

The Population Dimension in East Asian Development

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General Framing

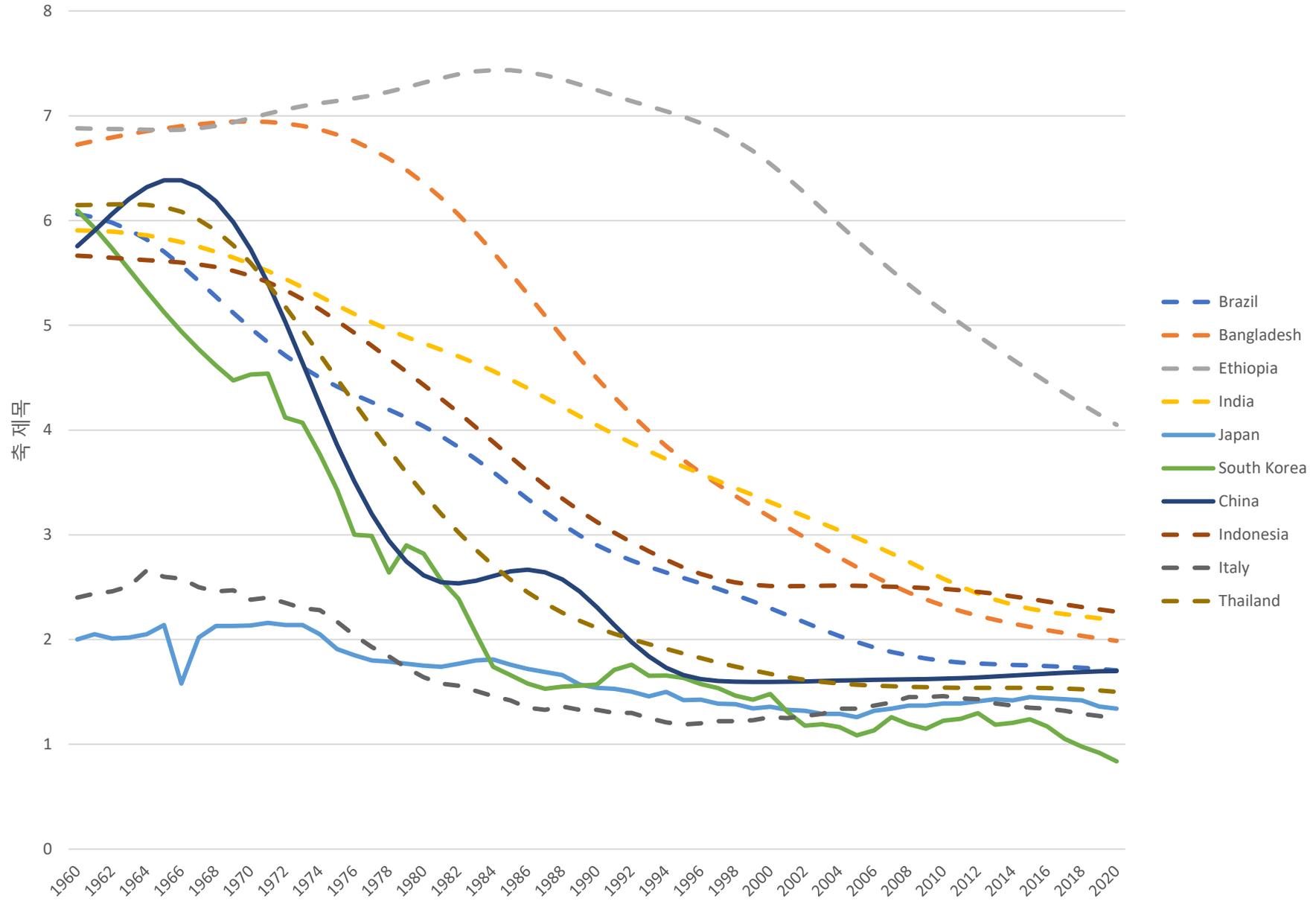
- East Asia has an unusual history in terms of economic growth.
 - Japan, S. Korea, and China among the fastest growing large countries.
- East Asia also has an unusual population history.
 - Among the fastest fertility transitions (at least for S. Korea and China).
 - Among the lowest fertility rates.
 - Among the fastest aging.
 - High population density prior to the demographic transition.
- I want to ask what these things had to do with each other.
 - Causality one way, both ways, or from identifiable third factors?
 - I do *not* want to make any claim that fertility restriction was the key to east Asian economic success.
 - I do want to think quantitatively about how much of the rapid growth in east Asia was due to the unusual population history.

Outline

1. Fertility transition speeds and their determinants
2. Dependency, aging, and sub-replacement fertility
3. The contribution of fertility reduction to economic growth
4. Quality-adjusted population density

Fertility Transition Speeds

Total Fertility Rates (World Development Indicators Data)



Speed and Size of Fertility Transitions

- Informal econometrics: for each country, I looked at the period of largest consistent decline in the TFR.
- France (1800, 4.4) (1910, 2.6) .16 per decade
- United States (1845, 6.1) (1935, 2.2) .43
- United Kingdom (1880, 4.9) (1935, 1.8) .56
- Sweden (1900, 4.0)(1935, 1.7) .66
- Italy (1910, 4.4)(1960, 2.3) .42
- Japan (1950, 4.0)(1960, 2.2) 1.8
- Brazil (1965, 6.0) (2005, 2.1) .98
- S. Korea (1960, 6.3) (1990, 1.6) 1.6
- Thailand (1970, 6.0) (1990, 2.3) 1.9
- China (1970, 6.3) (1985, 2.5) 2.5
- Bangladesh (1980, 6.6) (2010, 2.5) 1.4

What Causes Fertility Transitions? (The Usual Suspects)

- Decline in mortality
- Changes in economic structure
 - Return to human capital, social safety net
- Changes in social structure and culture (“modernization”)
 - Women’s rights, urbanization
- Changes in contraceptive technology
- Soft government persuasion
 - Propaganda, support for family planning, etc.
- Hard government persuasion
 - One-child policy in China

What Causes Fertility Transitions? (The Usual Suspects)

- These factors may matter different amounts in different cases of fertility transition.
 - Vary across countries
 - Vary on average over time
- No one has a good quantitative decomposition of which factors mattered how much in any give case, much less how it varied across cases.

