

Public Transfer Accounts with Applications to the US

Ronald Lee

Tokyo

October 18, 2005

Outline for Public Sector Lecture

1. Introduction
2. The basic data for public accounts
3. Empirical age profiles: charting the columns of the matrix
4. What can public sector accounts be used for?
5. We can view the age patterns of public transfers cross-sectionally
6. Changing fiscal support ratios as population ages
7. Fiscal projections
8. We can also view these age patterns longitudinally
9. Becker-Murphy theory
10. Windfall gains and losses
11. Generational Accounts for the US, 1850 to 2090
12. Sensitivity tests, political economy, and other extensions
13. Comparative Results for US and France

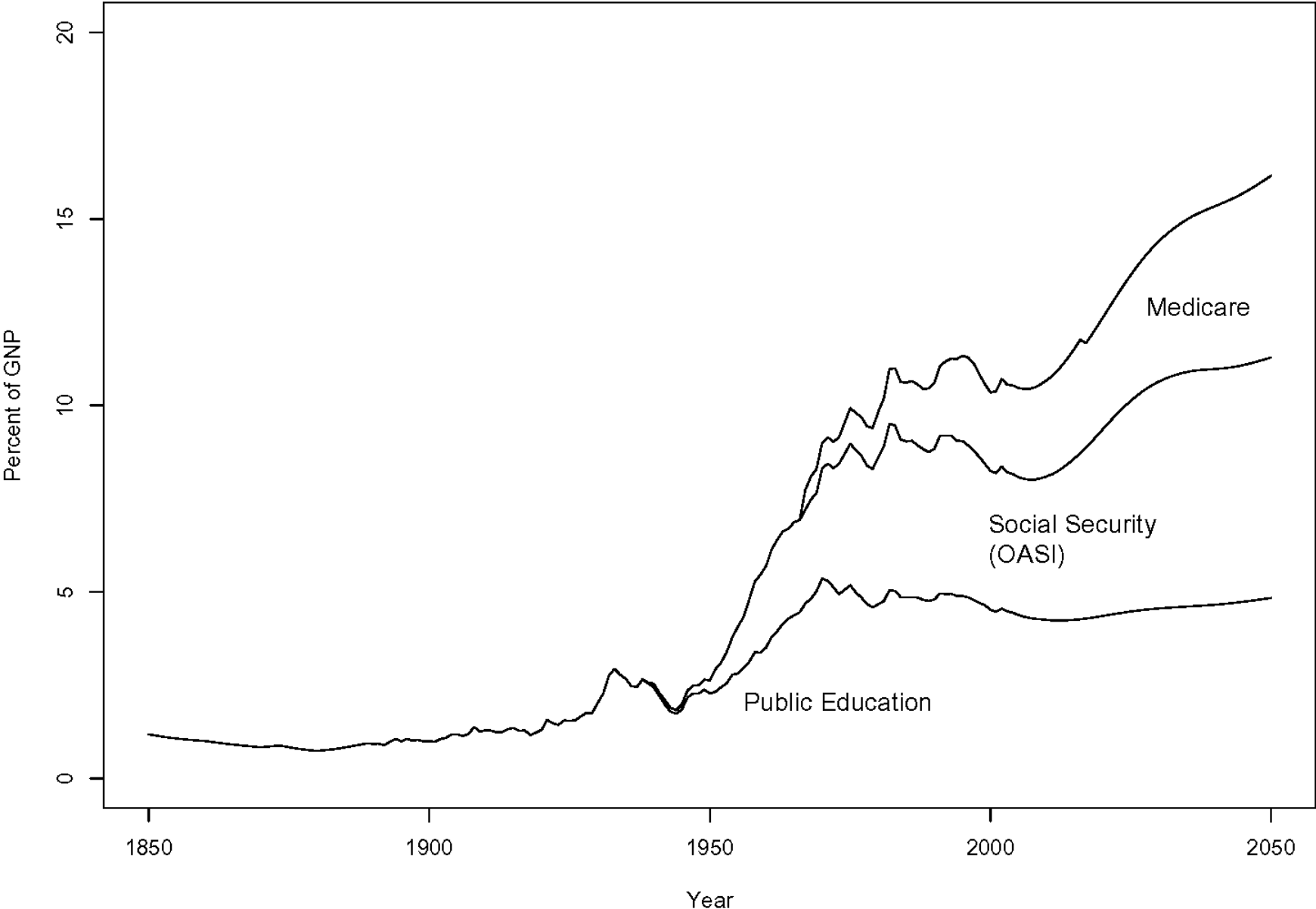
References for this lecture

- Bommier, Antoine, Ronald Lee, Timothy Miller, and Stephane Zuber (2004) "Who Wins and Who Loses? Public transfer accounts for US generations born 1850-2090," *National Bureau of Economic Research Working Paper No. 10969*, December 2004 (<http://www.nber.org/papers/w10969>).
- Ronald Lee and Ryan Edwards (2002) "The Fiscal Effects of Population Aging in the US: Assessing the Uncertainties," James M. Poterba, ed., *Tax Policy and Economy* v.16 (NBER: MIT Press, 2002) pp. 141-181.

1. Introduction

- Public sector transfers have become an increasingly important role of government
- In industrial nations, the most important are
 - Pensions (Social Security in US) (cash)
 - Health care (Medicare and Medicaid in US) (in-kind)
 - Public Education (in-kind)
- In most Third World countries, pensions and health care for elderly are not very important (some Latin American countries are an exception)
- Here are examples

Figure 4. Public education, Medicare, and Social Security (OASI) transfers as percent of GNP



2. The basic data for public accounts

Public Education Benefits Received by Age and Time (2004 US \$) per Native Born Individual

Age	Time (Calendar Year)					
	1850	1851	...	2004	...	2200
0						
1						
2						
...						
109						
110						

Historical data and methods

- Data sources
 - IPUMS (micro level census data)
 - Administrative data
 - National Accounts control totals
- Methods for imputation
 - Estimate age profiles of taxes and benefits
 - Adjust height of profiles to match control totals
 - Assume balanced budget for education
- Other accounts directly from data
- Discount at constant 3% for baseline; sensitivity tests (2%, 5%, historical 6 mo treasury).

Historical data and methods (cont.)

- For education, assume balanced budget
 - costs driven by enrollment rates, number of kids, and costs per pupil at each level
 - property taxes are set to generate revenue equal to costs
- For Social Security and Medicare, we use actual historical data on taxes and benefits.
- For budget balancing etc. we use actual population by age each year.
- NPV calculations are for native born.

Projections

- Demography – standard (Soc Sec assumps)
- Taxes and benefits –we match official assumptions and rules for Soc Sec and Medicare
- Health expends per enrollee rise 1% faster than prod growth throughout 21st century
- Productivity growth at 1.6%, covered wages at 1.4%.
- For education, assume
 - no future increases in enrollments,
 - age profile of costs per student rises with productivity growth rate

Results are reasonably consistent with

- recent Gokhale-Smetters fiscal imbalance
- recent generational accounts for US (Gokhale et al, 2000)

Alternative policy scenarios:

- Current policies would lead to ballooning deficits, and cannot be sustained.
- We assume imbalances will be corrected, in one of three alternate ways (once trust funds exhausted):
 - Raise taxes to meet cost of benefits.
 - Cut benefits to meet tax revenues.
 - **OUR BASELINE:** Combine tax and benefit adjustments 50-50.

3. Empirical age profiles: charting the columns of the matrix

The changing age profiles of taxes and benefits in the US: 1900, 1930 and 2000

% per capita gdp

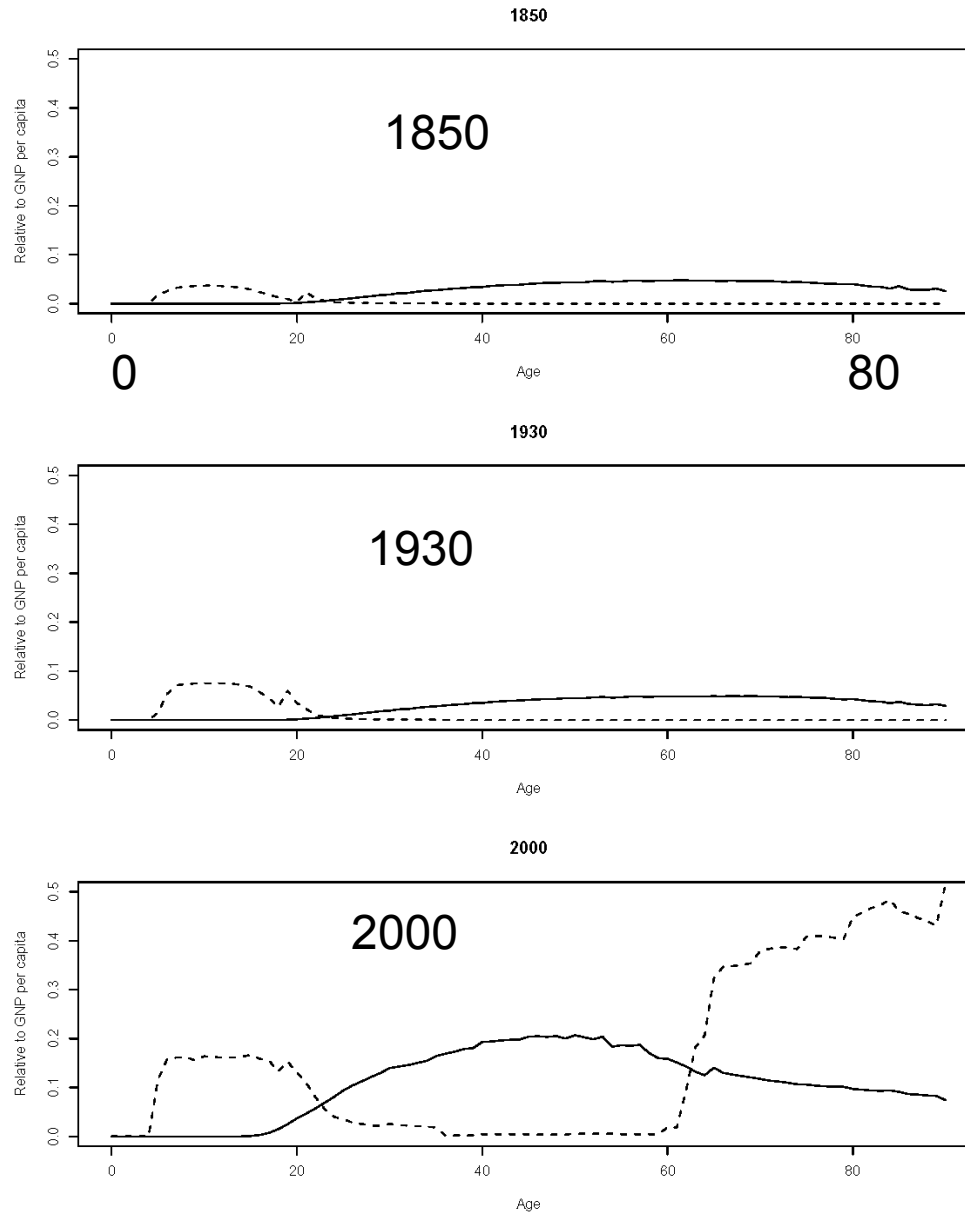
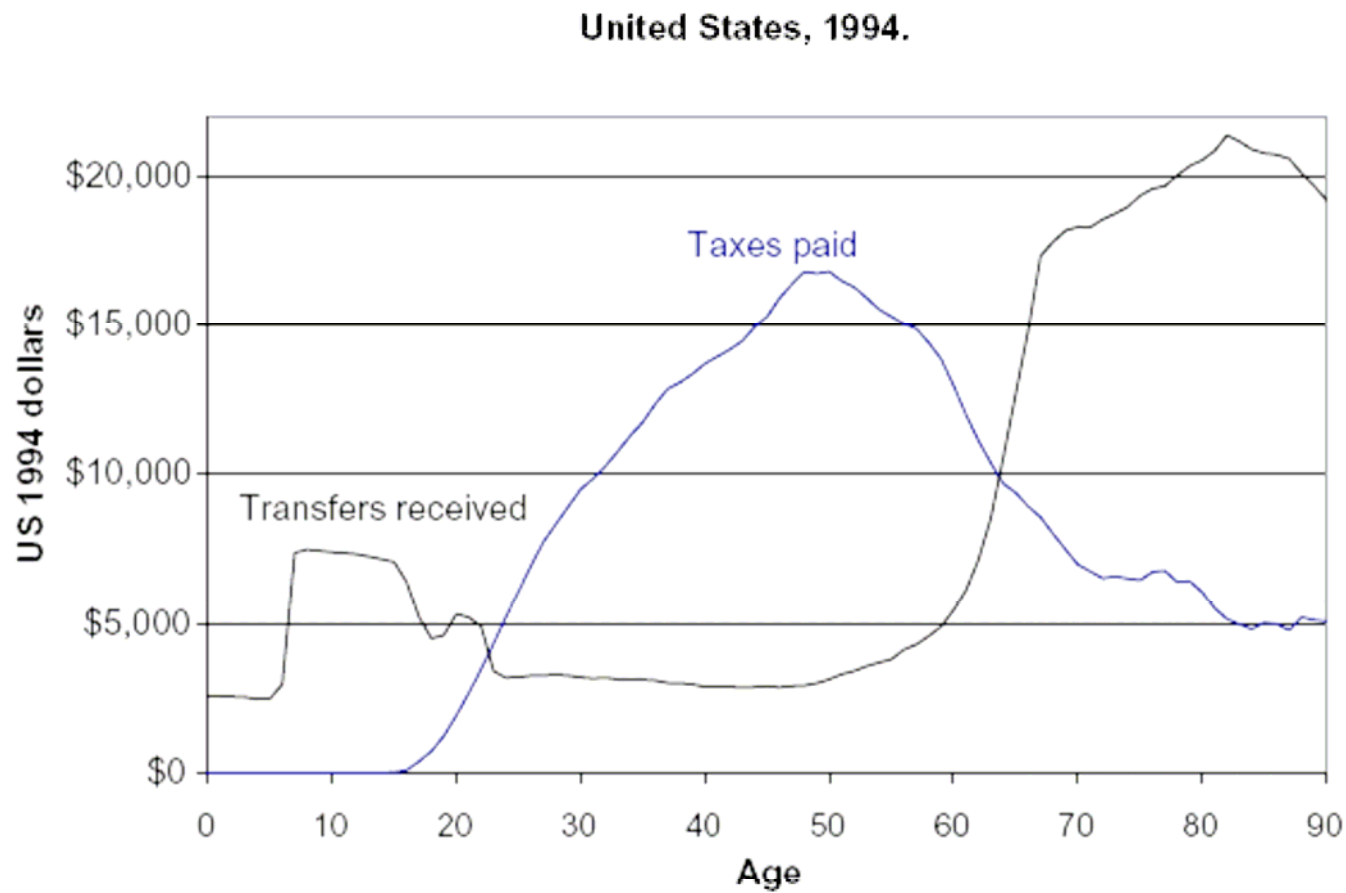


Figure 3. Age schedule of public sector transfers received and taxes paid per person in the U.S. and India



Per Capita Cost of Government Benefits by age of Recipient (including cash benefits such as Social Security)

