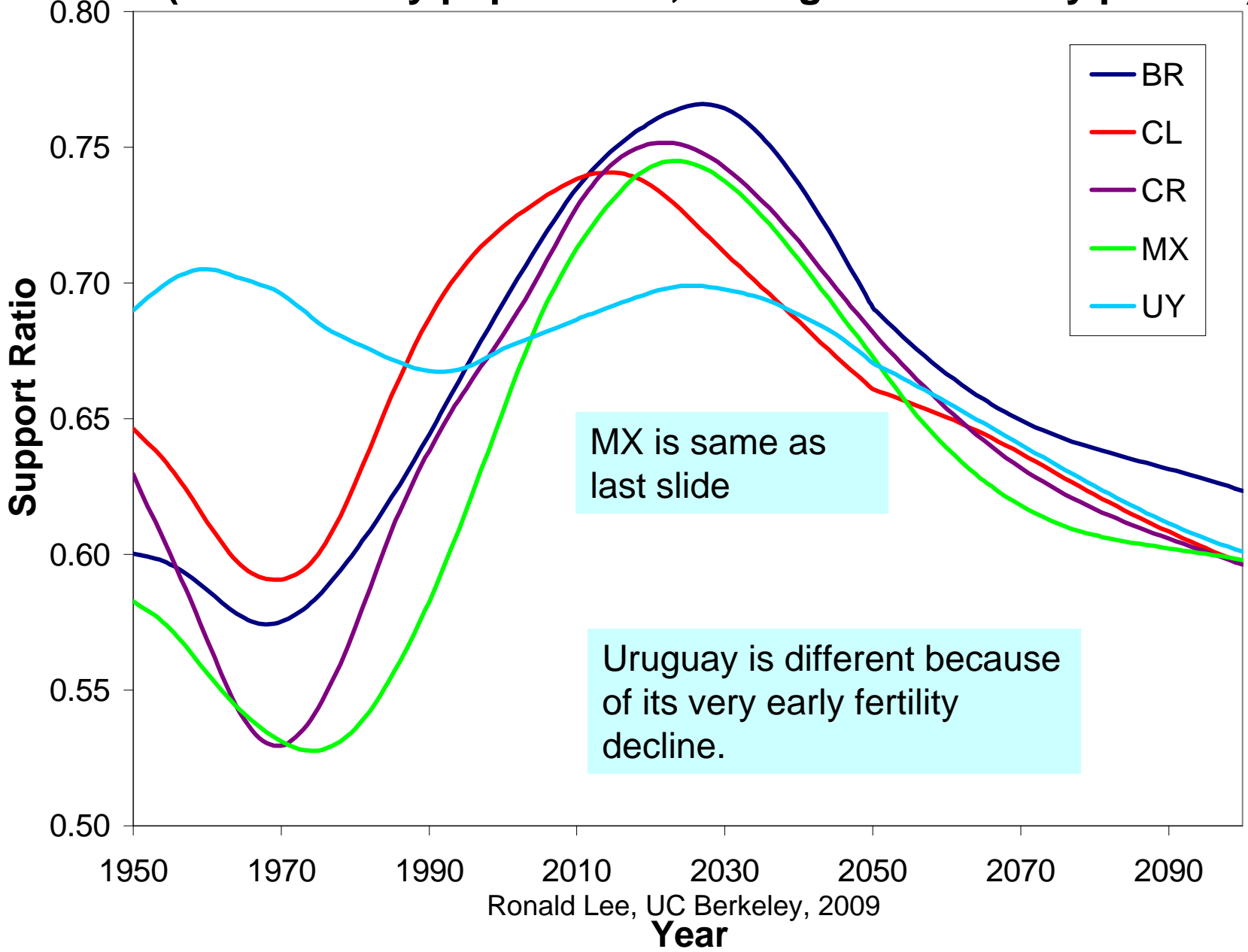


# Support Ratios for Mexican Population (simulations and UN projections, with average of 5 Latin American country profiles)