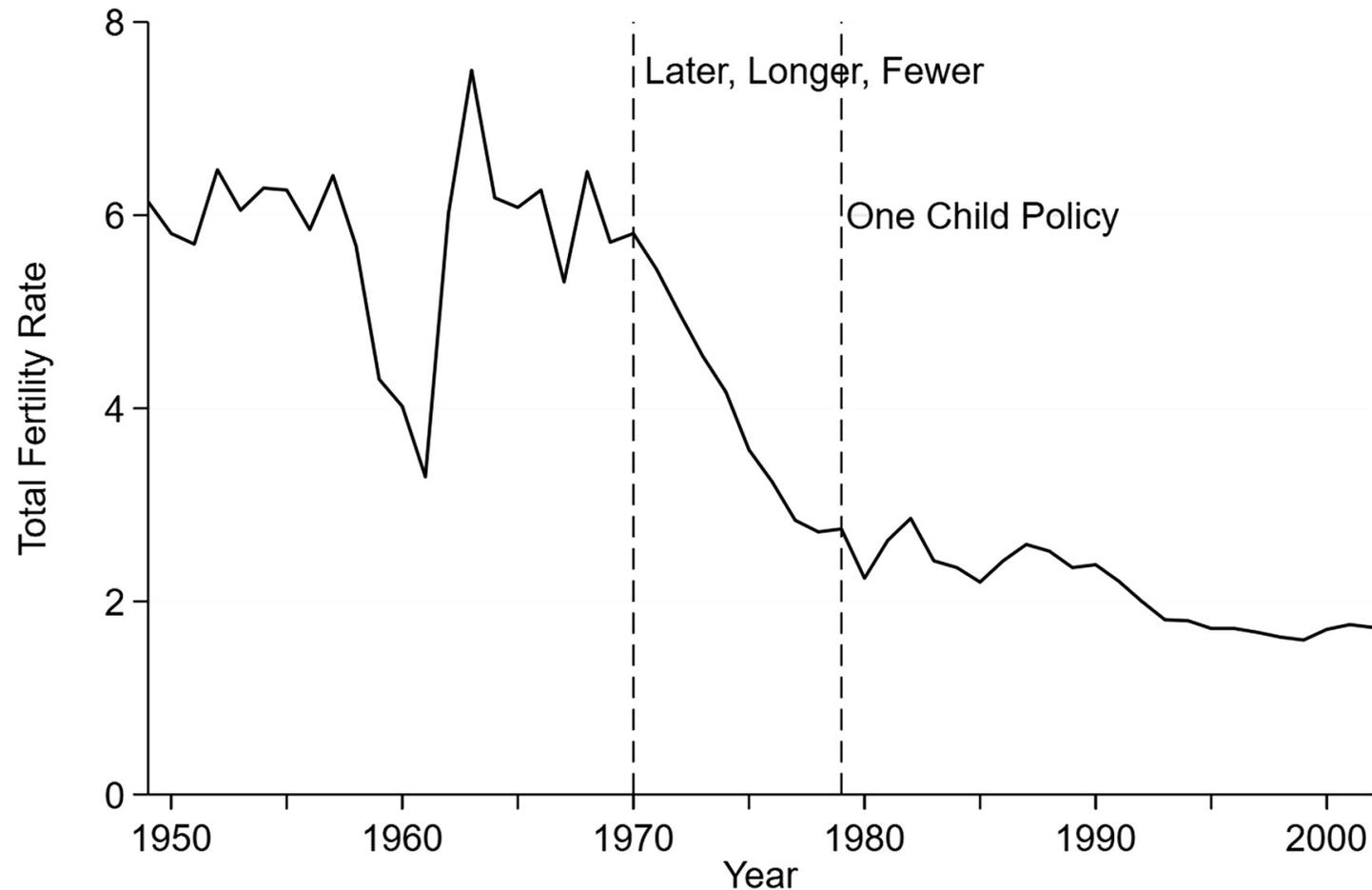
Fertility Reduction Policy in South Korea

- As of 1960: TFR 6.0
- Starting in 1961, series of 5-year plans to promote fertility restriction
 - Female family planning workers were assigned to townships who would issue coupons to motivated couples to get free contraceptive supplies and also directed people to designated doctors for vasectomies and IUDs.
 - Priority in public housing was given to couples that accepted sterilization and had two or fewer children; also direct payments to low income people who agreed to be sterilized.
 - Income tax rules were adjusted to disincentivize children beyond two.
 - Family laws were revised to give women greater inheritance rights for family property (to counter son preference).

Fertility Reduction Policy in China

- “Later, Longer, Fewer” starting in early 1970s
 - *Later* women encouraged to wait until 23 in rural areas and 25 in cities
 - *Longer* spacing between births, of 3-4 years.
 - *Fewer* three in rural areas and two in cities.
 - advocacy and education, provision of contraception, incentives including higher wages, better housing, and larger allocations of staple foods.
- “One Child” policy starting in 1979
 - Rules were much more restrictive than LLF and more stringently enforced.
 - intensive mass-education programs, mandatory IUD insertion for women with one child, abortion for unauthorized pregnancies, and sterilization for couples with two or more children.
 - Incentives for compliance included preferential access to health care, housing and job assignments, while couples that did not comply faced fines and the loss of access to education and other privileges.
 - Gradually phased out starting in the 1990s. Terminated in 2015.

China



- There is a large industry devoted to estimating the path of births in the absence of these policies.
- Semi-official government estimate is 400 million averted births.
- We would like to see a general equilibrium analysis that takes into account the feedback from lower fertility to higher income growth back to fertility.
- We could then compare the actual path to the counterfactual path, absent the policies.



“Let’s have two children and raise them well” (1970)



“One Household Full of Love. One Child Full of Health.”
From the 1980s



“Mom! Dad! I hate being alone.”

Efficacy of Policies to *Raise* Fertility

- Best policy: provision of high quality child care
- Other policies: cash payments, longer (and better paid) parental leaves, incentives to employers to provide more flexible working hours, and subsidies to assisted reproduction.
- Cost: Average estimated efficacy from various studies, applied to the US case.
- Raising the TFR from the 2019 level of 1.7 up to replacement would cost \$5,300 per year per child under 18. (total of \$387 billion, or about half of the defense budget in that year.)

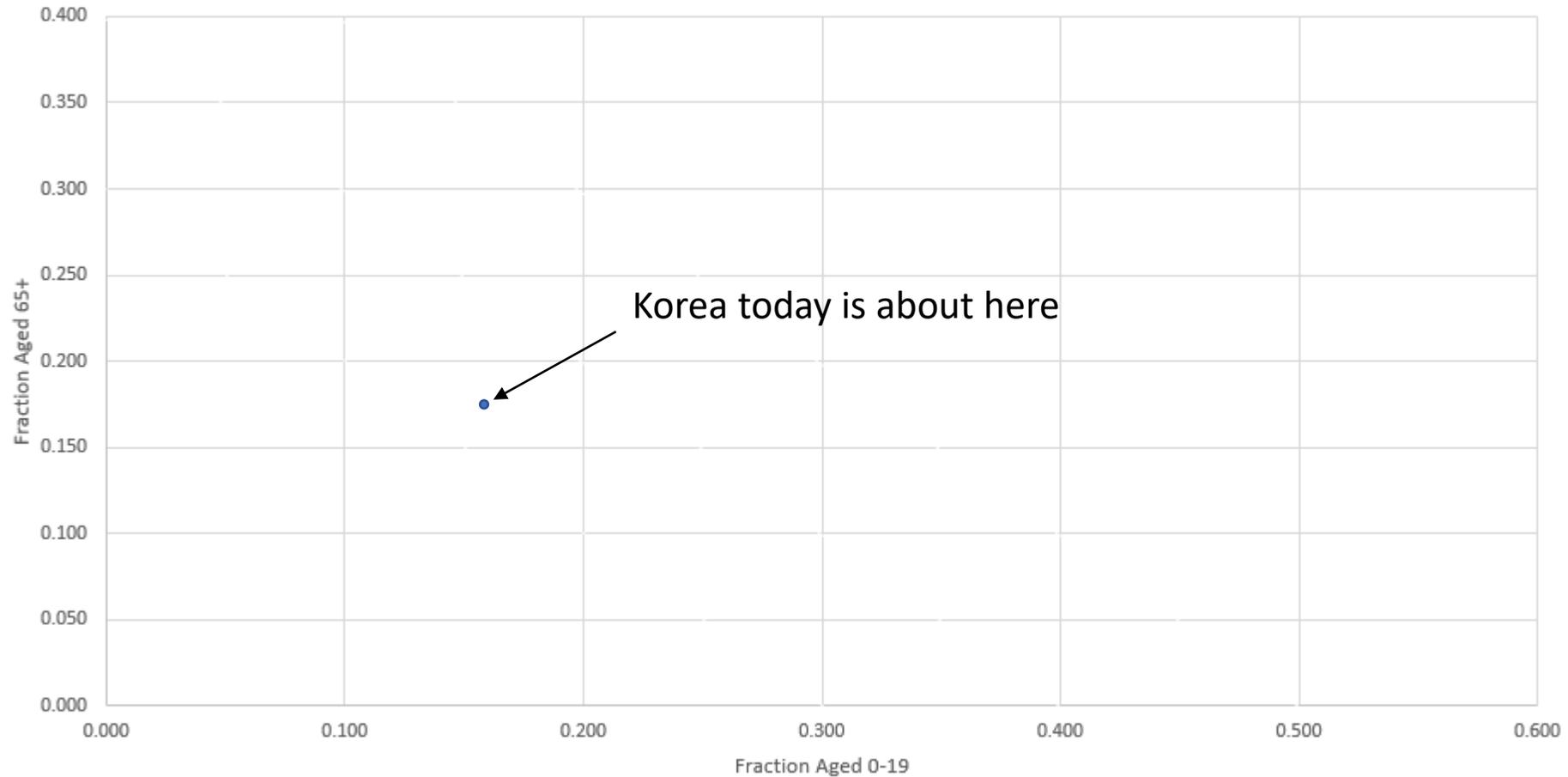
Dependency, Aging, and Sub- Replacement Fertility

