How old is too old?

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Kick-Off Meeting AGENTA

January 17-18, 2014

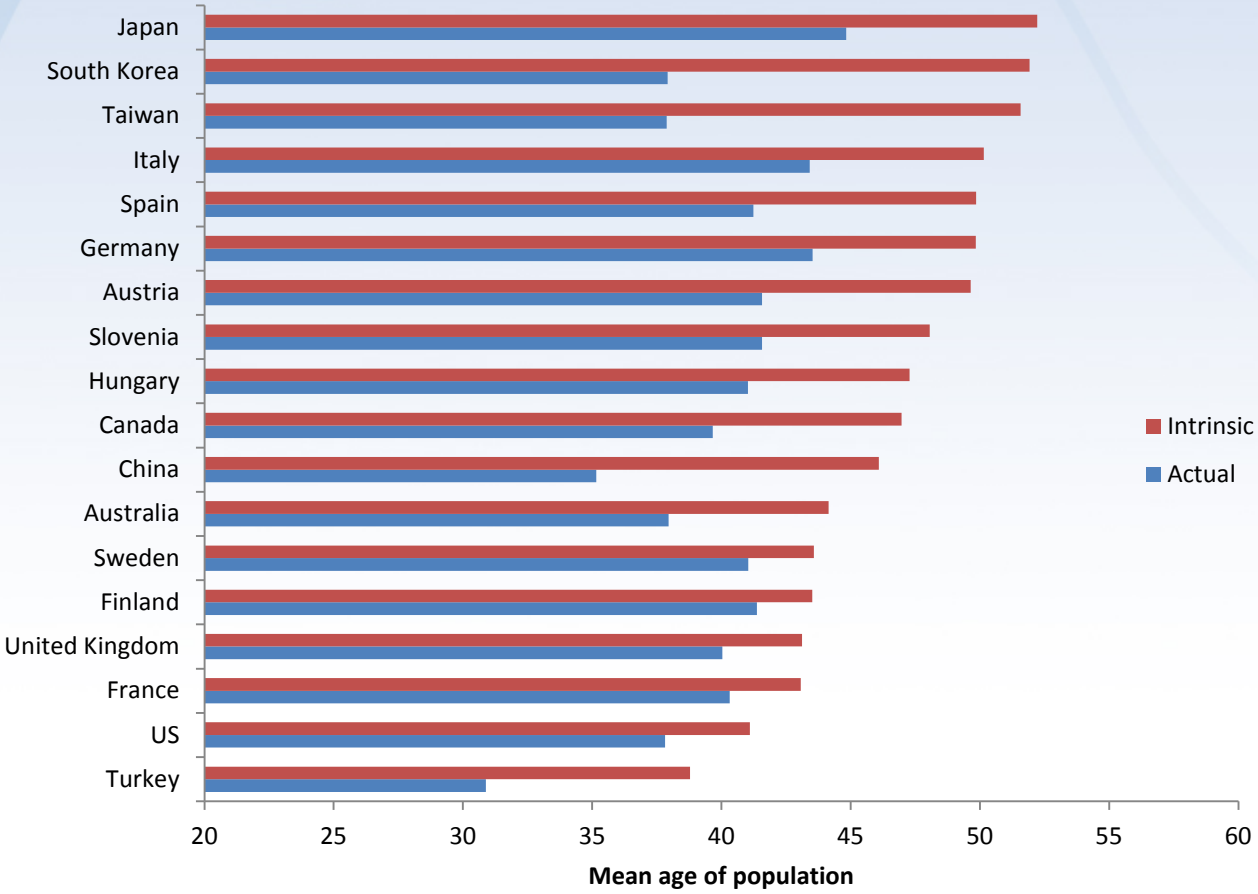
Vienna, Austria

Acknowledgements

- Draws heavily on paper currently under review: Lee, Mason, and members of NTA network, “Is Low Fertility Really a Problem? Population Aging, Dependency, and Consumption”.
- Helpful comments by Hippolyte d’Albis and David Canning
- Able research assistance of Diana Stajonovic and Gretchen Donehower.

Aging in Aging NTA Countries

- Many advanced countries are old and getting older.
- Eventually average age of population will be close to 50 or greater in E Asia and parts of Europe.
- Low fertility is very important factor along with rising longevity.
- Aging less severe in Northern Europe and US.



Note: Actual is average age in 2010; intrinsic is eventual age given survival and fertility schedules for 2005-10 and no immigration.

Analytic strategy

- Analysis focuses on intrinsic age of population – the age that will result if no changes in fertility or mortality
- For low fertility countries this age is lower than projected by the UN, because fertility is assumed to increase.
- Why this approach?
  - Uncertainty about future fertility trends
  - Policy issue of interest is whether countries should try to encourage changes in demographic rates, i.e., fertility and mortality.
  - Emphasis is on fertility (pro-natalist policies)

Analytic Strategy

- Emphasis is on two outcome:
  - Public finances
  - Material standard of living as measured by consumption per equivalent adult consumer
- Neither of these are intended to measure welfare as they do not include the value of children to their parents.
- Moreover, the analysis incorporates nothing about the effects of population on the environment, nor do we include scale economies.
- This limits the policy implications of the analysis.
- An important exception: Analysis can be appropriately used to rule out government intervention to raise fertility.

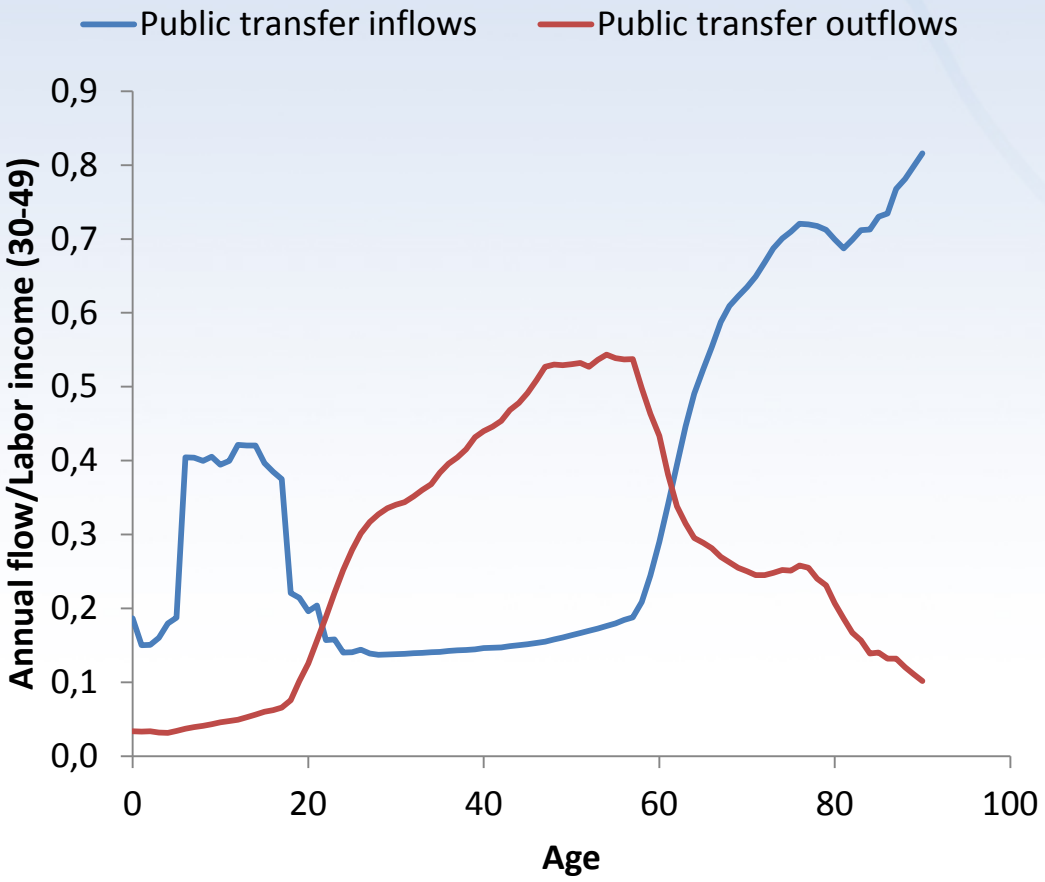
Highlights

- Aging (low fertility) will strain public sector finances in many countries.
- Aging is less of a problem for standards of living in most countries.
- Fertility below replacement and gradual population decline are compatible with economic goals.
- Some possible extensions.