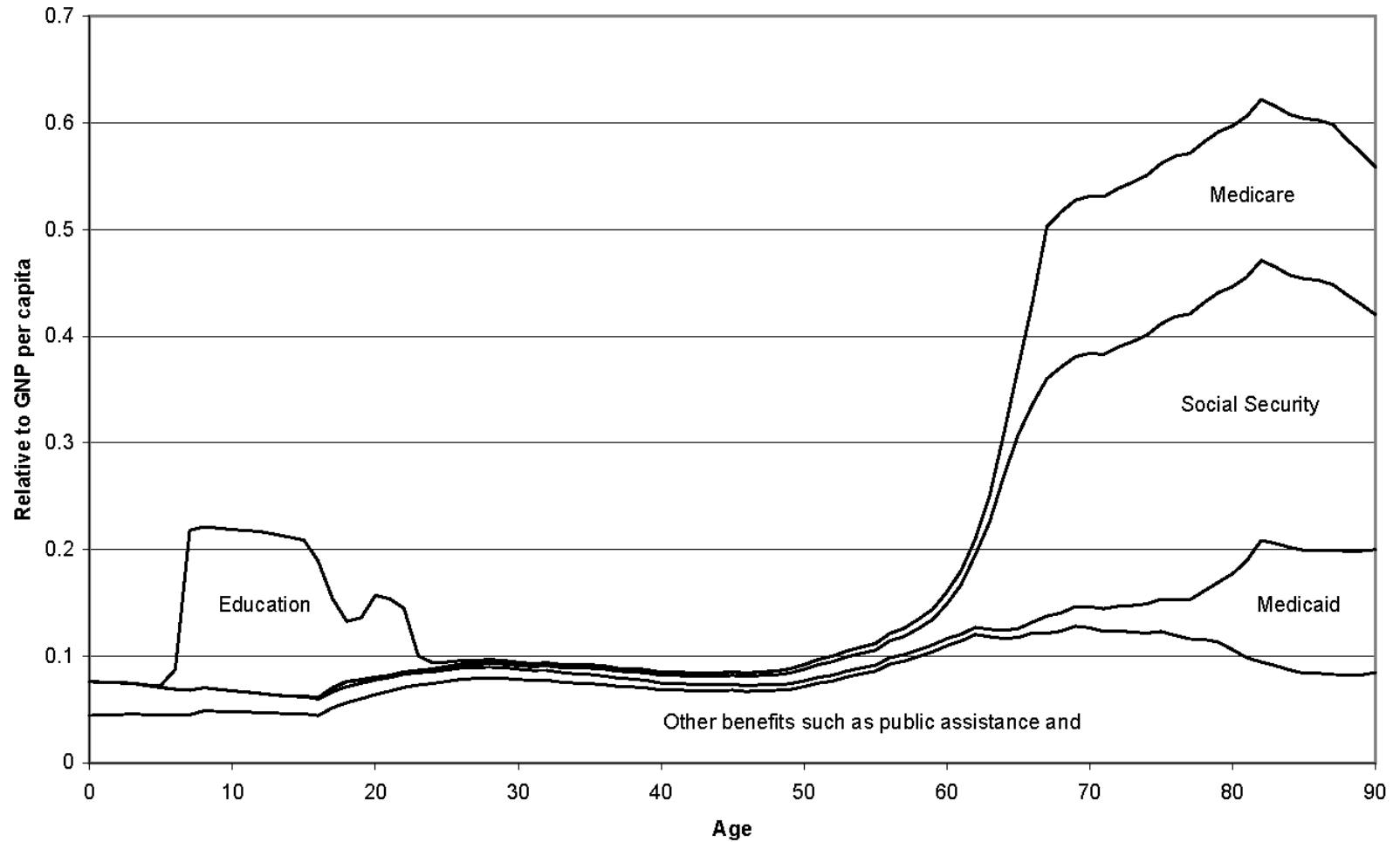
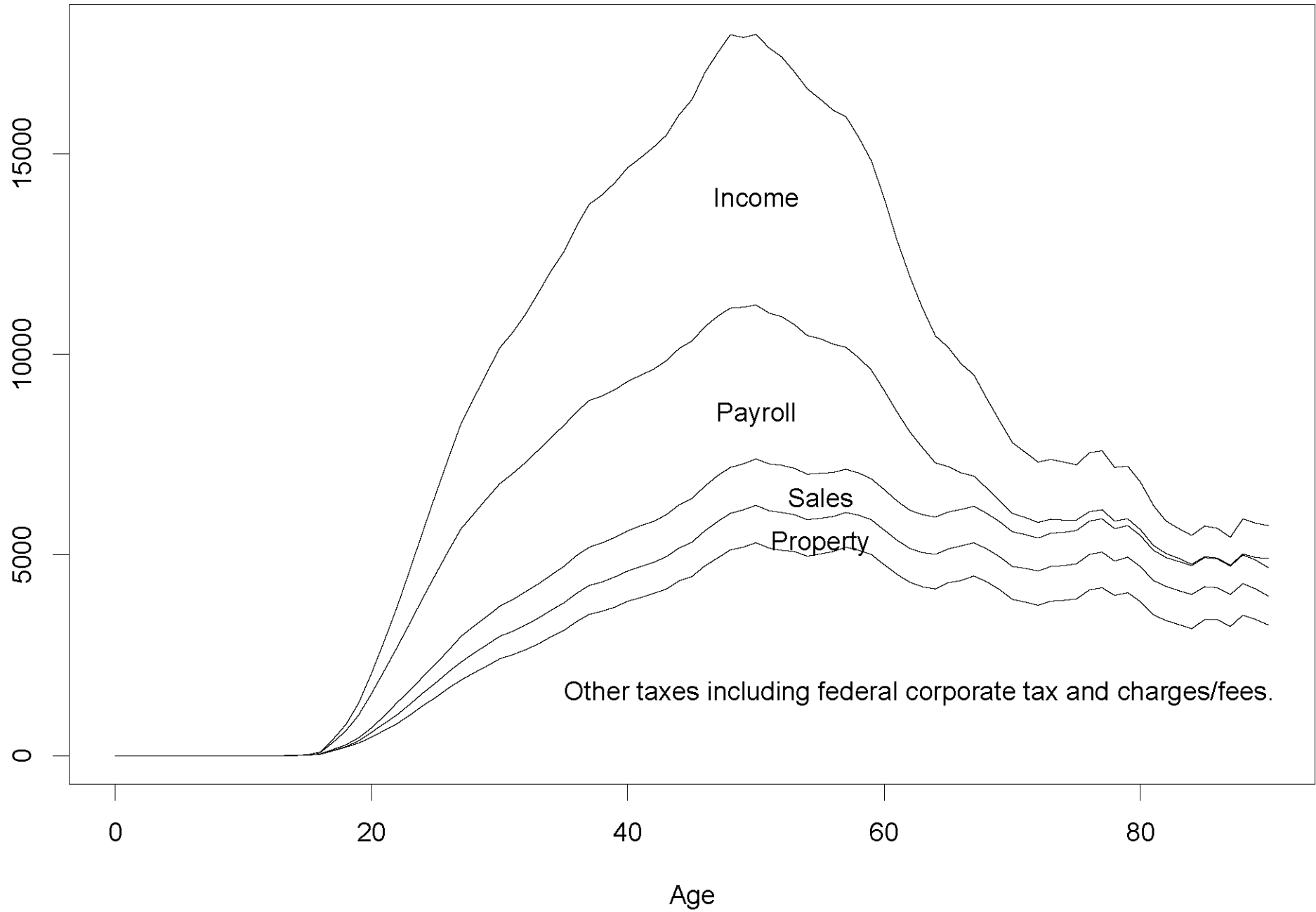
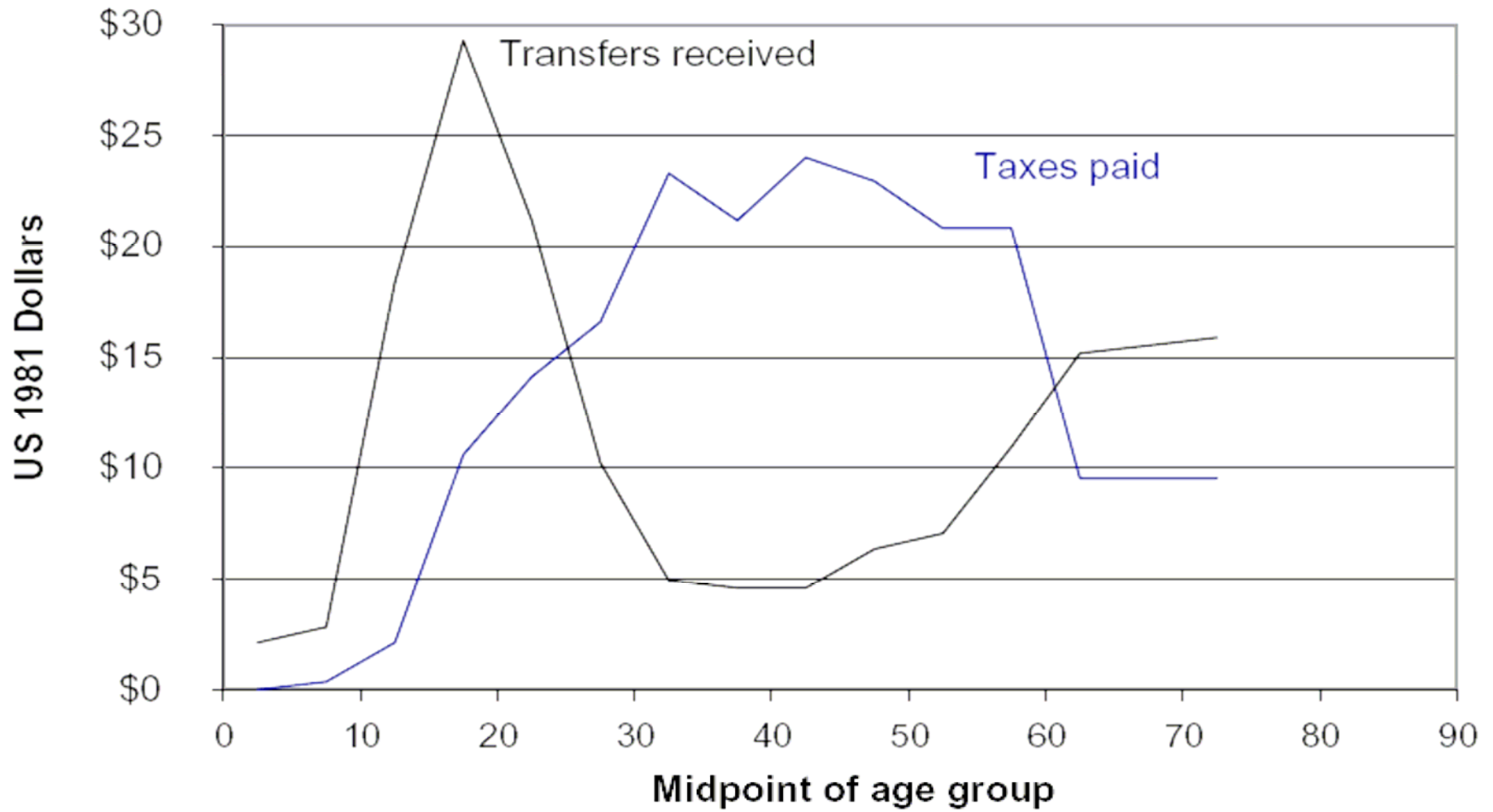


Figure 3. Taxes by program and age



India 1981



From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

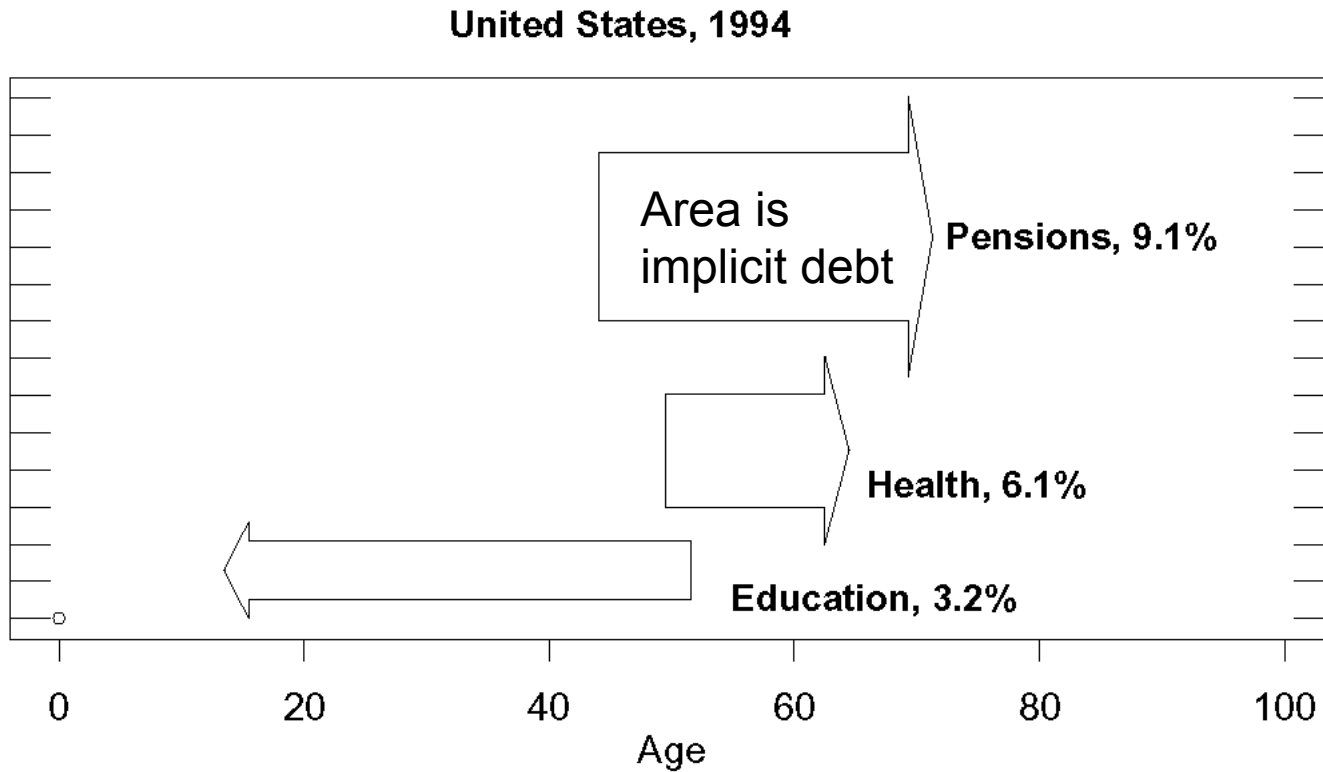
4. How can the public accounts be used? (Drawn from actual U.S. experience)

- Calculate Auerbach et al style Generational Accounting
- Fiscal projections
 - Consequences of population aging
 - Different demographic scenarios
 - Stochastic fiscal projections
- Fiscal impact of demographic events (fiscal externalities)
 - Births
 - deaths by age
 - immigrants
- Accounts for various programs
 - Implicit debt and explicit debt
 - Sustainability (infinite horizon) measures
- Generational accounting for current programs and proposed policies
 - Intergenerational redistribution, equity
 - Historical accounts
 - These differ from Auerbach et al style generational accounting.
- Policy simulations
 - Privatization of pension programs
 - Introduction of public sector pensions
- Changing direction of public sector transfers—upward or downward?

5. We can view the age patterns of public transfers cross-sectionally

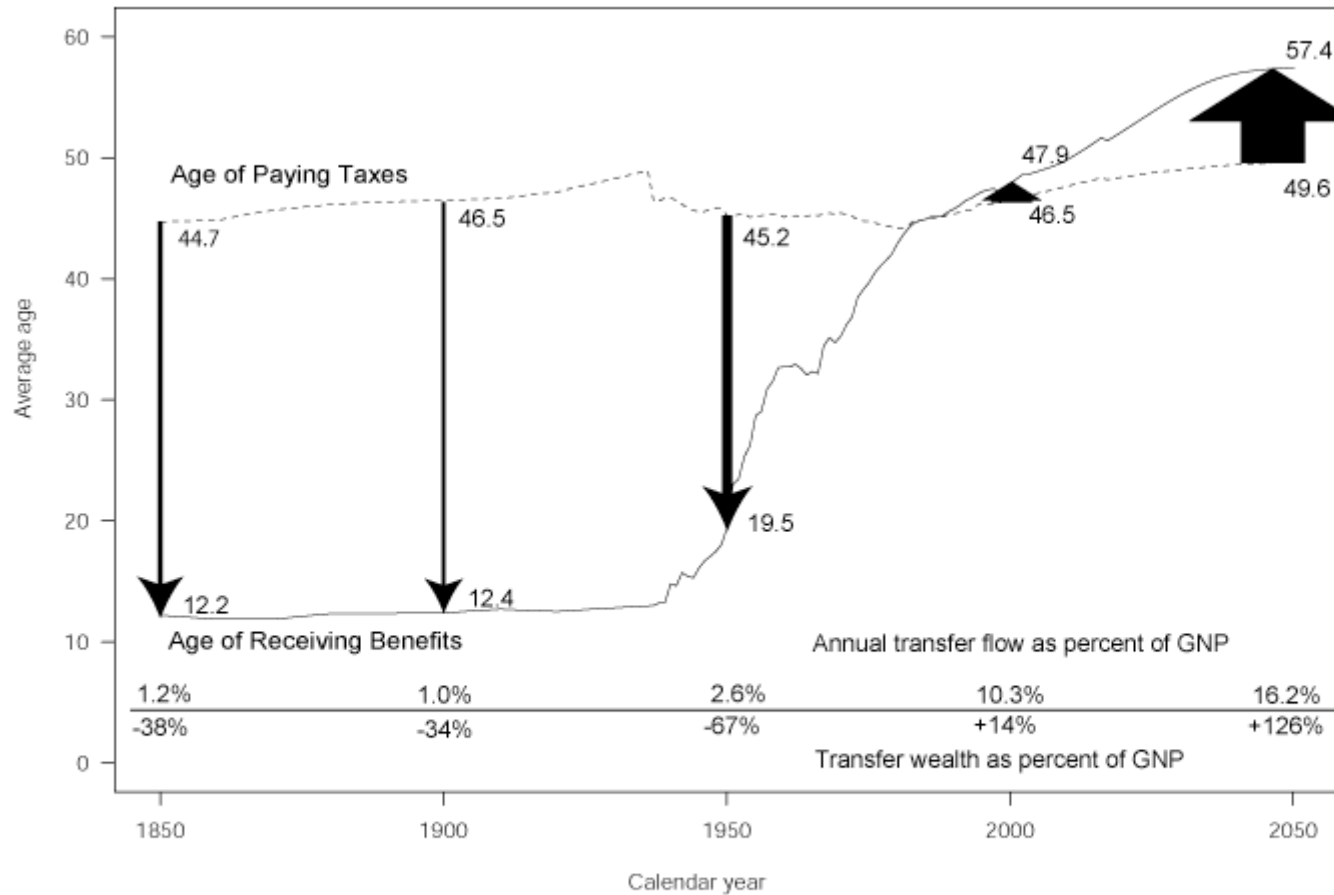
- Next slide shows details for some public transfer programs in US., cross-sectionally
 - Tail of arrow is at mean age of paying taxes;
 - head of arrow is at age of receiving benefits.
 - Width is per capita flow.
 - Area is transfer wealth or debt generated within transfer system

Figure 3. Direction and size (% of per-capita GDP) of public sector transfers in the United States



Calculations of resource flows in the US are based on a stationary population.