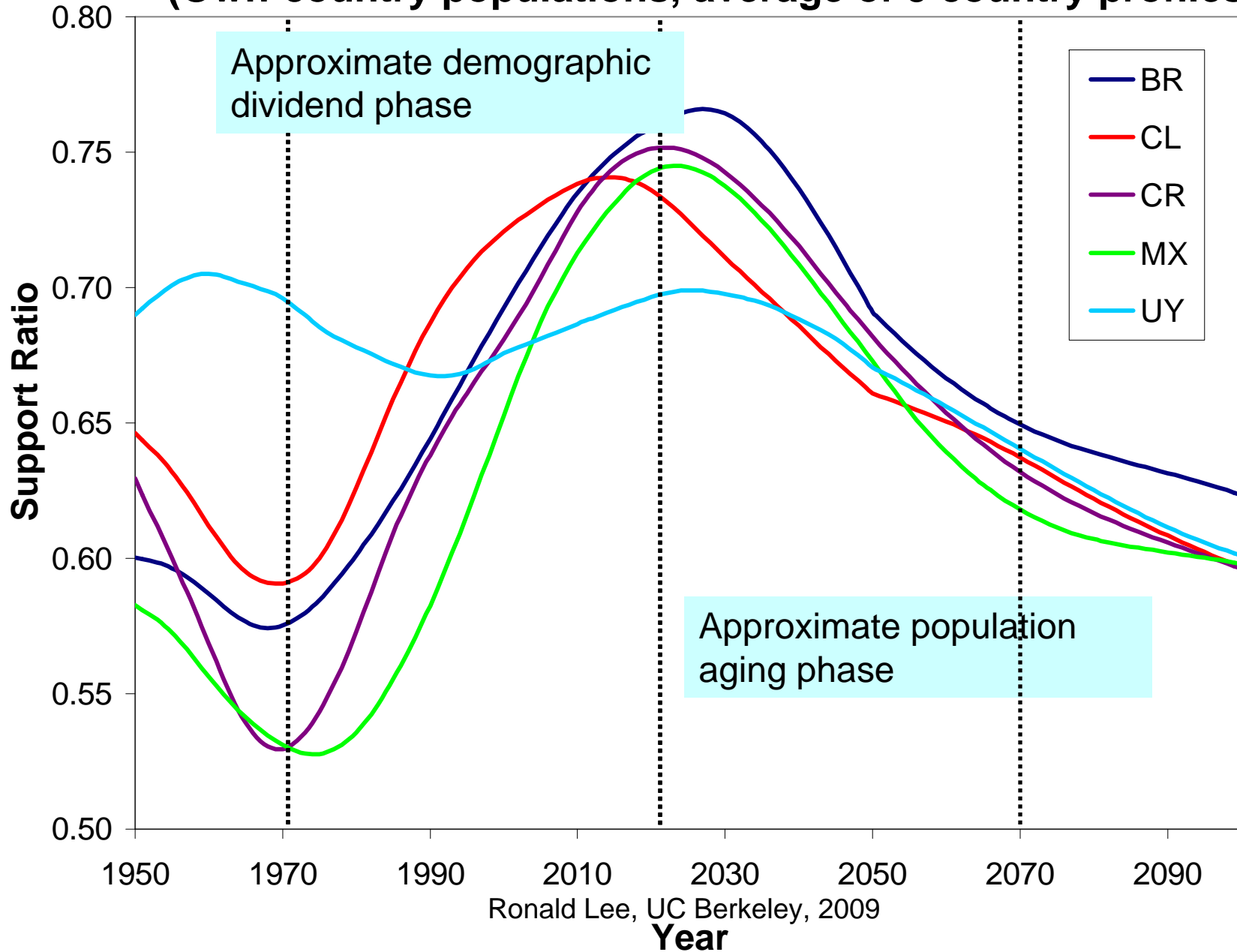


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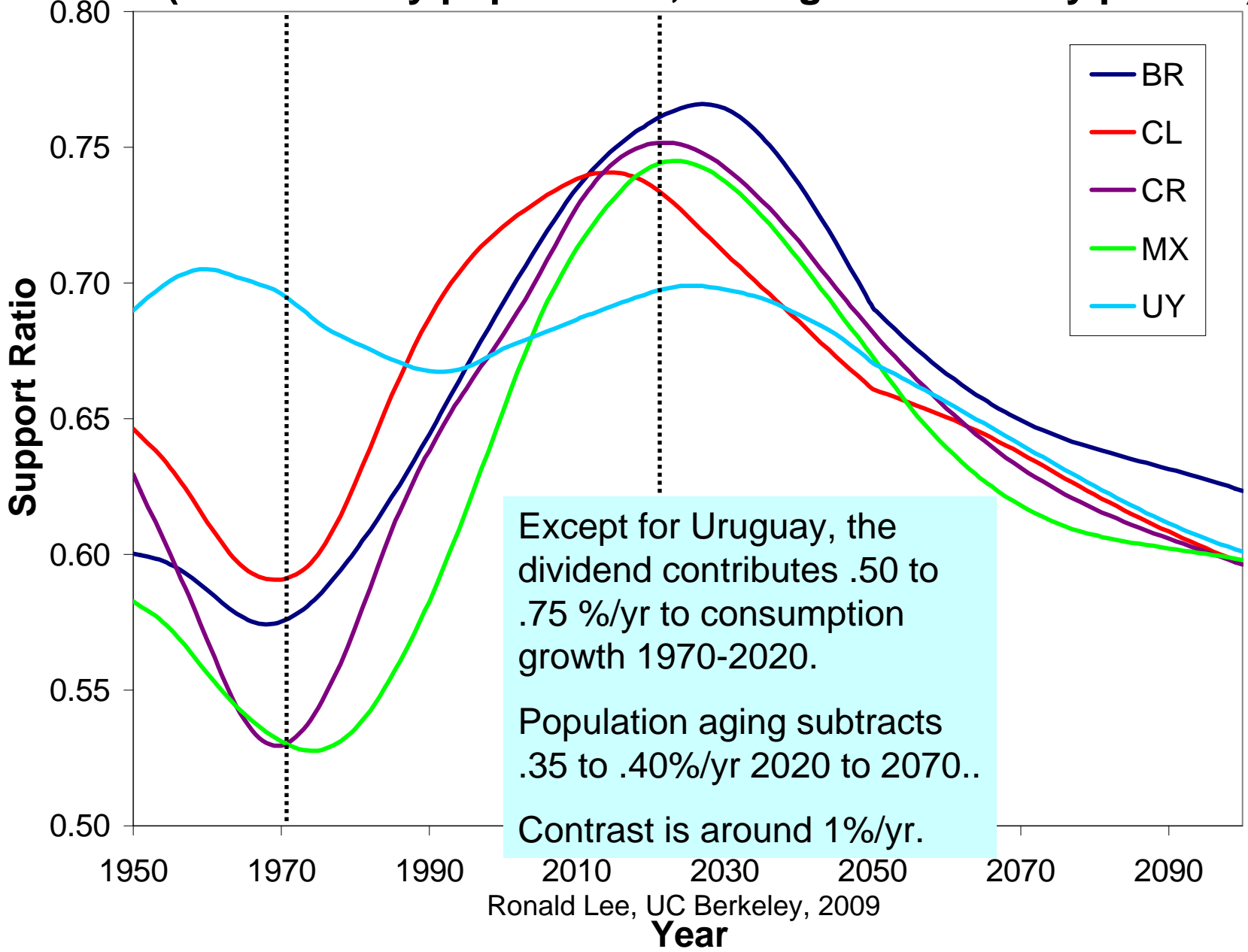
# Support Ratios for Latin America (Own-country populations, average of 5 country profiles)