Public Finances

Public transfer inflows and outflow by age, Japan 2004

- Aging will lead to a decline in the relative number in high tax-paying ages.
- Aging will lead to an increase in the relative number in high benefit-receiving ages.
- To maintain budget balance, taxes rates must be increases and/or benefits reduced.



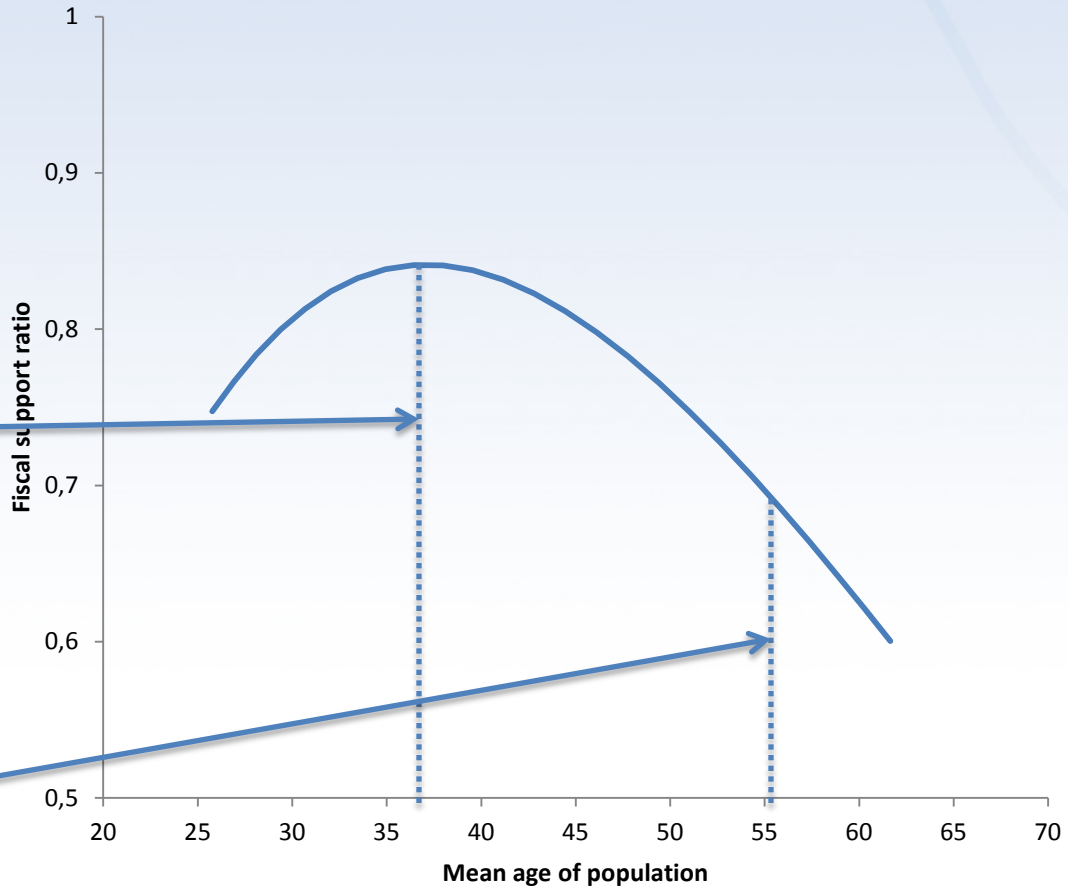
Source: Ogawa and Matsakura.

Fiscal support ratio (SRG)

SRG summarizes the adjustments to taxes and/or spending required to maintain balance between inflows and outflows.

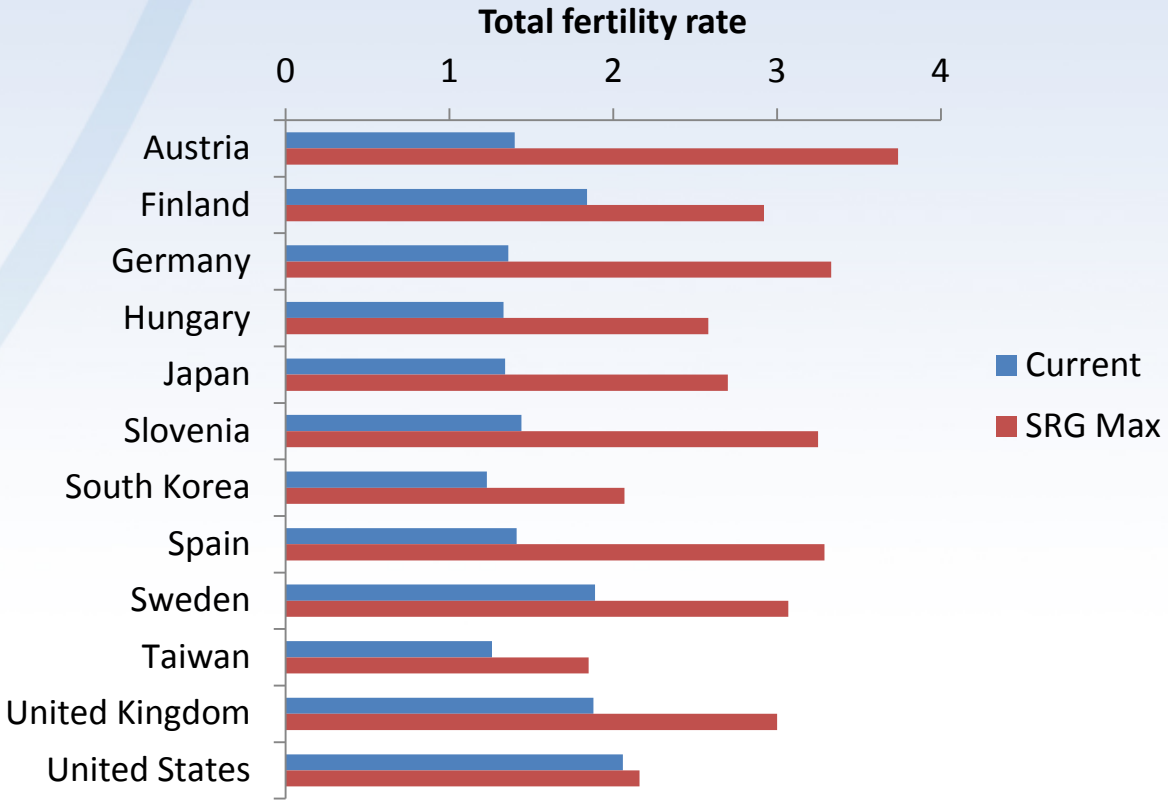
<u>Best possible outcome</u>
- Mean age in the mid-30s
- Spending cut of 16% or
- Tax increase of 19%

<u>Status quo outcome</u>
- Mean age in the mid-50s
- Spending cut of 30% or
- Tax increase of 45%



Given age profiles of public transfer inflows and outflows and 2009 mortality schedule.