Thinking About Population Aging

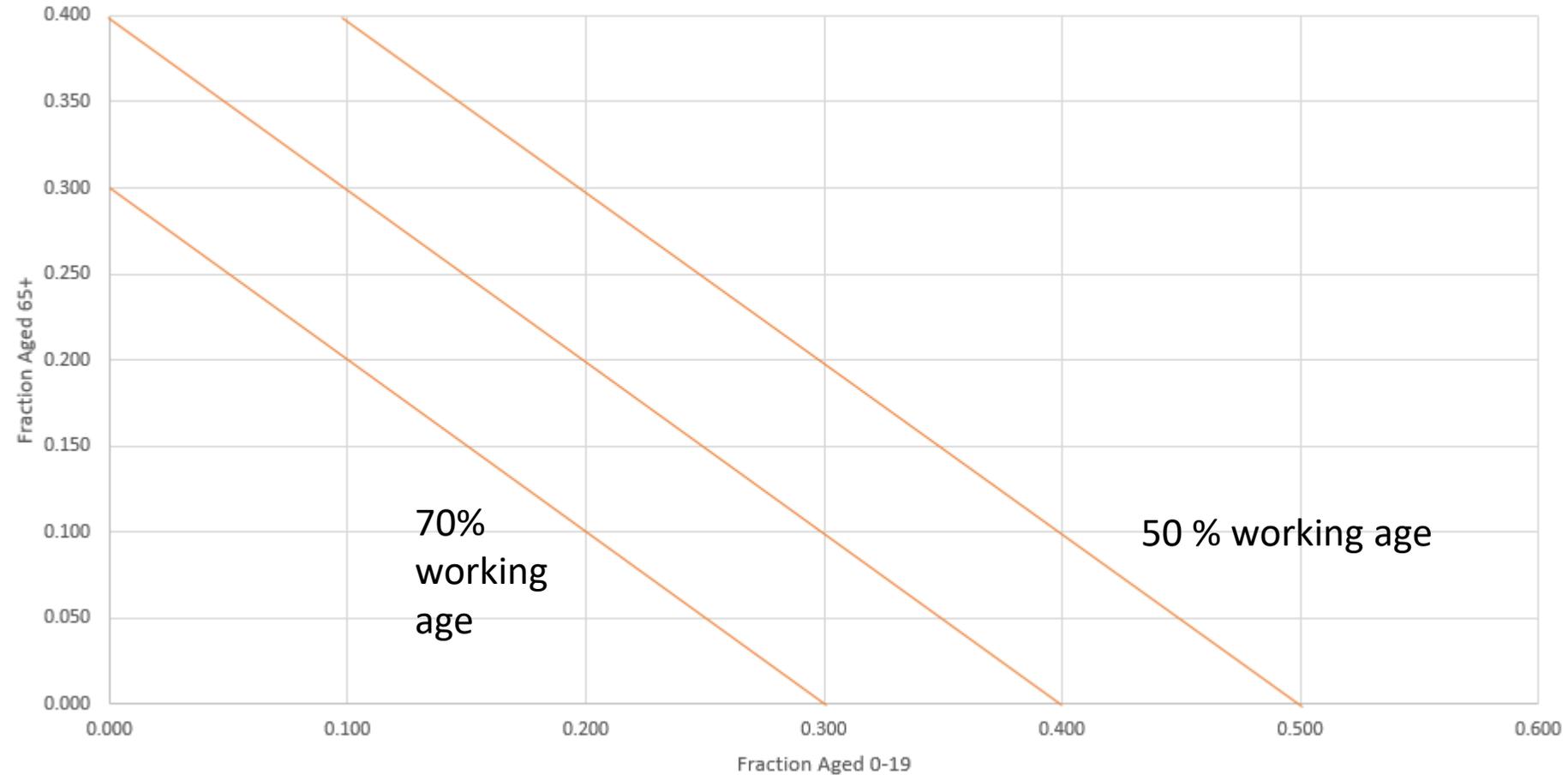
- Higher old-age dependency lowers consumption for all.
- But aging populations have fewer children, and they are dependent as well.
- We need an organizing framework to think this through.