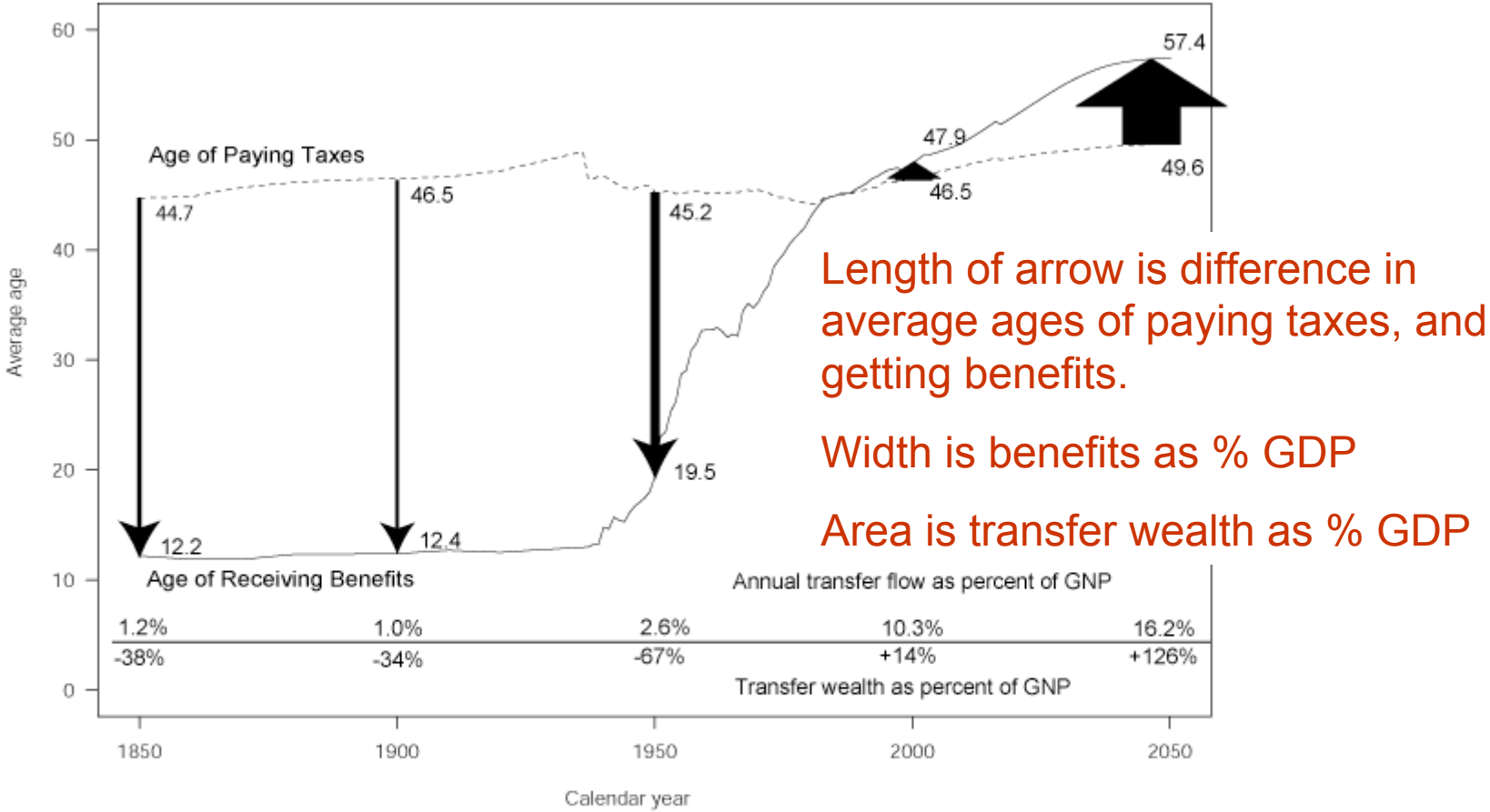
Public Sector Transfer Flows Reversed Direction in the 1970s, and Their Size Increased Relative to GDP (Soc Sec, Ed, Medicare)



Arrows show the direction of resource flows across age in the population in a given year. The tail of the arrow is placed at the average age of taxation and the head at the average age of receipt of benefit. The width of the arrow indicates the size of the transfer flow relative to GNP. The area of the arrow measures the transfer wealth generated by the public sector transfers, which is positive for net upward transfers and negative for net downward transfers. Transfers included here are education, Social Security, and Medicare.

Ronald Lee, UC Berkeley, 1/5/04

Public Sector Transfer Flows Reversed Direction in the 1970s, and Their Size Increased Relative to GDP



Length of arrow is difference in average ages of paying taxes, and getting benefits.

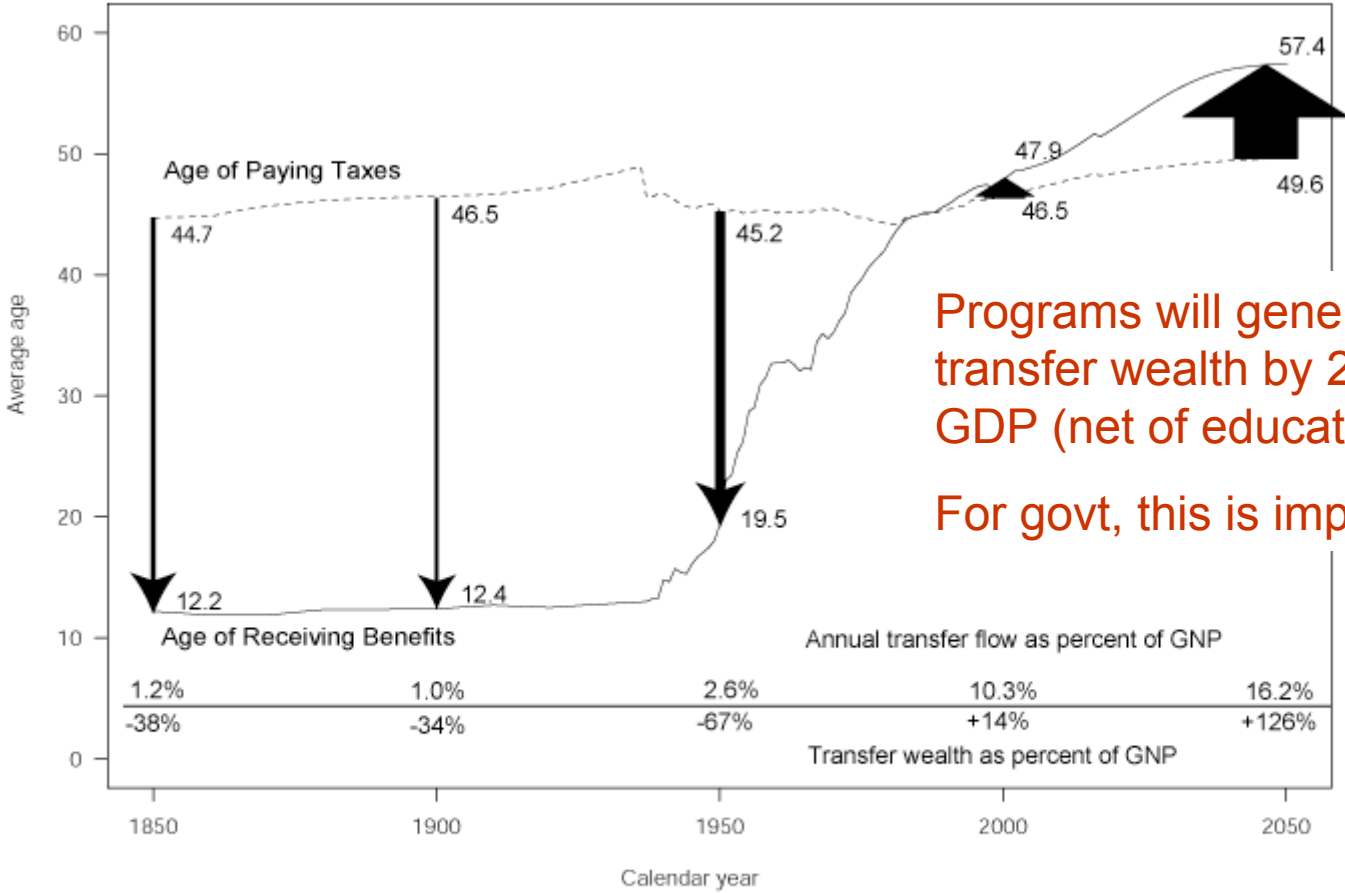
Width is benefits as % GDP

Area is transfer wealth as % GDP

Arrows show the direction of resource flows across age in the population in a given year. The tail of the arrow is placed at the average age of taxation and the head at the average age of receipt of benefit. The width of the arrow indicates the size of the transfer flow relative to GNP. The area of the arrow measures the transfer wealth generated by the public sector transfers, which is positive for net upward transfers and negative for net downward transfers. Transfers included here are education, Social Security, and Medicare.

Ronald Lee, UC Berkeley, 1/5/04

Public Sector Transfer Flows Reversed Direction in the 1970s, and Their Size Increased Relative to GDP



Programs will generate large transfer wealth by 2050 – 126% GDP (net of education).
 For govt, this is implicit debt.

Arrows show the direction of resource flows across age in the population in a given year. The tail of the arrow is placed at the average age of taxation and the head at the average age of receipt of benefit. The width of the arrow indicates the size of the transfer flow relative to GNP. The area of the arrow measures the transfer wealth generated by the public sector transfers, which is positive for net upward transfers and negative for net downward transfers. Transfers included here are education, Social Security, and Medicare.

Ronald Lee, UC Berkeley, 1/5/04

6. How Population Aging Will Affect Government Budgets

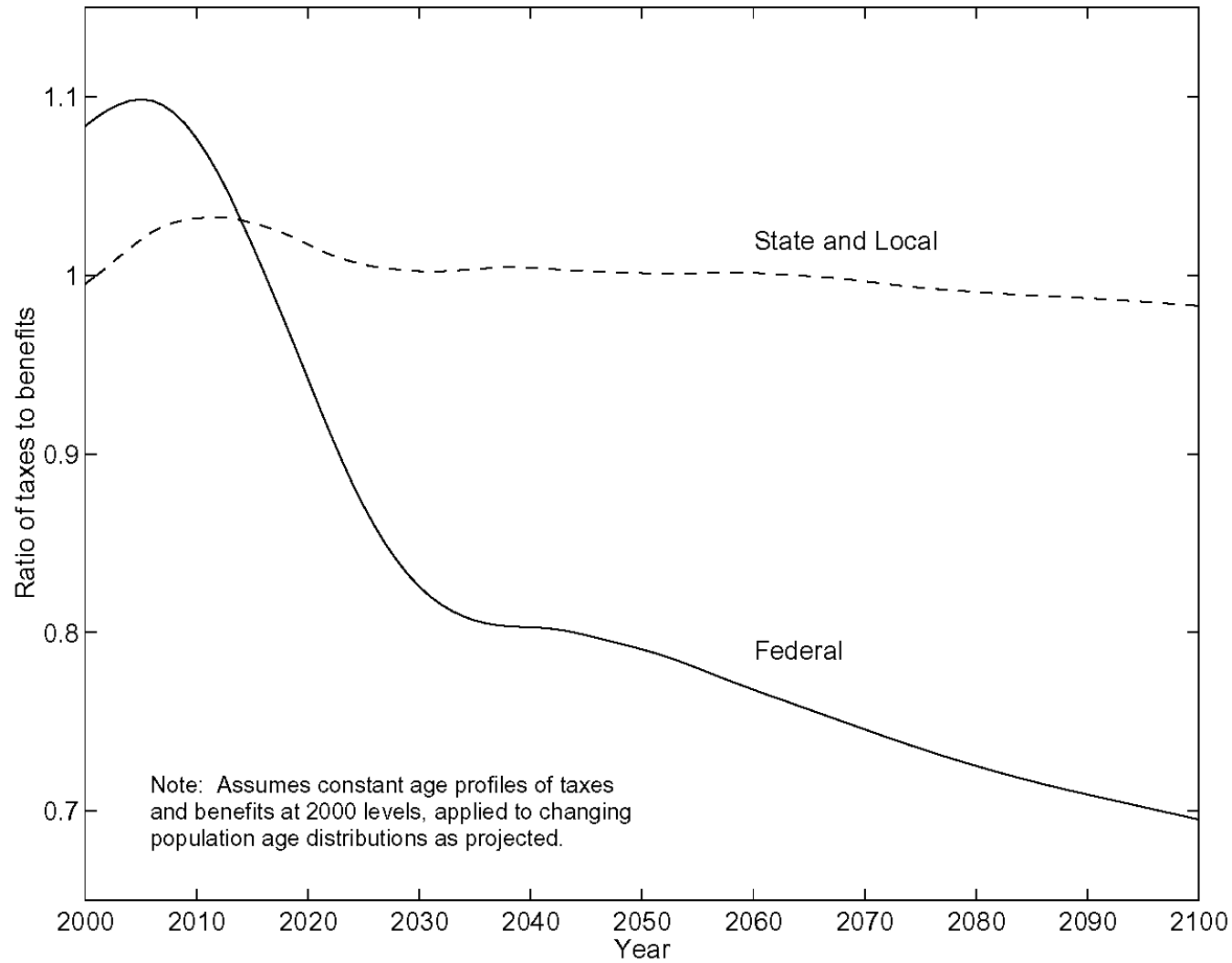
The fiscal support ratio for year t is:

Population(x,t) weighted sum of taxes based on fixed age schedule of taxes, $\tau(x)$, e.g. for 2000

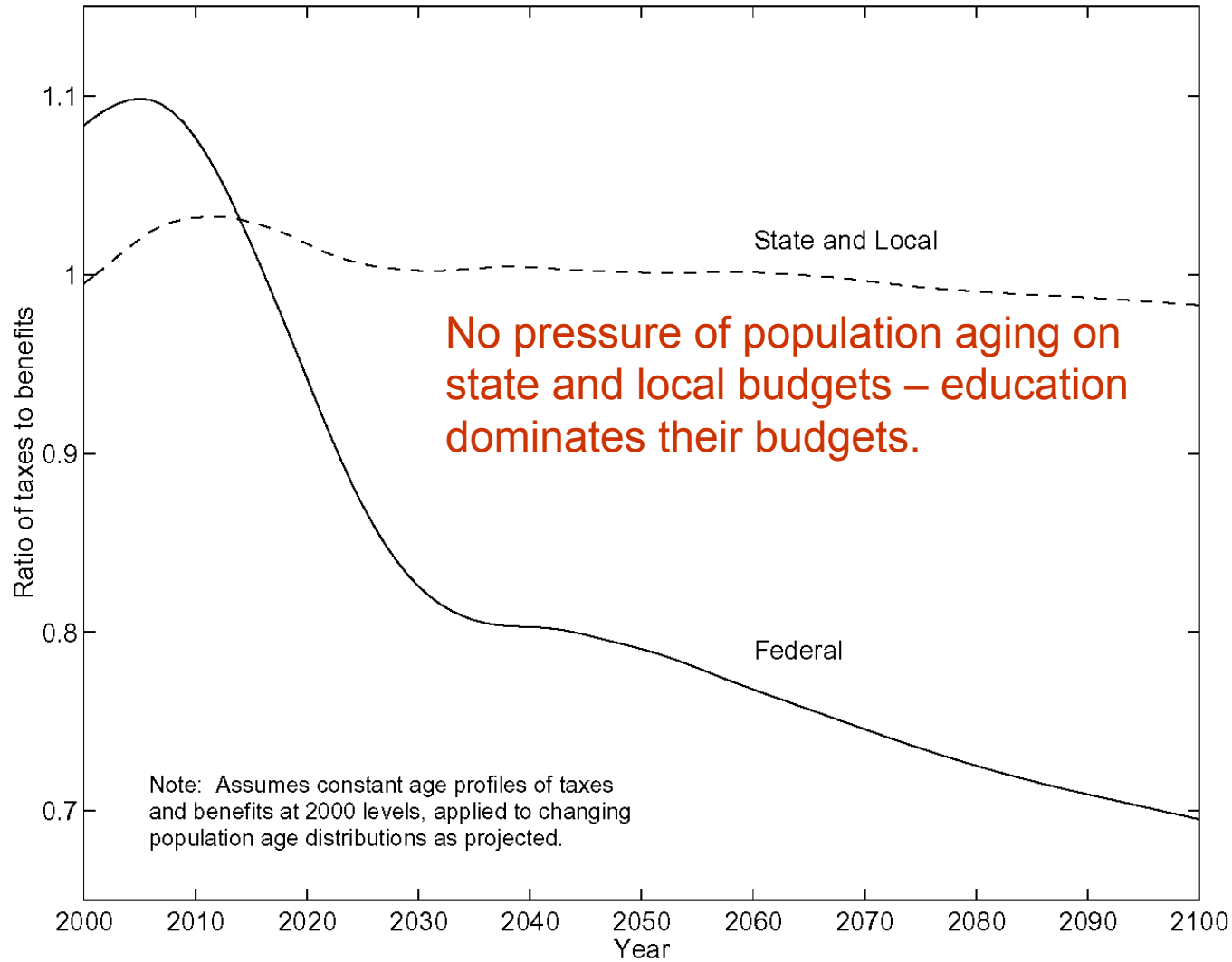
Population(x,t) weighted sum of benefits based on fixed age schedule of taxes, $\beta(x)$, e.g. for 2000

It shows the fiscal effects of changing population age distribution, e.g. as population ages, **given the current program and price structure.**

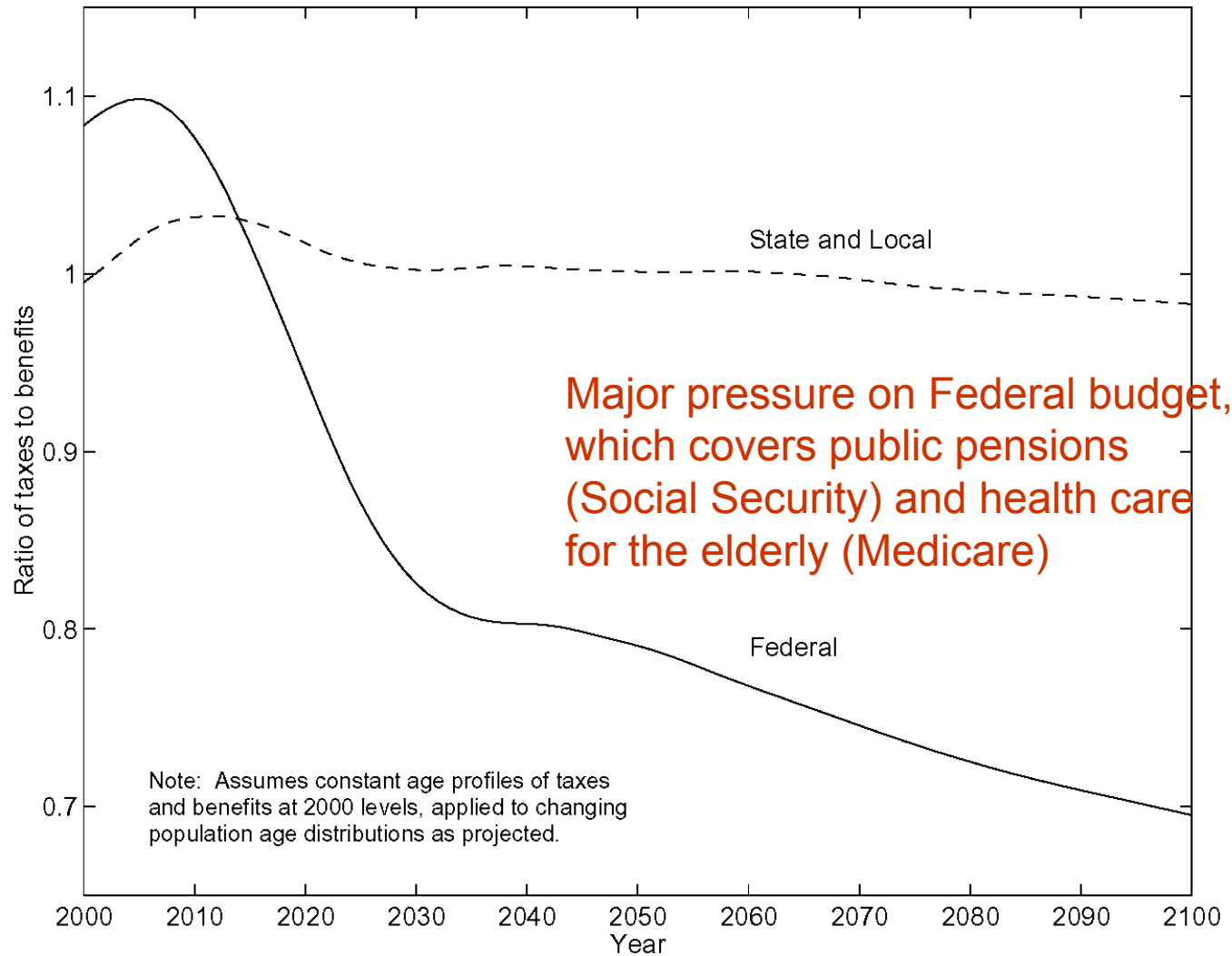
Fiscal Support Ratio Projections, 2000-2100



Fiscal Support Ratio Projections, 2000-2100



Fiscal Support Ratio Projections, 2000-2100



Given current program structure

- Balancing federal budget at end of century requires
 - Cutting benefits by one third or
 - Raising taxes by 50%
- As health care costs rise, larger adjustments will be necessary.