Higher TFR and younger population would improve fiscal situation in advanced countries (except perhaps US)



Source: Lee, Mason et al. 2013.

Key points

- Current tax and spending is in a very favorable, but transitory, demographic environment – fiscal demographic dividend.
- For any demographic scenario, major adjustments, higher taxes and/or lower spending, will be required.
- In most countries the best possible outcome occurs at a much younger age than is plausible.
- Status quo fertility and mortality will require very large adjustments to taxes and benefits.
- Analysis says NOTHING about whether spending should be increased or spending reduced.

Highlights: Standards of Living

- Analysis builds on existing theory: Solow, 1956; Samuelson, 1958, 1975; Phelps, 1961; Tobin, 1967; Arthur and McNicoll, 1977, 1978; Tobin, 1978; Willis, 1988; Lee, 1994.
- Fertility decline has two long-term fundamental effects
  - On age structure influencing the relative size of the working-age population.
  - On population growth influencing capital deepening and/or consumption rates.
- At high levels of fertility, two effects are reinforcing and fertility decline leads unambiguously to higher standards of living.
- At low levels of fertility, the age structure effect turns negative and eventually dominates the population growth effect.

Per Capita Consumption Identity

$$\frac{C}{N} = \frac{(1-s)Y}{L}\frac{L}{N}$$

$$= \frac{C}{L}\frac{L}{N}$$

$$\text{Consumption per effective consumer} = \text{Consumption per effective worker} \times \text{Support Ratio}$$

Effective consumers (N) – population is weighted to account for age differences in consumption.

Effective producers (L) – population is weighted to account for age differences in labor force participation, hours worked, productivity, and unemployment.

Consumption per Effective Worker

Aggregate constraint: consumption can be increased by reducing the saving rate, but that leads to less capital and lower income. The tradeoff depends on the rate of population growth.

$$sy = (n + \lambda + \delta)k$$

k – capital per worker

n – population growth rate

λ – productivity growth rate

δ – depreciation rate

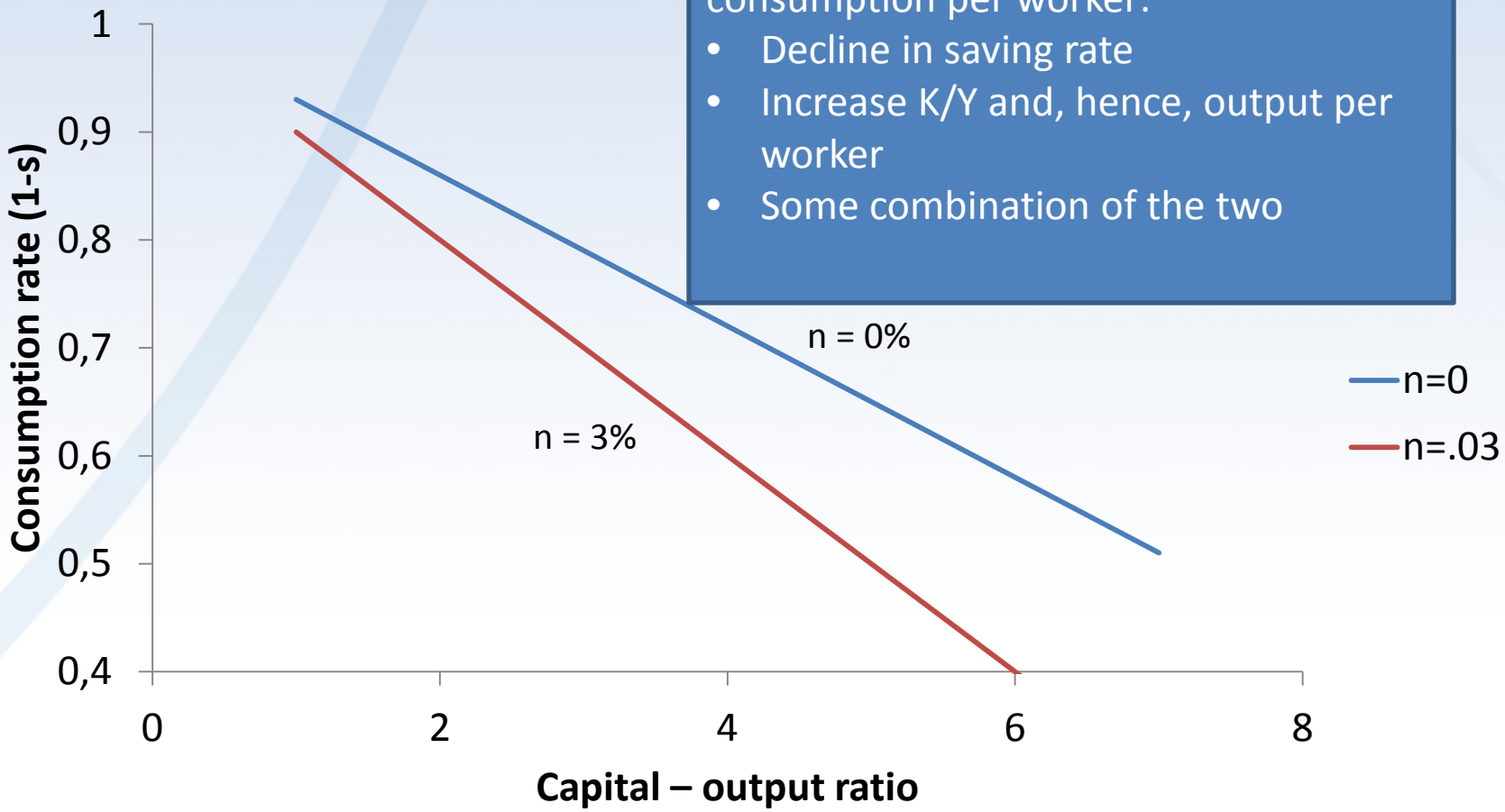
$$s = (n + \lambda + \delta)\, K/Y$$

Aggregate budget constraint

$$1-s=1-(n+\lambda+\delta)K/Y$$

Slower population growth allows greater consumption per worker:

- Decline in saving rate
- Increase K/Y and, hence, output per worker
- Some combination of the two