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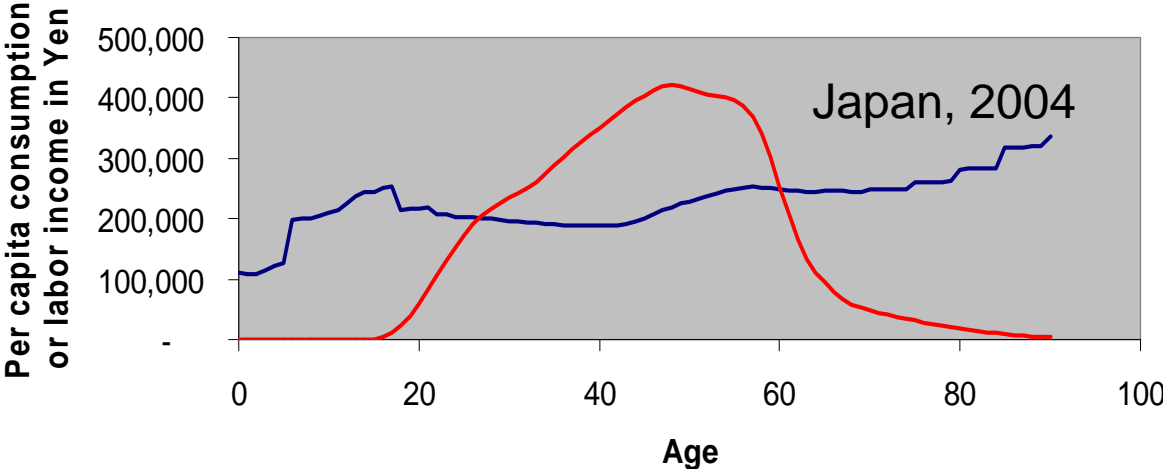
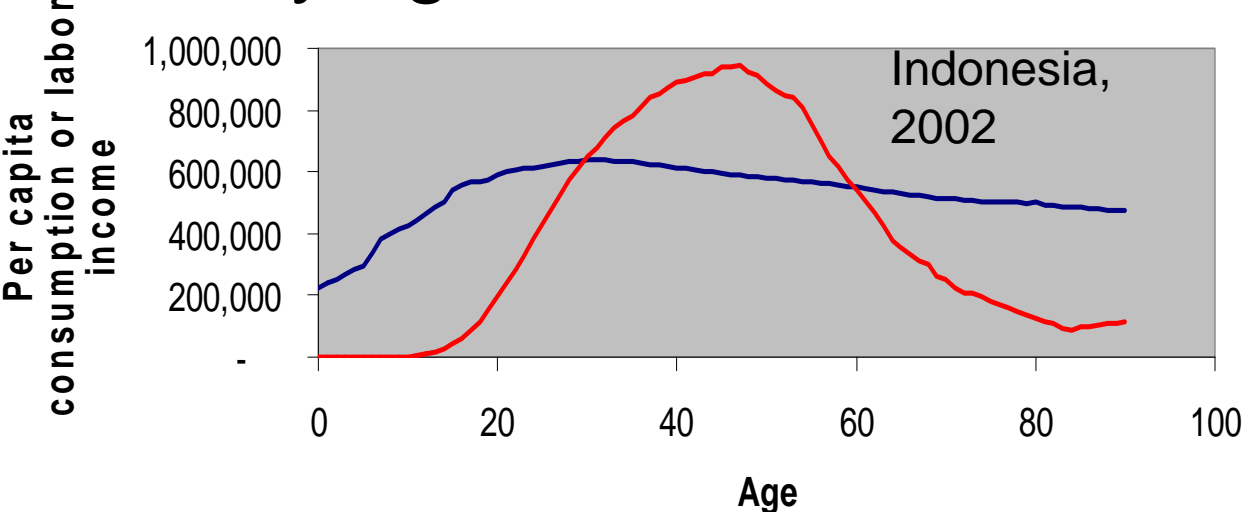
# Support Ratios for Latin America (Own-country populations, average of 5 country profiles)



4. In older populations, more consumption by elderly people is funded somehow.

- Illustrate with Indonesia (young) and Japan (old).

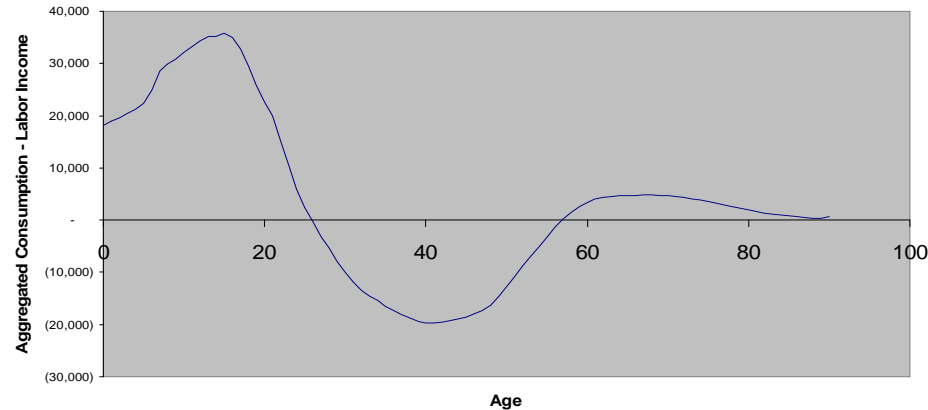
# *Per capita* consumption and labor income by age for Indonesia and Japan



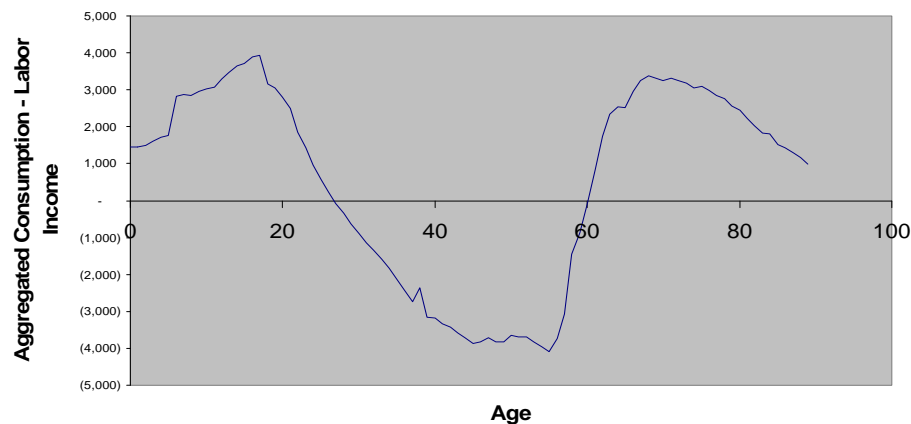
Indonesia NTA Maliki; Japan NTA Ogawa

# The aggregate lifecycle deficit at each age (population by age times per capita age profiles)

Aggregate Life Cycle Deficit for Indonesia (2005) in Rupiah



Aggregate Life Cycle Deficit for Japan (2004) in Yen



Express the total old age aggregate life cycle deficit as a share of aggregate consumption at all ages.

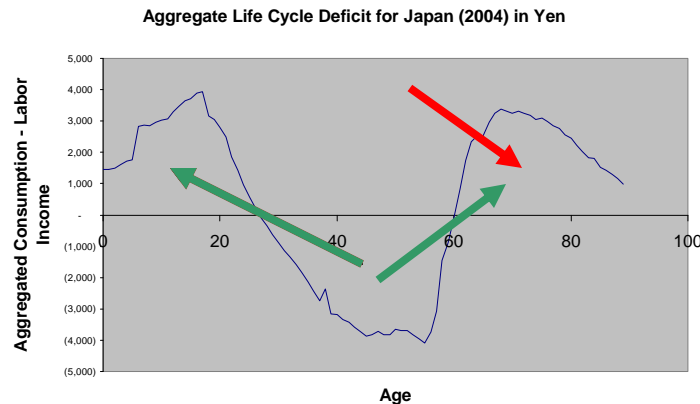
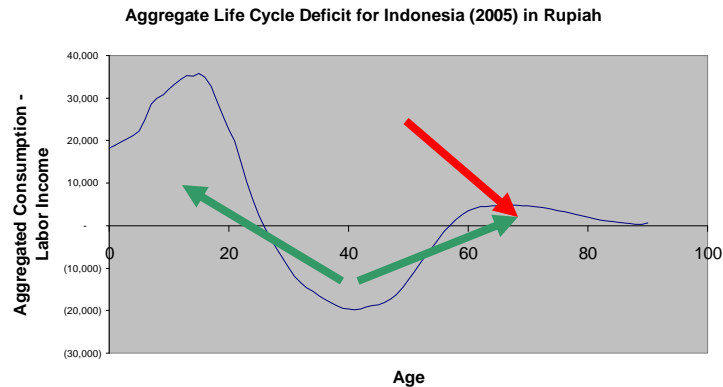
Measures the importance of consumption by the elderly in excess of their labor income.