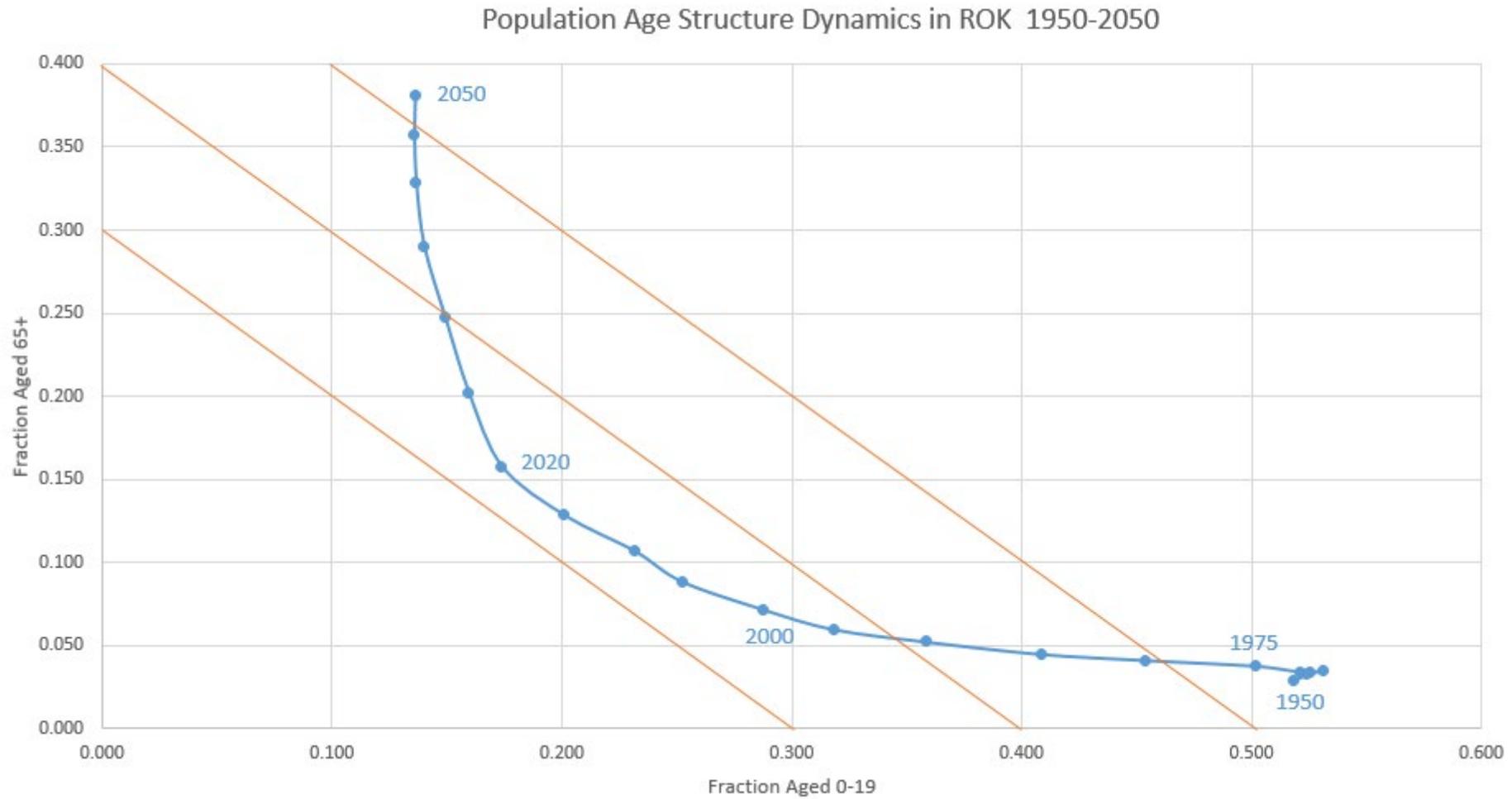
Graphing Population Dependency



Iso-Dependency Lines



Aging in Korea



Quick Calculation

- GDP per capita = GDP per worker \times workers per capita

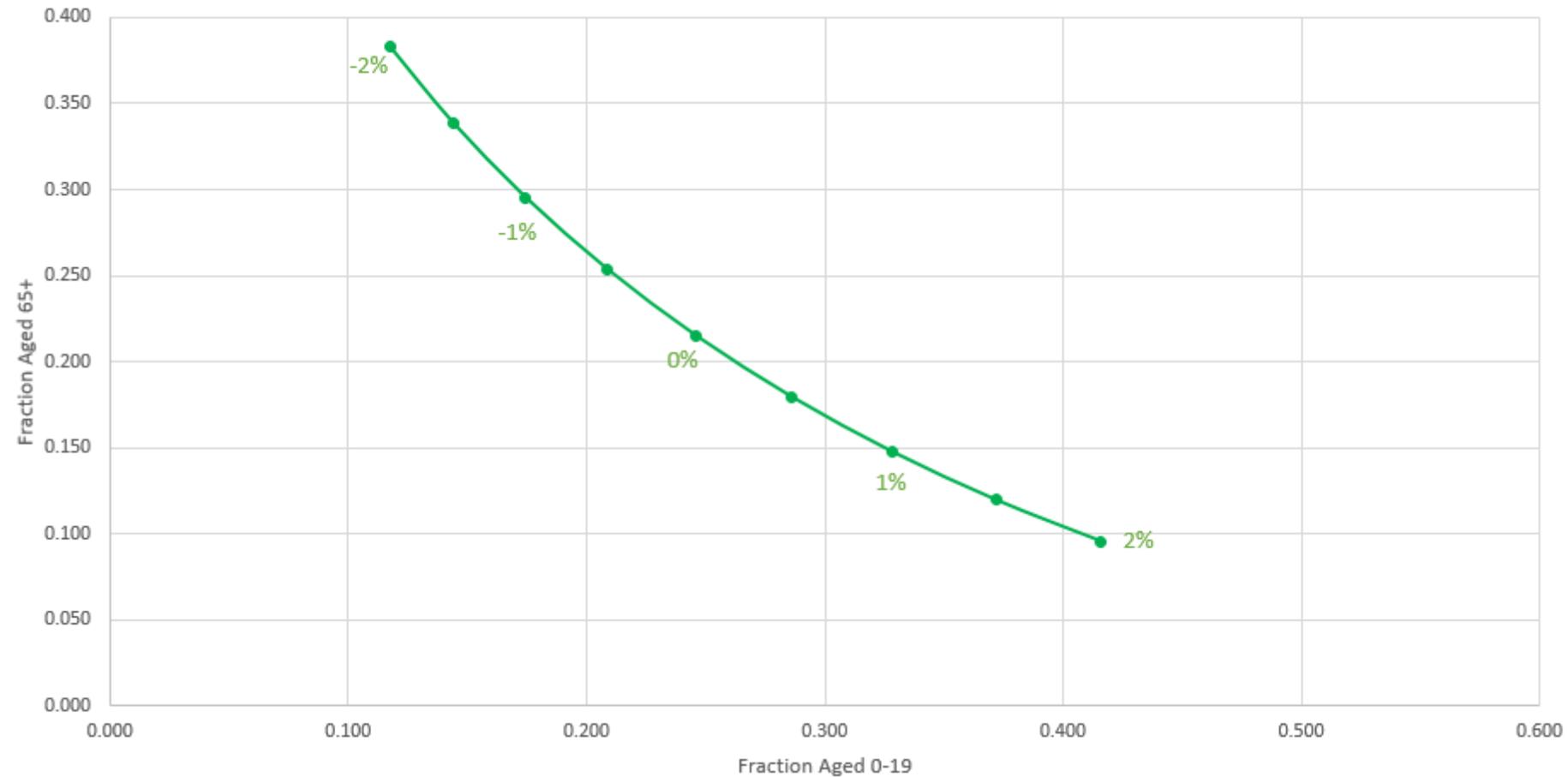
$$g_{GDP \text{ per capita}} = g_{GDP \text{ per worker}} + g_{workers \text{ per capita}}$$

- Korea working age (20-64) share of the population
- 1975-2000 rose from 0.46 to 0.64 \rightarrow 1.3% per year “tailwind”
- 2020-2050 will fall from 0.67 to 0.43 \rightarrow -1.1% per year “headwind”
- To be added: similar pictures for Japan, China, and a few other countries.

A Different Perspective

- Changes in fertility feed through to affect the population age structure only gradually.
 - The pig in the python.
- When fertility falls rapidly (as in Korea), there is a period during which both old-age and youth dependency rates are low.
 - This is often called “the demographic dividend.”
- This can't last!
- *Stable Population*: A population in which growth rate and the shares of different age groups are constant. (Results from fertility and mortality rates being constant for a long time.)