Outcome depends on how capital accumulation (s, K/Y) are affected by aging

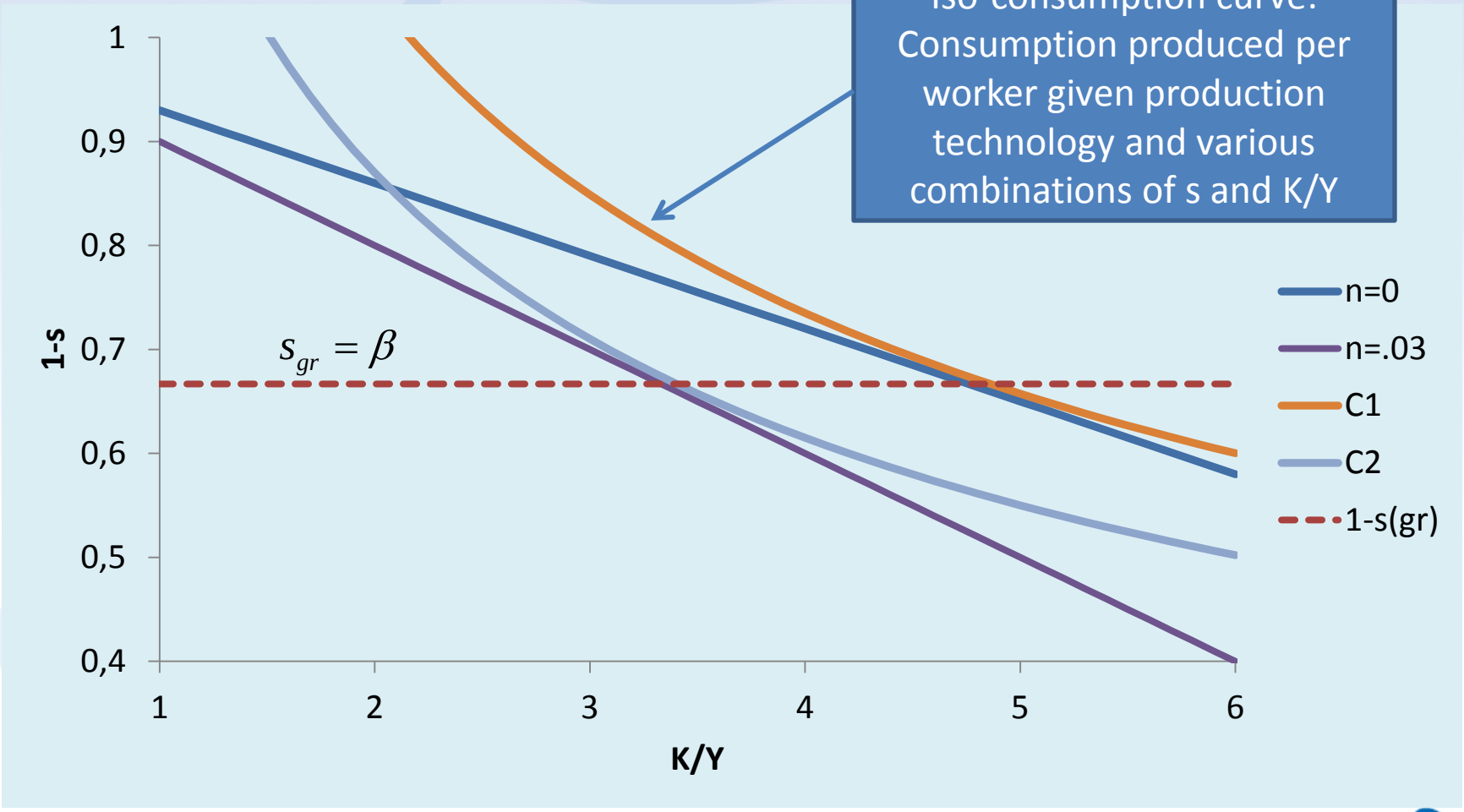
I. Exogenous saving
   - Solow growth model
   - Special case: Golden rule growth

II. Exogenous K/Y
   - Consistent with stylized facts (although recent rise in K/Y)

III. Lifecycle saving model
   - Based on NTA profiles

Case I: Golden Rule

$$1-s=1-(n+\lambda+\delta)K/Y$$



Note: Assumes Cobb-Douglas production function.

Case I: Golden Rule

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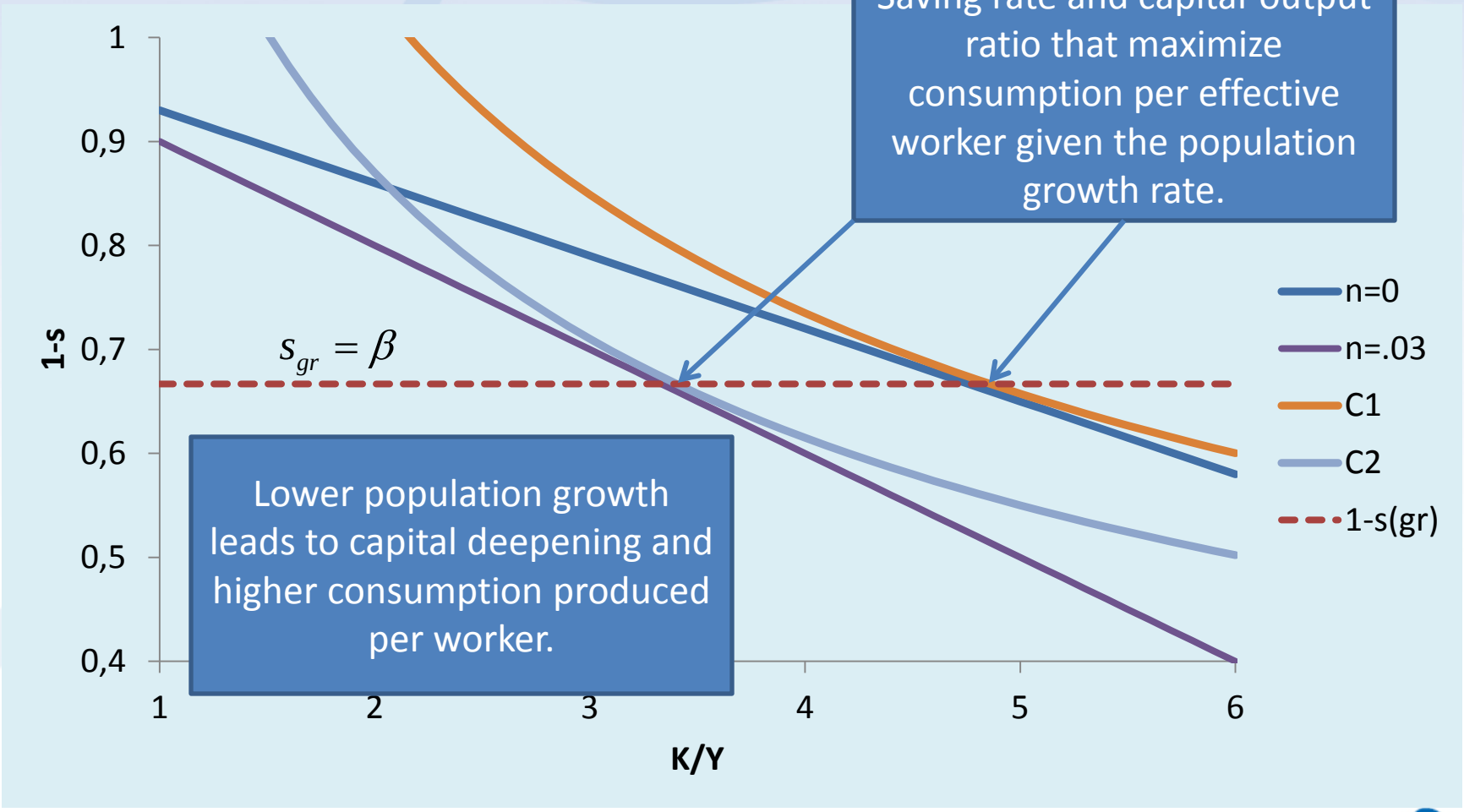
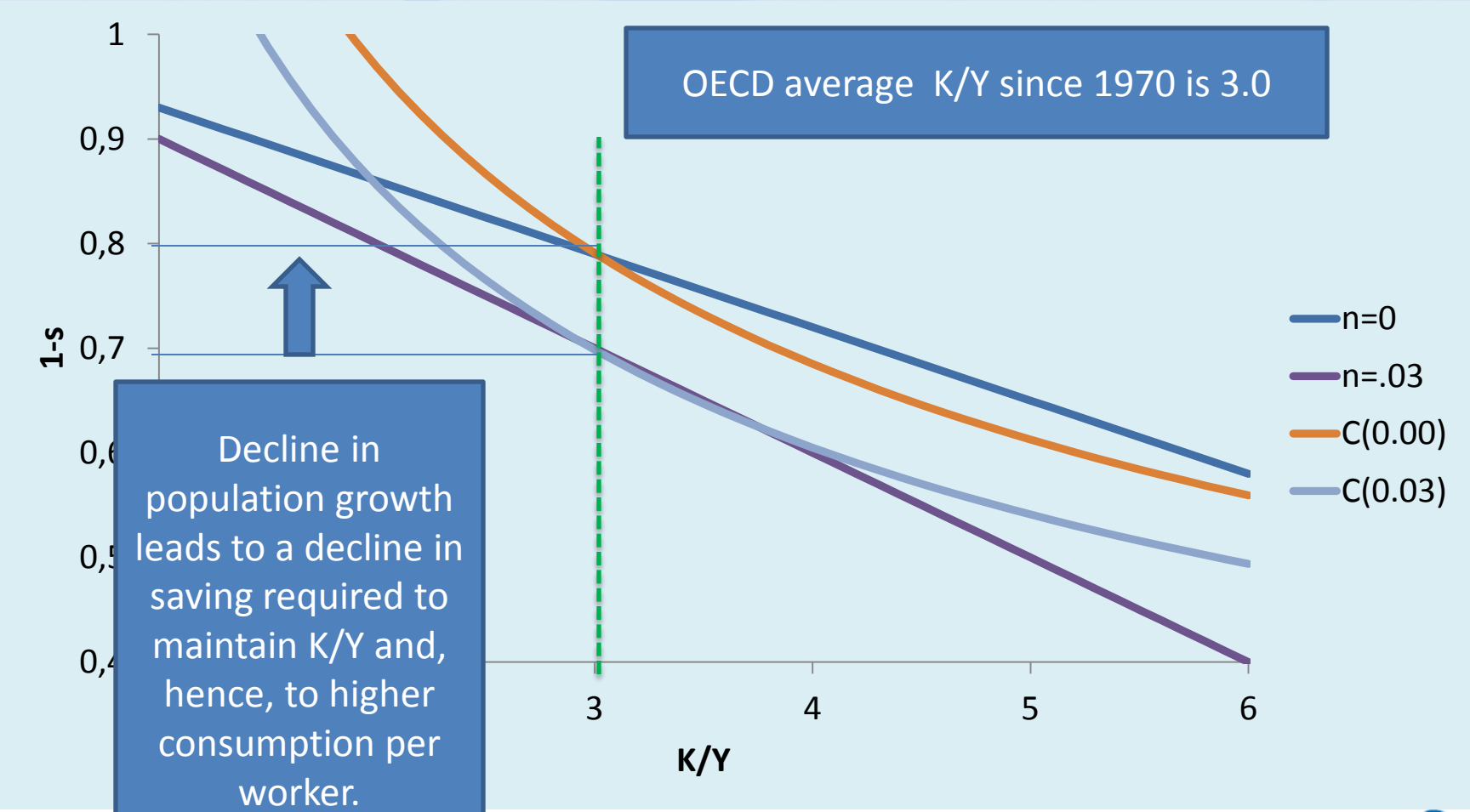