7. Fiscal Projections for USA

- Support ratios do not take into account economic change:
 - productivity growth,
 - price changes for benefits,
 - planned changes in programs
- Fiscal projections incorporate all of these, in addition to population change.

Mechanics of projections

- Projected productivity growth shifts both the tax profiles and the benefit profiles
 - Productivity growth alters public pension cost profiles in ways that depend on the system's rules
 - Costs of health care benefits are projected separately to reflect faster growth
- Projected interest rates are used to update program debt or trust fund values
- Demography, productivity, and interest rates can all be modeled and projected stochastically, leading to probabilistic budget projections.

Figure 6. Government expenditures as shares of GDP

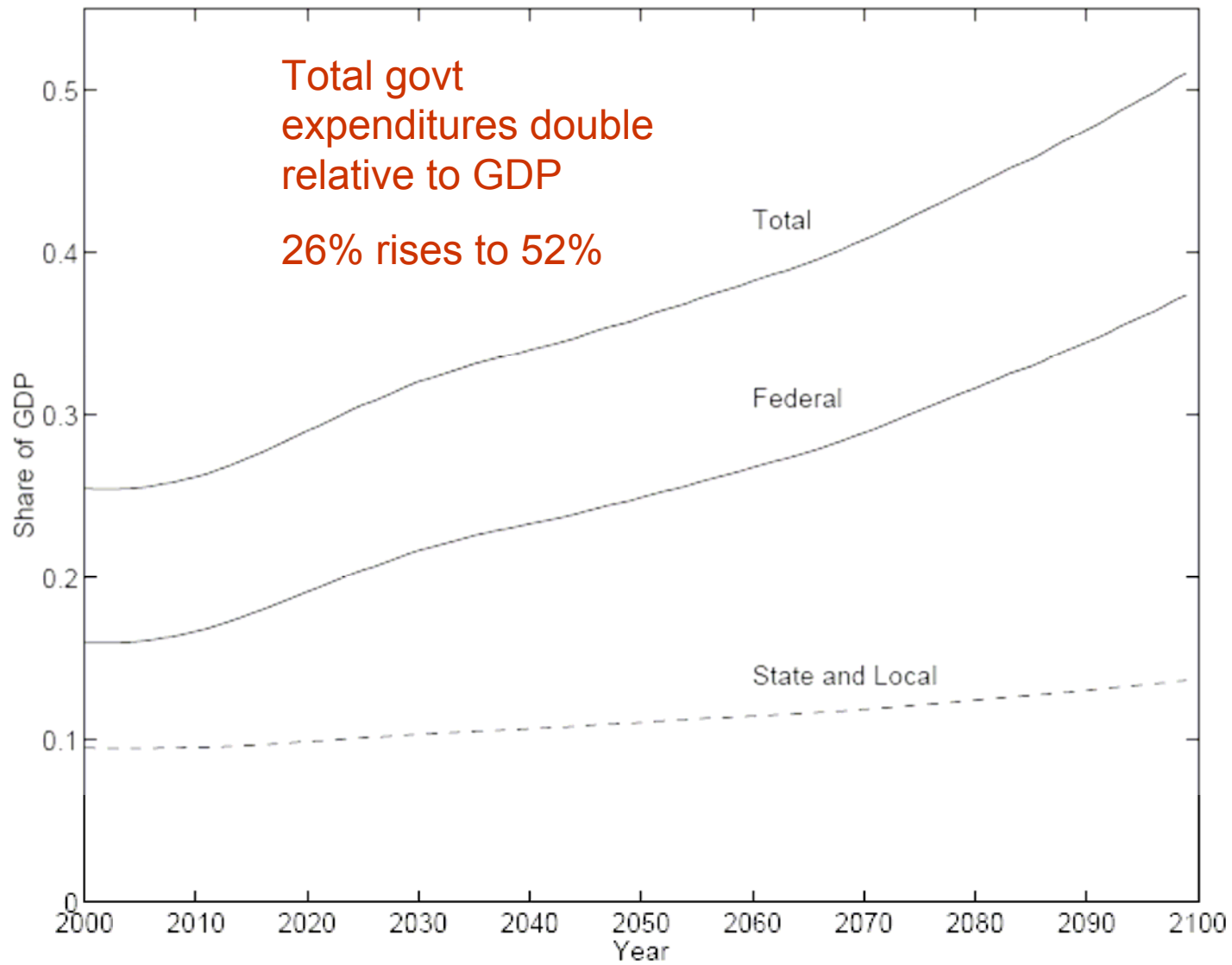


Figure 7. Government expenditures per GDP by age group

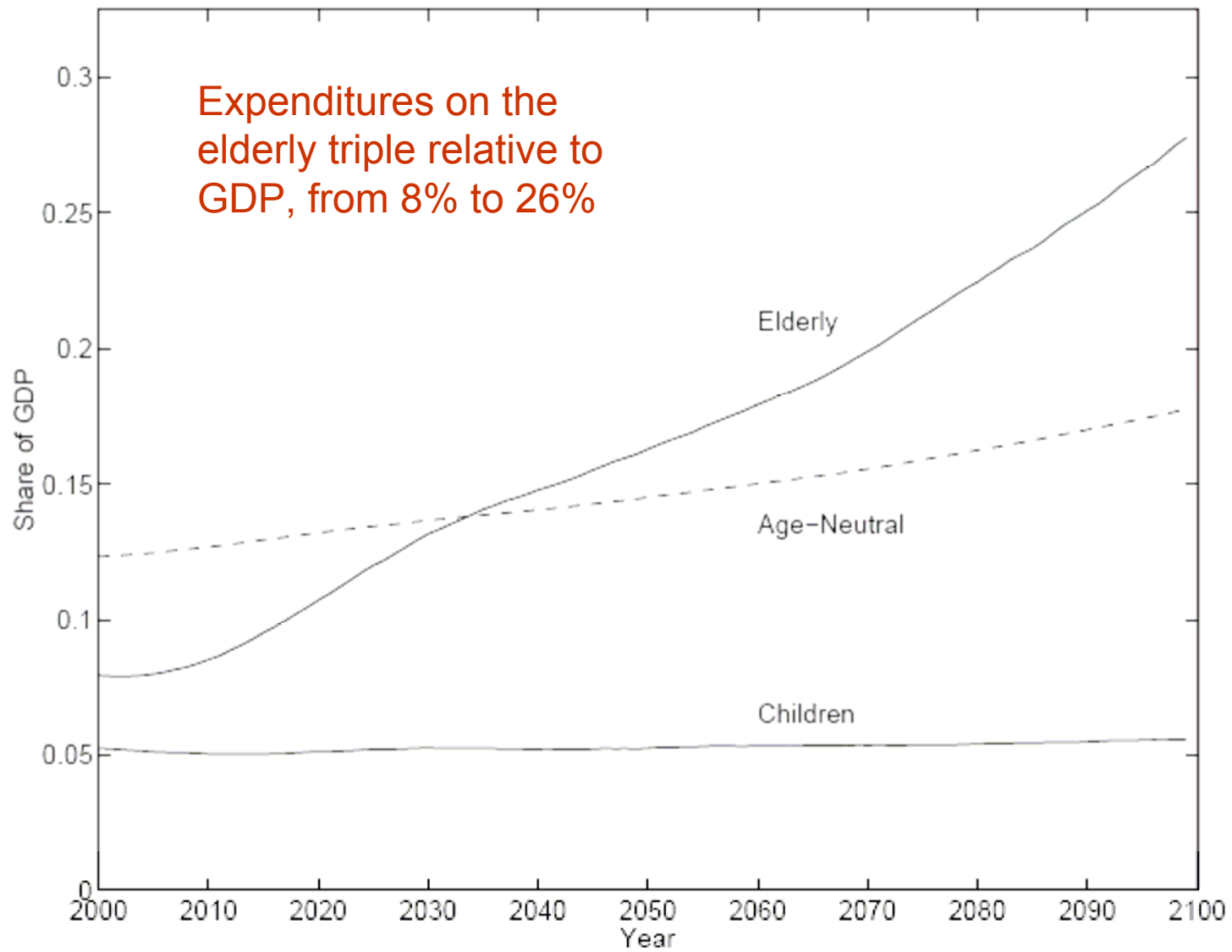
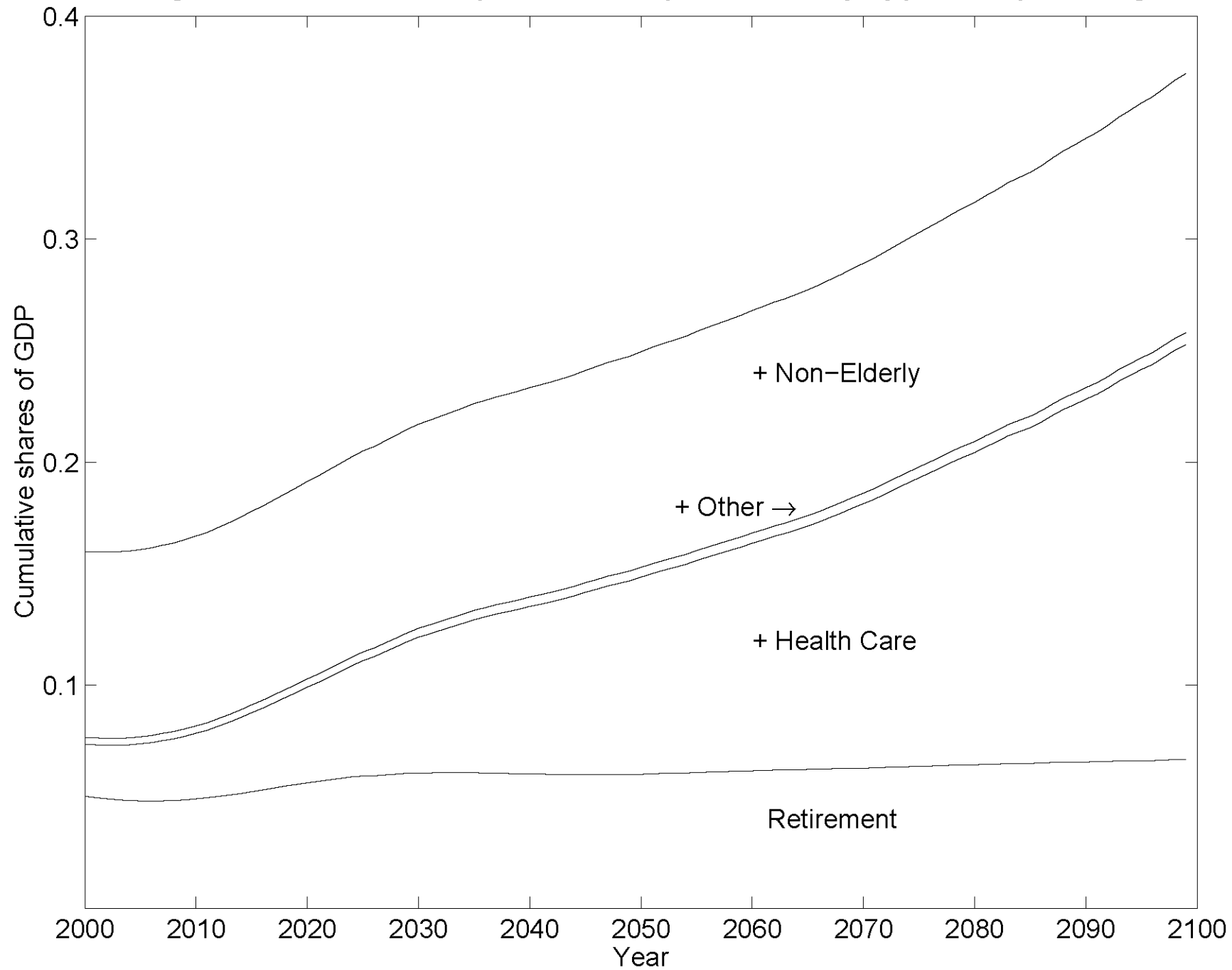


Figure 8. Federal expenditures per GDP by type of spending



8. We can also view these age patterns longitudinally

- Discuss results in terms of several questions:
 - Which generations are net gainers or losers?
 - Compare historical patterns to Becker-Murphy theory
 - Consider implications of different budget balancing policies for generational redistribution of income
- First define Net Present Value of a transfer system for a generation

All industrial nations have huge public transfer programs for pensions and health care

- Do these programs permit the current elderly to live well at the unfair expense of today's youth and tomorrow's newborns?
 - Large implicit debts
 - Very large fiscal imbalances
 - Low rates of return
 - Unsustainable programs under current policy
- Is this an intergenerational rip-off?

Quote from David Brooks, op ed piece in New York Times, 2/5/05

- “The living and well organized are taking money from the weak and unborn. Over the past few decades we have seen a gigantic transfer of wealth from struggling young families and the next generation to members of the AARP [Elderly].”
- Many others express similar views.
- Evaluate by looking at Net Present Values of generations participating in the public transfer system.

Calculating NPV for generation born in year t

- $\tau(x,s)$ = tax paid at age x in year s
- $\beta(x,s)$ = benefit received at age x in year s
- $l(x,t+x)$ = proportion of births in year t surviving to age x in year t+x.
- $$\text{NPV}(t) = \sum e^{-rx} l(x,t+x) [\beta(x,s+x) - \tau(x,s+x)]$$
- $r=.03$ in baseline. Also try .02, .05. Also historical, varying year to year.
- NPV can be calculated from any age; here mostly at birth, i.e. age 0.

Our estimates cannot tell us how the transfer system has affected generational consumption.

- Without public ed, parents would have provided private ed for children, somewhat.
- Without Social Security, people would have worked longer, lived more often with their kids, had larger private pensions, and saved more.
- Without Medicare, health costs would not have risen so much, people would have saved more, employers would have provided more insurance, families would have provided care, etc.

9. How are these transfer programs linked? Becker and Murphy (1988).

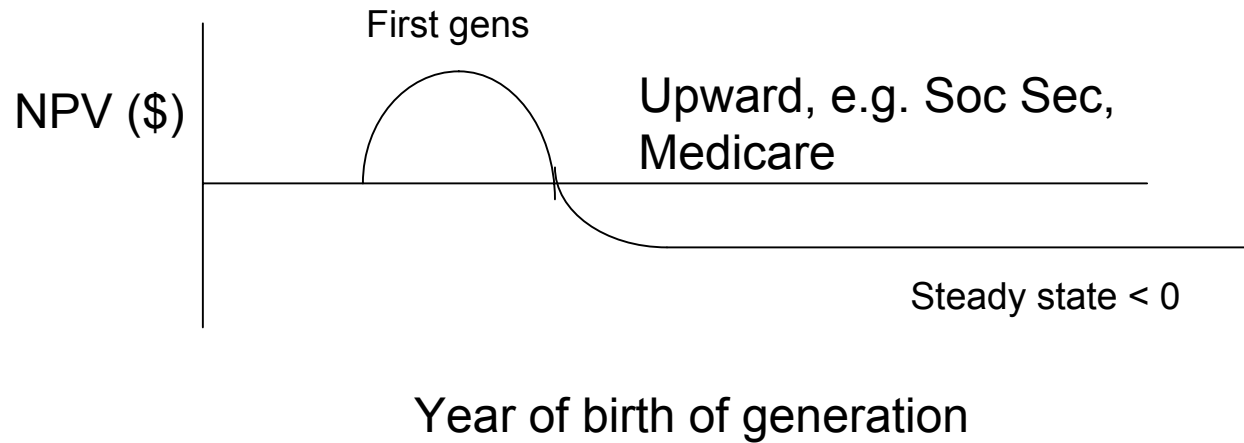
- Initially, parents under-invest in children's education because their altruism is limited and no institutions guarantee repayment
- Public education taxes parents to provide more education for kids (adults worse off)
- Then taxes kids (as adults) to provide pensions for the elderly (now the parents are better off).
- Thus linked transfers permit efficient investment in human capital, more rapid economic growth.
- With right timing and size of transfers, possible that no generation loses.

