Demography and Low-Frequency Capital Flows

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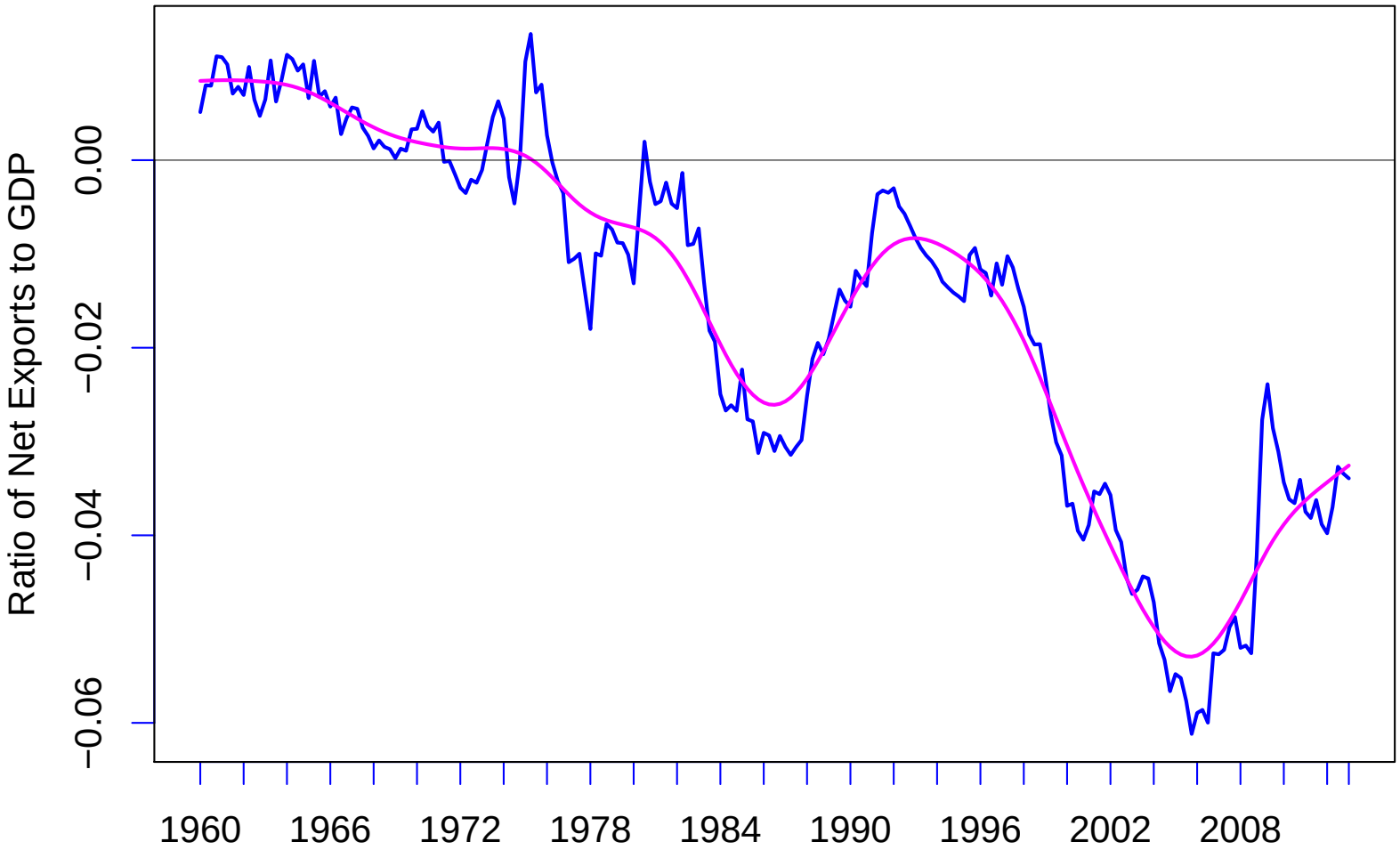
An embarrassment from my past



Capital flows in the prewar period

- Michael Bordo, "Globalization in historical perspective," 2002

  > *The fifty years before World War I saw* **massive flows of capital** *from Western Europe to (mainly) the Americas and Australasia. At its peak, the outflow from Britain reached nine percent of GNP and was almost as high in France, Germany, and the Netherlands.*

- Link: `http://econweb.rutgers.edu/bordo/nabe.pdf`

Capital flows in the prewar period

- Michael Bordo, "Globalization in historical perspective," 2002

  > *A striking feature is the size and* **persistence** *of current account deficits in this period, esp in Australia, Canada, Argentina, and the Nordic countries, as well as the surpluses of the UK and France.*

- Link: `http://econweb.rutgers.edu/bordo/nabe.pdf`

Capital flows now

- Group of 20, Communique, April 15-16, 2011

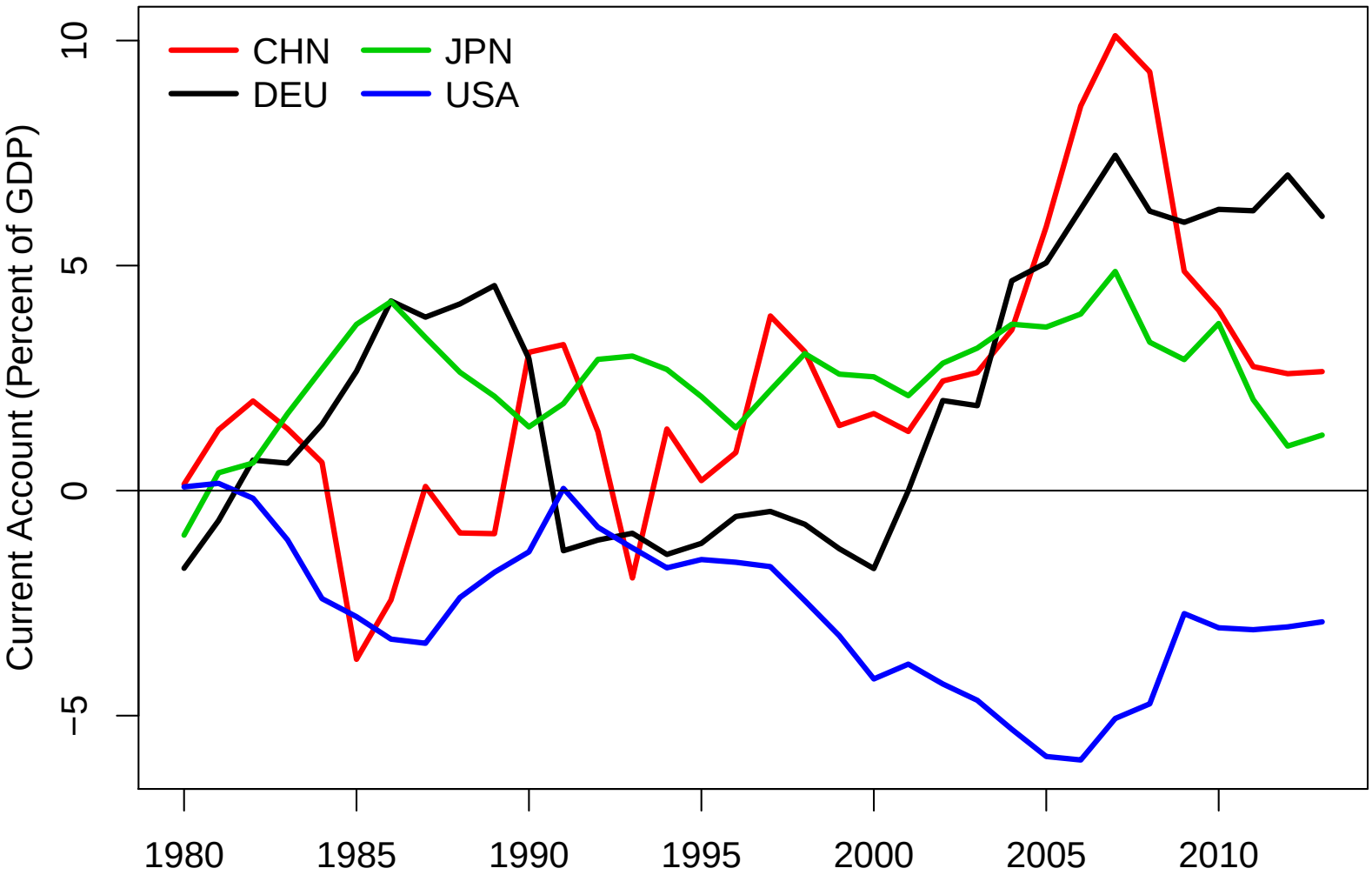
  We agreed on a set of indicative guidelines ... to address **persistently large imbalances**. *We now launch ... an in-depth assessment of the nature of these imbalances and the root causes of impediments to* **adjustment**. *... We will ascertain for our next meeting the corrective and preventive measures.*

- Øystein Olsen, Norges Bank, March 2011

  Global trade imbalances *have been reduced somewhat over the past two years, but there is a considerable risk that they will persist. They must be* **corrected**.