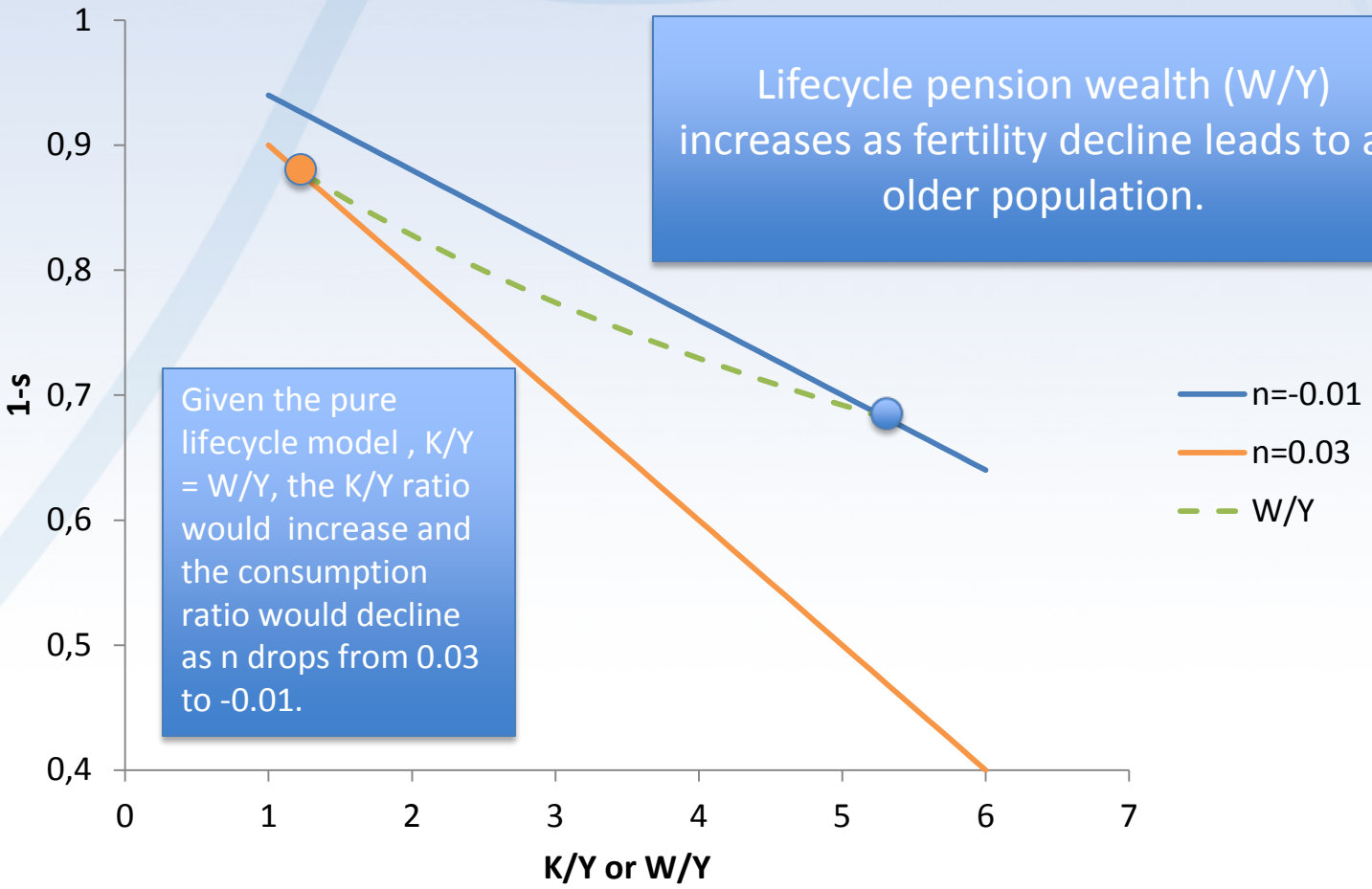
Note: Assumes Cobb-Douglas production function.