The older the population, the greater this share.

Calculate aggregate deficit as share of total consumption.

Indonesia NTA Maliki; Japan NTA  
Ogawa

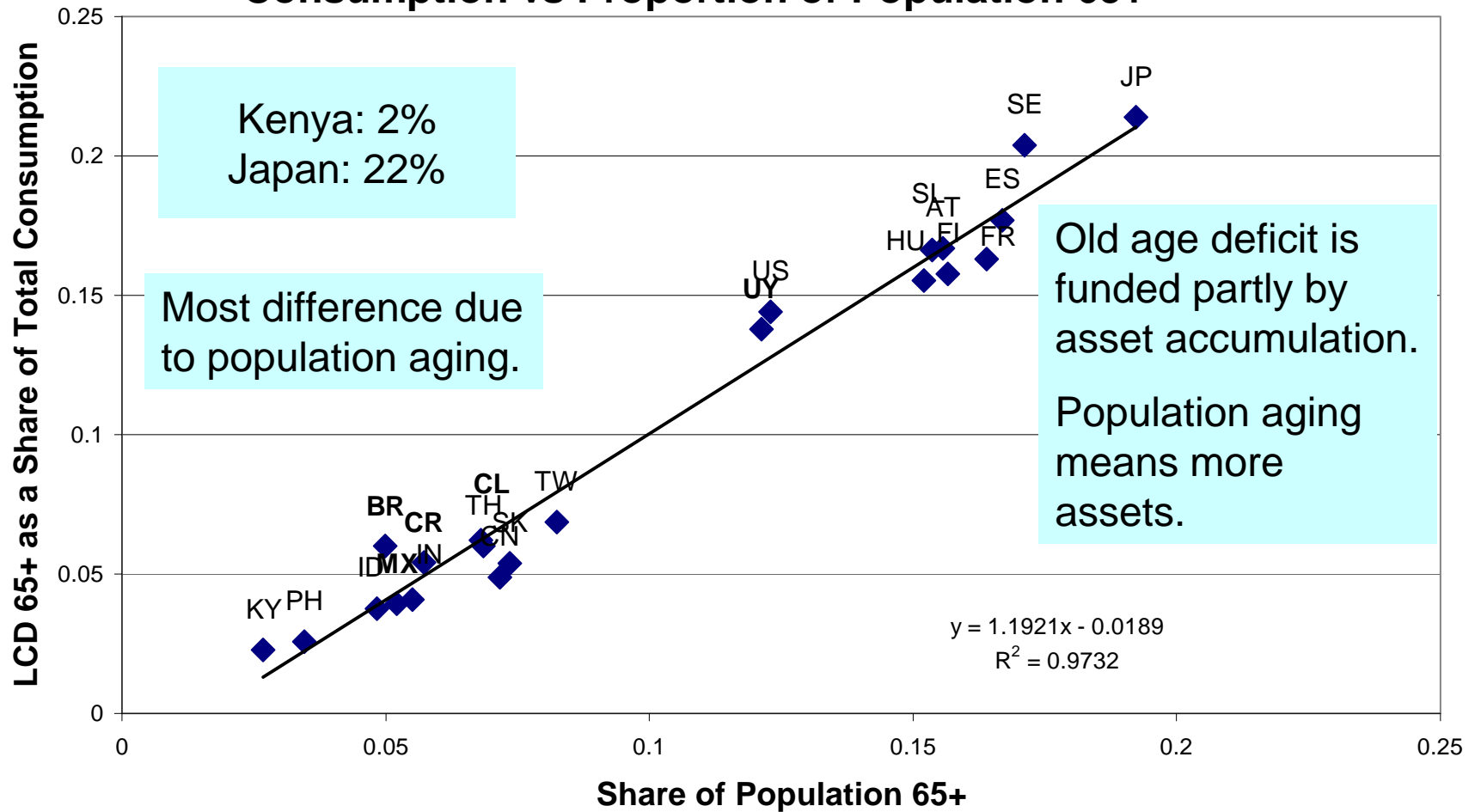
# Aggregate old age deficit is funded by assets and transfers (public and private)



- Green arrows show transfers from surplus of prime working years.
- Red arrows show asset income consumed by elderly out of earlier savings.