Locus of Stable Populations

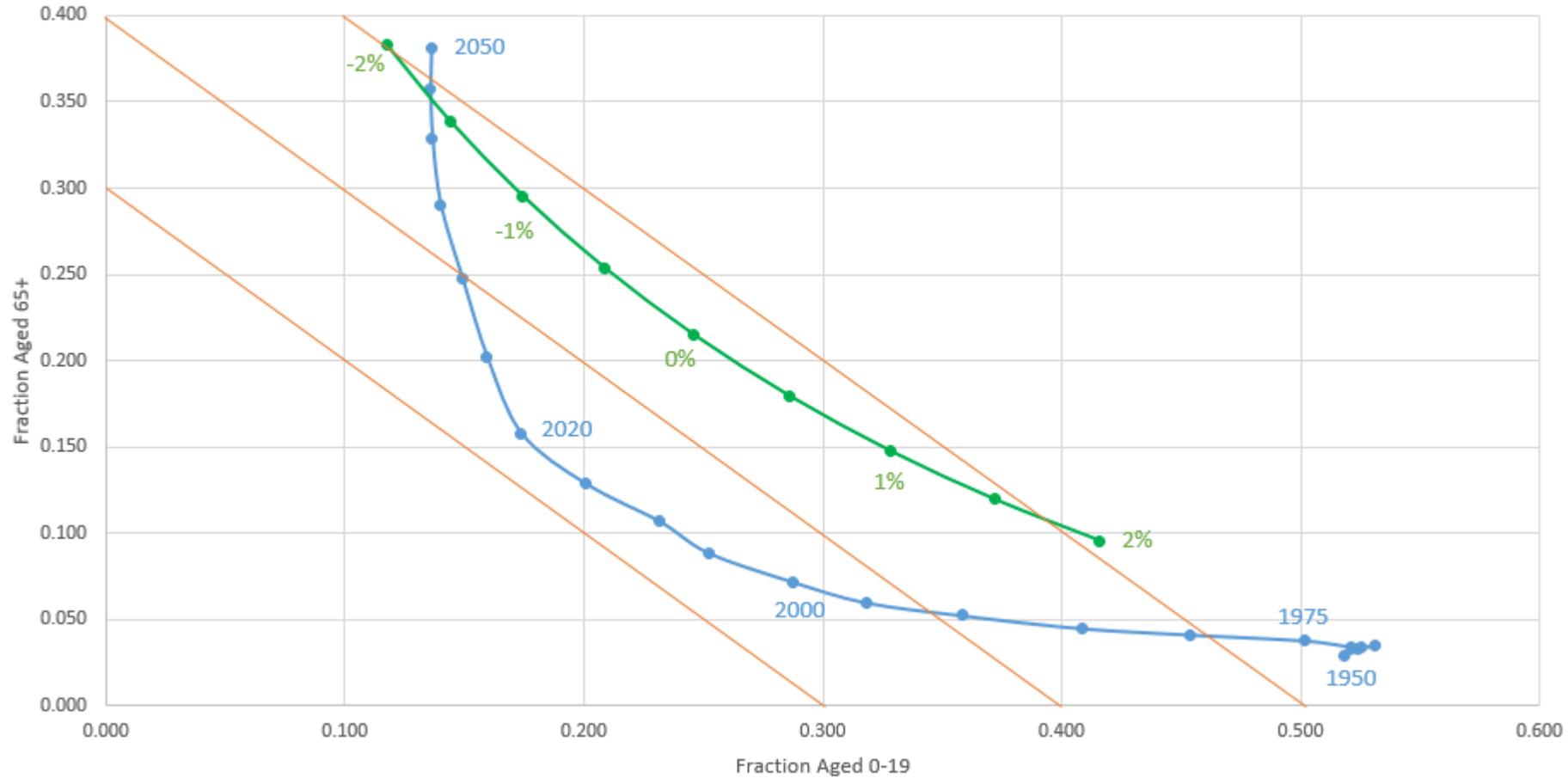


Based on Korean life table for 2020 (both sexes combined).

Labels show population growth rates.

The consumption-maximizing stable population is at the tangency of this curve with the iso-dependency line.

Population Age Structure Dynamics in ROK 1950-2050



Takeaways:

- The current low level of dependency is not feasible as a steady state.
- Dependency differences among different population growth rates are small relative to what Korea is going through.
- Raising fertility to achieve constant population size would mean an even bigger dependency burden for many decades!

Demographic Meltdown!

- Future aging is driven by current and recent low fertility.
- That low fertility was *not* due to slow economic growth.
- But if you thought that slow economic growth due to aging would further lower fertility, then there is the possibility of a “demographic meltdown.”

Some Nuance

- Old people may cost more than children – that would change the slope of the iso-dependency lines.
- Support for the old is done more by governments, while support for the young is done more by families. So aging raises the size of government.
- The borders of what constitutes “old” and “young” can change.
- Simple model ignores capital investment and natural resources.
 - But if you put these in, you get the conclusion that the optimal population growth rate is lower.
- I don't think that these observations affect the basic points.
 - The end of the demographic dividend is a bad thing, but it was inevitable.
 - Consumption per capita in a stable population that is shrinking is not that different from consumption per capita in a stable population with constant size.

The Contribution of Fertility Reduction to Economic Growth

A Richer Quantitative Model

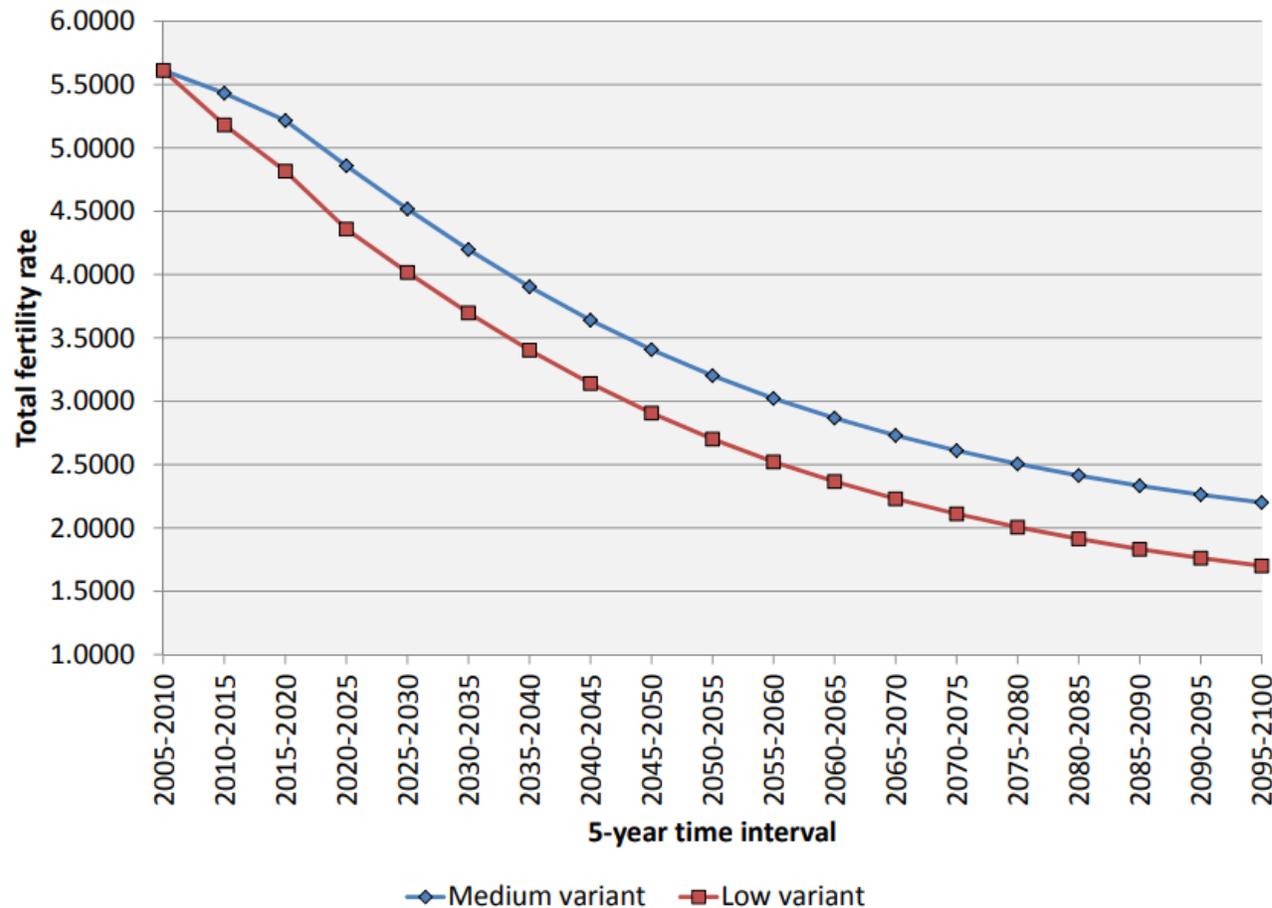
- We want to know the effect of fertility reduction on economic growth.
 - Fertility rate and economic growth are both endogenous variables.
 - You can't just regress growth on fertility to learn the structural effect.
 - There are not good instruments at the national level.
-
- Ashraf, Weil, and Wilde (*Population and Development Review*, 2013) use a parameterized simulation model to address this question.