Case II: Exogenous (K/Y)

$$1-s=1-(n+\lambda+\delta)K/Y$$

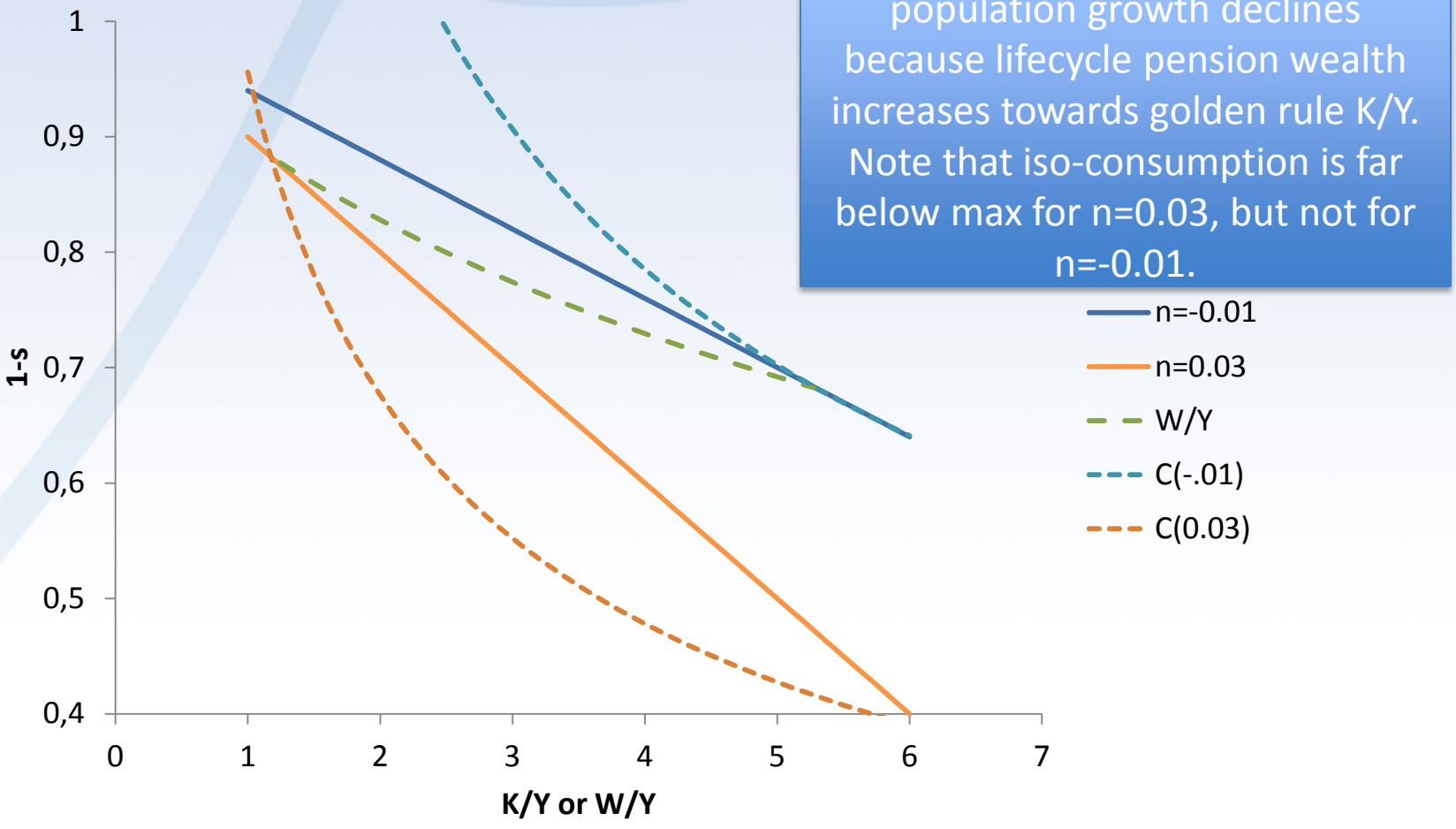


Lifecycle Pension Wealth



Lifecycle Pension Wealth

C/L increases quite substantially as population growth declines because lifecycle pension wealth increases towards golden rule K/Y. Note that iso-consumption is far below max for n=0.03, but not for n=-0.01.



Key Points

- Slower population growth (lower fertility, population aging) allows workers, on average, to produce more consumer goods and services favoring higher standards of living.
- Whether standards of living rise depends on the support ratio: effective number of consumers per effective worker.

Support Ratio (L/N)

- Constructed using National Transfer Account estimates.
- Effective number of workers incorporates age variation in:
  - Labor force participation
  - Unemployment
  - Hours worked
  - Productivity and wages
- Effective number of consumers incorporates age variation in combined public and private consumption reflecting tastes, biology, and public policy towards health care and public pensions.

Support Ratio Defined

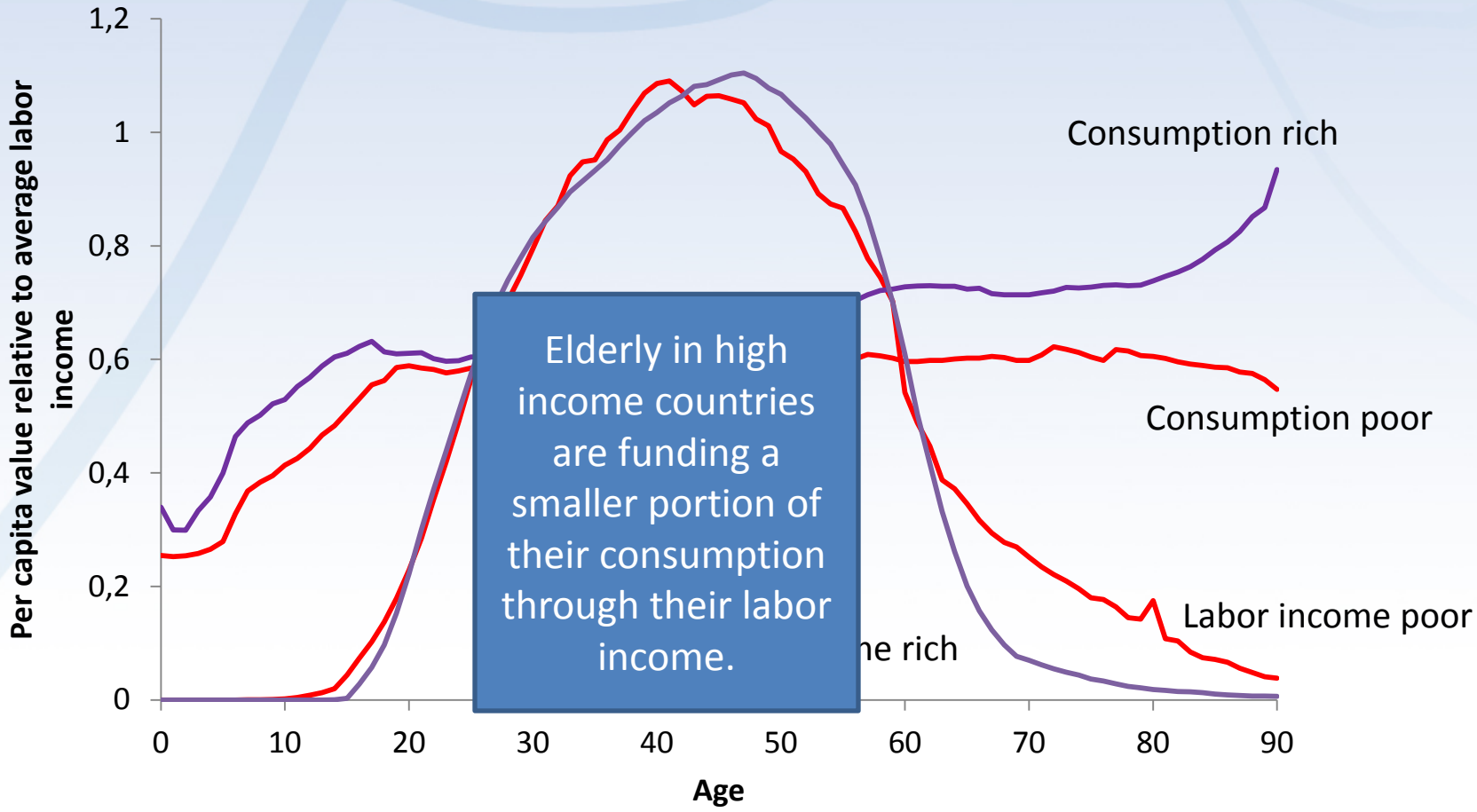
$$SR_t = \frac{L}{N} = \frac{\sum_x y_l(x,t_0)P(x,t)}{\sum_x c(x,t_0)P(x,t)}$$

y_l – Age index of labor income

c – Age index of consumption

P – Population.