## Aggregate Old Age Consumption Deficit as a Share of Total Consumption vs Proportion of Population 65+



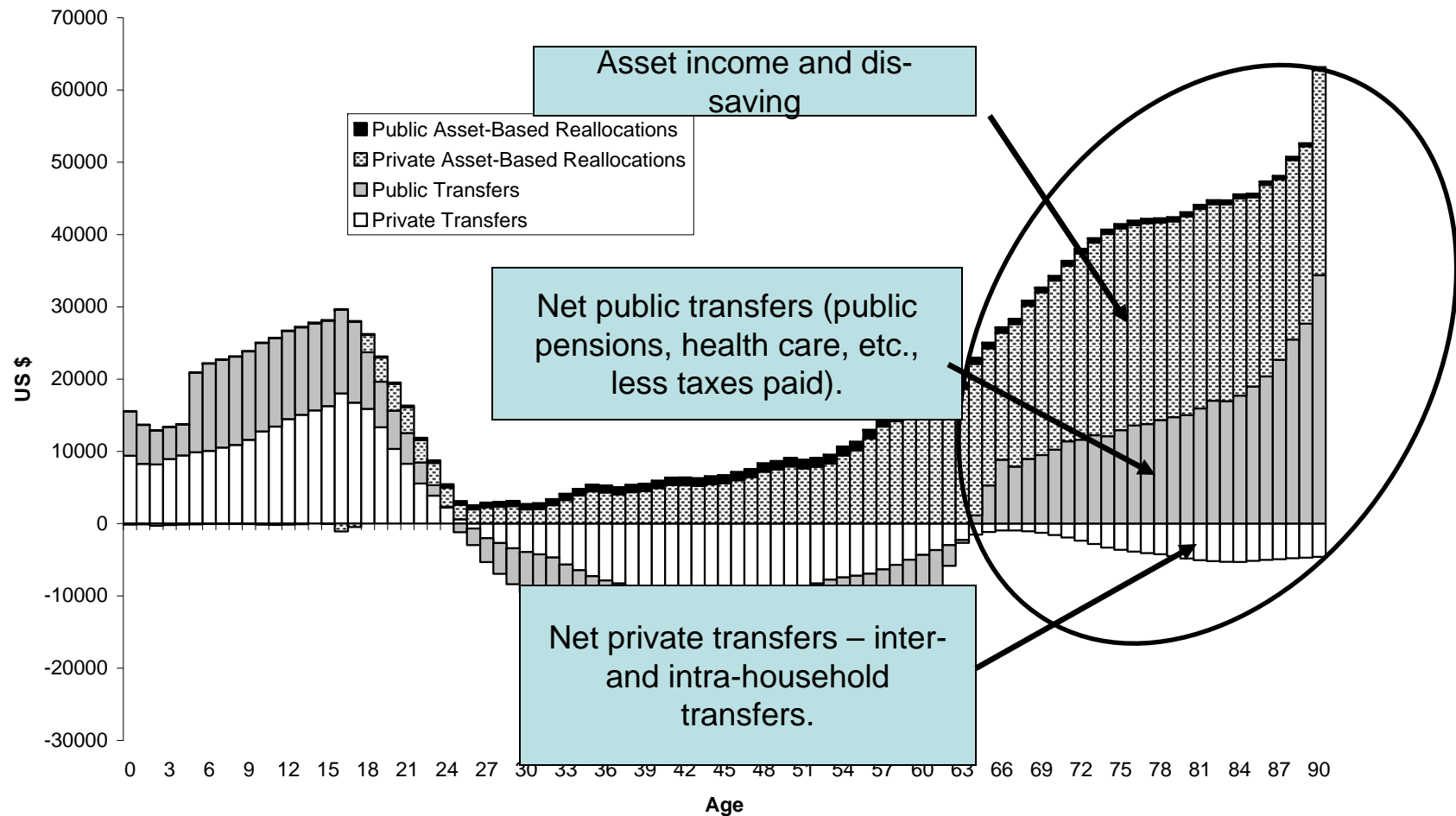
# Implications for capital accumulation

- Population aging raises need to provide for old age deficit.
- If met by more asset accumulation, then population aging raises asset income and perhaps labor productivity.
- If met by public or private transfers, then population aging just raises the transfer burden on workers.
- Policy should find right balance of assets and transfers.

# 5. How is the elderly life cycle deficit funded in different countries?

# Funding the Old-age Deficit in the US

Components of Lifecycle Deficit, US 2003



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Shares of assets, public transfers, and private transfers, differs from country to country.

- The % shares of each add to 100%.
- We can show these on a “triangle graph”.

Triangle graph shows funding shares of life cycle deficit of elderly (65+, consumption – labor income): Assets, Public Transfers, Private transfers

At each corner, 100% of deficit is funded by that item.

PH nearly 100% Assets.

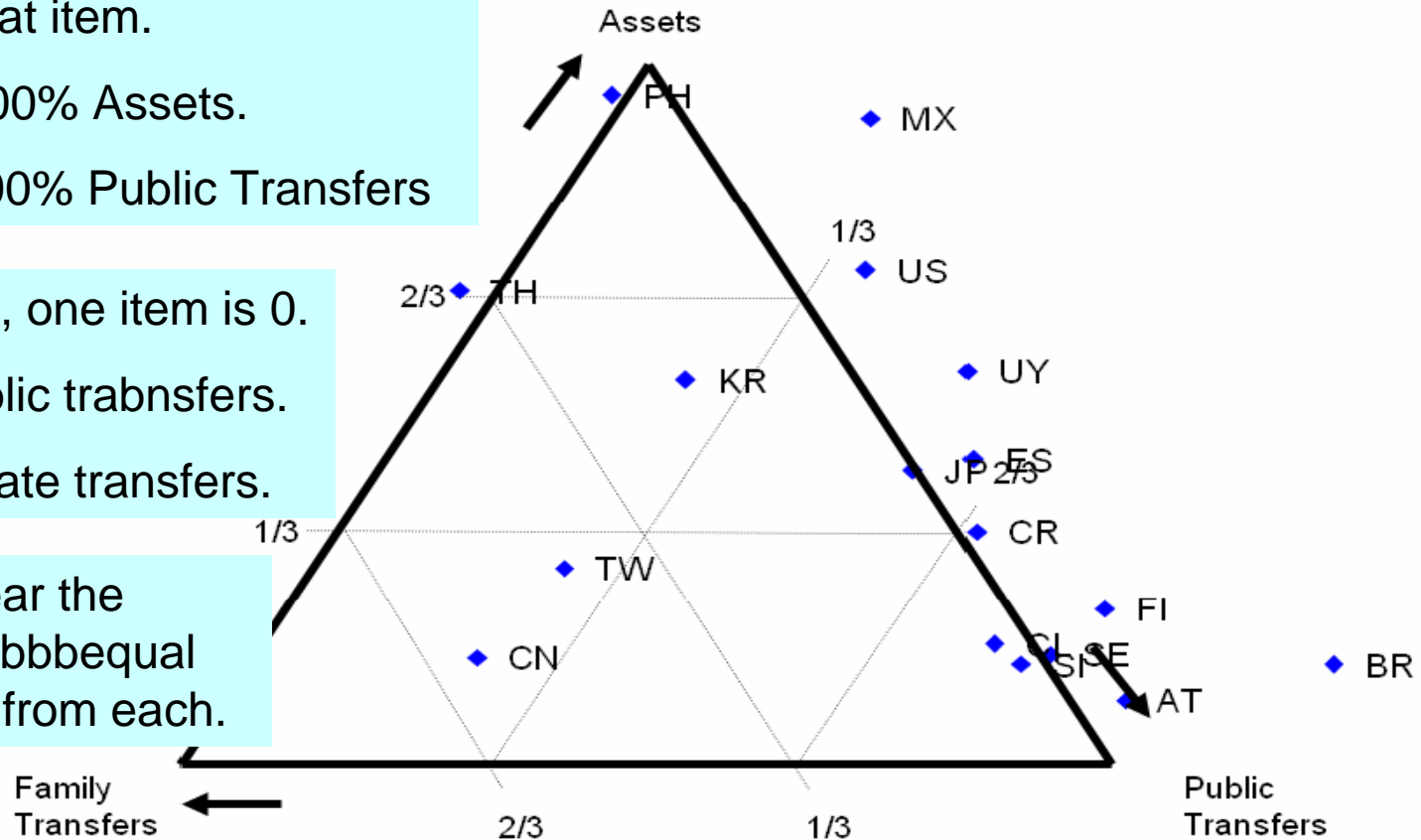
AT nearly 100% Public Transfers

On each side, one item is 0.

TH has 0 public transfers.

JP has 0 private transfers.

