Reformulating the Support Ratio to Reflect Asset Income and Transfers

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What is macro-economic impact of changing pop age distribution?

- ***Support Ratio*** is a simple and intuitive indicator of the impact

- Consumption changes in proportion to support ratio, other things equal.

- Very widely used.

- This discussion applies equally to the ***Dependency Ratio***

NTA

Suppose that labor is the only source of income. Then…

- The LCD of young and old would be balanced completely by transfers from workers to young and old.

- Output would be proportional to size of effective labor.

- Standard support ratio would give correct impact of population age distribution changes on consumption.

More realistically, output comes from labor and capital

- Then
  - Output is not proportional to labor
  - Ownership of capital is source of income.
- Suppose that individuals are completely financially independent, accumulating assets during working years for retirement.
  - Now population age distribution is irrelevant.
  - Population aging is no problem for workers.
- The support ratio falls nonetheless--misleading
- **Impacts arise only through transfers!**

The standard story is not quite right

- Labor is not the only source of output or income

- Consumption exceeds labor income by 22% in average NTA country.

- Capital and other assets also generate income and pay for consumption.

- The Life Cycle Deficit is balanced by asset income as well as transfers from workers.

Here is the standard model

$Y = LAf(k, hk)$

$C = (1-s)Y$

$C = (1-s)LAf(k, hk)$

$\dfrac{C}{N} = (1-s)\dfrac{L}{N}Af(k, hk)$

$c = (1-s)\dfrac{L}{N}Af(k, hk)$

Y= Labor x av product of labor

Cons = (1-s)Y

Divide by N, effective consumers.

Consump per effective consumer = Support ratio x proportion not saved x av product of labor

From this comes standard story:
Other things equal, consumption is
proportional to the support ratio.

But should we expect other things to
be equal when support ratio changes?

Consider an increase in workers.

- Add 10% more workers
  - Support ratio rises by 10%.
- But each new worker raises output by **_marginal product of labor_**, not by average product.
  - Capital-labor ratio declines
  - Output rises by only 10%*β, where β is labor share in output, or about 2/3, say 7%.
- Not obvious whether consumption per EAC goes up or down.

Consider an increase in elderly

- Support ratio falls, consumption declines
- But suppose each new elder has accumulated capital to fund own consumption?
  - output rises by marginal product of capital, or elasticity .3
- No one else's consumption is reduced, and possibly it is raised (due to higher capital-labor ratio)

Illustration of accumulation of assets by elderly (age pattern is relevant; motive is not)

Net Worth by Age of Household Head in US, 2007, from Survey of Consumer Finance
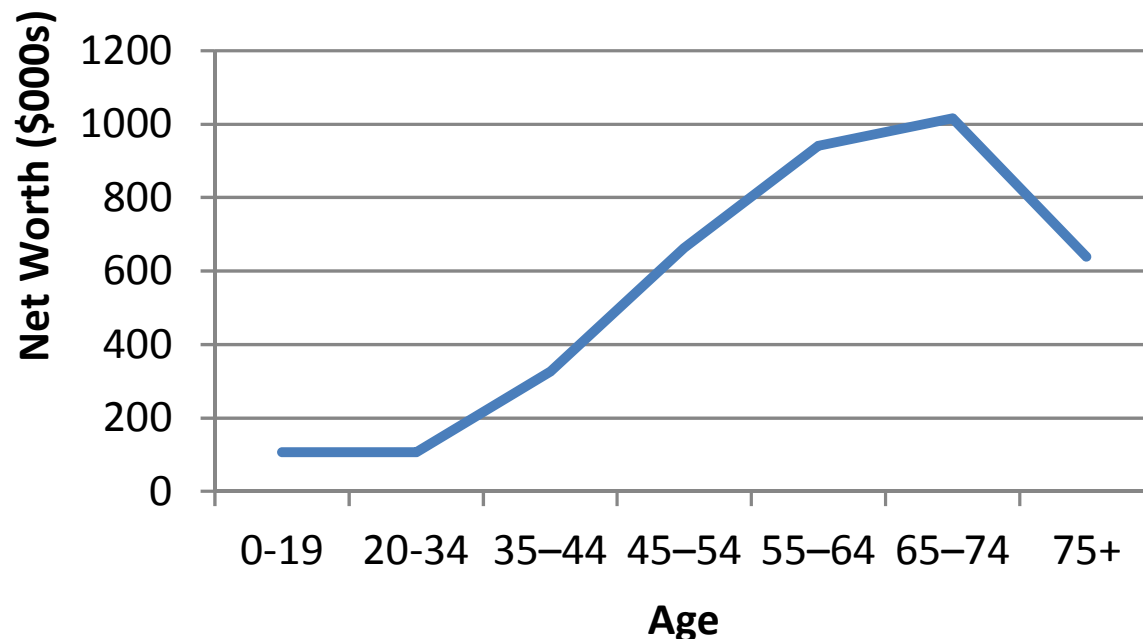
Source: Survey of Consumer Finance

Two problems with standard story

- Change in output is wrong (we just saw).