Ashraf, Weil, and Wilde

- Channels by which fertility affects output per capita:
 - Dependency rates
 - Solow (capital deepening)
 - Malthus (fixed factors)
 - Human capital (quality-quantity)
 - Life-cycle saving
 - Life-cycle labor supply
 - Experience
 - Child care time
 - Boserup (omitted)

Each channel is
parameterized based
on microeconomic
evidence

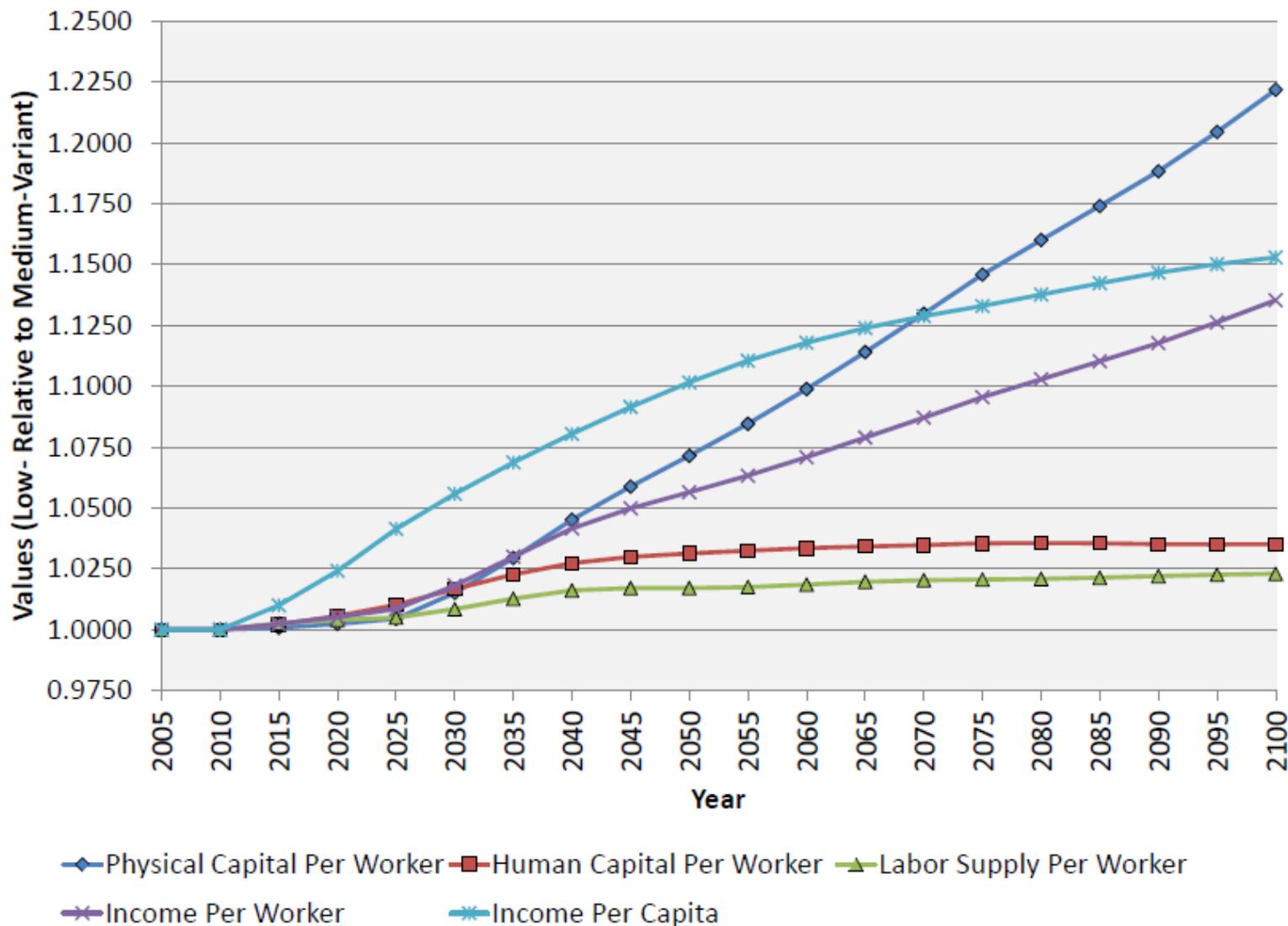
Ashraf, Weil, and Wilde (continued)



- “experiment” is a reduction in the TFR of 0.5 (relative to medium variant projection) starting in 2010 and phased in over 15 years.