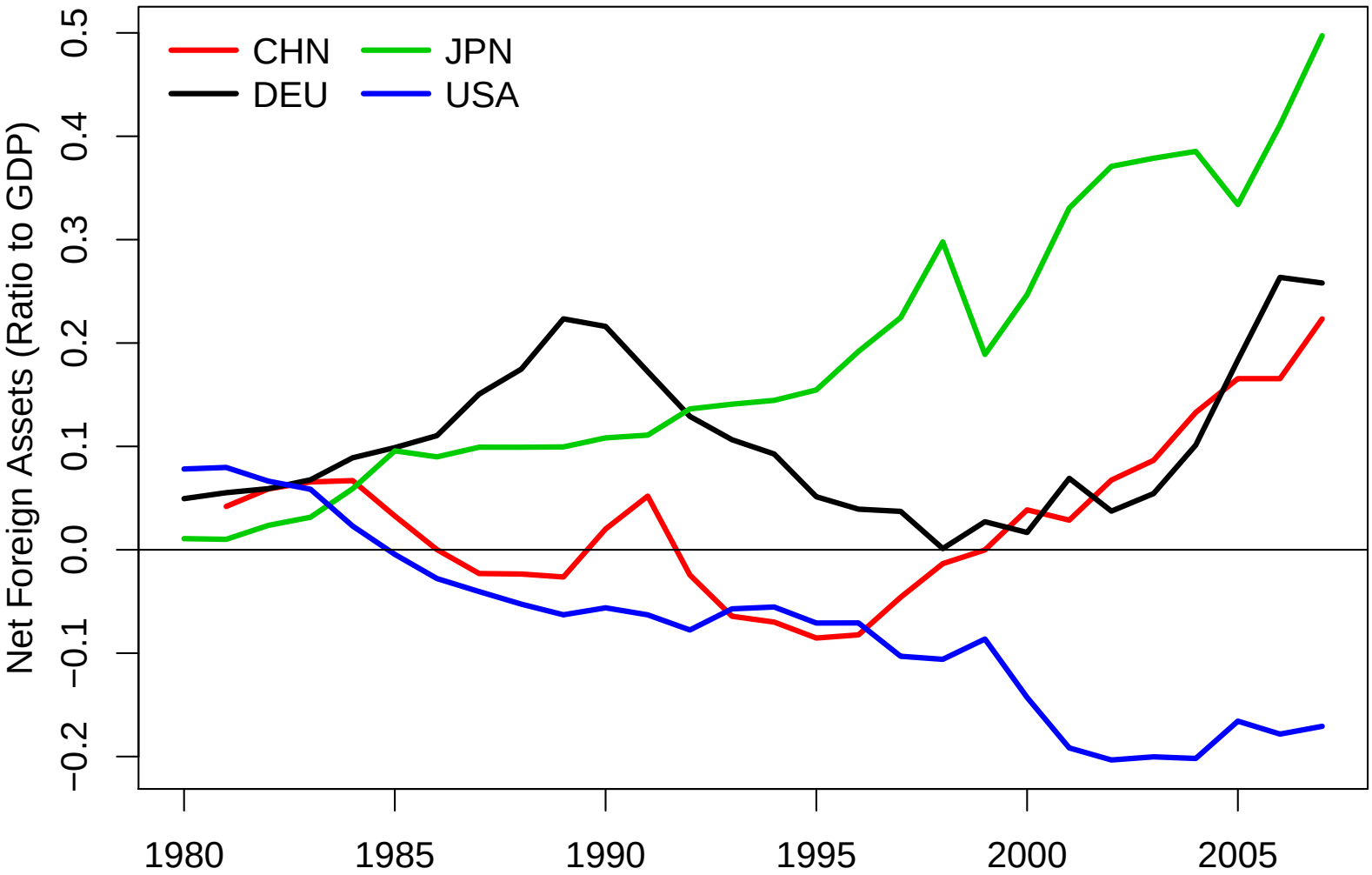
Facts

Facts: capital flows



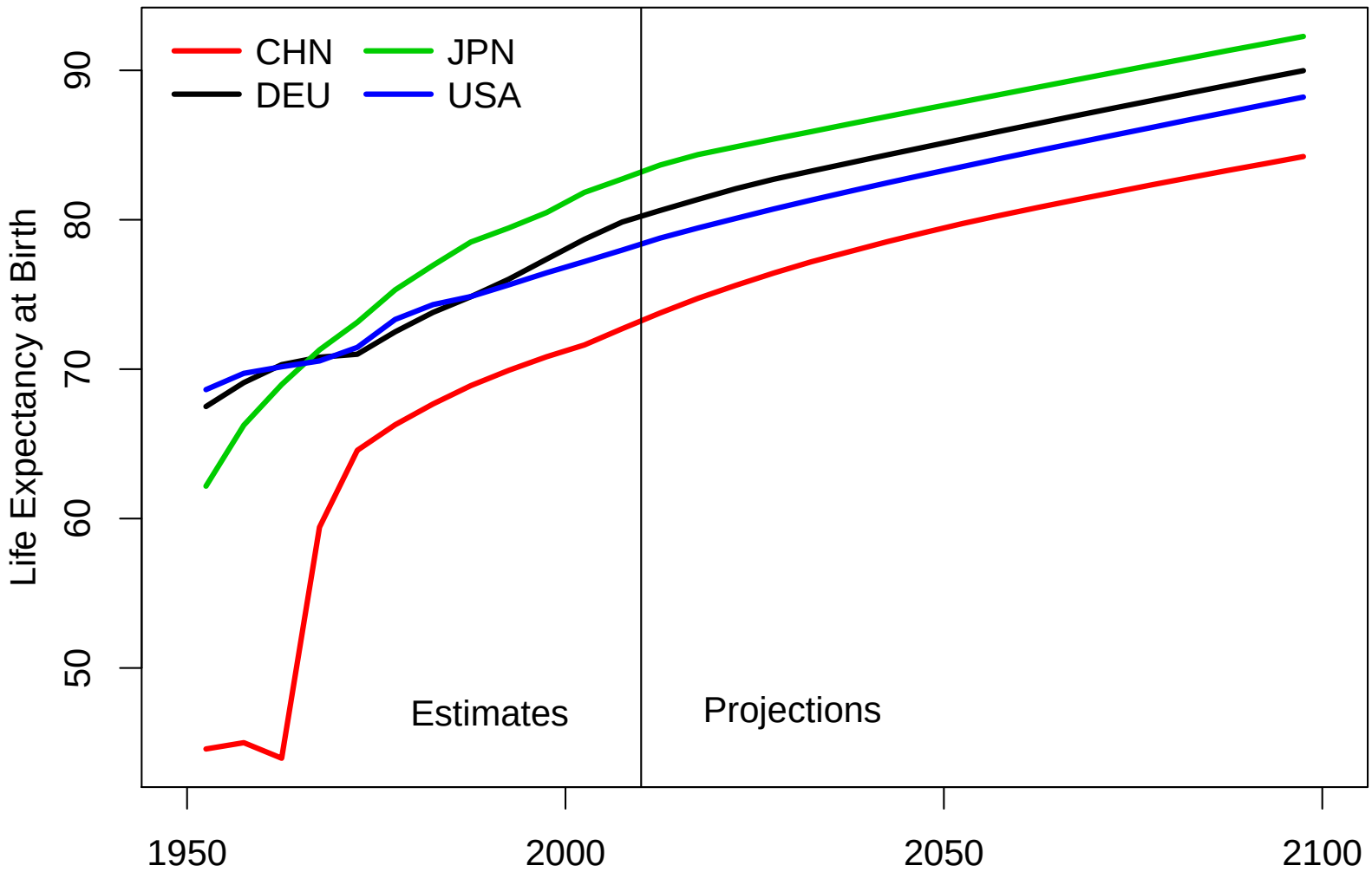
Source: IMF, World Economic Outlook, April 2013