- Life cycle deficit may be funded by asset income rather than by transfers.

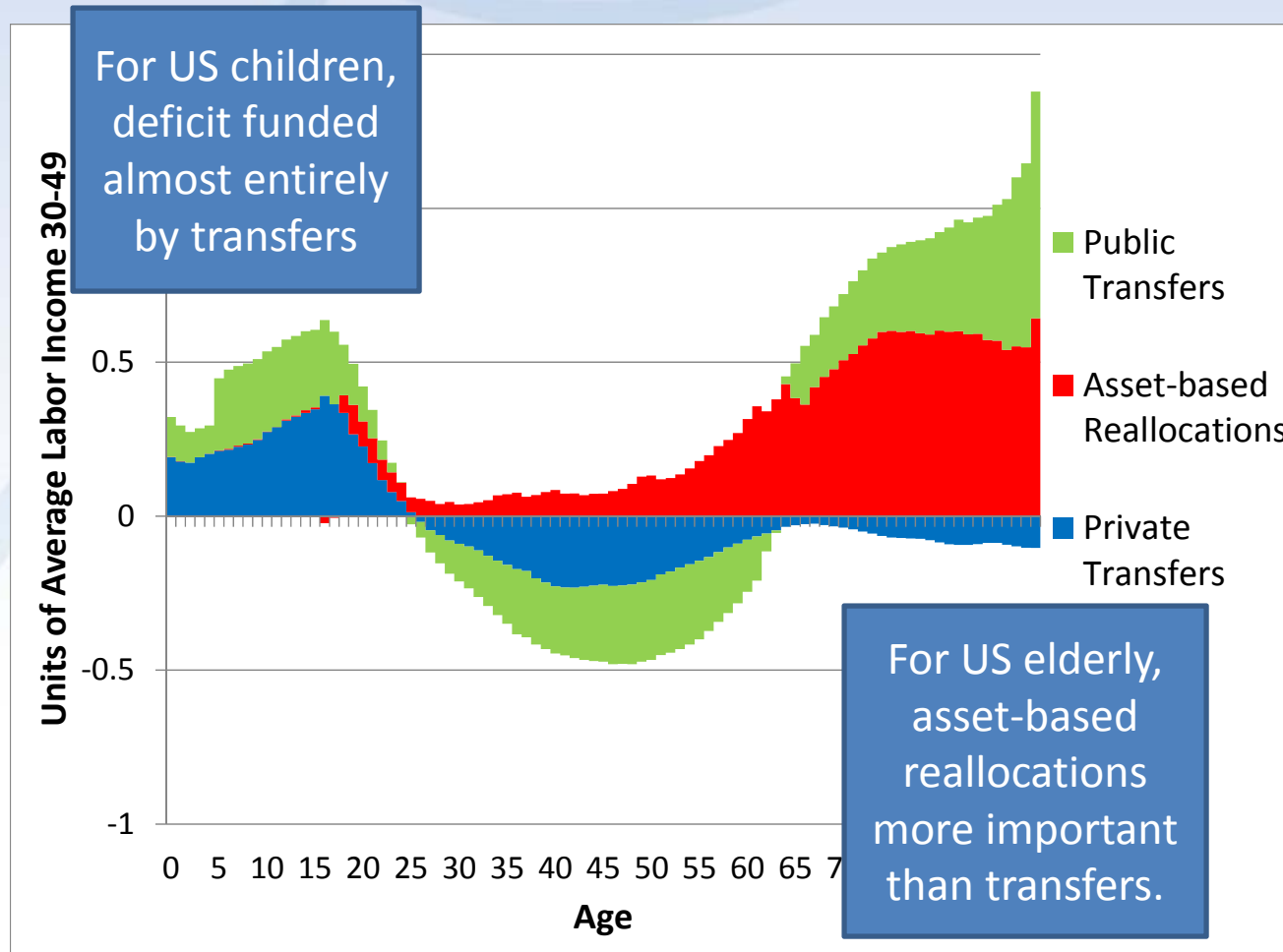- Standard story correct only when LCD is funded entirely by transfers.