Public transfers are a zero sum game across generations, unless there are efficiency gains or losses. Here there are two gains:

- Educational transfer yields an improved allocation of investment between physical and human capital, following Becker-Murphy, if initially the rate of return to educ $>$ to capital
- Possible spillover effects of an educated population lead to faster growth of per capita income.
- However, deadweight losses work in opposite direction

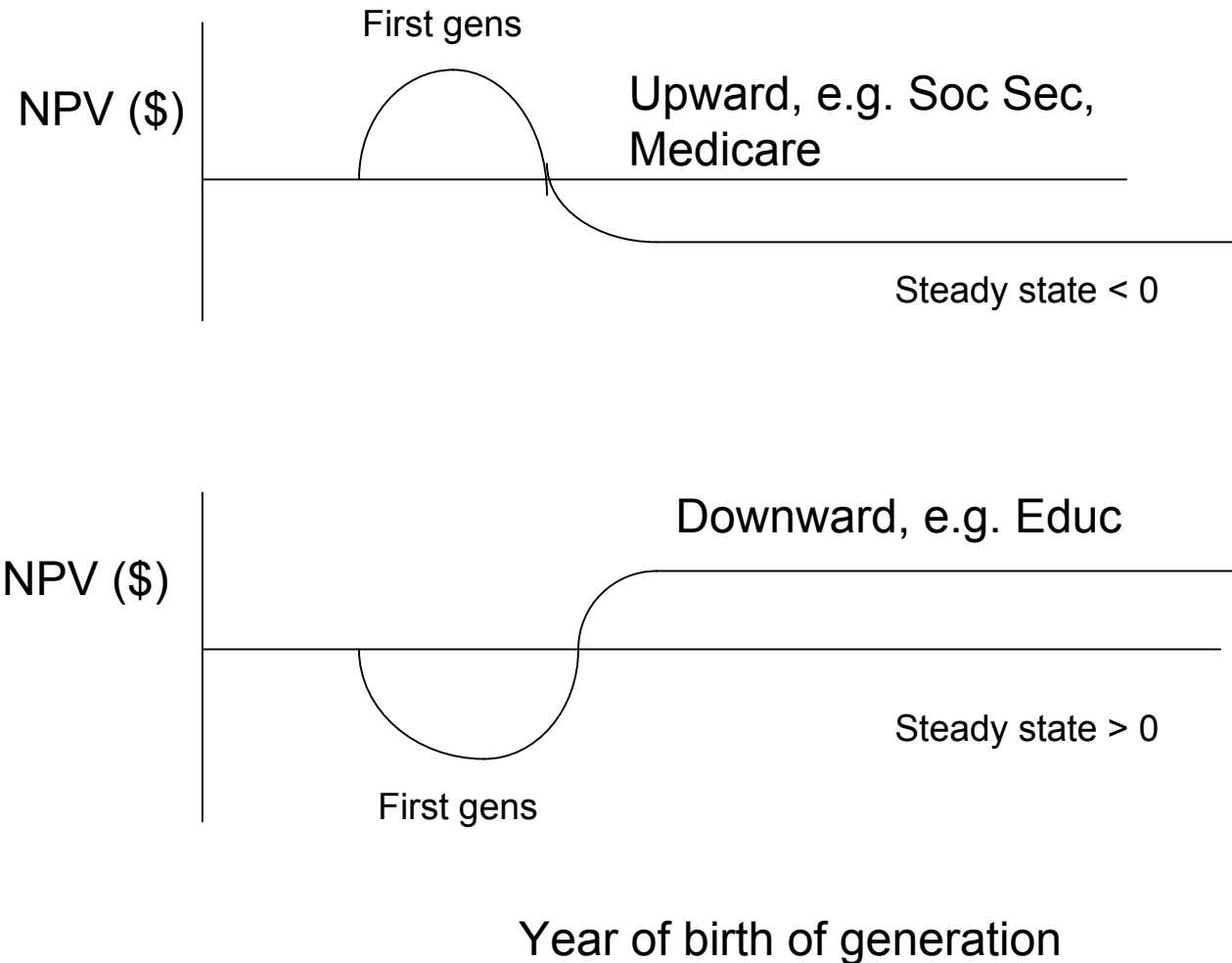
10. Windfall gains and windfall losses

Net Present Value of life time benefits minus taxes (NPV) by generation for upward transfers versus downward transfers

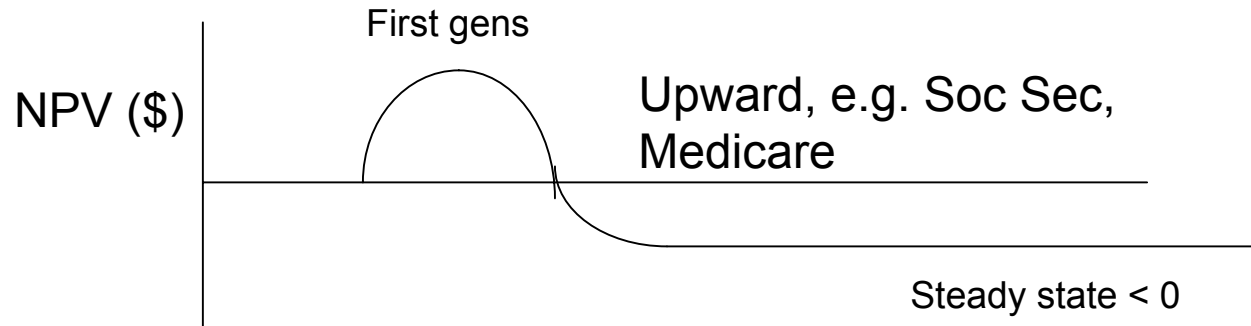


When upward transfers start up, first generations get a windfall gain; later generations pay the price with negative NPVs.

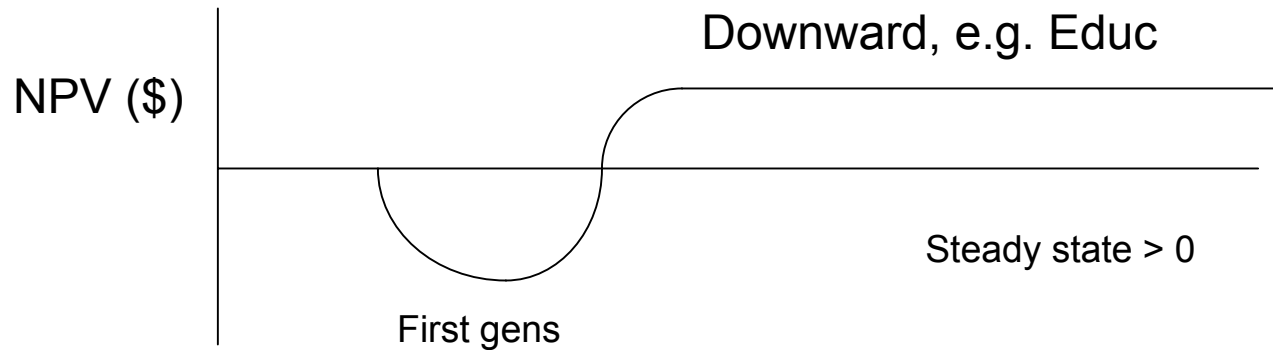
Net Present Value of life time benefits minus taxes (NPV) by generation for upward transfers versus downward transfers



Net Present Value of life time benefits minus taxes (NPV) by generation for upward transfers versus downward transfers



When downward transfers start up, the opposite happens: first generation loses, later ones gain.



Year of birth of generation

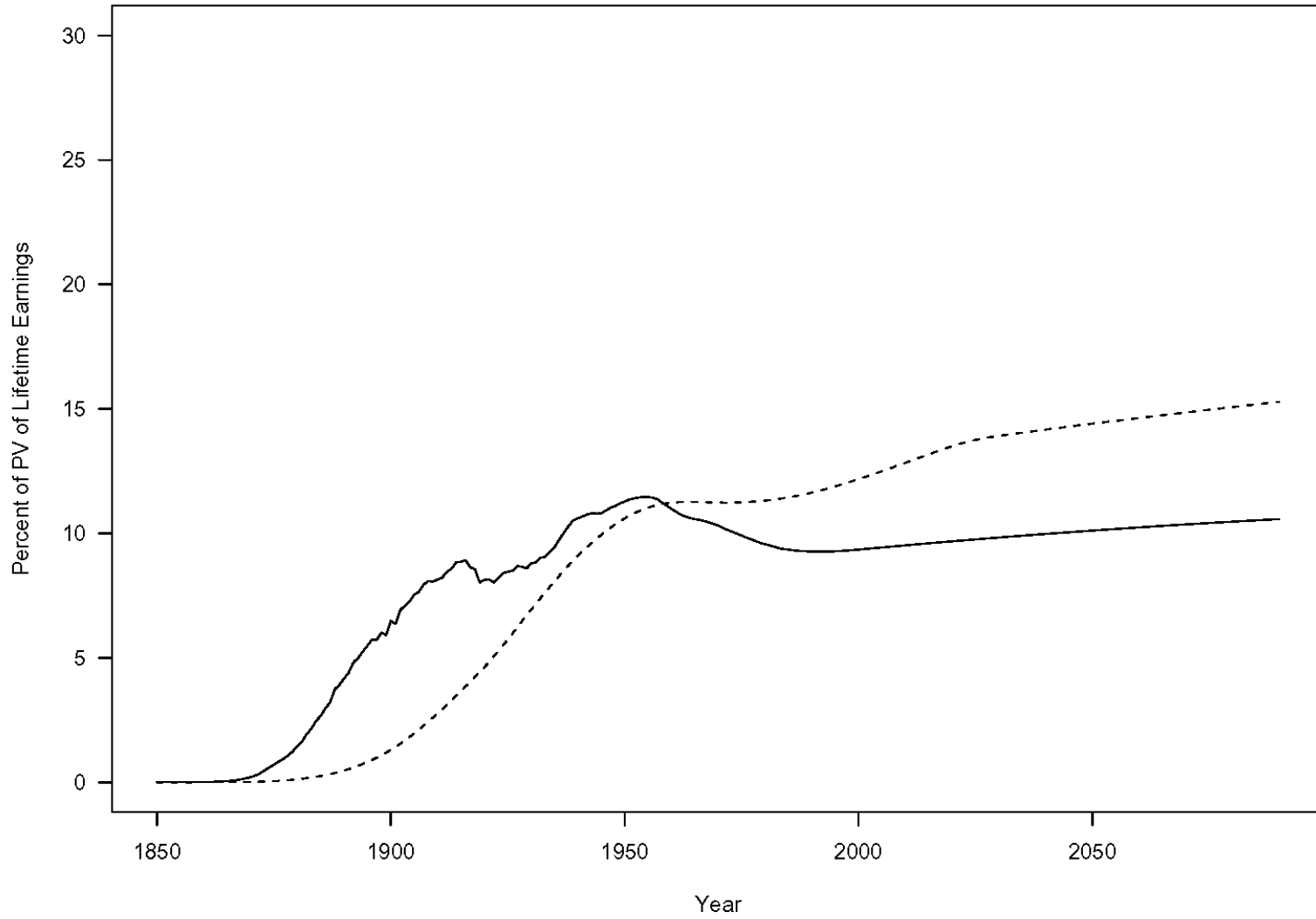
Factors influencing the generational accounts: Net Present Value trajectory (NPV)

- Changes in terms of transfer programs.
 - Windfall gains and losses at startup
 - Similar whenever taxes or benefits change, e.g. introduction of drug benefit, raising pay roll tax
- Changes in demography
 - Population aging
 - Baby boom, baby bust
 - Increasing longevity
- NPV in steady state mature system
 - Relative size of upward and downward transfers
 - Dollar of education is worth 12 dollars of pensions at 50% survival & 3% discount
 - Discount rate relative to growth rate of GDP
 - NPV can be positive or negative

11. Generational Accounts for the US, 1850 to 2090

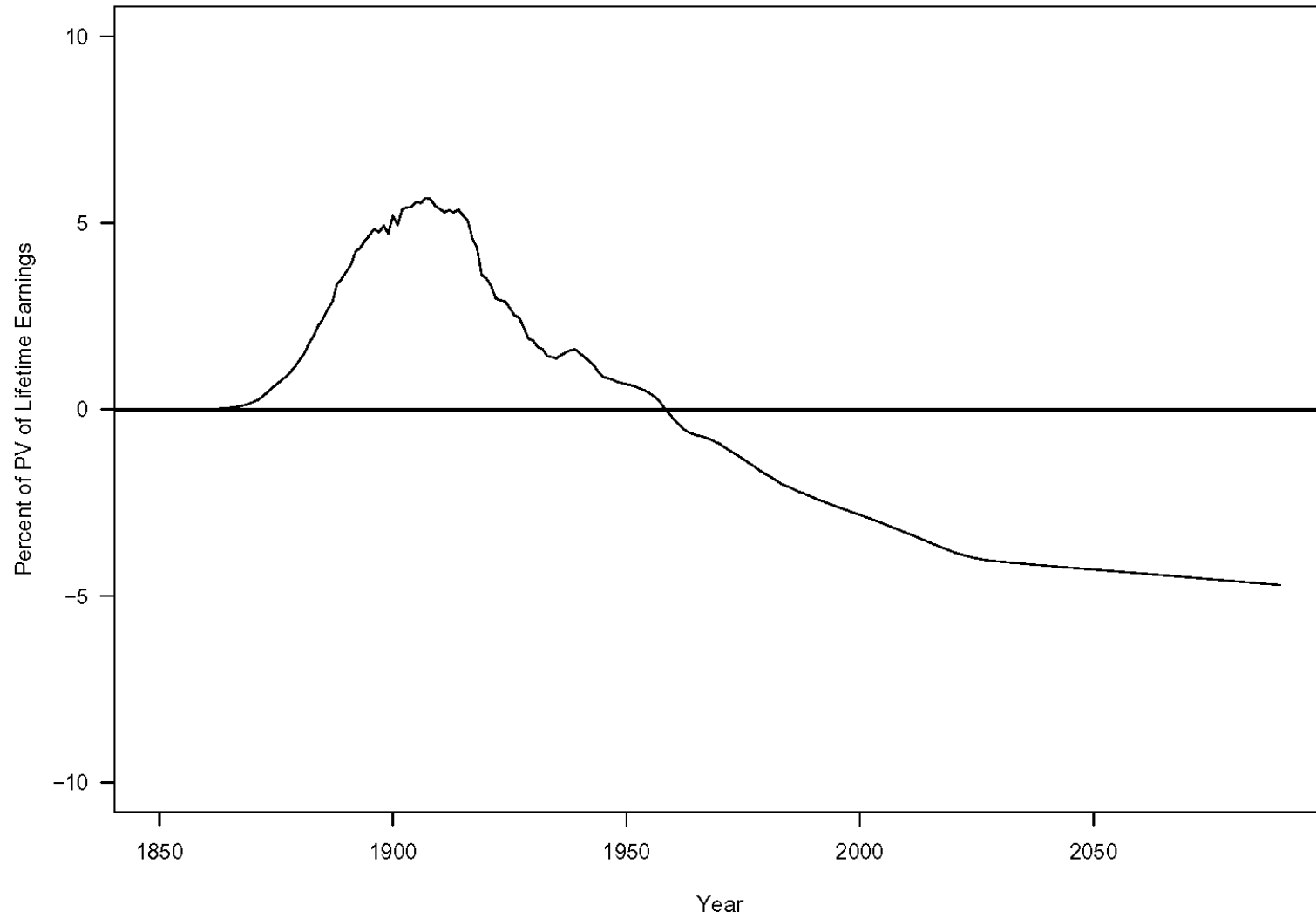
- Based on Bommier, Lee, Miller and Zuber; NBER Working Paper.