Facts: net foreign asset positions



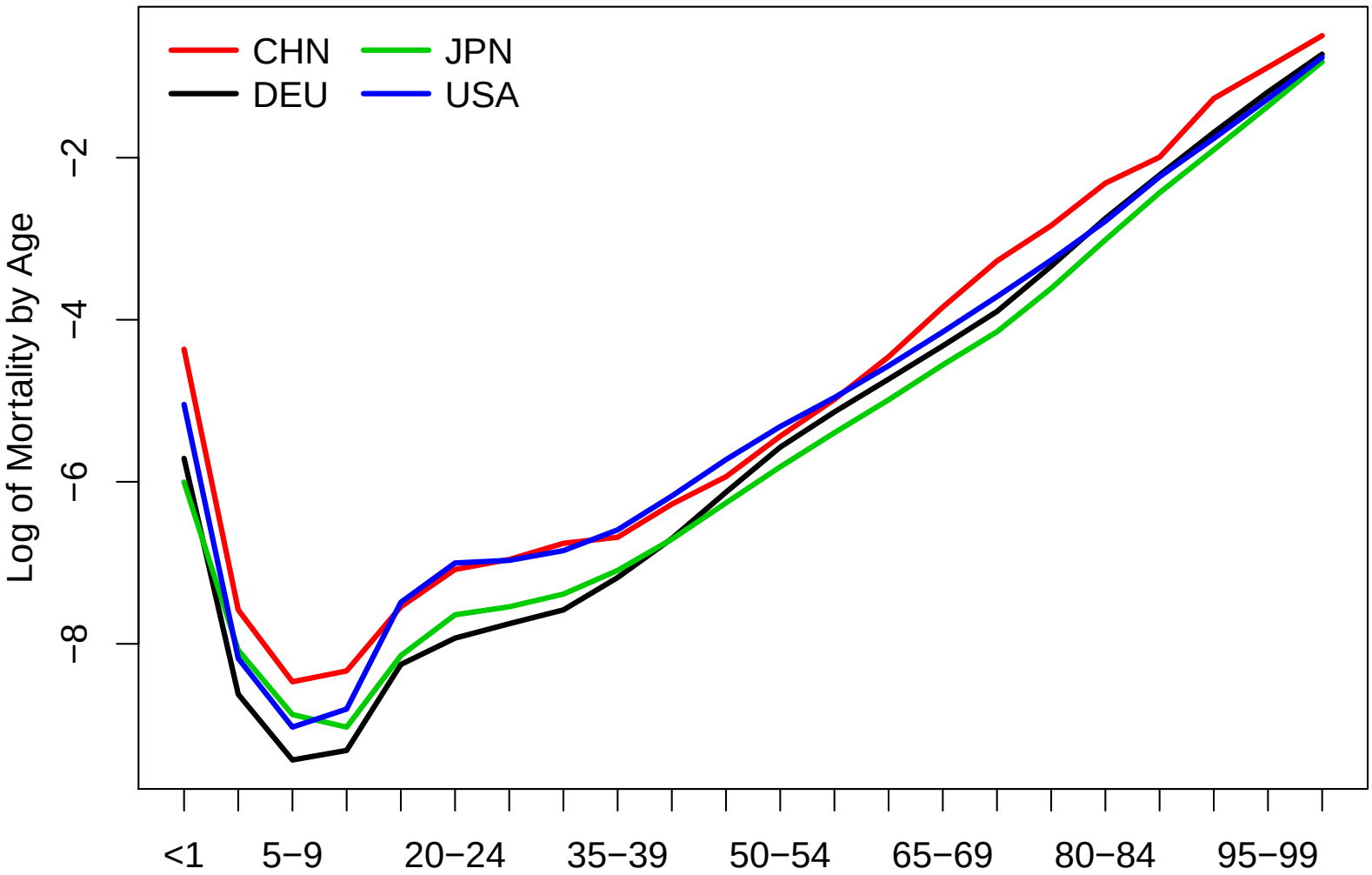
Source: Lane and Milesi−Ferretti

Facts: life expectancy



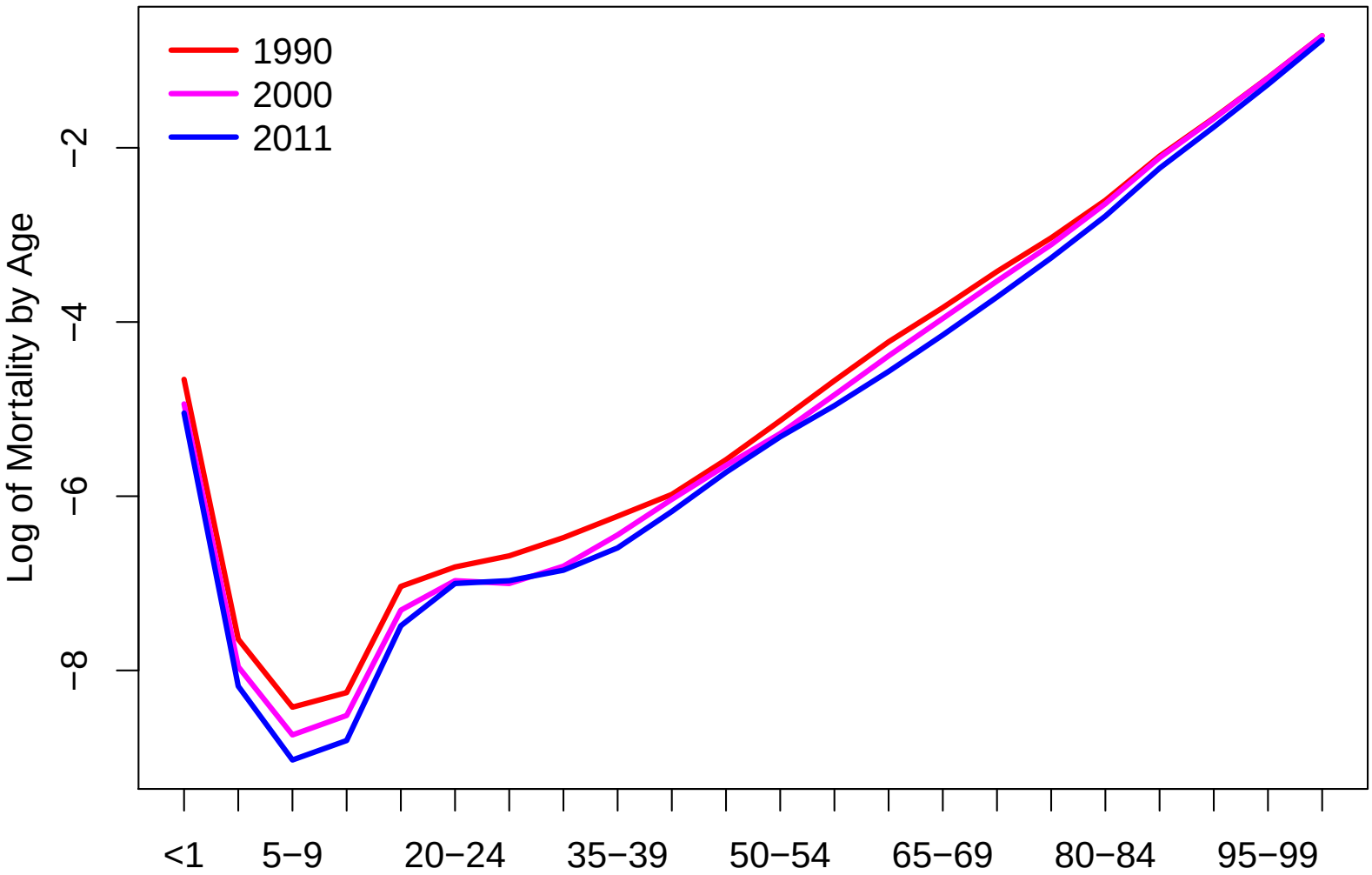
Source: UN, World Population Prospects, 2010 revision