FIGURE 1: The time paths of the total fertility rate by demographic scenario

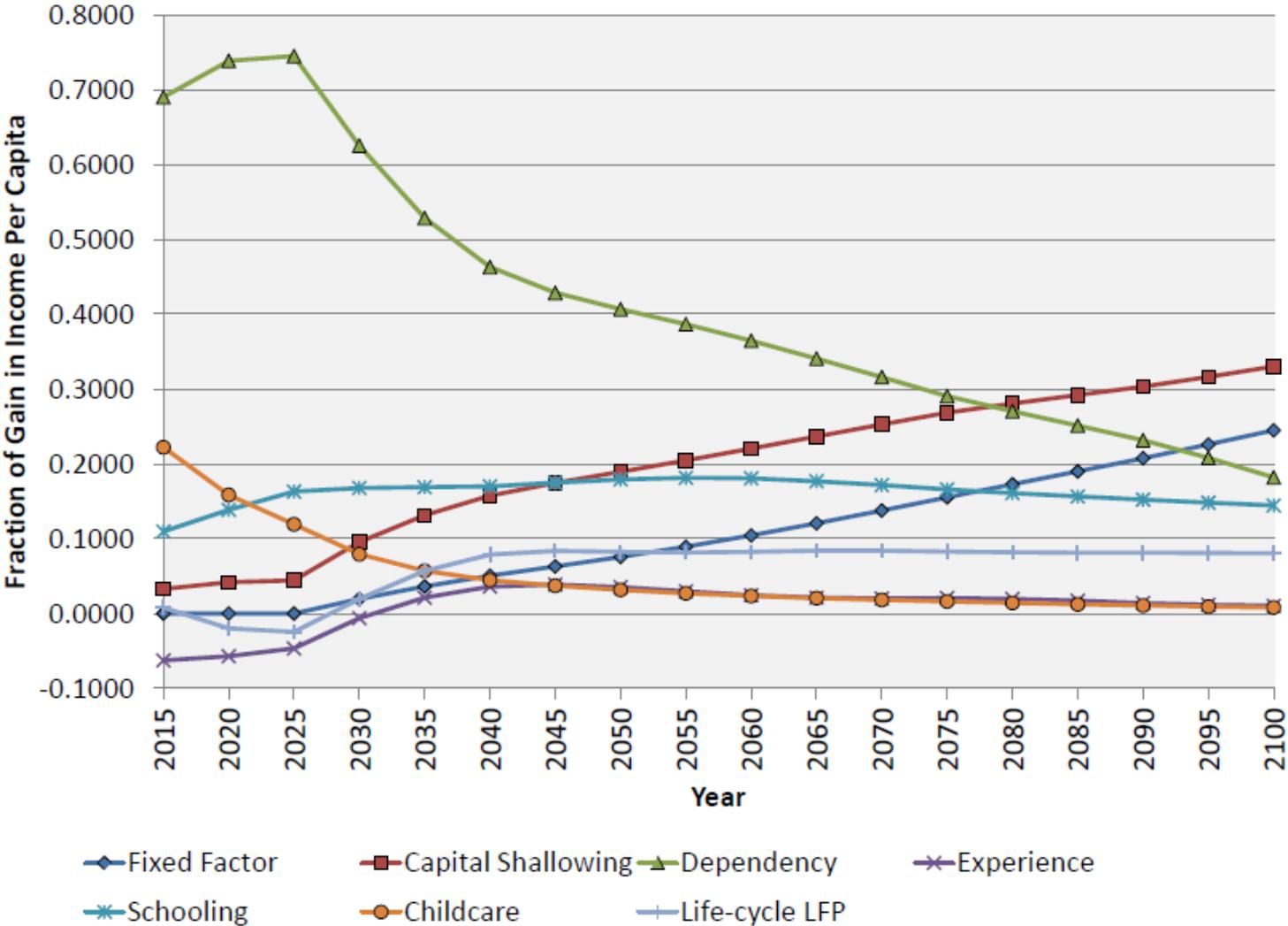
Results



Results are relative to a baseline in which there is not the extra reduction in fertility.

At a horizon of 50 years, GDP per capita is 12% higher a result of the extra fertility reduction.

Channel Decomposition



For the first 3 decades, the change in dependency is the dominant channel.

At horizon of 70 years, dependency, pressure on natural resources, capital deepening, and schooling are roughly equal in importance.

Size of the Effect

- Simulation says an exogenous reduction in TFR raises GDP per capita by 12% at a horizon of 50 years.
- The “unexpected” amount of TFR reduction in Japan and Korea was about 1.0.
- So that explains growth by a factor of 1.25 over a 50 year period.
- About 0.5% per year extra growth of GDP per capita.
 - Maybe can explain 1.0% per year in China.
- That would say that the rapid reduction in fertility is not a huge part of the east Asian story.
- Or that the model is missing something.

Quality-Adjusted Population Density

Population Density

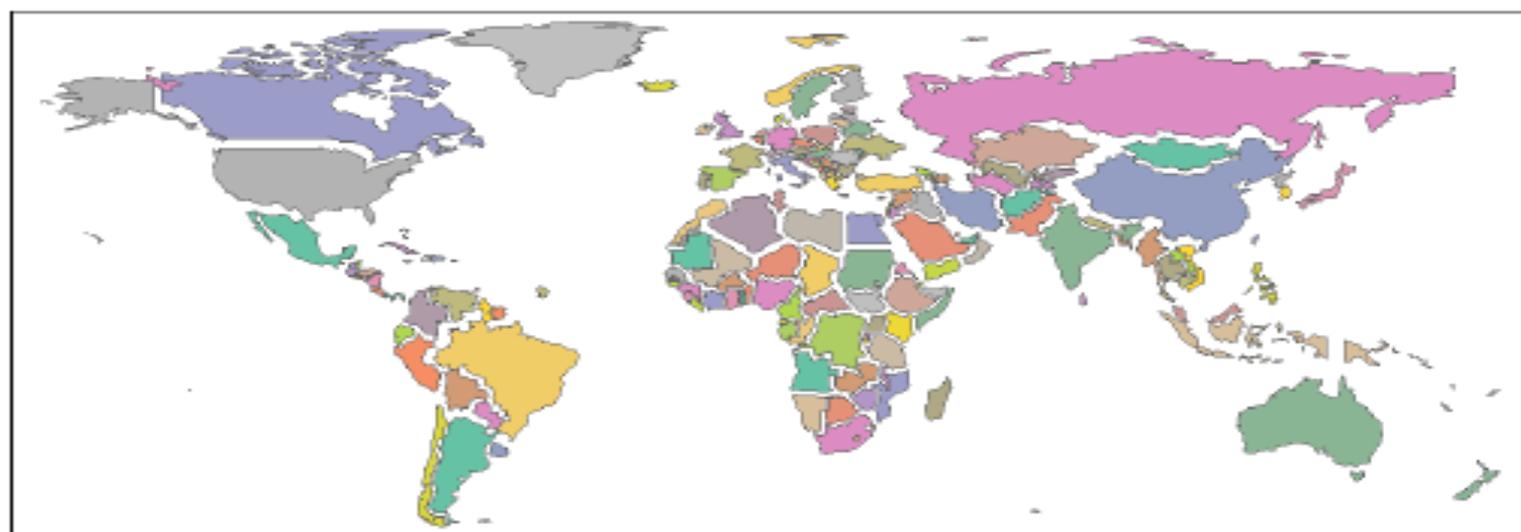
- Worries about “overpopulation” during population explosion of the 20th century focused on the ratio of people to natural resources.
 - For developed countries that trade in world markets this is less important than for poor countries reliant on peasant agriculture.
 - But we still might care.
- Are east Asian countries particularly densely populated?
- Conventional population density (people per square km) might be a bad measure, because land differs in characteristics.