PV of Social Security Benefits (solid) and Taxes (dashed)



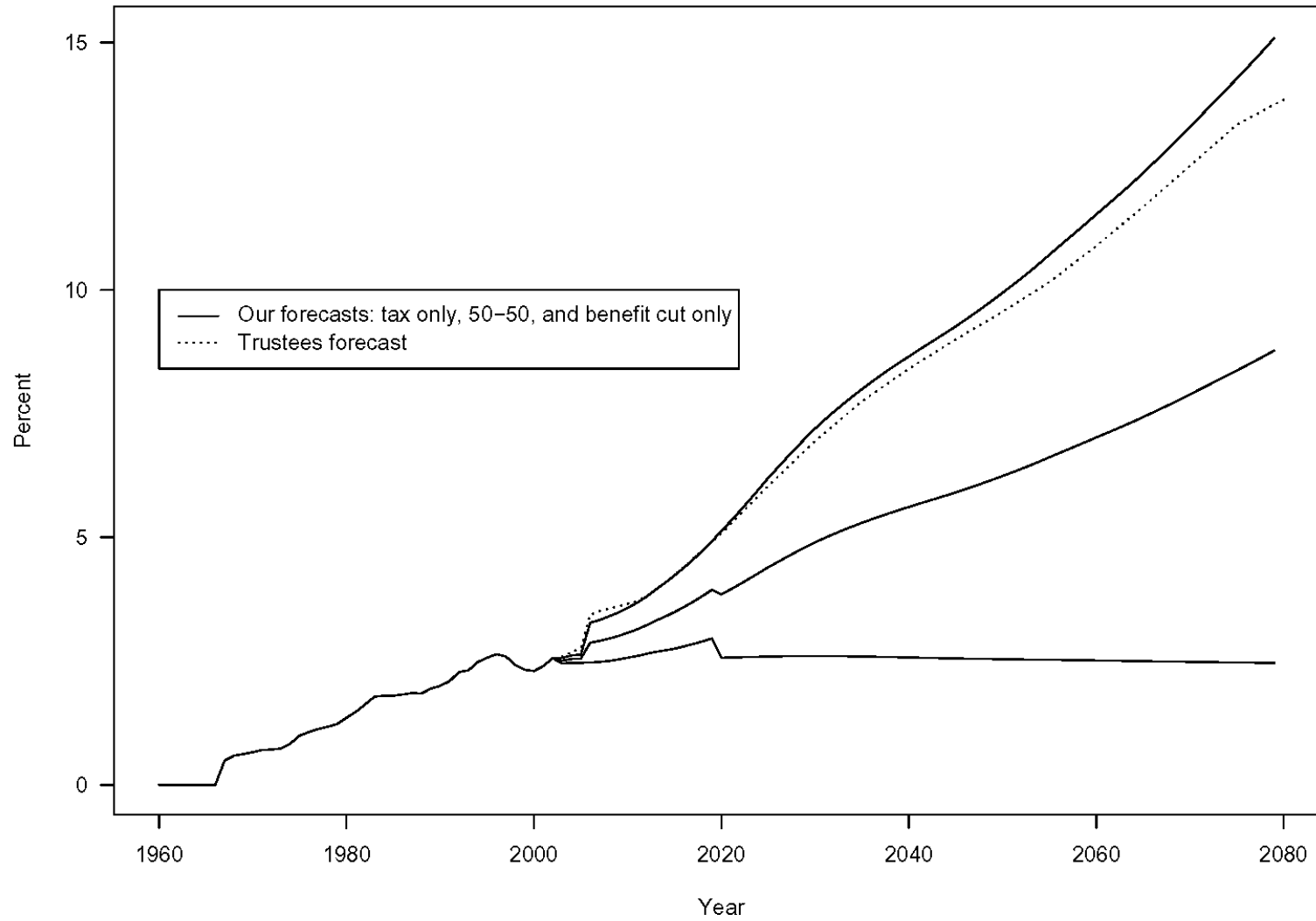
From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

NPV of Social Security Benefits



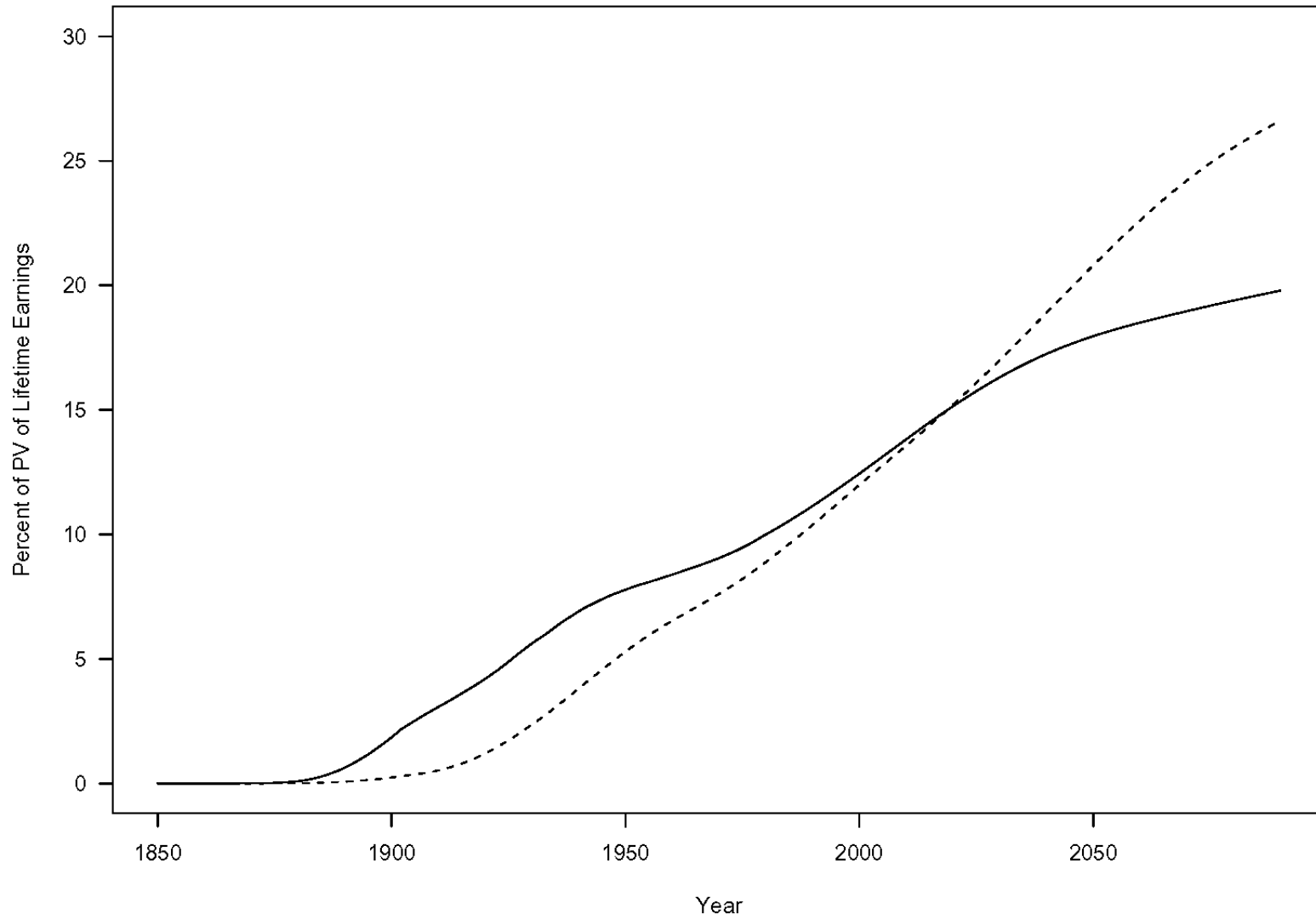
From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

Medicare Expenditures as Percent of GDP



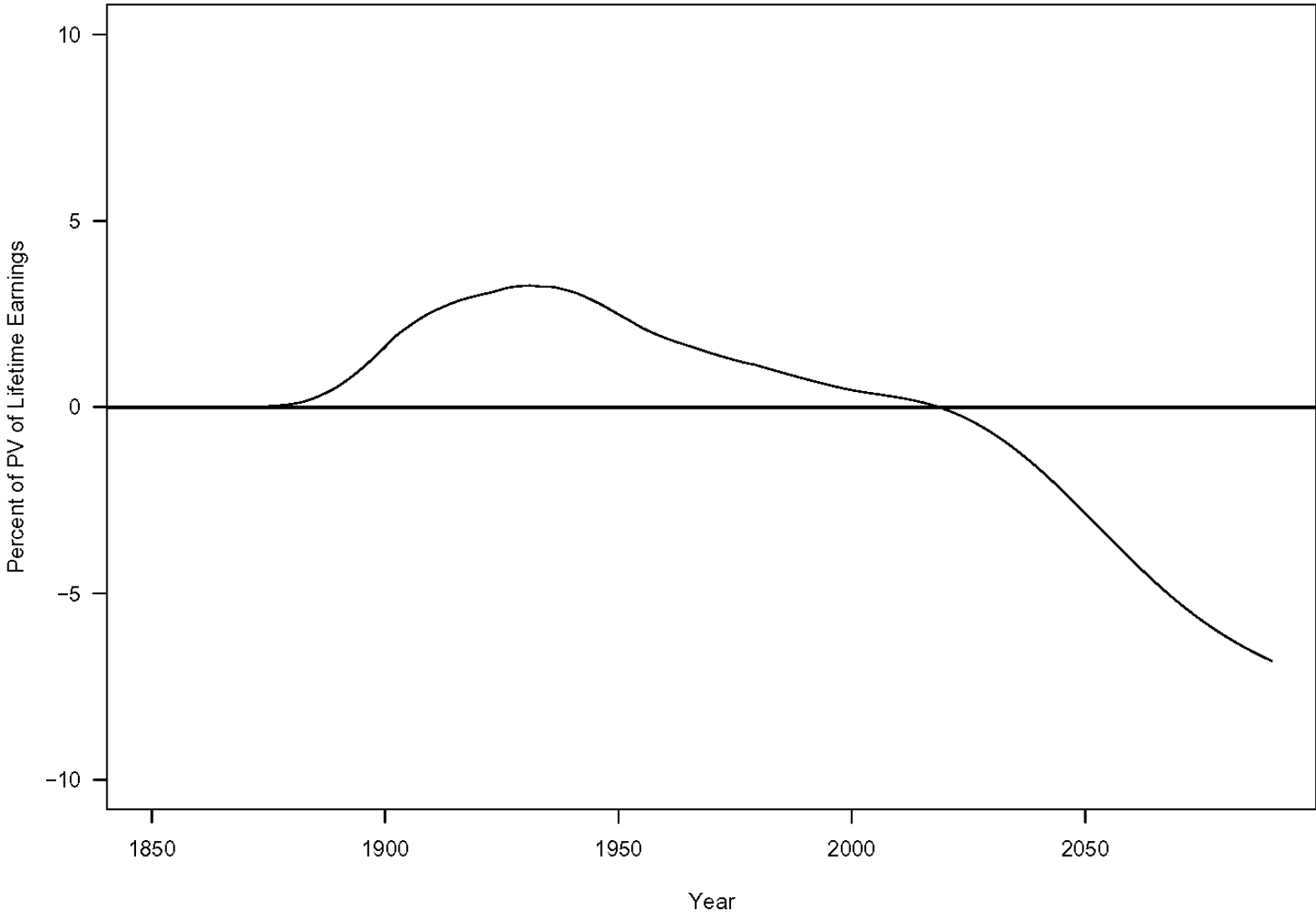
From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

PV of Medicare Benefits (solid) and Taxes (dashed)



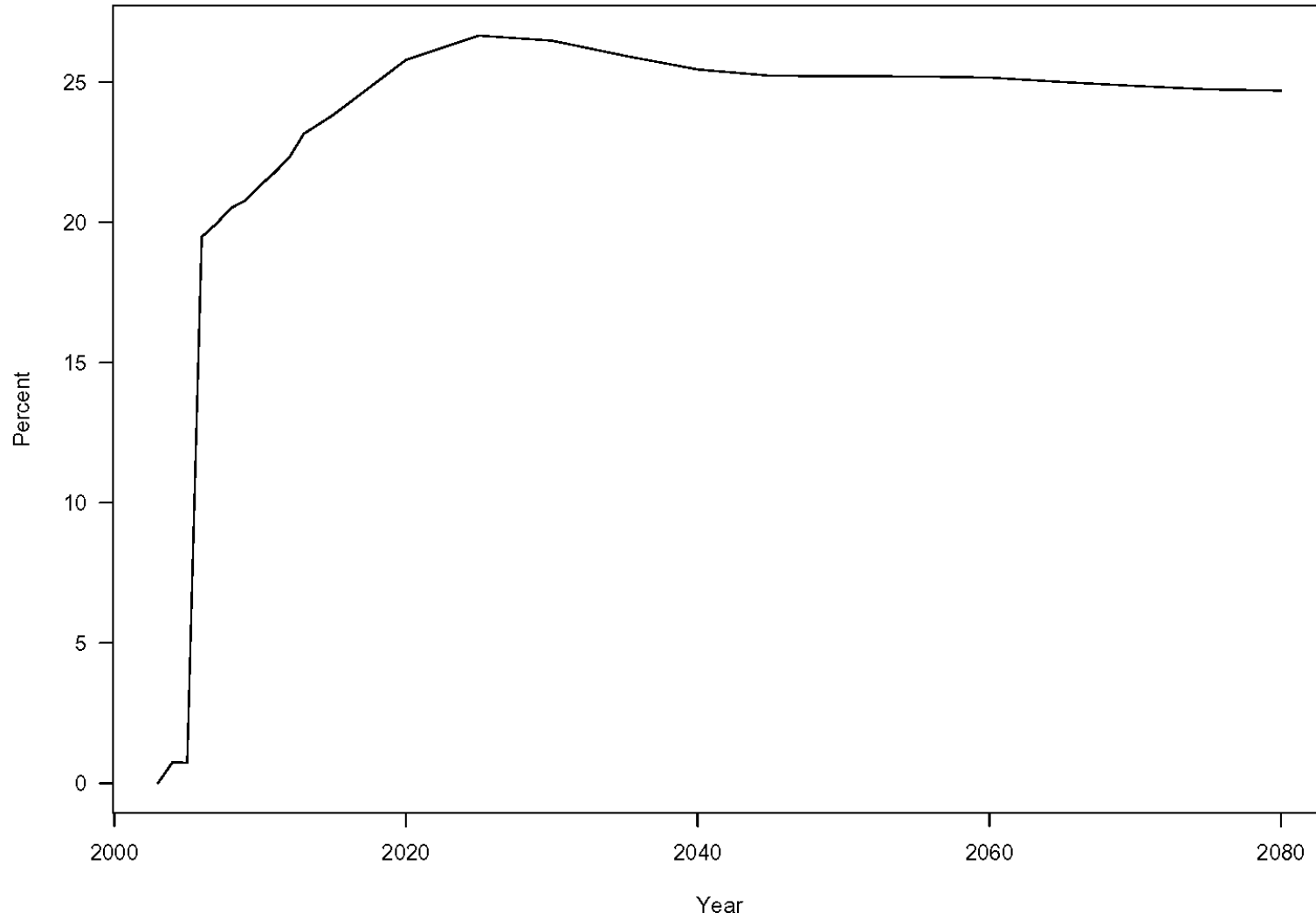
From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

NPV of Medicare Benefits



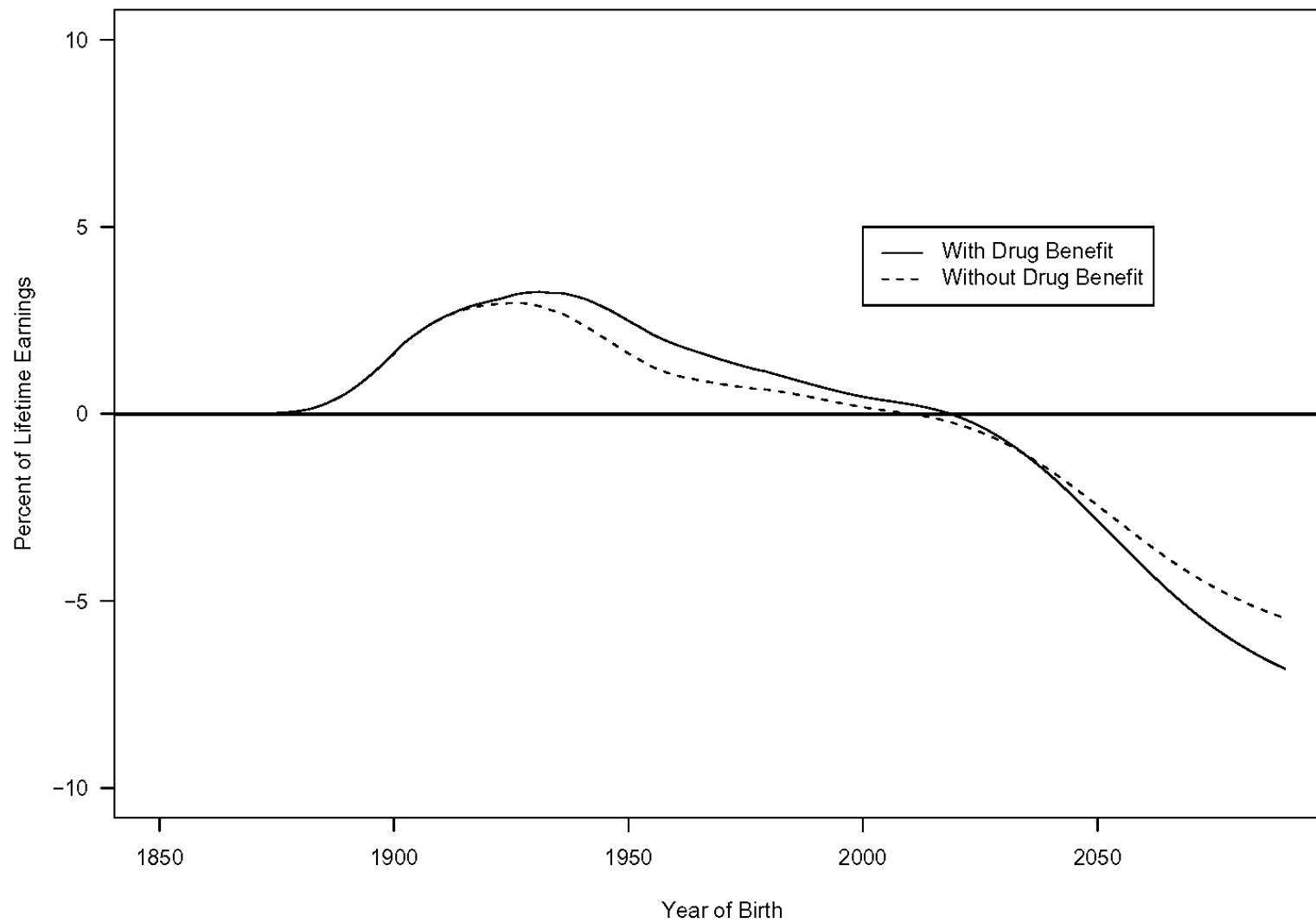
From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

Forecast of Drug Expenditures as Percent of Medicare



From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

NPV at birth of expected lifetime Medicare benefits as percent of lifetime earnings



From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

Fig 3. NPV at birth of expected lifetime Social Security and Medicare benefits as percent of lifetime earnings