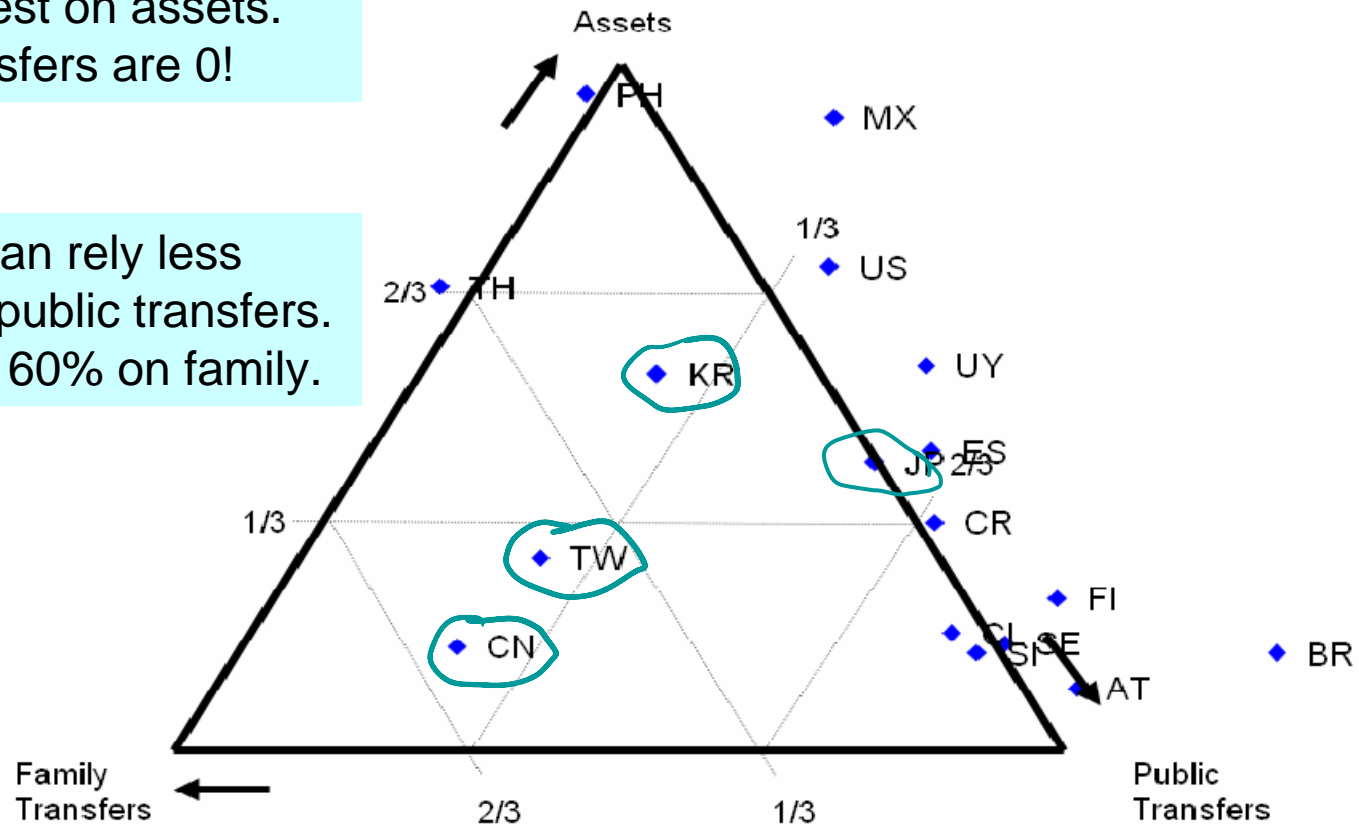
Taiwan is near the middle, with equal shares (1/3) from each.



# Triangle graph for funding life cycle deficit of 65+: East Asian countries show familial support of elderly (except Japan)

Japan relies 2/3 on public transfers, rest on assets. Family transfers are 0!

Other E. Asian rely less than 1/3 on public transfers. China relies 60% on family.



# Triangle graph for funding life cycle deficit of 65+: Latin American elderly make private transfers to others.

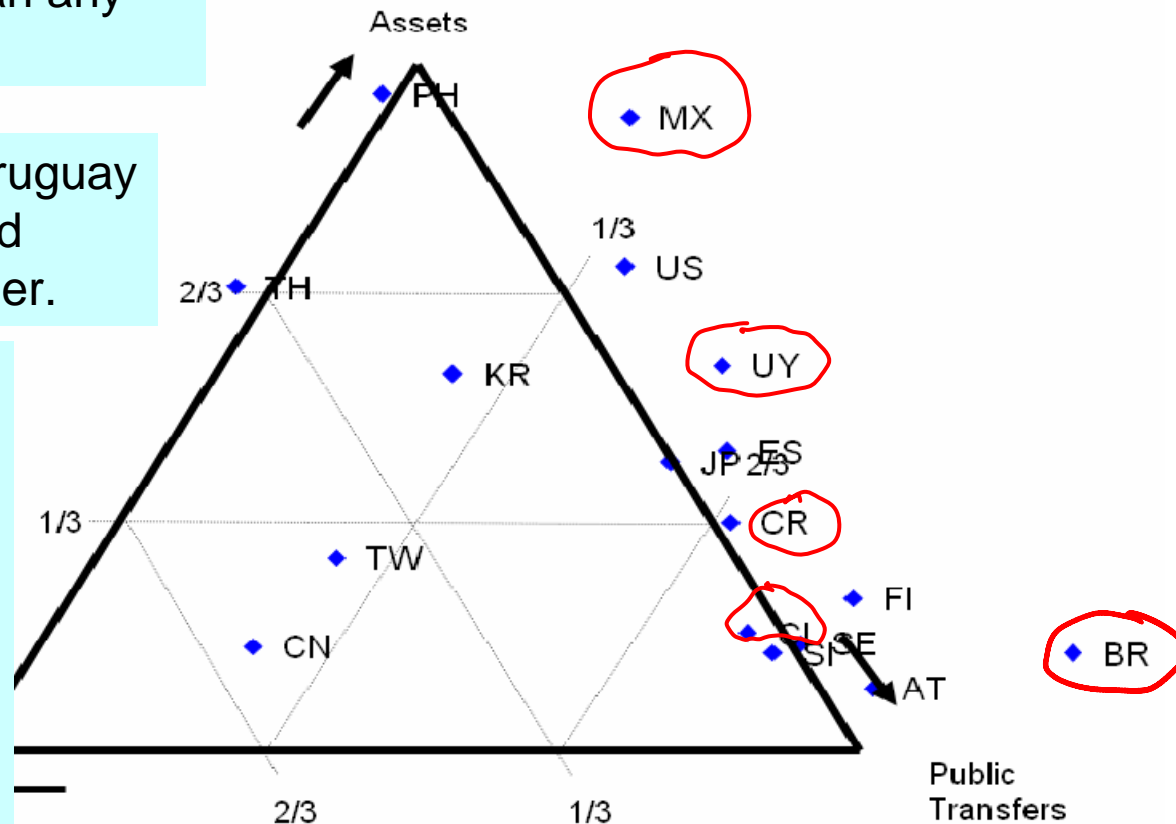
Brazil's public transfers to elderly are greater than any other country's.