NTA

Accounting

$$C(x) - Y^l(x) = \underbrace{\tau^+(x) - \tau^-(x)}_{\text{Net Transfers}} + \underbrace{rA(x) - S(x)}_{\text{Asset-based Reallocations}}$$

$\underbrace{}_{\text{Lifecycle Deficit}}$

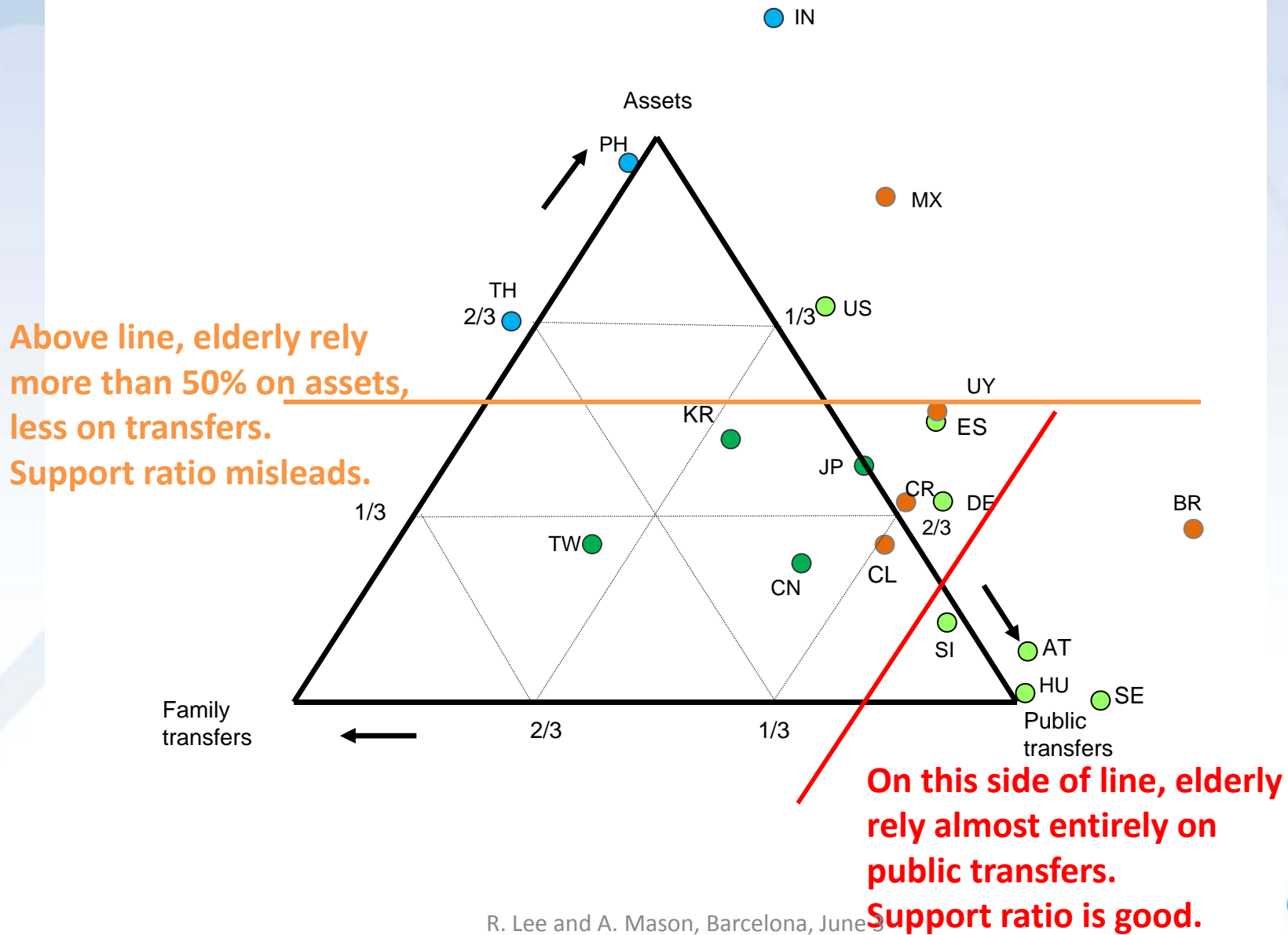$\underbrace{}_{\text{Age Reallocations}}$

- Lifecycle deficit: Two methods of funding
  - Public and private net transfers
  - Asset-based reallocations
    - Asset income (rA(x))
    - Dissaving (-S(x))

Funding the lifecycle deficit, US 2003

For US children, deficit funded almost entirely by transfers

For US elderly, asset-based reallocations more important than transfers.