Profiles of labor income and consumption
High and low-income countries



Source: Lee and Mason 2011.

Analytics combining C/L and SR

- Fiscal

$$SRG_{\max}: A_{taxpayers} - A_{beneficiaries} = 0$$

- Support ratio

$$SR_{\max}: A_{producers} - A_{consumers} = 0$$

- Consumption (Fixed K/Y or golden rule case)

$$C / N_{\max} : A_{producers} - A_{consumers} - K / C = 0$$

Current TFR and TFRs that maximize each objective

Income group	Current TFR	Fiscal support ratio	Support ratio	Consumption	
				K/Y=3	Golden rule
Lower income	3.82	1.04	1.77	1.24	0.94
Upper-middle income	2.19	3.31	2.02	1.52	1.20
High income	1.58	2.83	2.28	1.79	1.48

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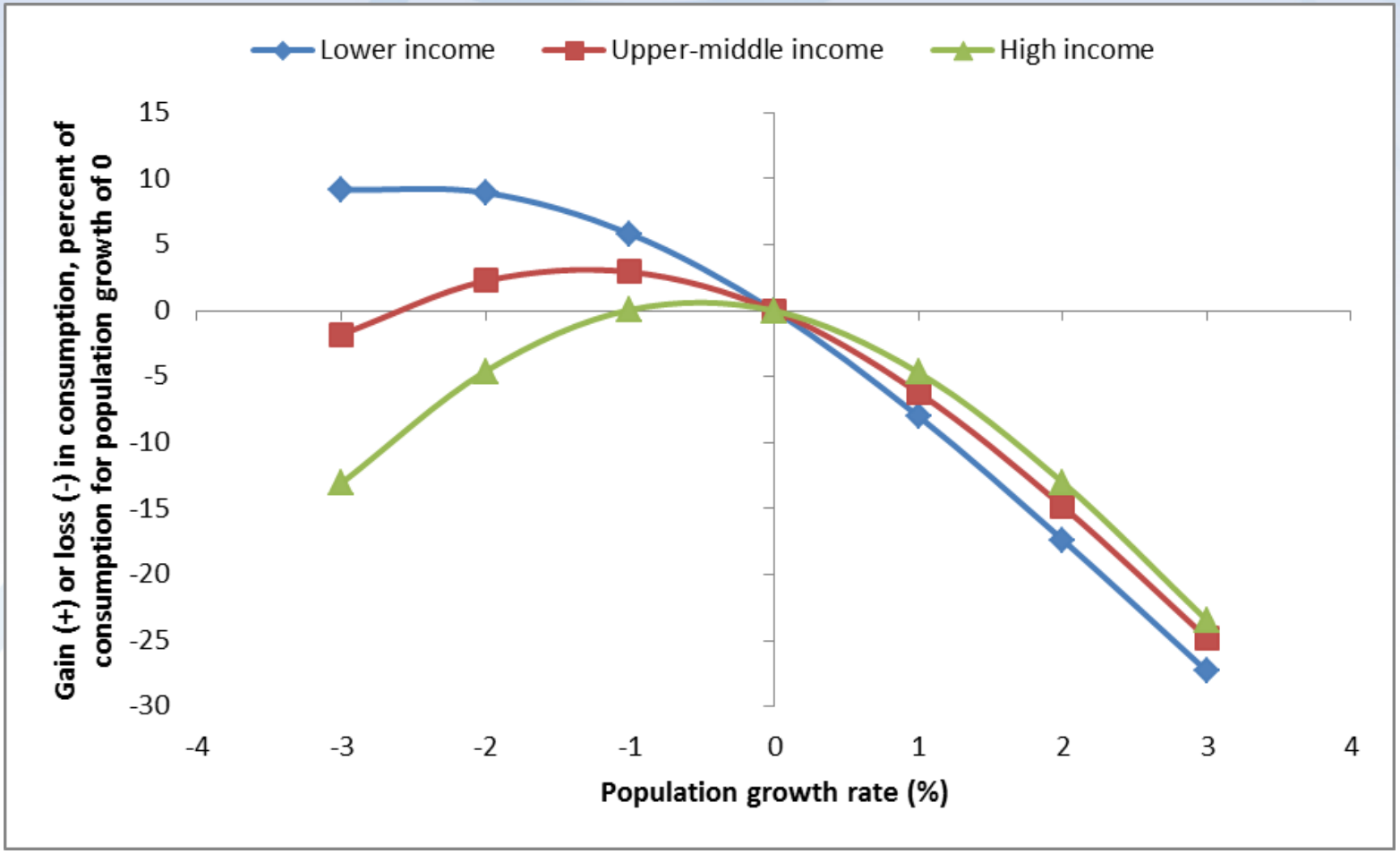
Upper-middle income	2.19	3.31	2.02	1.52	1.20
High income	1.58	2.83	2.28	1.79	1.48
- low TFR	1.35	2.85	2.21	1.74	1.44
- high TFR	1.88	2.79	2.35	1.86	1.54