Brazil, Mexico, and Uruguay make larger downward transfers than any other.

Mexico relies mostly on assets. Why?

Mexican households own no more assets than in other LA countries.

They use assets for consumption because unlike the other NTA countries, public pensions are small.

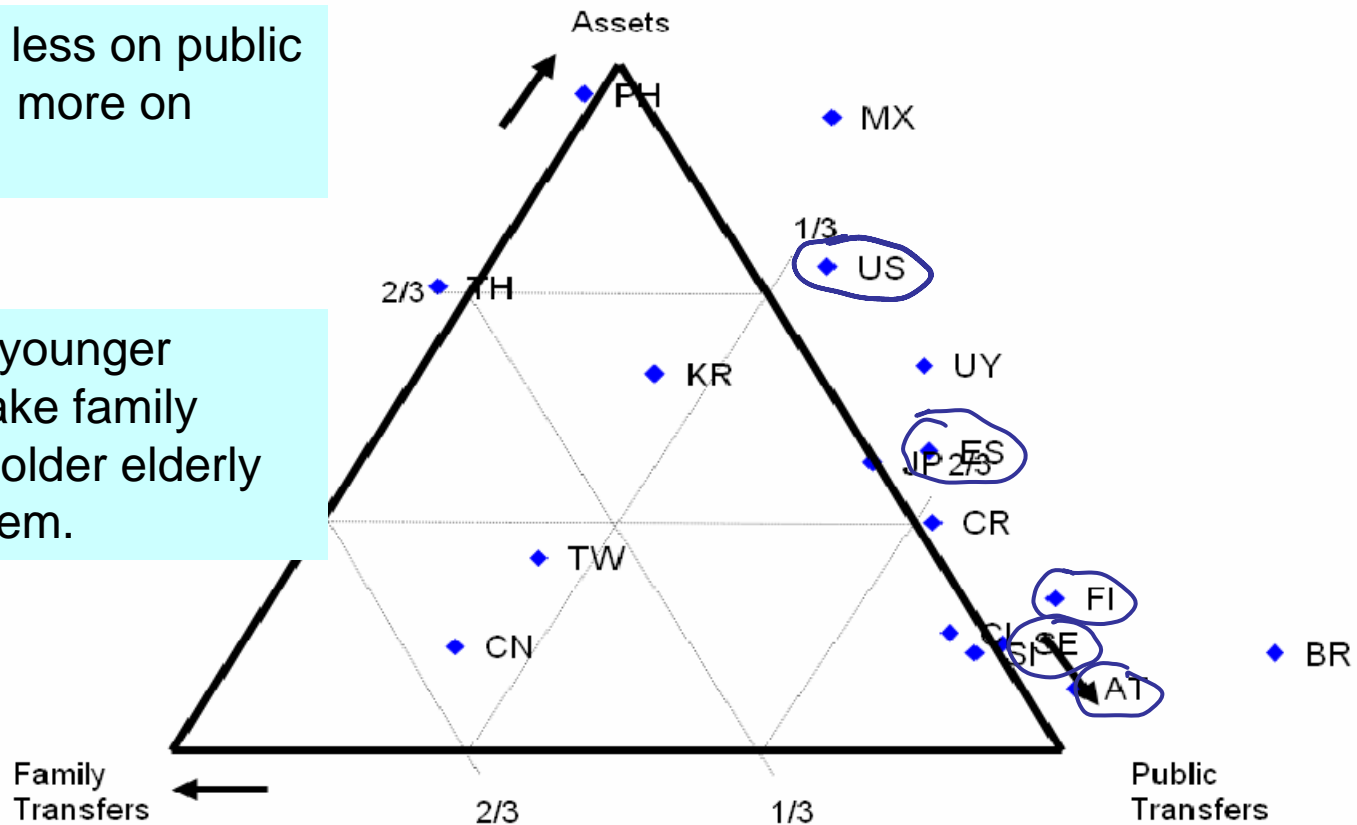




# Triangle graph for funding life cycle deficit of 65+: in US and Europe elderly also transfer to others.

US relies less on public transfers, more on assets.

In Japan, younger elderly make family transfers, older elderly receive them.



6. The demographic transition also promotes investment in human capital.

# Human Capital

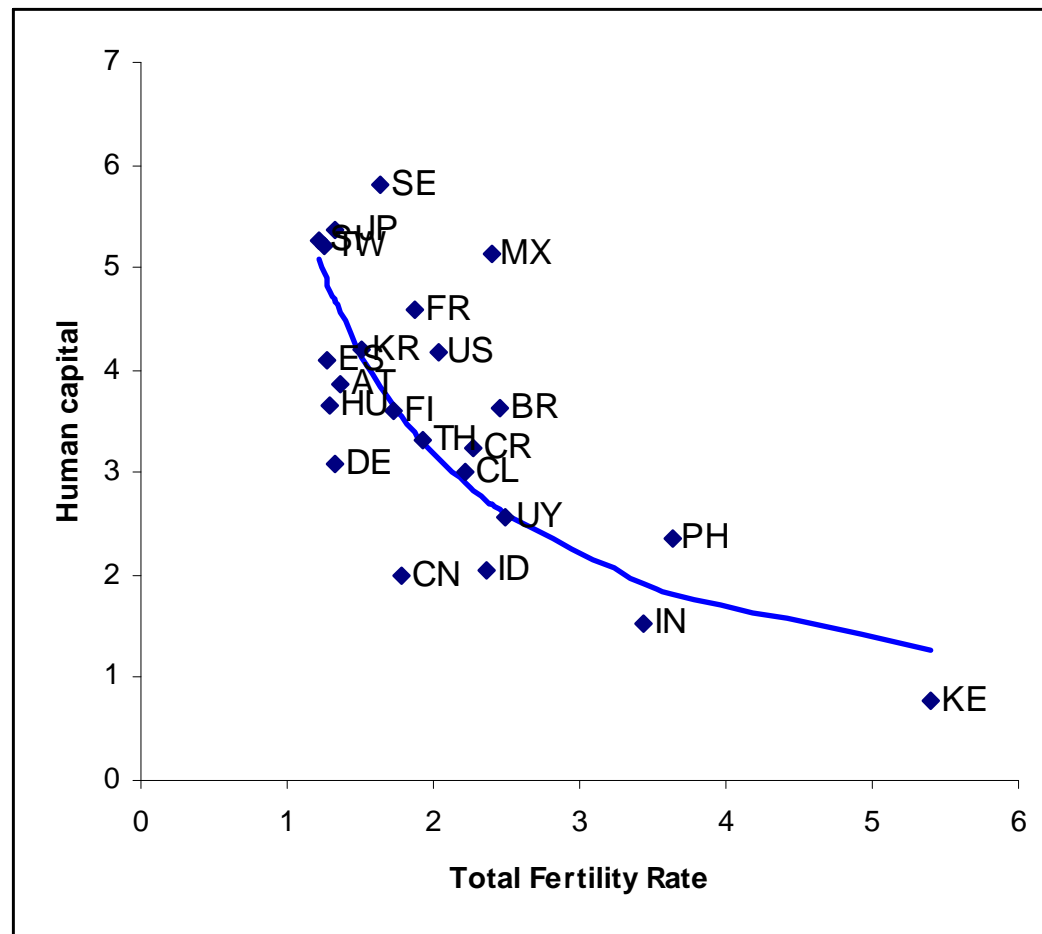
- Parents choose between number of children and amount to invest per child (Quantity-quality tradeoff)
- As economies develop parents opt for fewer children and spend more per child (Becker; Becker and Lewis, Willis).
- Aging (low fertility) will be accompanied by more human capital, regardless of causal direction.
- The human capital “response” helps to offset the negative effect of population aging on the support ratio.