Public Transfers

Asset-based Reallocations

Private Transfers

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Shares of net consumption of elderly funded by **Family Transfers, Public Transfers** and **Asset income** (part not saved)

The Solution – take asset based reallocation into account

- Generalized support ratio

$$GSR(t) = \frac{\int_0^\omega N(x,t)\, y_l(x)\, dx + \int_0^\omega N(x,t)\left[rA(x) - s(x)\right] dx}{\int_0^\omega N(x,t)\, c(x)\, dx}$$

$N(x,t)$: population age x in year t

Base year profiles held constant

$yl(x)$: labor income profile

$rA(x) - s(x)$: asset-based reallocation profile

$c(x)$: consumption profile

The Solution

- General Support Ratio

$$GSR(t) = \frac{\int_0^\omega N(x,t)\, y_l(x)\, dx + \int_0^\omega N(x,t)\left[rA(x) - s(x) \right] dx}{\int_0^\omega N(x,t)\, c(x)\, dx}$$

Standard support ratio:
share of consumption
funded through work.

The Solution

- General Support Ratio

$$GSR(t) = \frac{\int_0^\omega N(x,t) \, y_l(x) \, dx + \int_0^\omega N(x,t)\left[rA(x) - s(x) \right] dx}{\int_0^\omega N(x,t) \, c(x) \, dx}$$
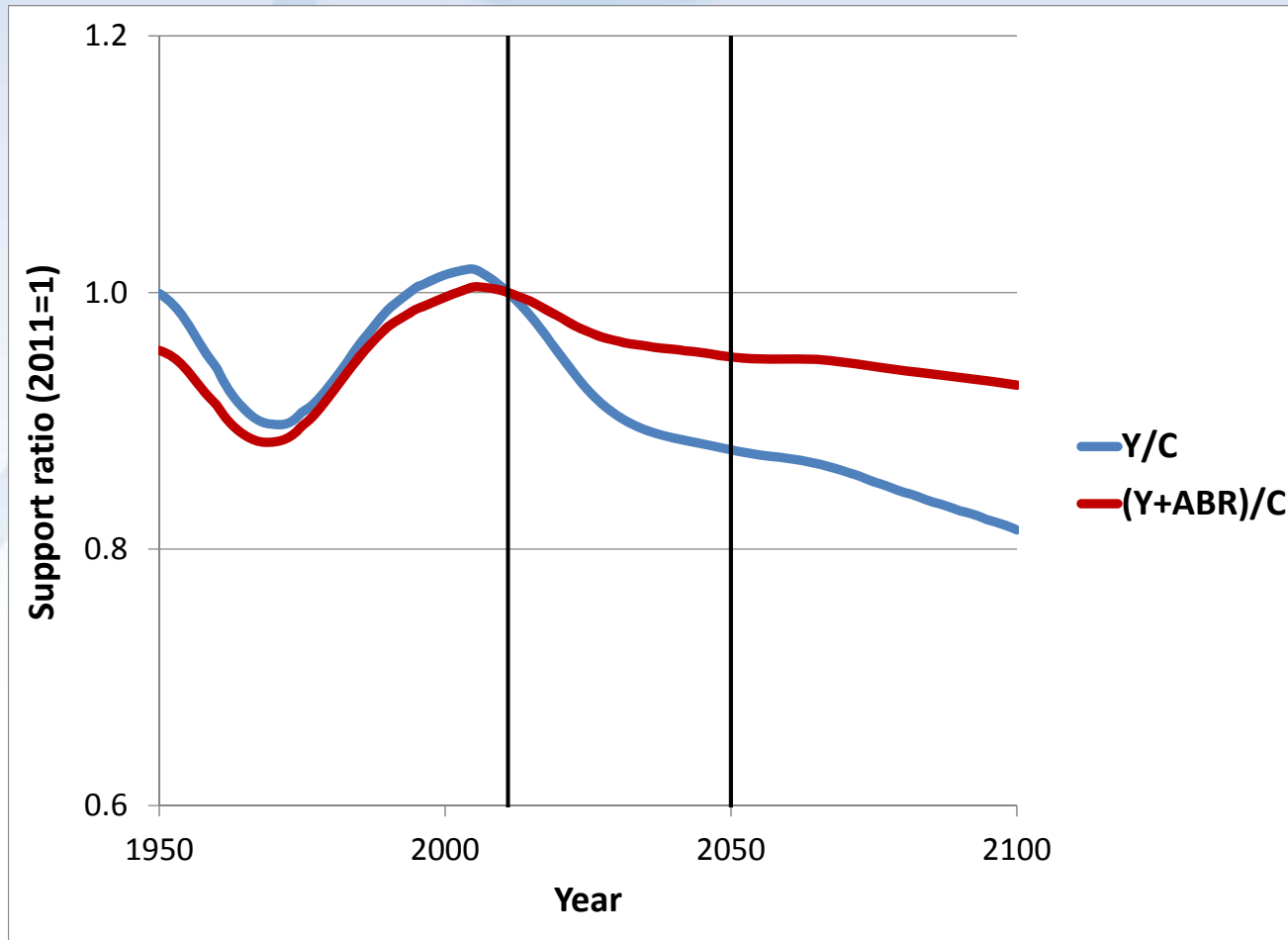
Share of consumption