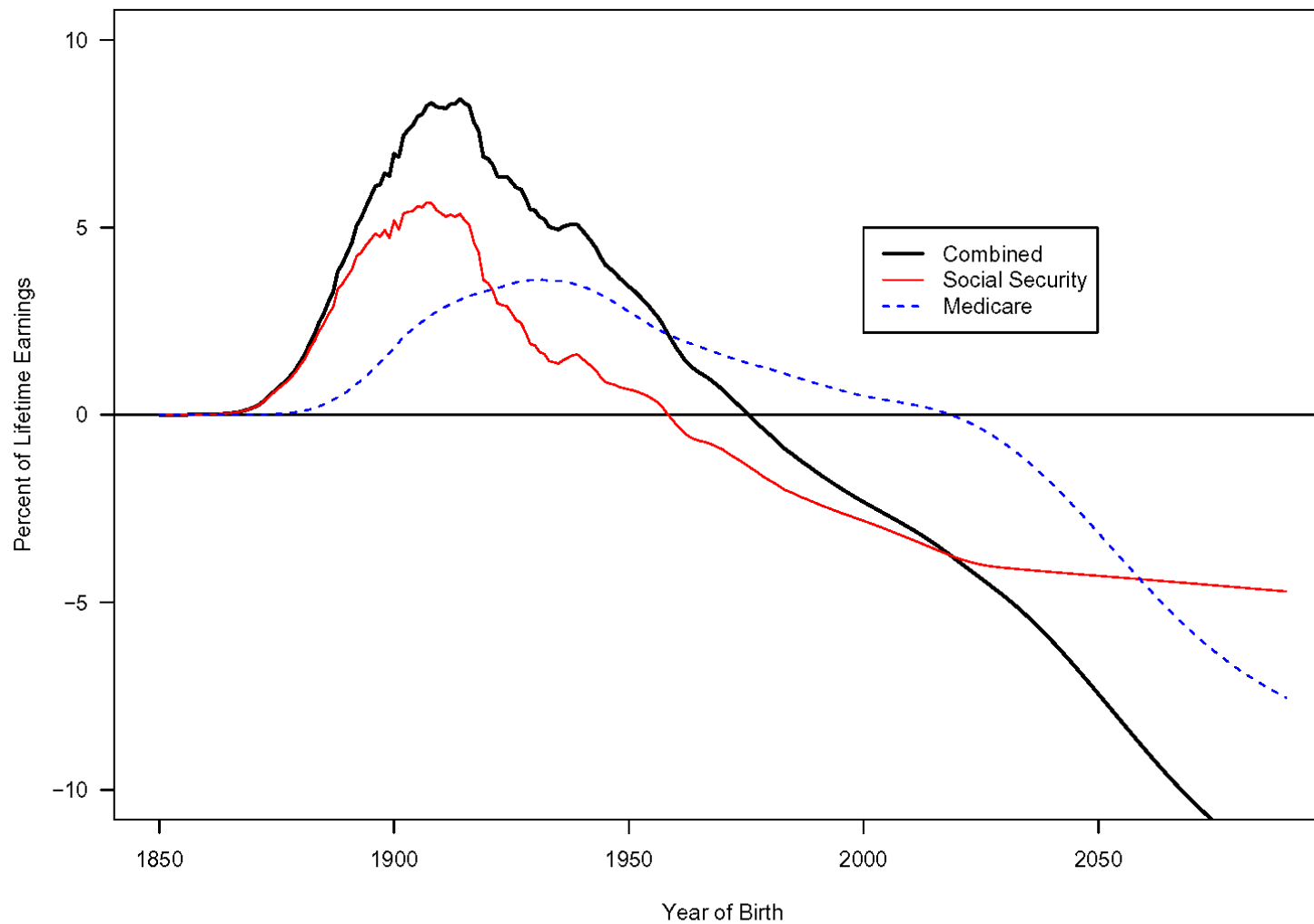


Fig 4. NPV at birth of expected lifetime Social Security and Medicare benefits as percent of lifetime earnings

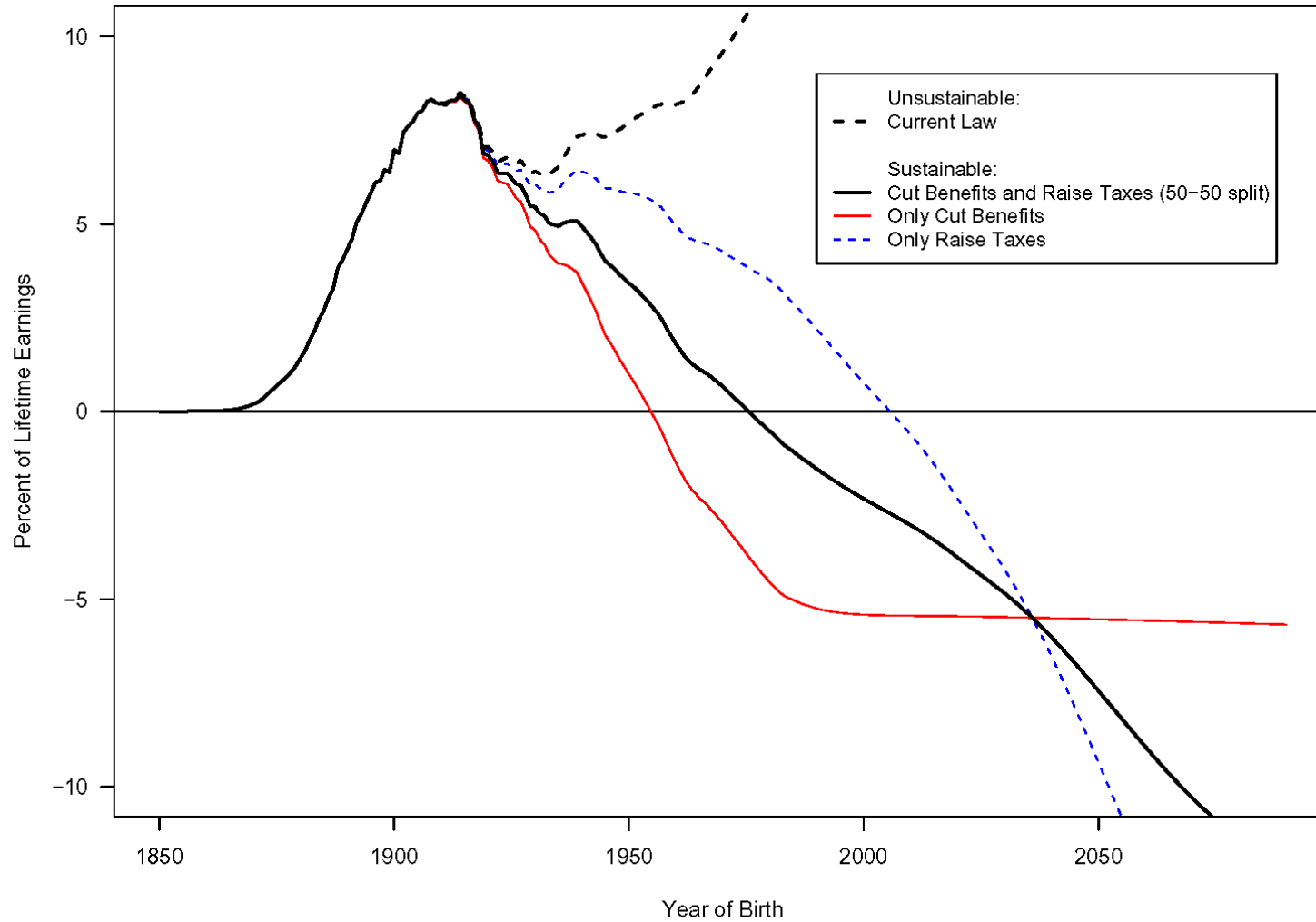
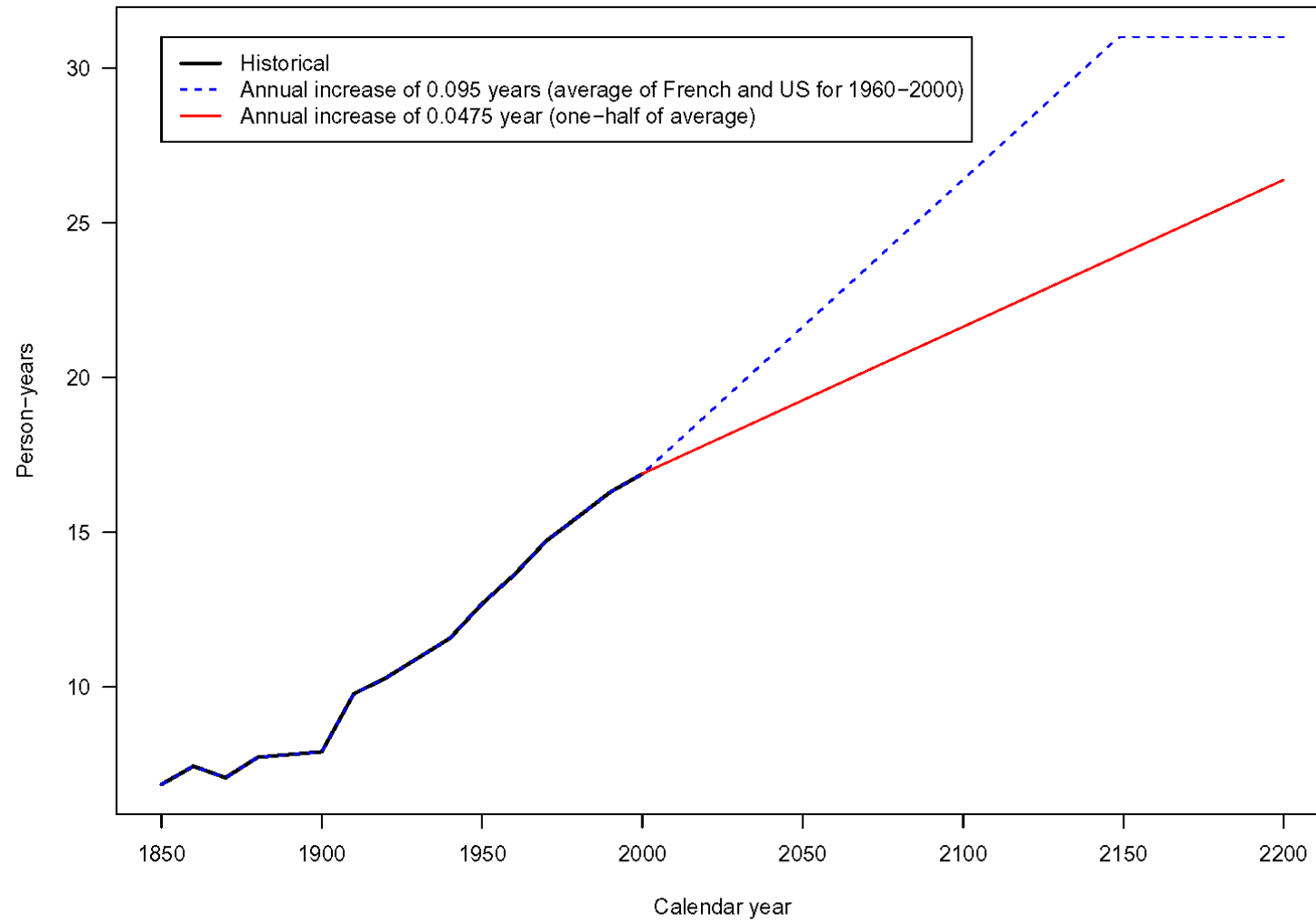
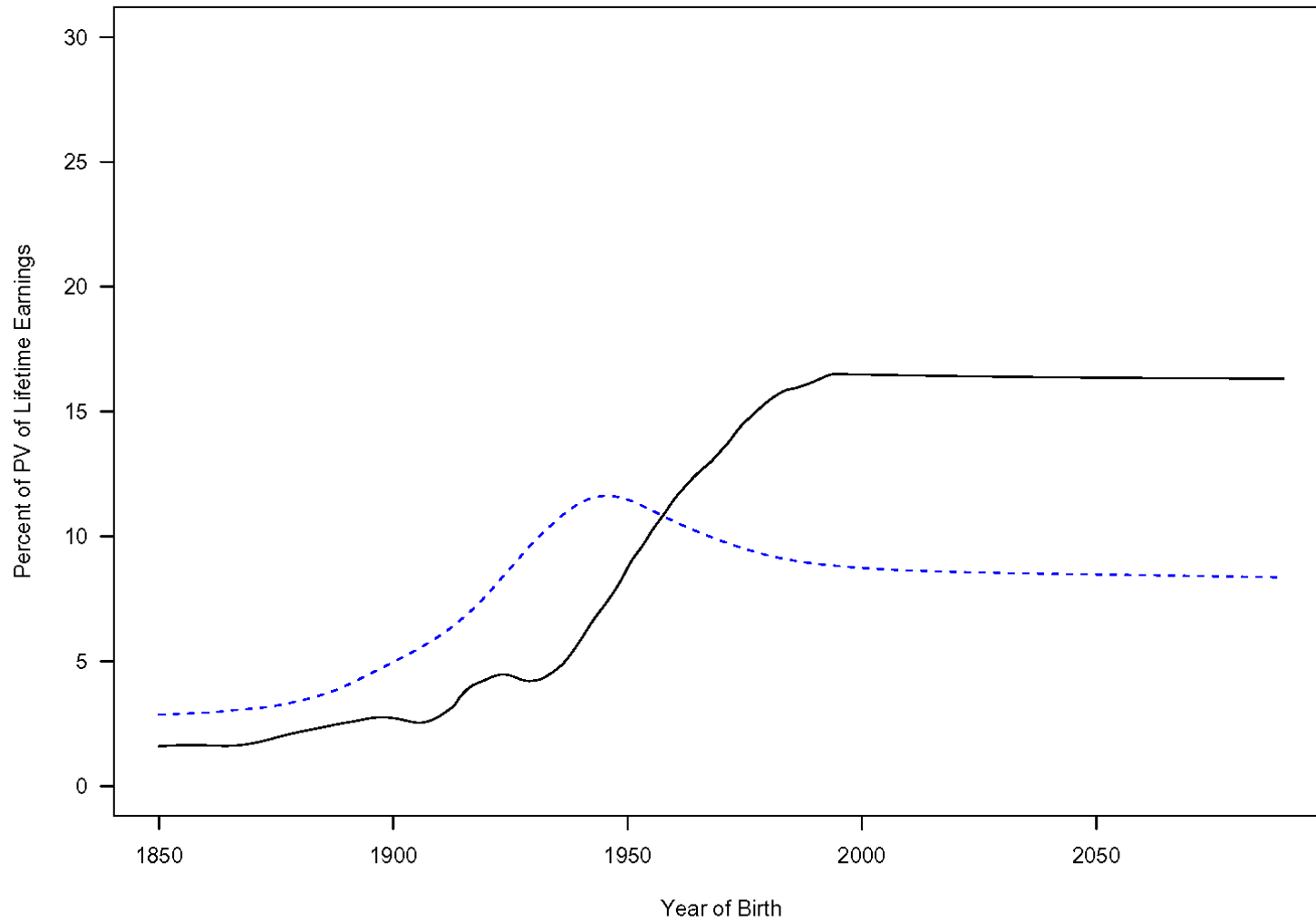


Fig 5. Person-years of schooling: Historical and Forecast



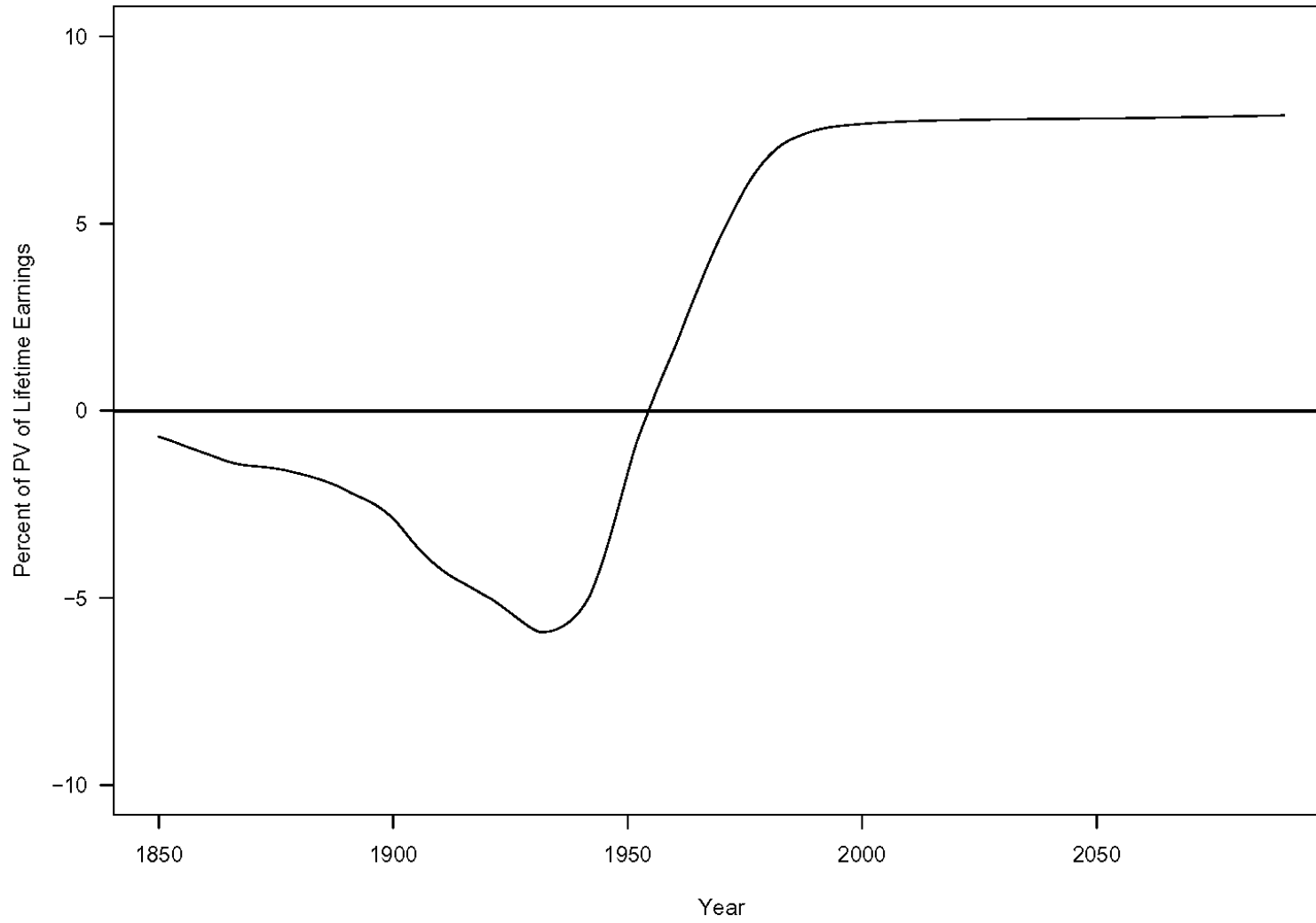
From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