Facts: mortality rates



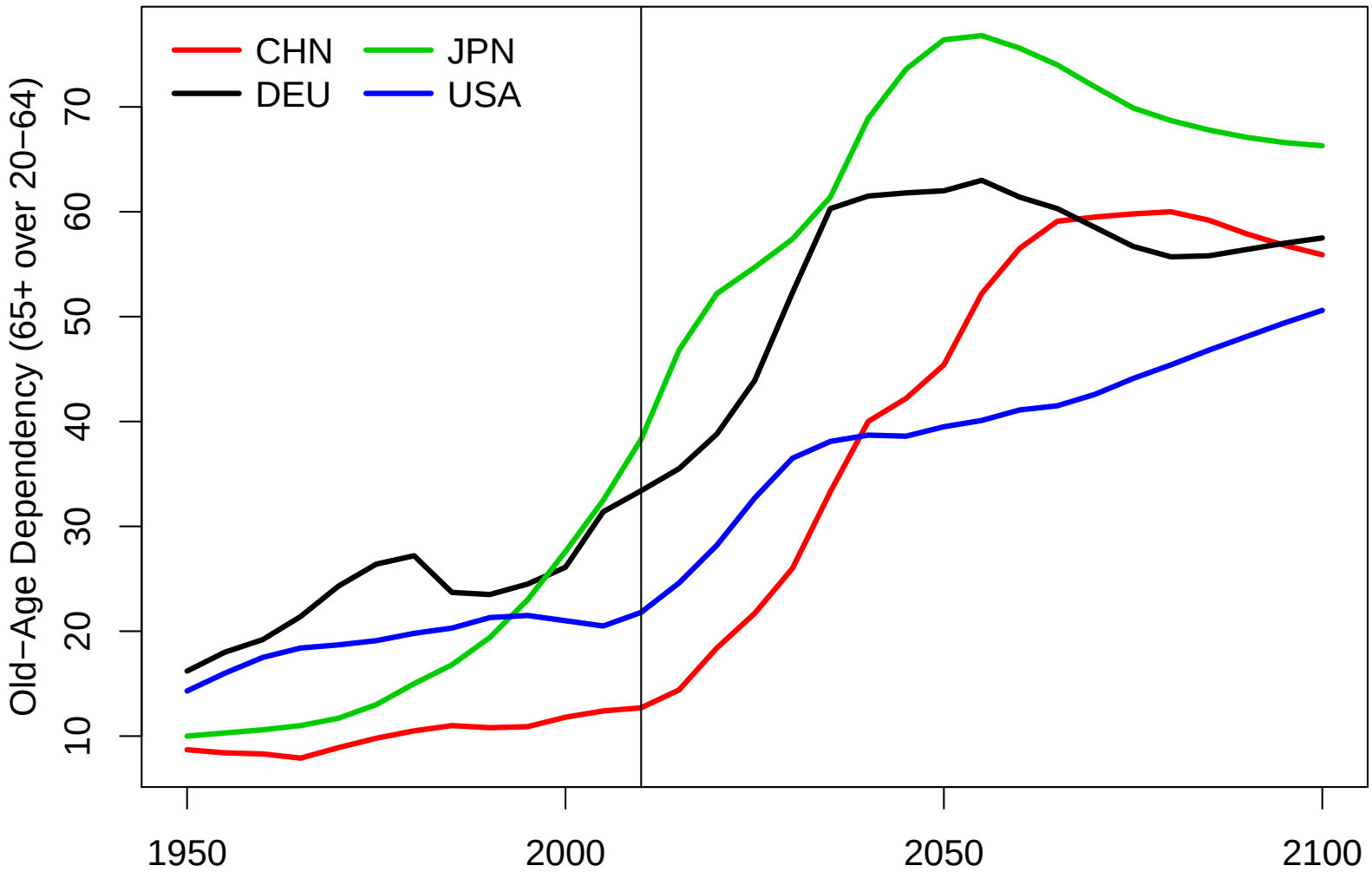
Source: WHO, Global Health Observatory

Facts: US mortality rates



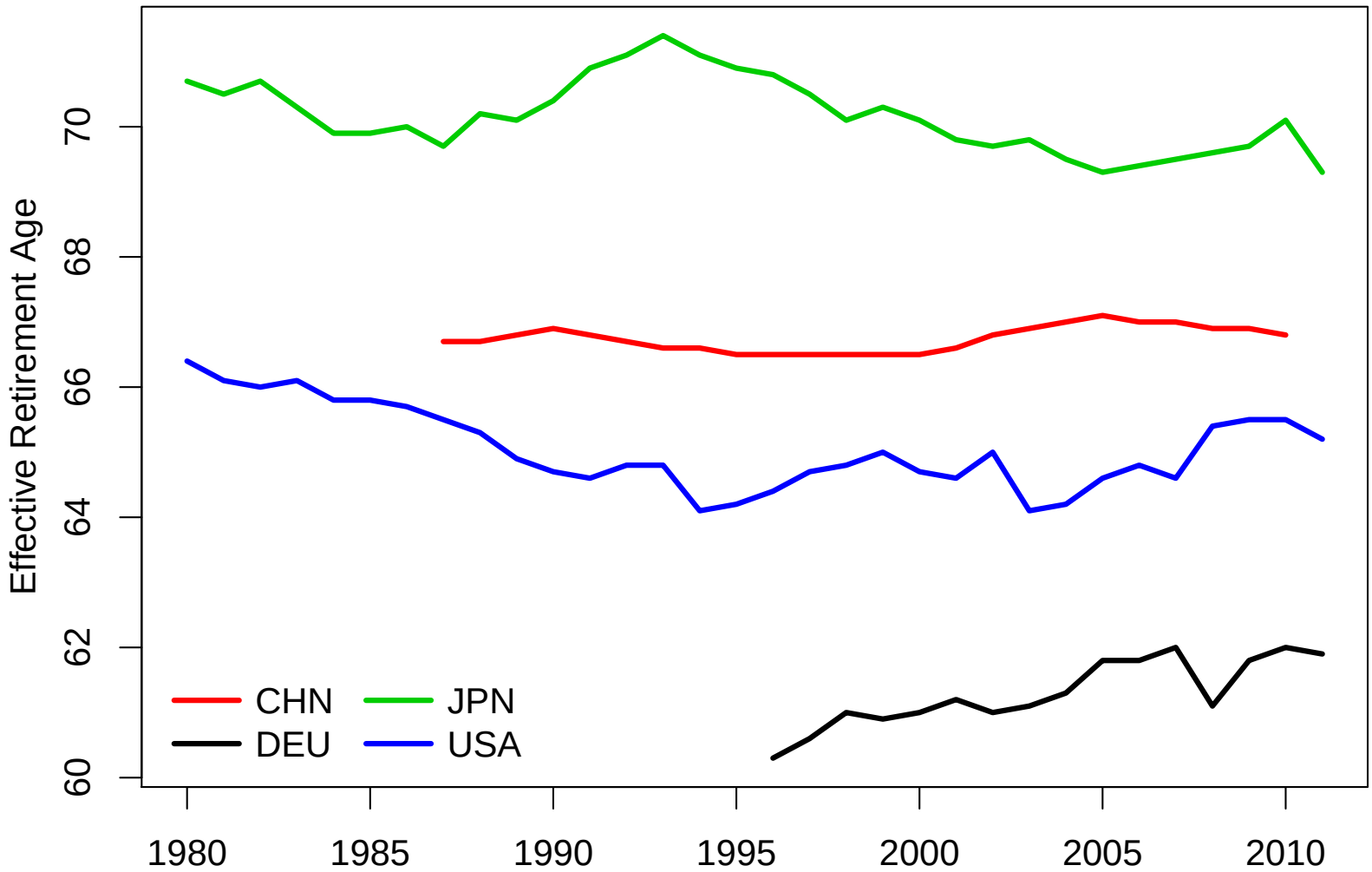
Source: WHO, Global Health Observatory

Facts: dependency rates



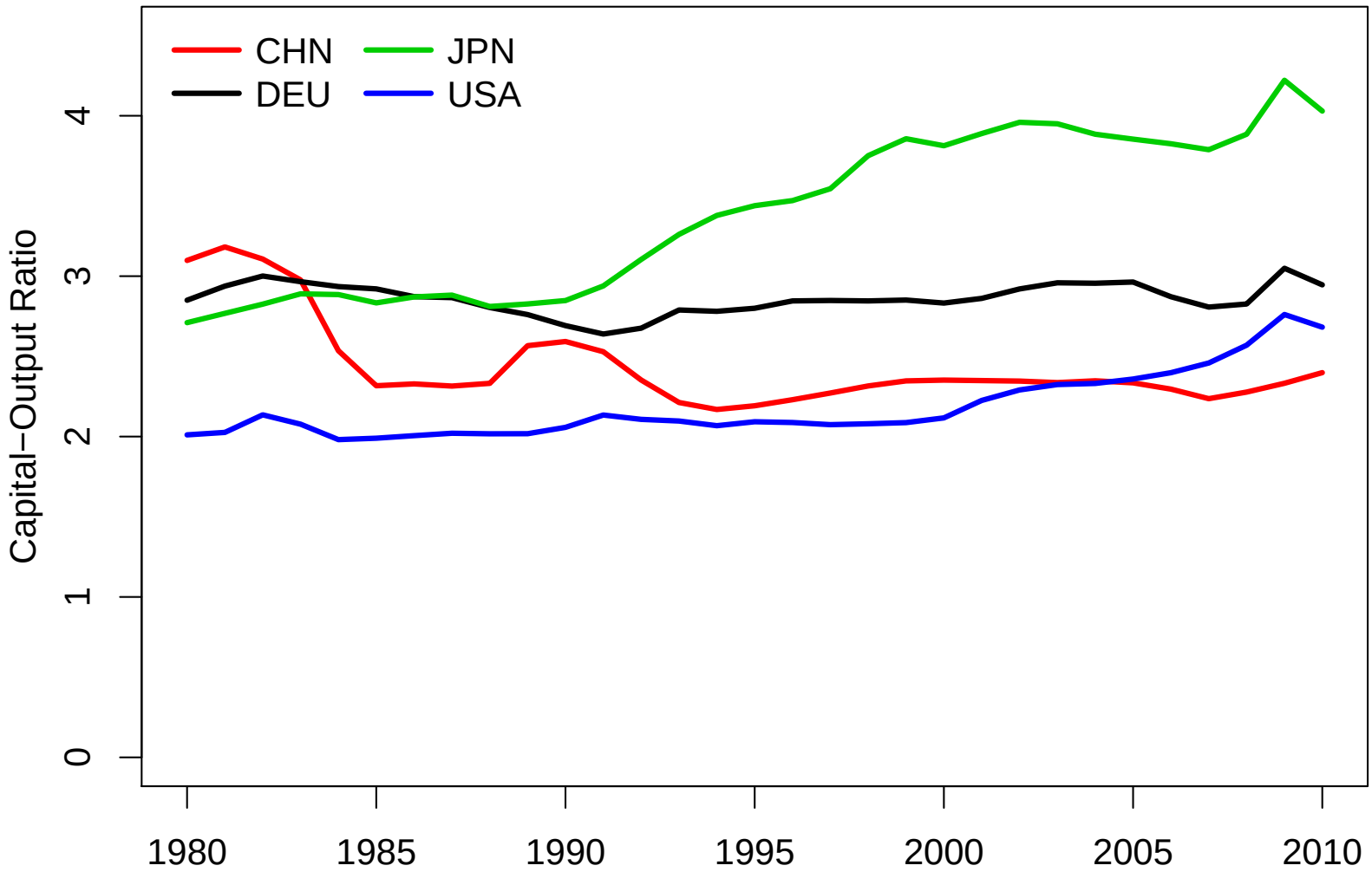
Source: UN, World Population Prospects, 2010 revision

Facts: retirement ages



Source: OECD, Average Effective Age of Retirement

Facts: capital-output ratios



Source: Penn World Table and authors calculations

An Overlapping Generations Model

Model: motivation

- Capital flows and stocks are persistent
- Demography inherently persistent — and different across countries
- Worth exploring a connection?

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- Demography inherently persistent — and different across countries
- Worth exploring a connection?

  Evidently yes: Attanasio-Kitao-Violante, Boersch-Supan-Ludwig-Winter, Brooks, Domeij-Floden, Feroli, Ferrero, Henriksen, Krueger-Ludwig, and others all had the same idea

Model: overview

- One-good world
- Overlapping generations, realistic mortality rates, annual
- Key ages: start working/consuming at 21, retire at 65
- Preferences: power utility over consumption, fixed labor supply
- Technology: CES production
- **Goal: explore impact of changes in life expectancy**