# Empirical Relationship between Human Capital and Fertility

- NTA measure of Human Capital (HK) investment
  - NTA measures **public and private** spending per capita at each age for **health and for education**
  - Sum these for ages 0-17 for health and 0-26 for education
  - Normalize on average labor income ages 30-49
- Compare HK to Fertility in preceding five years

# Cross-sectional Relationship

Estimated elasticity  
 $d \ln HK / d \ln TFR$   
is -0.913



Source: Lee and Mason, forthcoming,  
European Journal of Population (2009).  
Ronald Lee, UC Berkeley, 2009

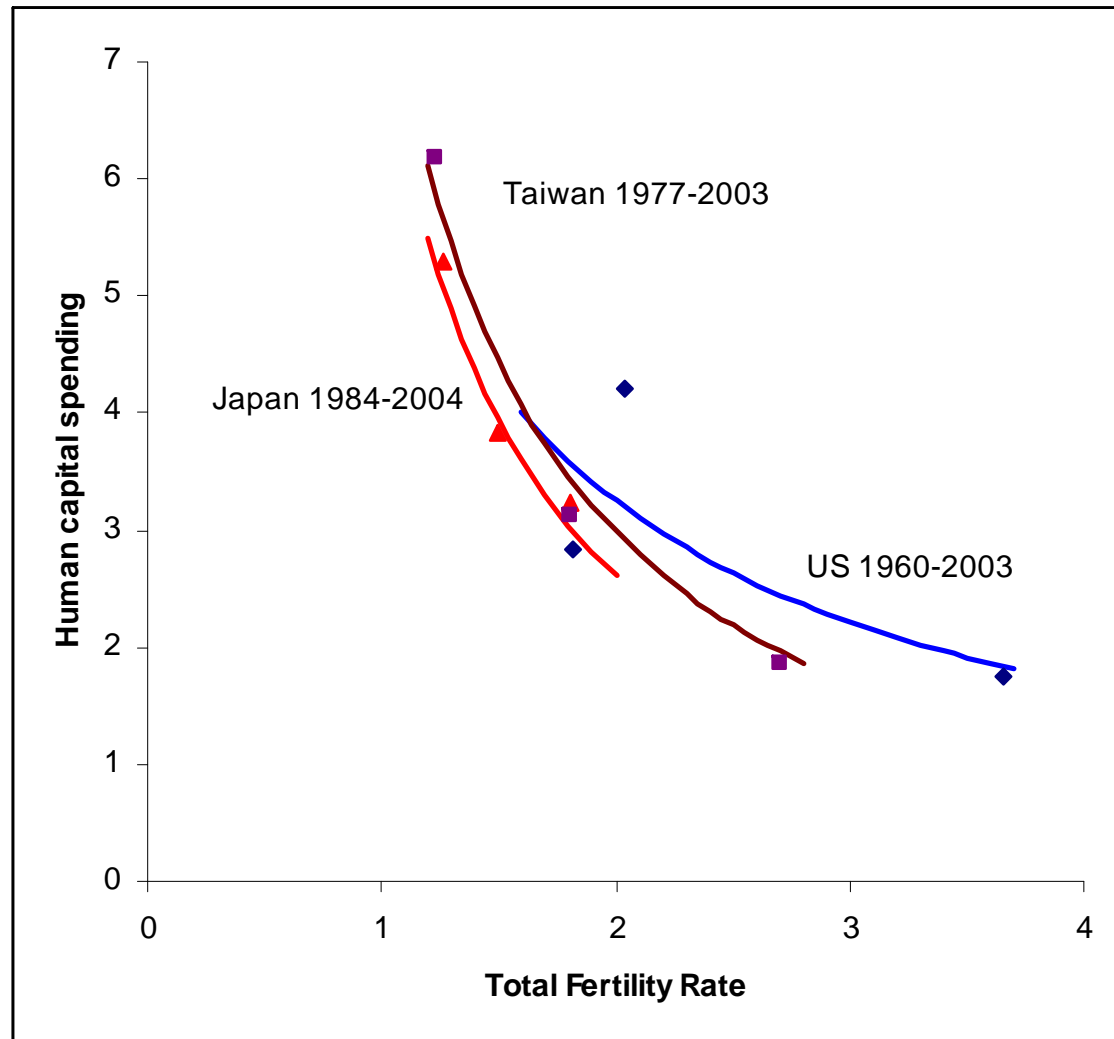
# Time Series Relationship

## Estimated elasticities

Japan	-1.46
Taiwan	-1.40
United States	-0.72

## Number of Observations

Japan	5
Taiwan	27
United States	23



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Population aging is accompanied by increased investments in HK of children

- Raises the productivity and earnings of labor force in future
- Substitutes HK for number of workers
- Offsets falling support ratios.

## 7. Policy can alleviate the economic impact of population aging

- Population aging will certainly cause problems.
  - Fiscal sustainability of public programs is a huge problem for many Latin American countries. I did not discuss this.
  - Population aging will cause falling support ratios, which will reduce consumption, other things equal, by 1%/yr relative to dividend phase.
  - Some risk that that fiscal pressures of aging will crowd out human capital investments in children.



# But...

- Population aging raises the demand for capital by raising the share of old age consumption in the economy.
  - If old age consumption is funded ***at least in part*** by assets rather than transfers, then population aging will lead to higher capital/labor ratio.
  - ***Policy should find the right balance between unfunded public pensions and funded programs, either public or private.***
  - Avoid mistakes of current industrial nations in this regard.
- The low fertility that causes population aging also goes with increased HK investment in children, and higher labor productivity in the future. ***Policy should support investments in human capital of children.***