- 1-GSR(t): Share of consumption funded or relying on relying on public and private transfers. assets
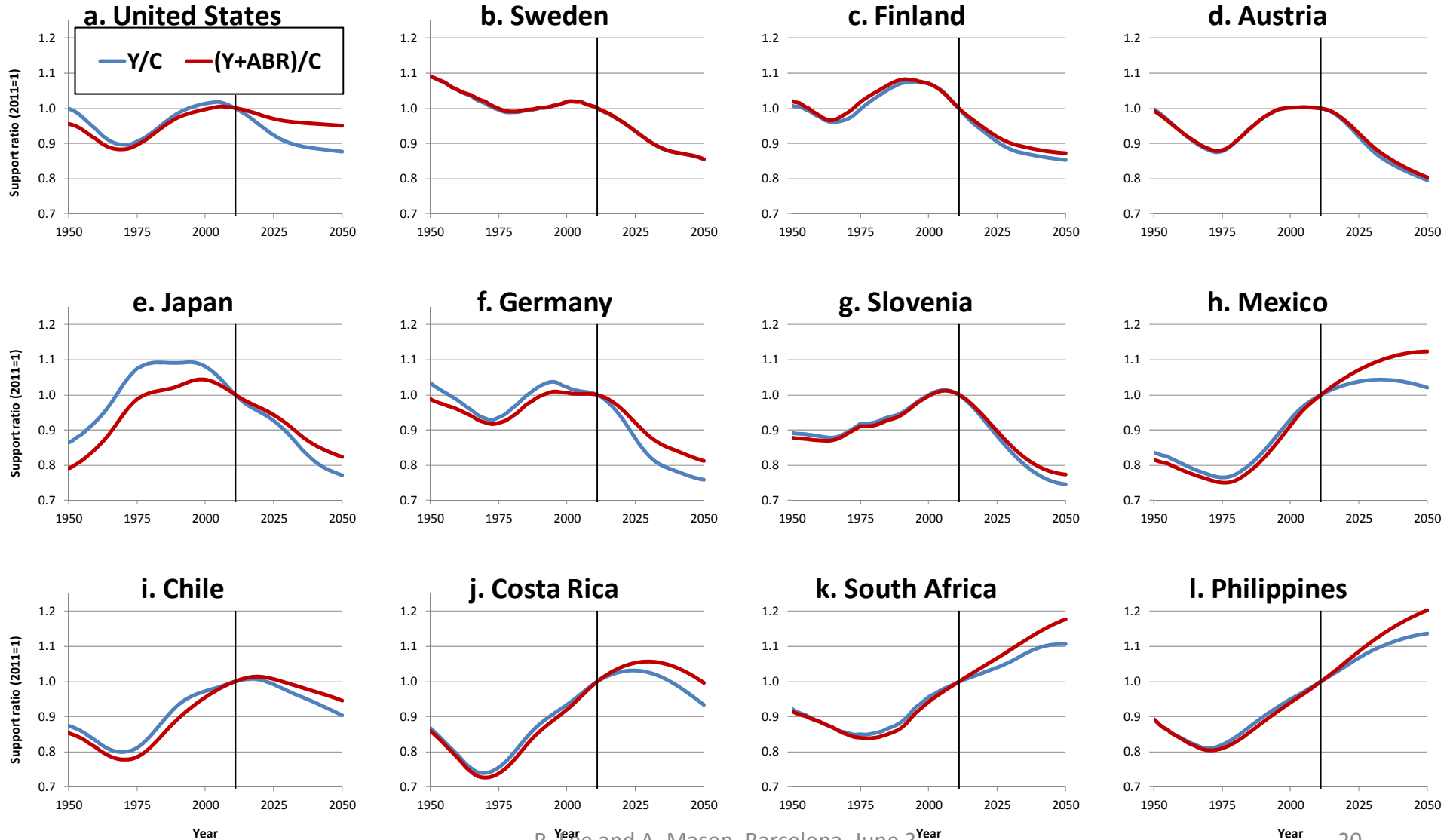