Model: demography

- Age distribution of population

$$\begin{aligned} x_{it} &= \text{number of people alive of age } i \text{ at date } t \\ X_t &= \sum\nolimits_i x_{it} = \text{population} \end{aligned}$$

- Various aggregates ($z = c, a$ etc)

$$Z_t = \sum\nolimits_i z_{it} x_{it}$$

- Survival and mortality

$$\begin{aligned} s_{it} &= \text{probability person of age } i \text{ at date } t \text{ survives one period} \\ 1 - s_{it} &= \text{mortality rate} \end{aligned}$$

Model: households

- Preferences

$$U_{it} \quad = \quad c_{it}^{1-\sigma}/(1-\sigma) + \beta s_{it} U_{i+1,t+1}$$

- Efficiency of labor

$$e_{it} \quad = \quad \text{for } i \text{ of working age} \quad = \quad 1 \text{ for now}$$

- Budget constraint with annuities

$$s_{it} a_{i+1,t+1} \quad = \quad (1+r_t)a_{it} + e_{it} w_t - c_{it}.$$

- First-order condition

$$c_{it}^{-\sigma} \quad = \quad \beta c_{i+1,t+1}^{-\sigma}(1+r_t)$$

Model: equilibrium

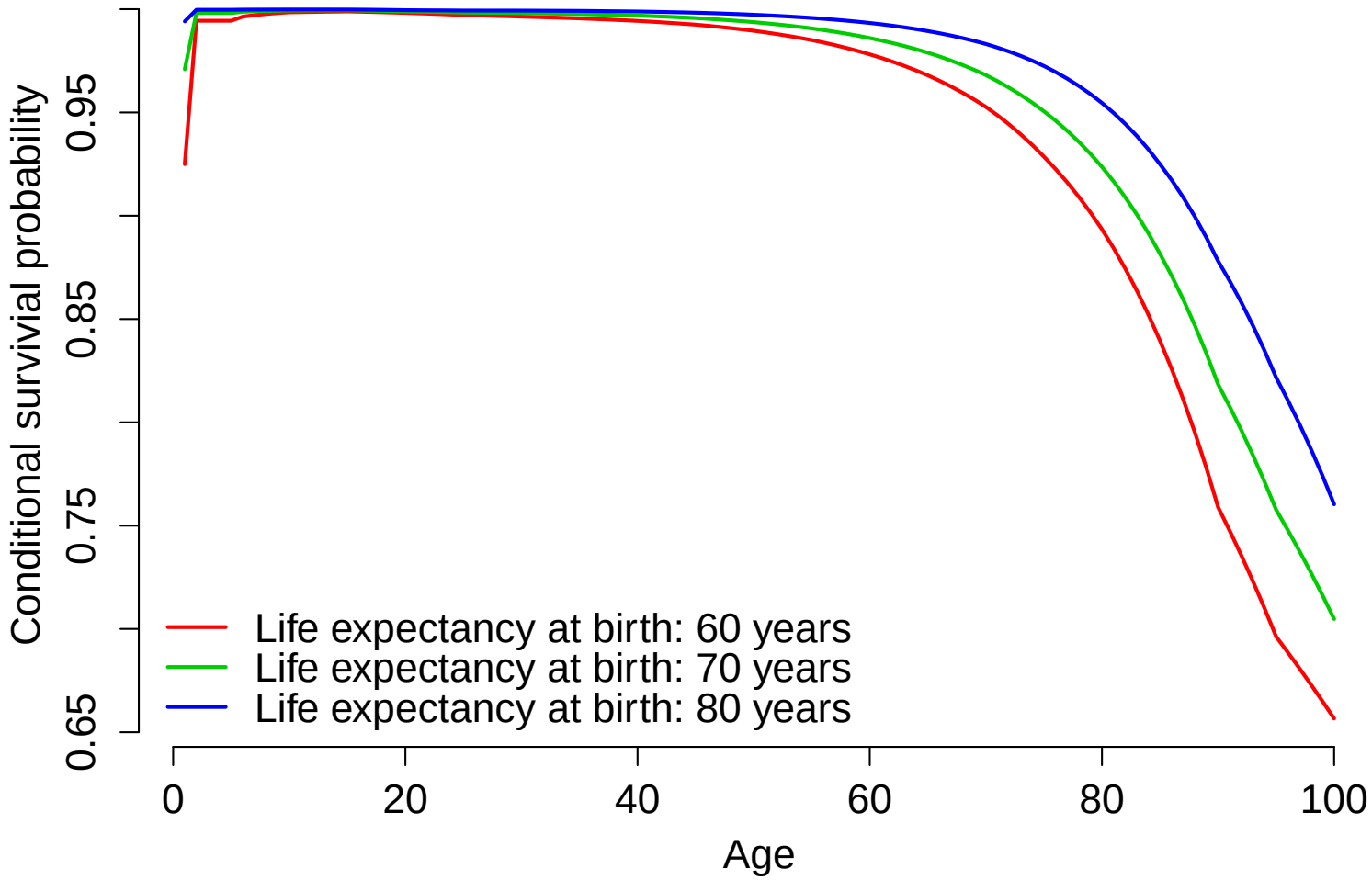
- Households choose consumption to maximize utility given prices and budget constraints
- Firms choose inputs to maximize profits given prices and technology
- One of the following:
  - Closed economy: supply equals demand for capital, $A_t = K_t$
  - **Open economy:** given interest path, $NFA = A_t - K_t$