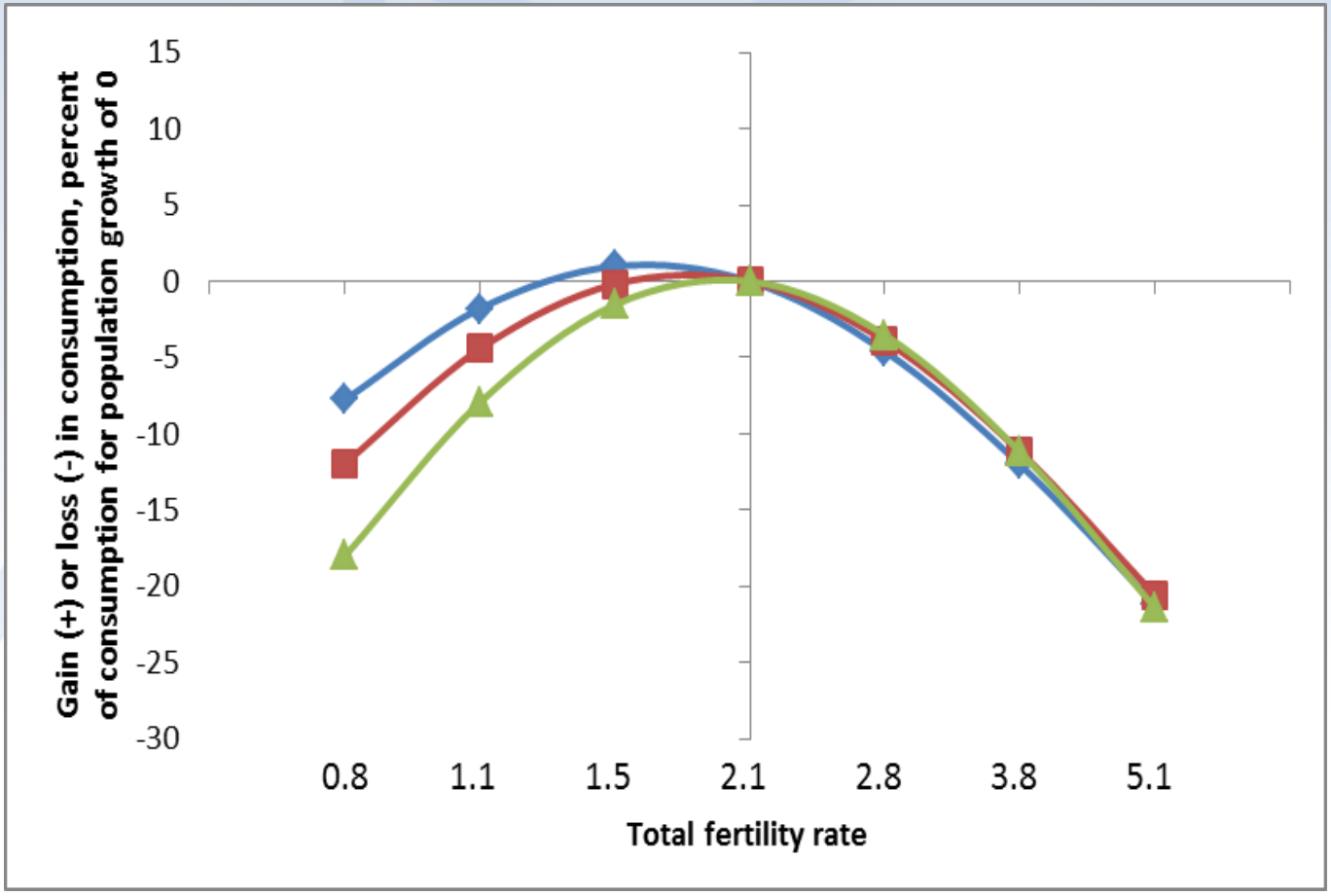
Countries with TFR < 1.5 classified as low TFR.
Low TFR: Austria, Germany, Hungary, Italy, Japan, Slovenia, South Korea, Spain, Taiwan.
High TFR: Australia, Canada, France, Sweden, UK, US.

Effect of TFR on Consumption (K/Y = 3, own mortality schedule)



Note: Average values for NTA countries using their current survival schedule and consumption and labor income profiles.

Effect of TFR on Consumption (K/Y = 3, Japan survival schedule)



Note: Average values for NTA countries using current survival schedule for Japan and their own consumption and labor income profiles.

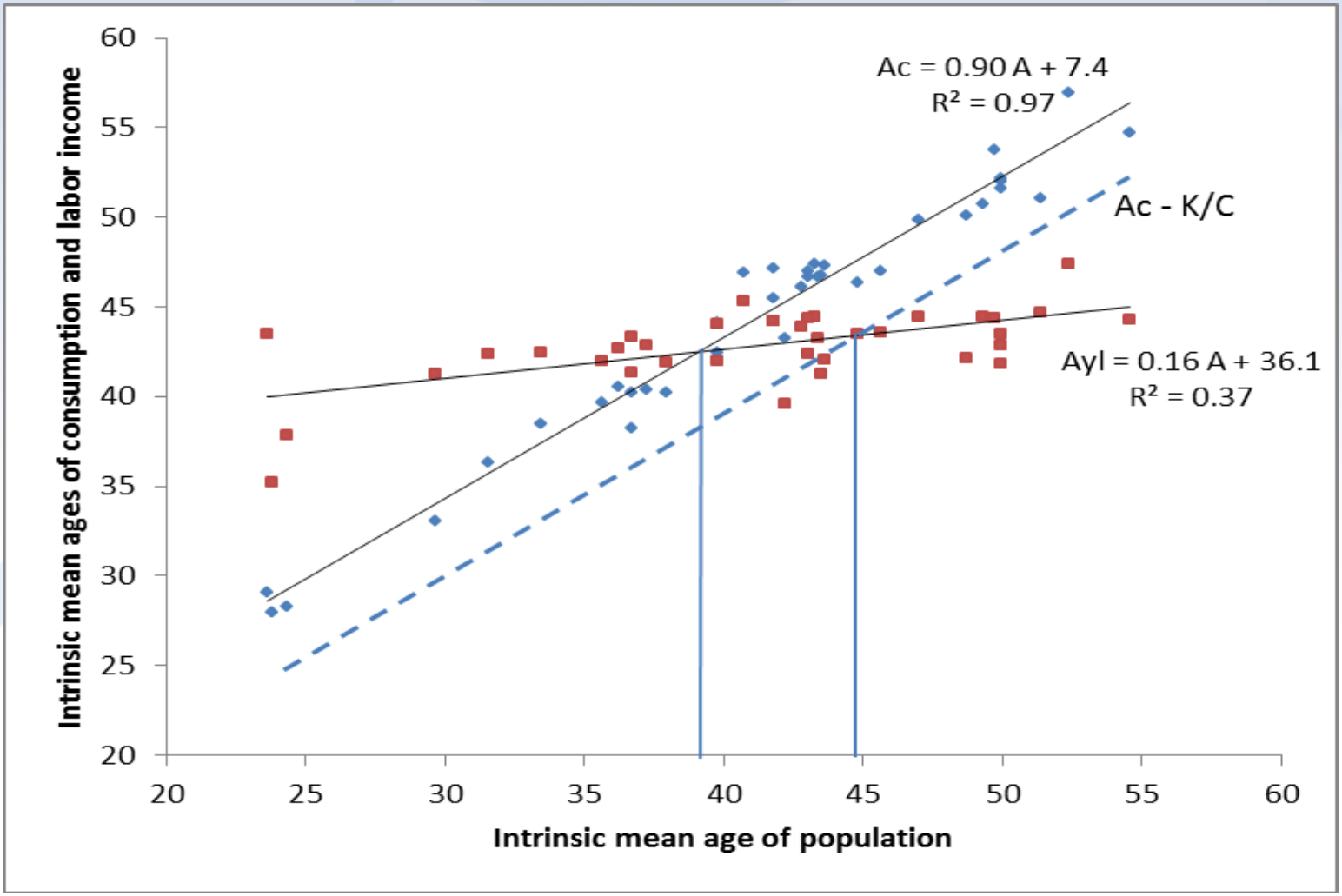
Conclusions

- Very low fertility will require substantially higher taxes or lower benefits in European countries with large, public old-age support systems.
- Moderately low fertility does not lead to lower standards of living.
- Very low fertility has a moderately adverse economic effect.
- Analysis does not include “consumption value” of children. Hence,
  - Does not provide rationale for intervention to reduce fertility
  - Does indicate that pronatalist incentives may not be warranted.
- Implications of scale economies and resources not considered, but these may reinforce our findings.

Extensions

- How does population aging influence age of effective consumers and producers if labor income and consumption profiles are shifting?
  - People may be more productive in old age
  - Elderly may use political power to raise their consumption
- How do changes in life expectancy (held constant above) influence the conclusion?

Cross-sectional relationship between A, Ac, and Ayl



As e0 increases, fertility required to maintain high C/N will increase.