Age profiles of consumption, labor income and asset-based reallocations, US 2003
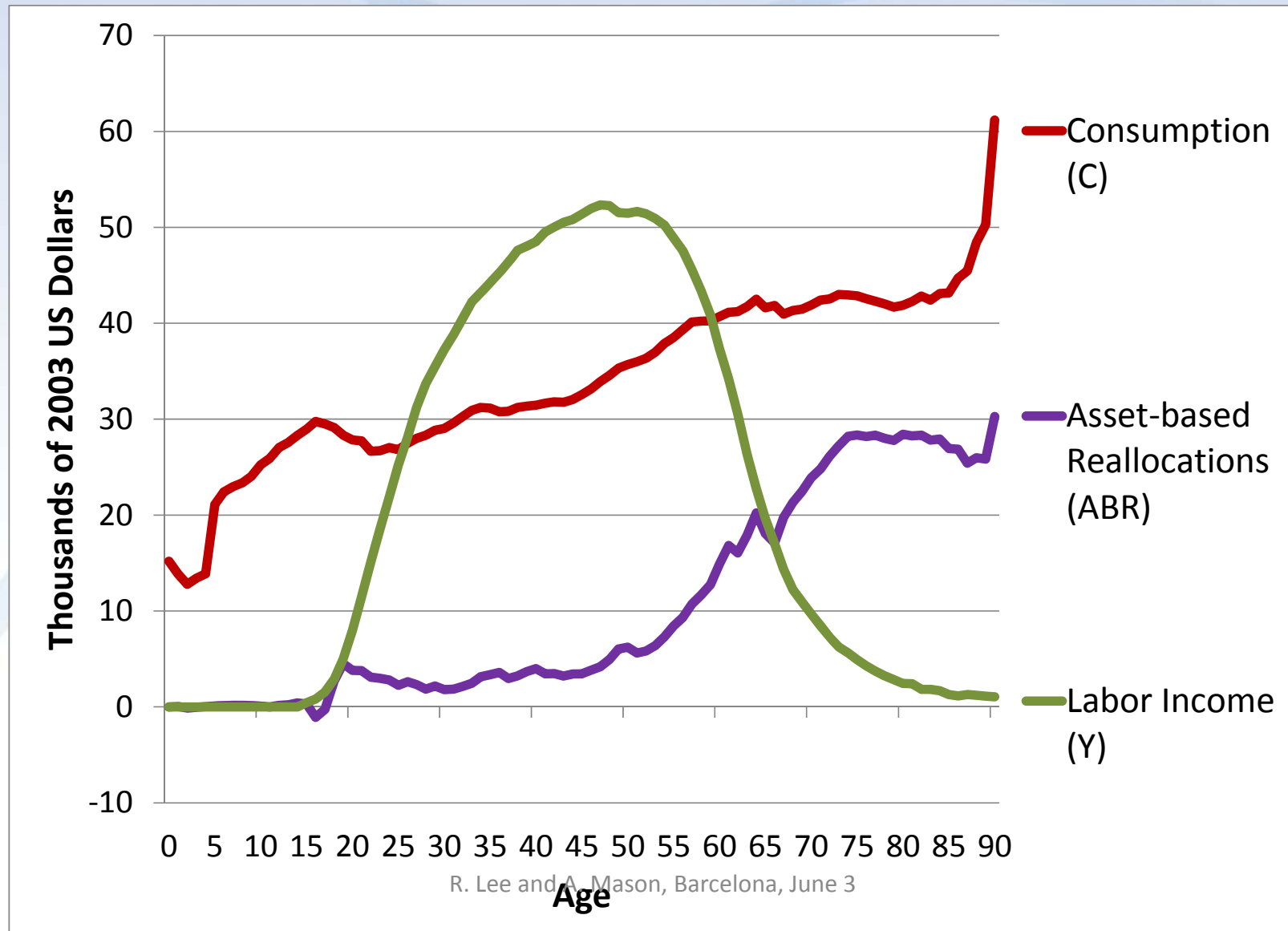