Steady State Supply and Demand

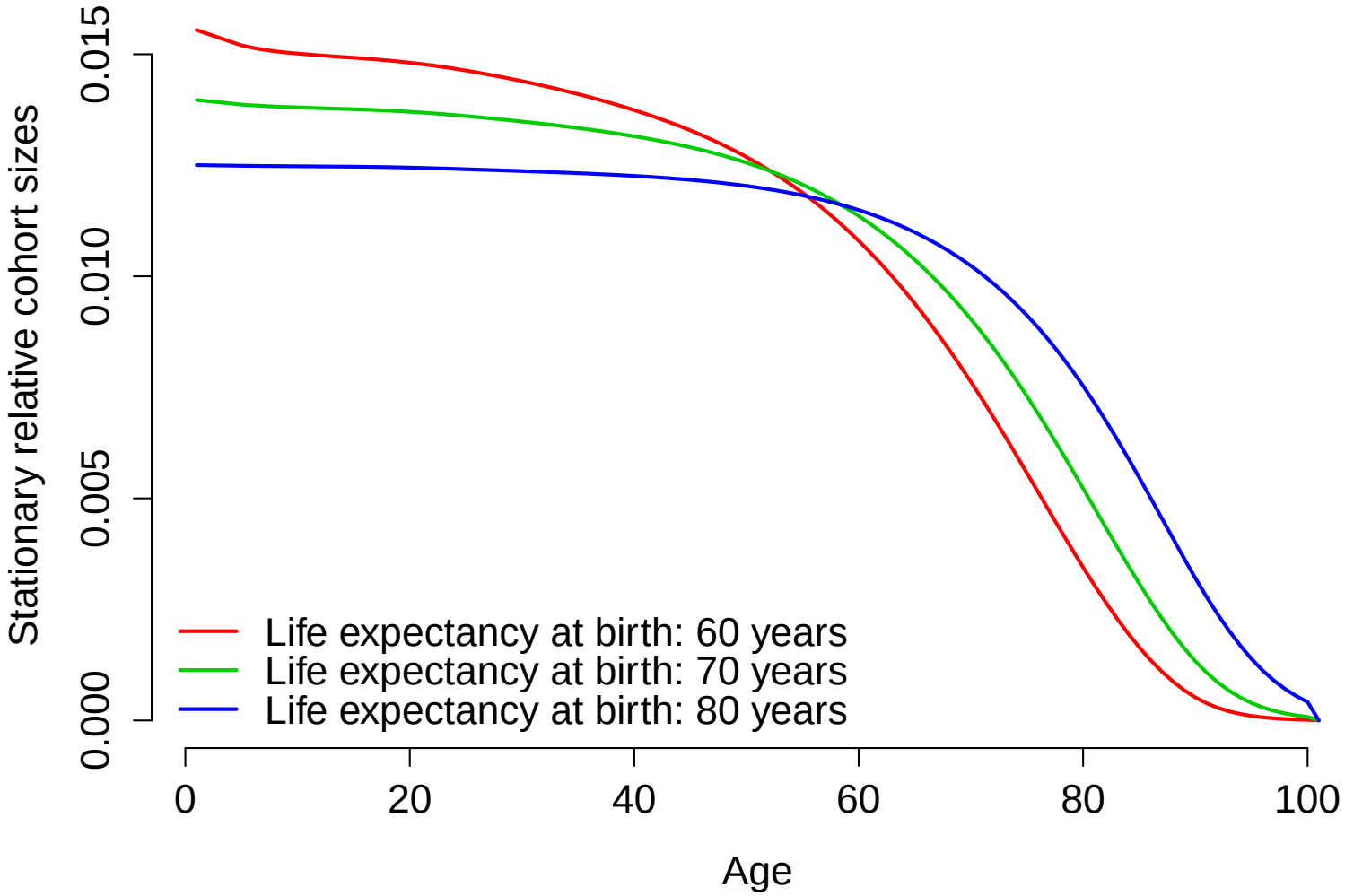
Steady state: overview

- Capital market supply and demand
- Stylized demographics
  - One birth every period
  - Mortality rates scaled down to increase life expectancy
- Illustrate **impact of life expectancy**