Quality Adjusted Population Density

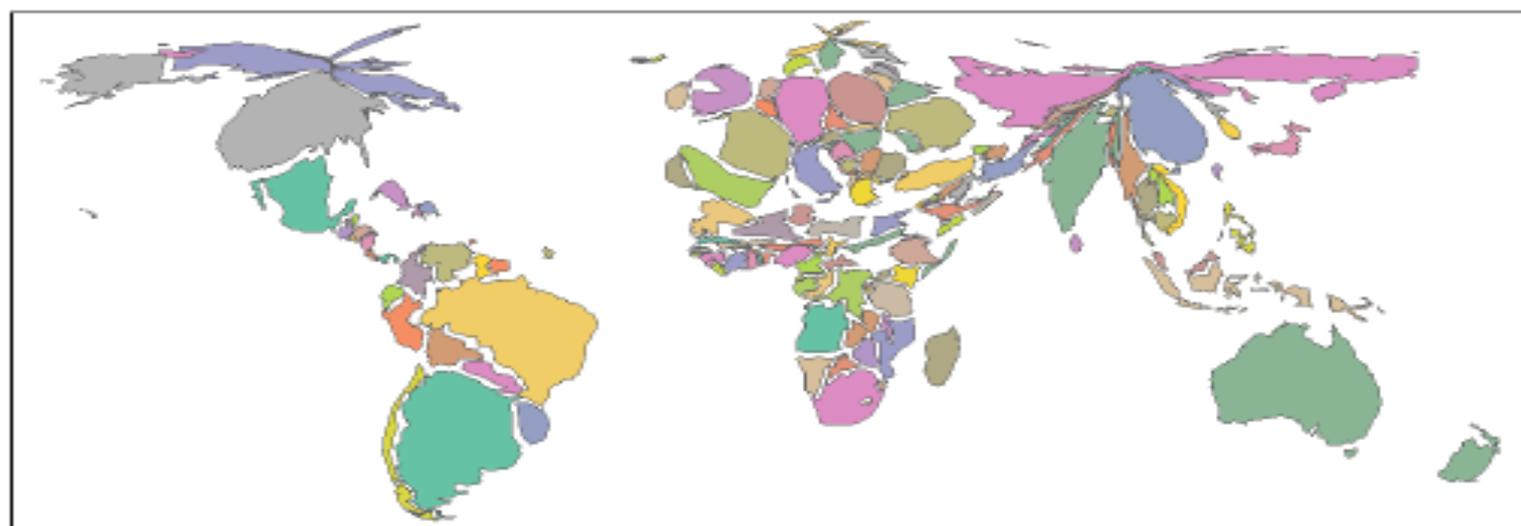
- Henderson, Storeygard, and Weil (working paper, 2022), “Land Quality”
- Estimates weights on geographic characteristics to create a summary measure of land quality.
 - Based on a regression of population density in grid squares on geographic characteristics and country fixed effects.
- For every country, we can calculate
 - Quality Adjusted Area (*QAA*)
 - Quality-Adjusted Population Density (*QAPD*)

Figure 2. Country Level Quality Adjusted Area

A. Countries by Land Area

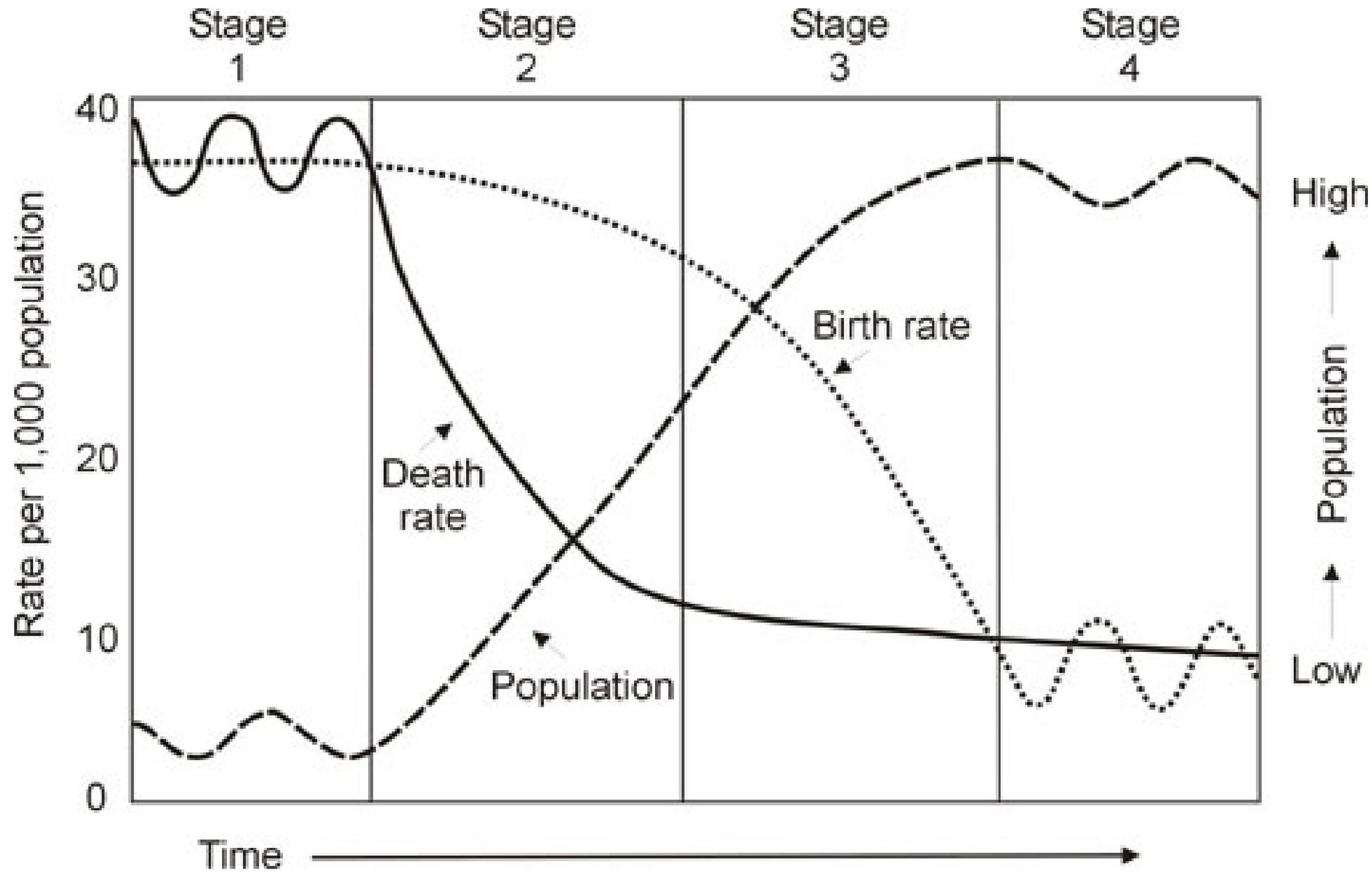


B. Countries by Quality Adjusted Area



Another Perspective: Population Multipliers

- Population Multiplier is the factor by which population increases over the course of the demographic transition.



Population Multipliers 1820-2010 (Maddison data)

- France 2.0
- United Kingdom 3.0
- Spain 3.5
- China 3.6
- Japan 4.0
- S. Korea 5.3
- India 6.3
- Netherlands 7.0
- Iran 11.9
- Thailand 14.6
- Egypt 21.7
- Ethiopia 31.4

Very low values for France and UK reflect the fact that they started the demographic transition before 1820.

Overall, east Asian countries have among the lowest multipliers in the world, reflecting both lack of unused land as of 1820 and rapid fertility transitions.

Conclusions

- Conventional models say that rapid fertility transition played some role, but was not overwhelmingly important, in east Asian economic growth.
 - But maybe the conventional models are missing some channel by which fertility mattered.
- Those models also say that future aging and sub-replacement fertility will impose some moderate costs for 2-3 decades, but will not be disastrous.
 - But maybe this analysis misses some important effect.