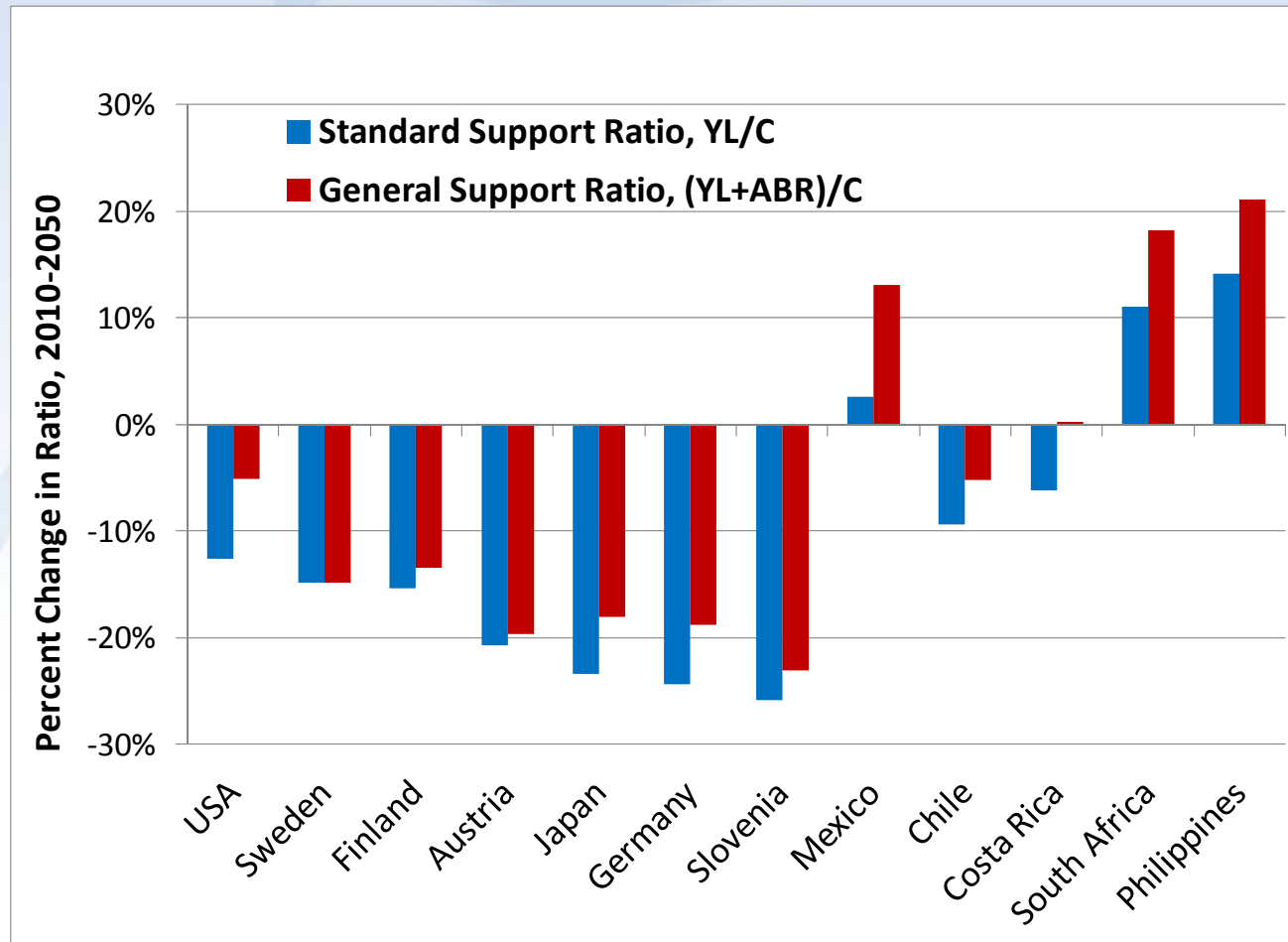# Standard support ratio and general support ratio, US (2011=1.0)