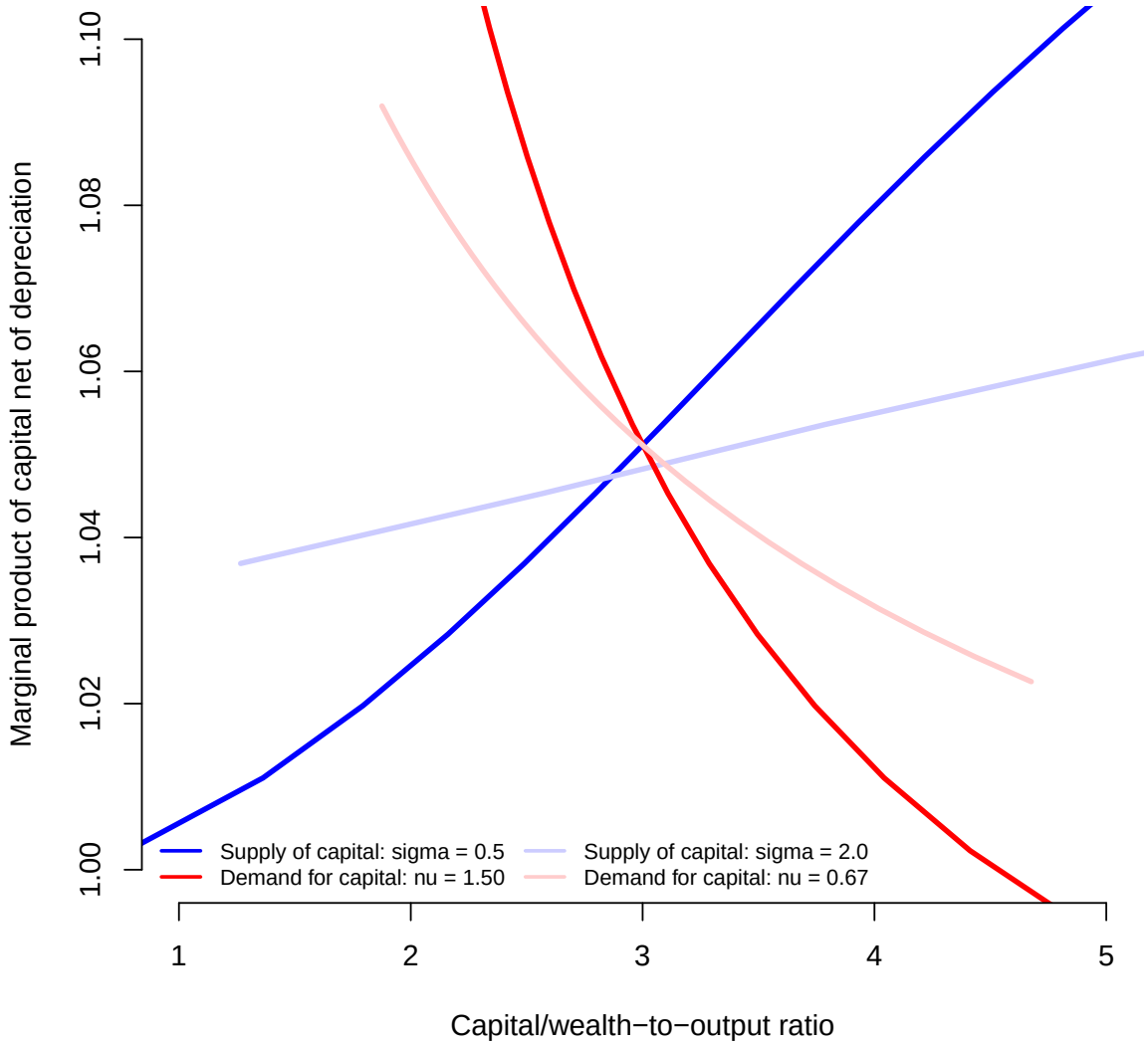
Steady state: survival probabilities



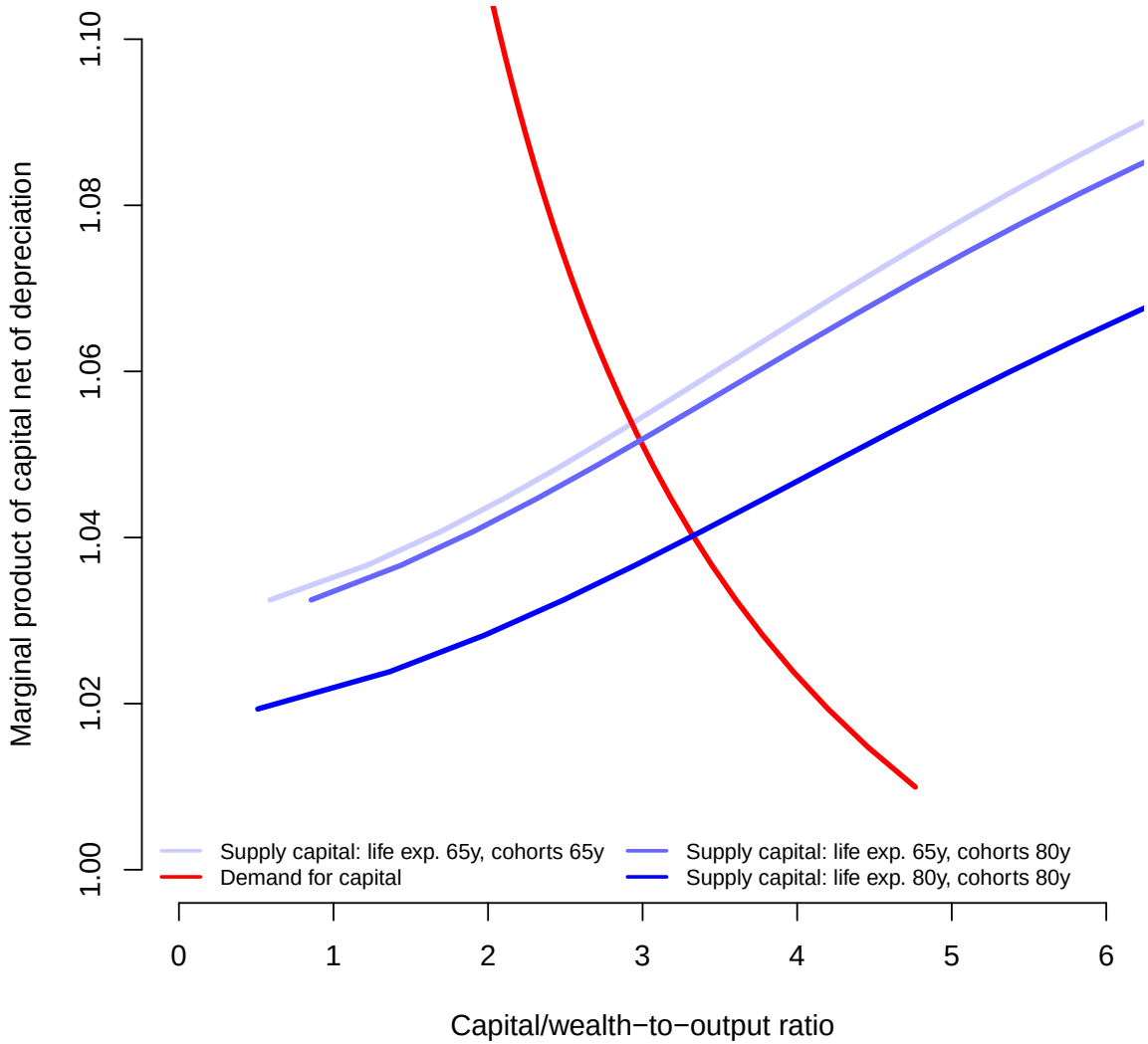
Steady state: age distributions



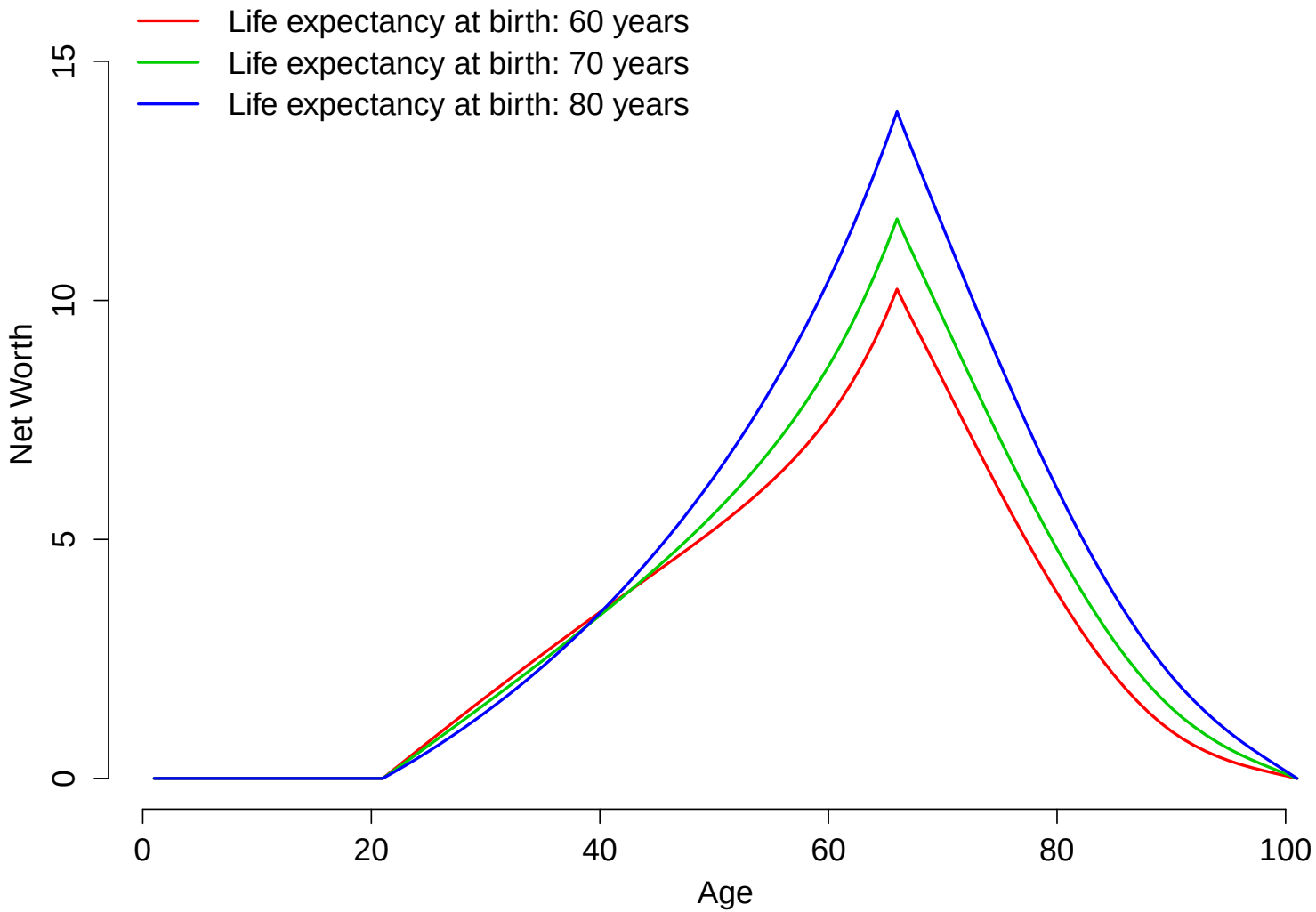
Steady state: supply and demand



Steady state: life expectancy 65 $\rightarrow$ 80



Steady state: net worth by age

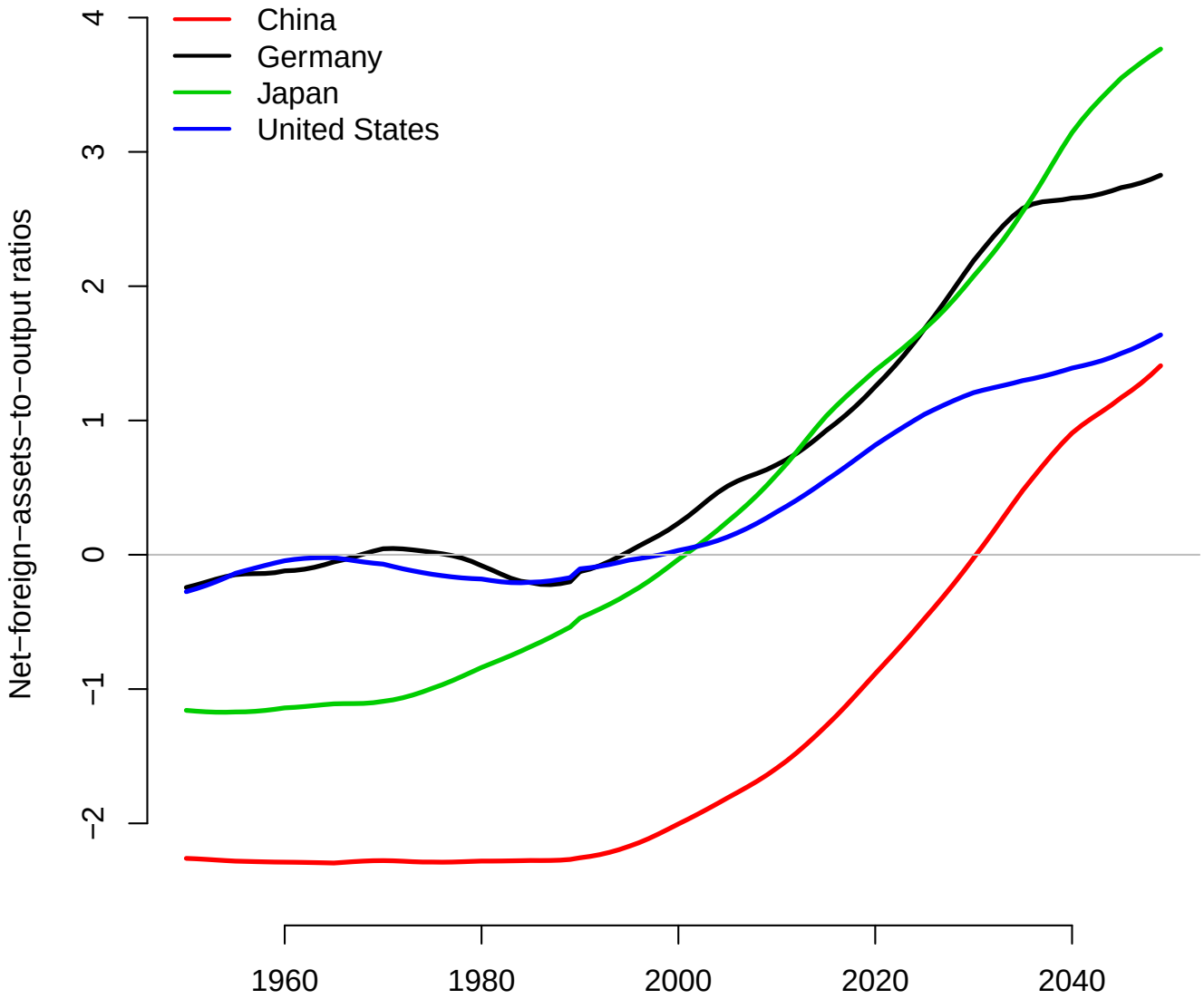


Dynamics

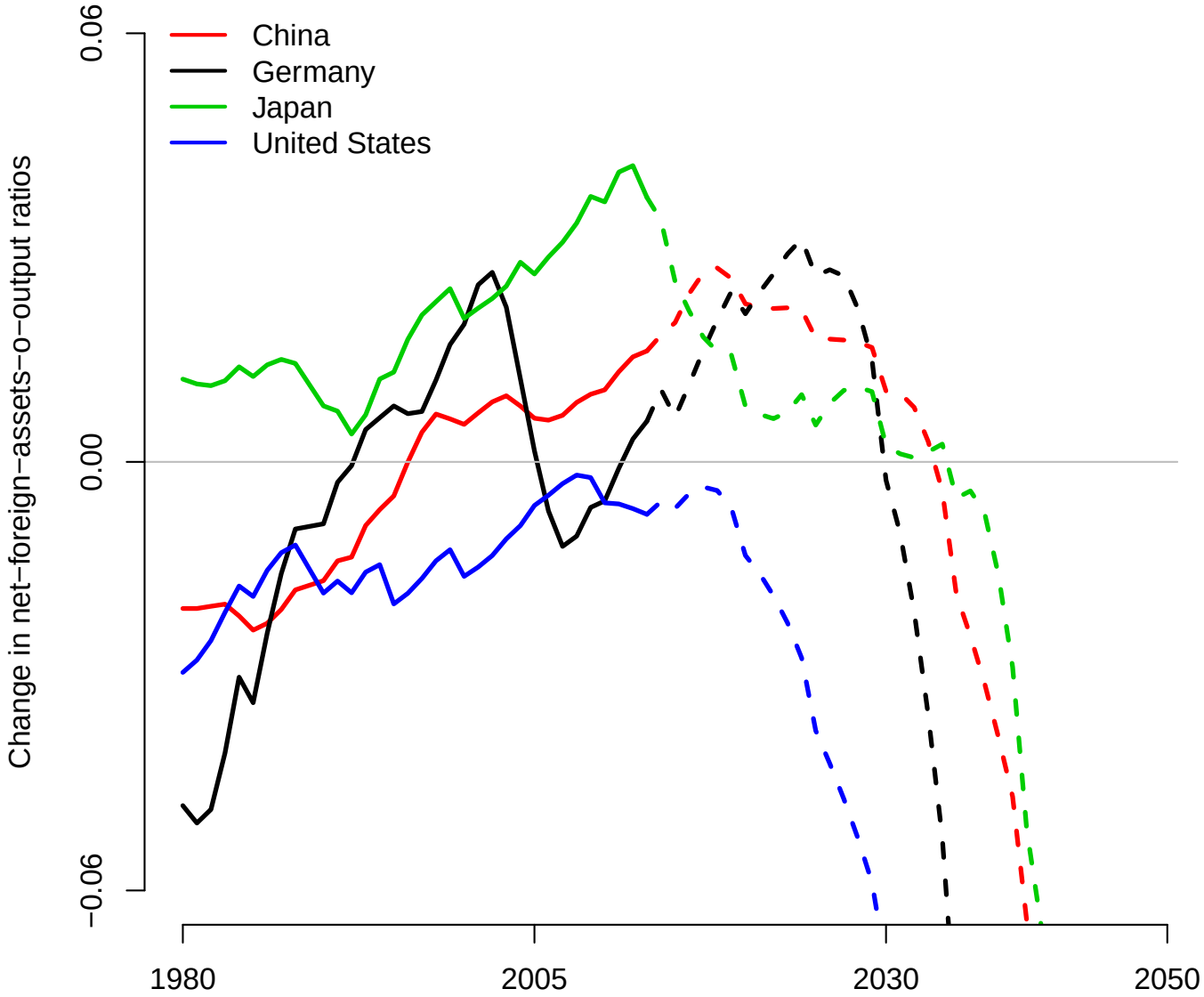
Dynamics: overview

- Countries differ only in demography
- Inputs
  - Log utility, Cobb-Douglas production
  - Mortality from WHO data
  - Age distribution from UN projections
- Result: **aging drives capital stocks and flows**

Dynamics: net foreign assets (constant r)



Dynamics: capital flows (falling r)



Last thoughts

- Capital flows
  - A fact of life for more than a century
  - Persistent
  - A role for demography?
  - What else would you suggest?
- Open questions
  - Why do capital-output ratios differ?
  - Why does China save so much?