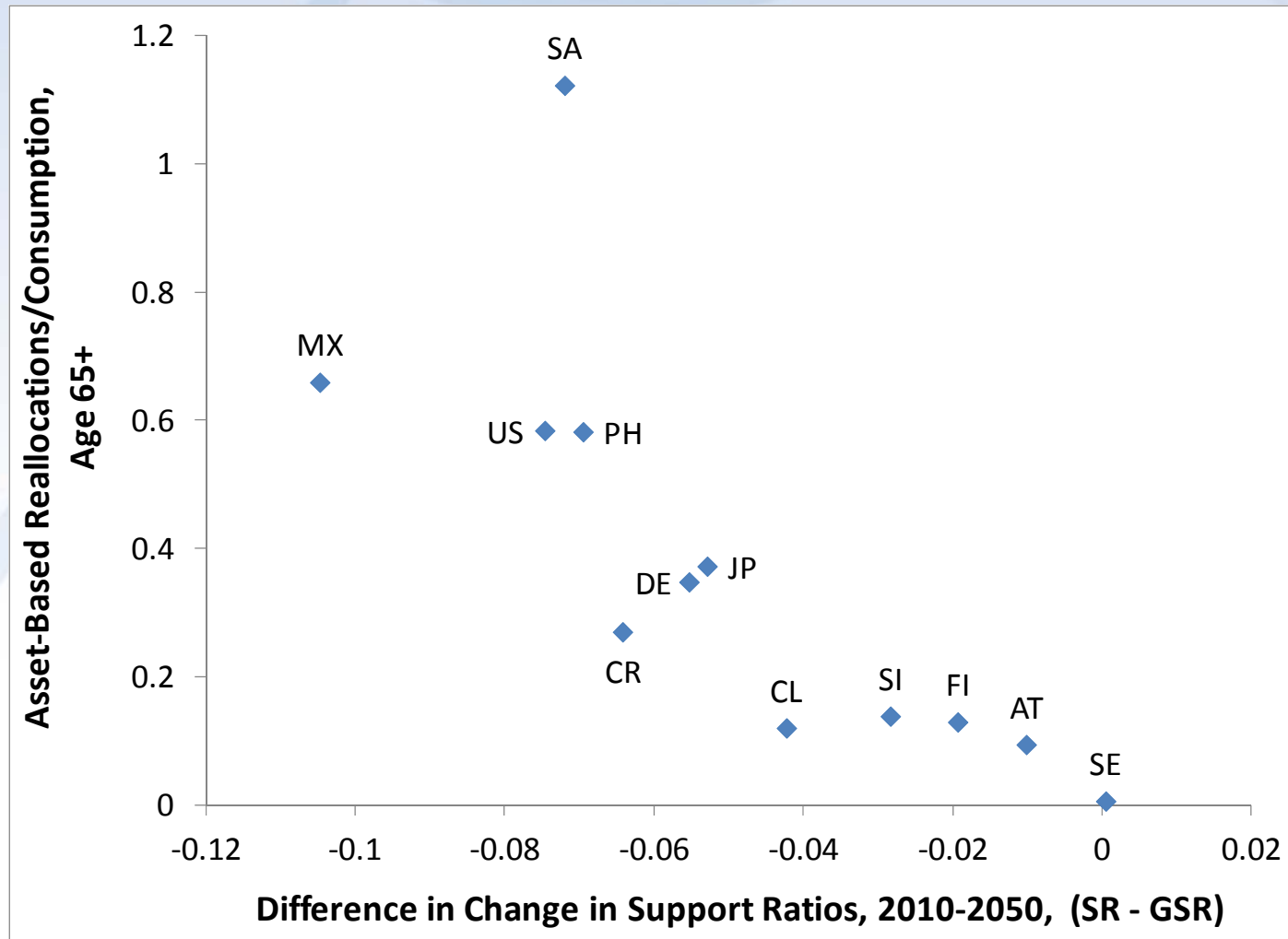# Standard support ratios (blue) and general support ratio (red)

Vertical lines at year 2011 represent first year of projection. All SR scaled to equal 1 in 2011.

Change in support ratios from 2010 to 2050

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Proportion of C financed by ABR vs. difference between the change in the two support ratios, 2010-2050

Caveats

- Assumes that new elderly have accumulated assets equal to those of previous elderly.
  - They might accumulate less due to public pensions and annuitization of wealth
  - They might accumulate even more due to fewer kids and for longer retirement.
- If elder assets are land or other natural resources then their assets do not boost output.
  - In this case, standard support ratio story is correct.
  - Is this so in lower income countries with high reliance on asset income in old age? Indonesia, India, Philippines?

Conclusion for General Support Ratio

- Describes the economic dependency structure better than the support ratio.

- Avoids unduly pessimistic view of population aging by incorporating second dividend effects that arise from capital accumulation.

- Reflects cost of heavy reliance on transfers.

- Implications relative to traditional ratio
  - Dividend period is extended
  - Effects of population aging are smaller.