Fig 6. Present Value of Education Benefits (solid) and Taxes (dashed)



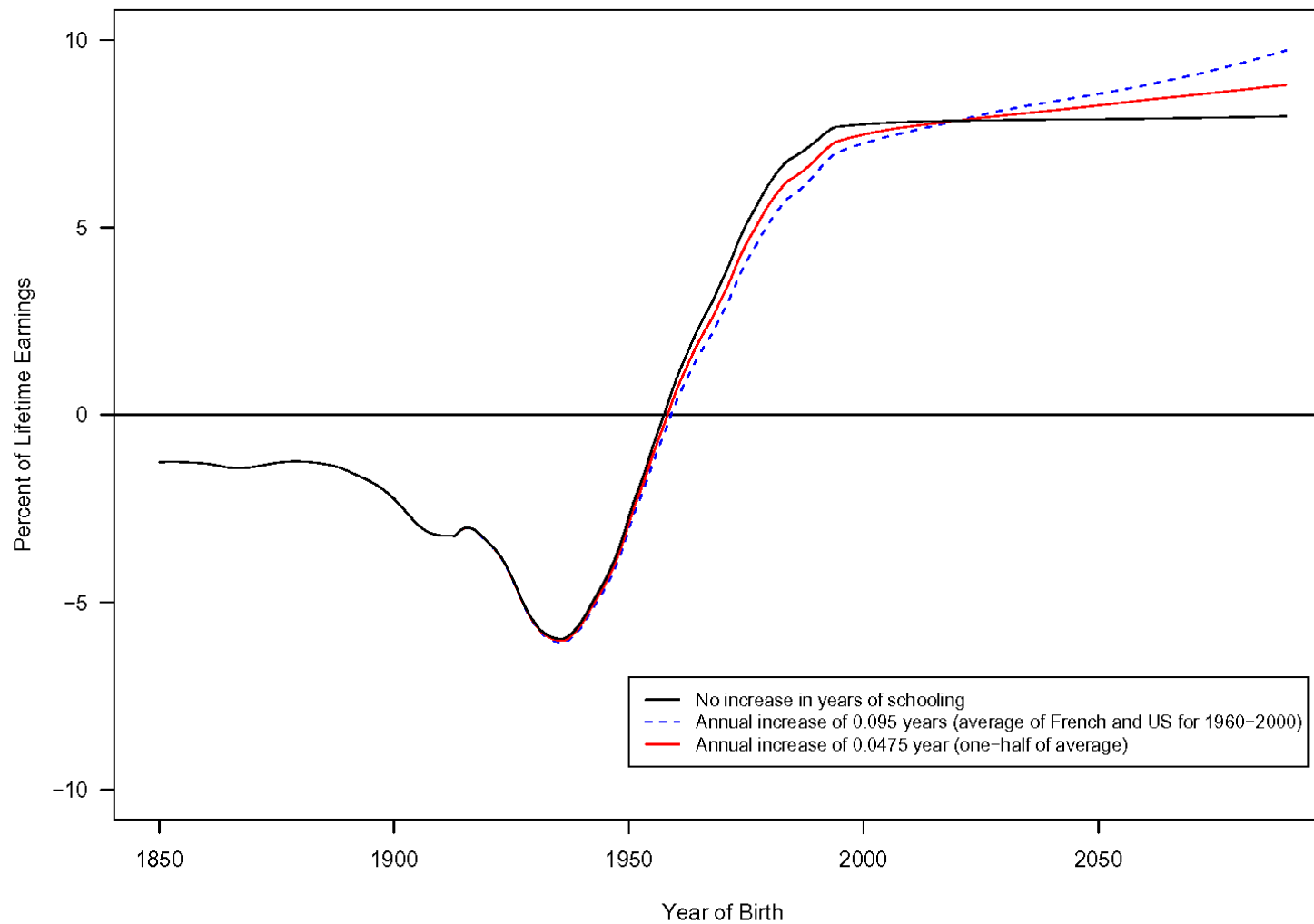
From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

NPV of Education Benefits



From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

Fig 7. NPV at birth of expected lifetime Education benefits as percent of lifetime earnings

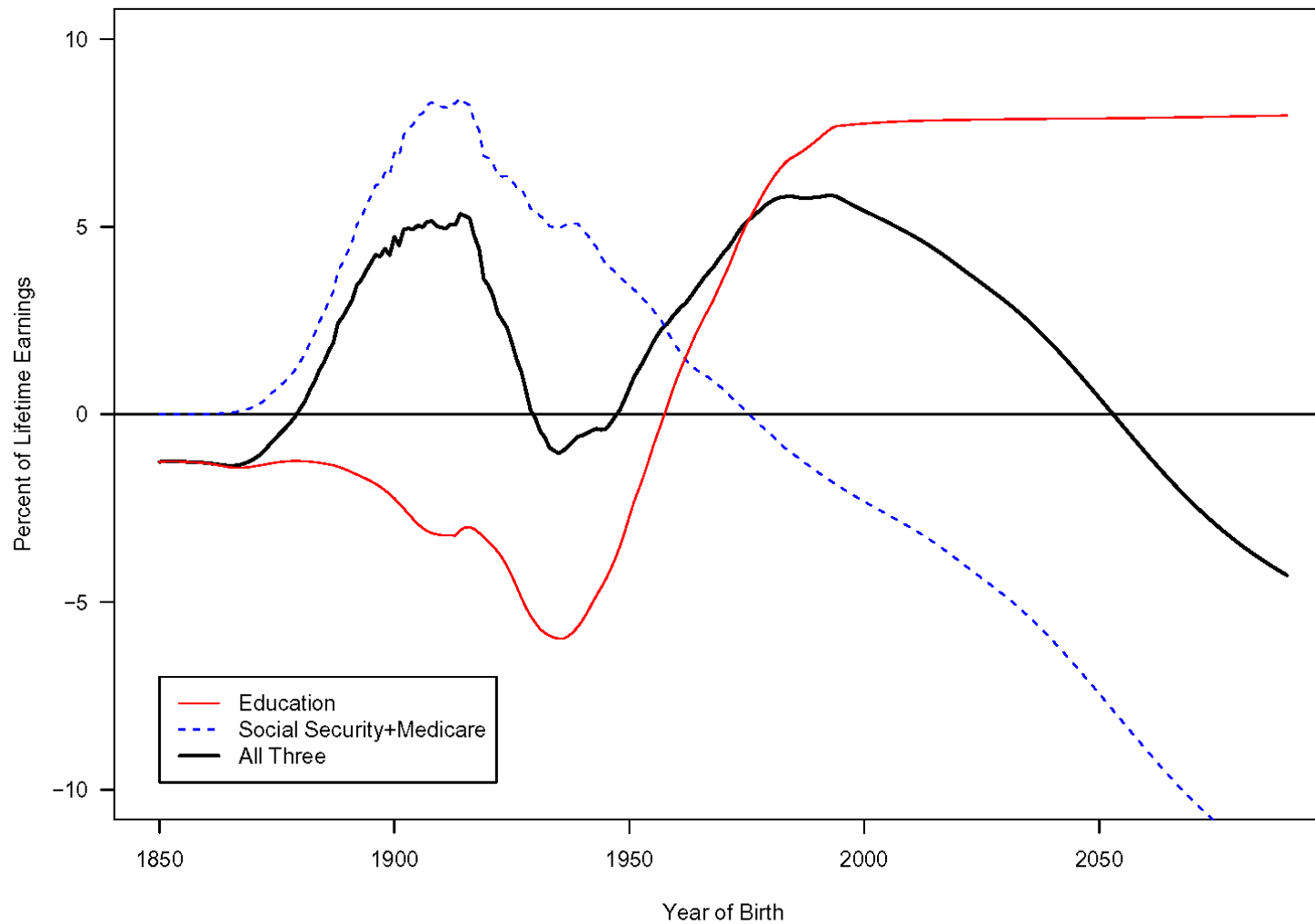


From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

Putting it all together

- Combine NPV for upward transfers
 - Soc Sec
 - Medicare
- With downward transfers: Pub Ed

Fig 8. NPV at birth of expected lifetime Education, Social Security and Medicare benefits as percent of lifetime earnings



Generational redistribution is opposite to our expectations

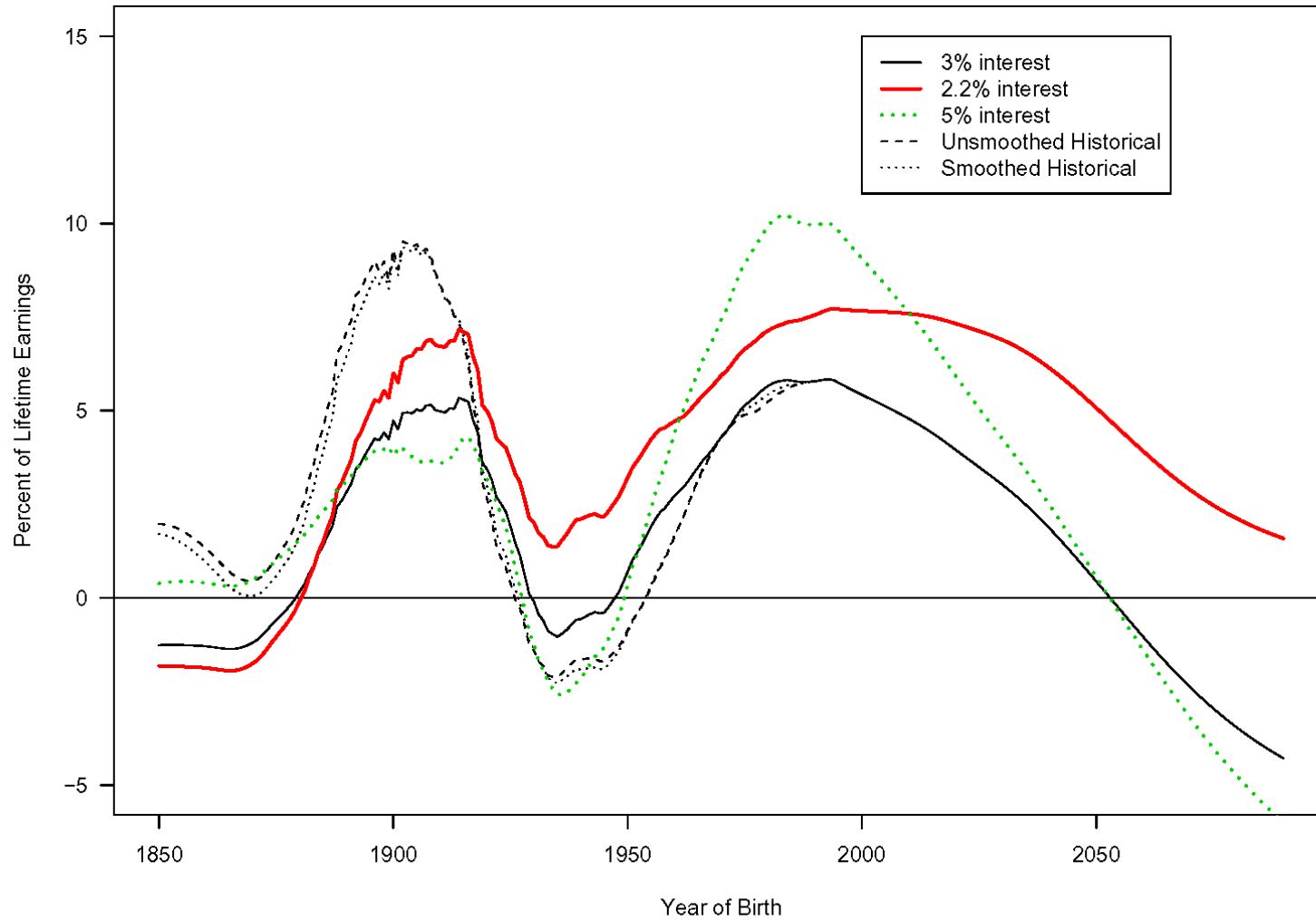
- All born 1880-1929 are net gainers, as expected.
- But also: All generations born from 1948 to 2052 are net gainers from transfer system, not expected.
 - Current children and young adults are all net gainers
 - All their future children and even grandchildren are net gainers.
- Those born 1977 to 2001 all have bigger proportionate gains than any other generation, including 1880-1929 who got windfall Soc Sec.
 - peak 5.3% in 1914-1915
 - peak 5.8% for 1982-1994
- Current ages 57 to 74 are all net losers– but only slightly (<1%); born 1930-1947.

Roughly consistent with Becker-Murphy theory

- NPVs from upward transfers (pensions and elder health care) and downward transfers (public education) are mirror images.
- Combined NPV is closer to zero than its components.
- Could be Pareto improving (intergenerationally), if efficiency gains of public education outweigh deadweight losses.

12. Sensitivity tests, political economy, and other extensions

Fig 11. Sensitivity Tests of NPV Using Various Discount Rates



From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

Now look at generational consequences of different budget balancing policies and their political implications.

Fig 9. Budget Balancing Policy Options: NPV at birth of expected lifetime Education, Social Security and Medicare benefits as percent of lifetime earnings

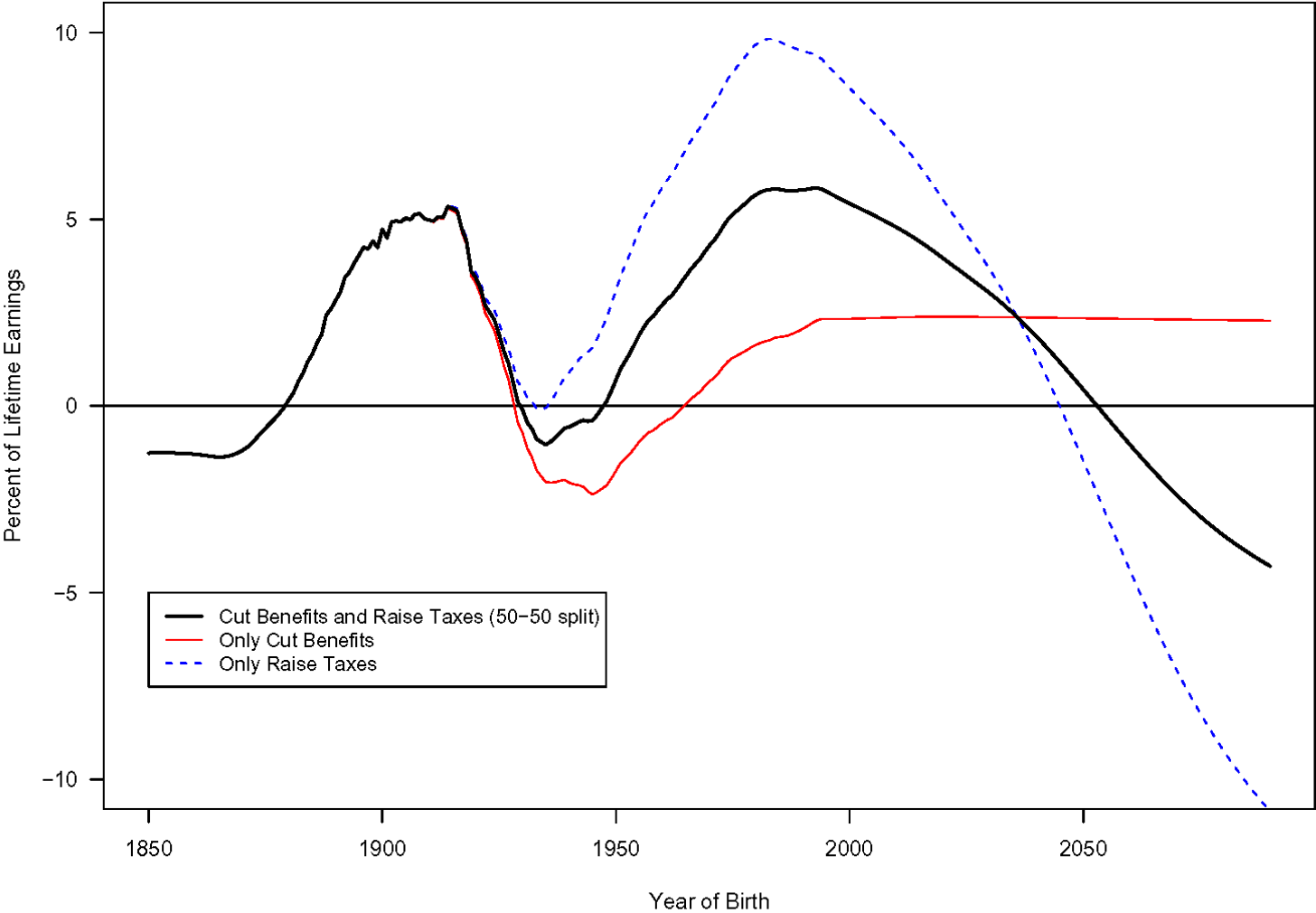


Fig 10. Net present value of participating in all transfer systems by age in 2004

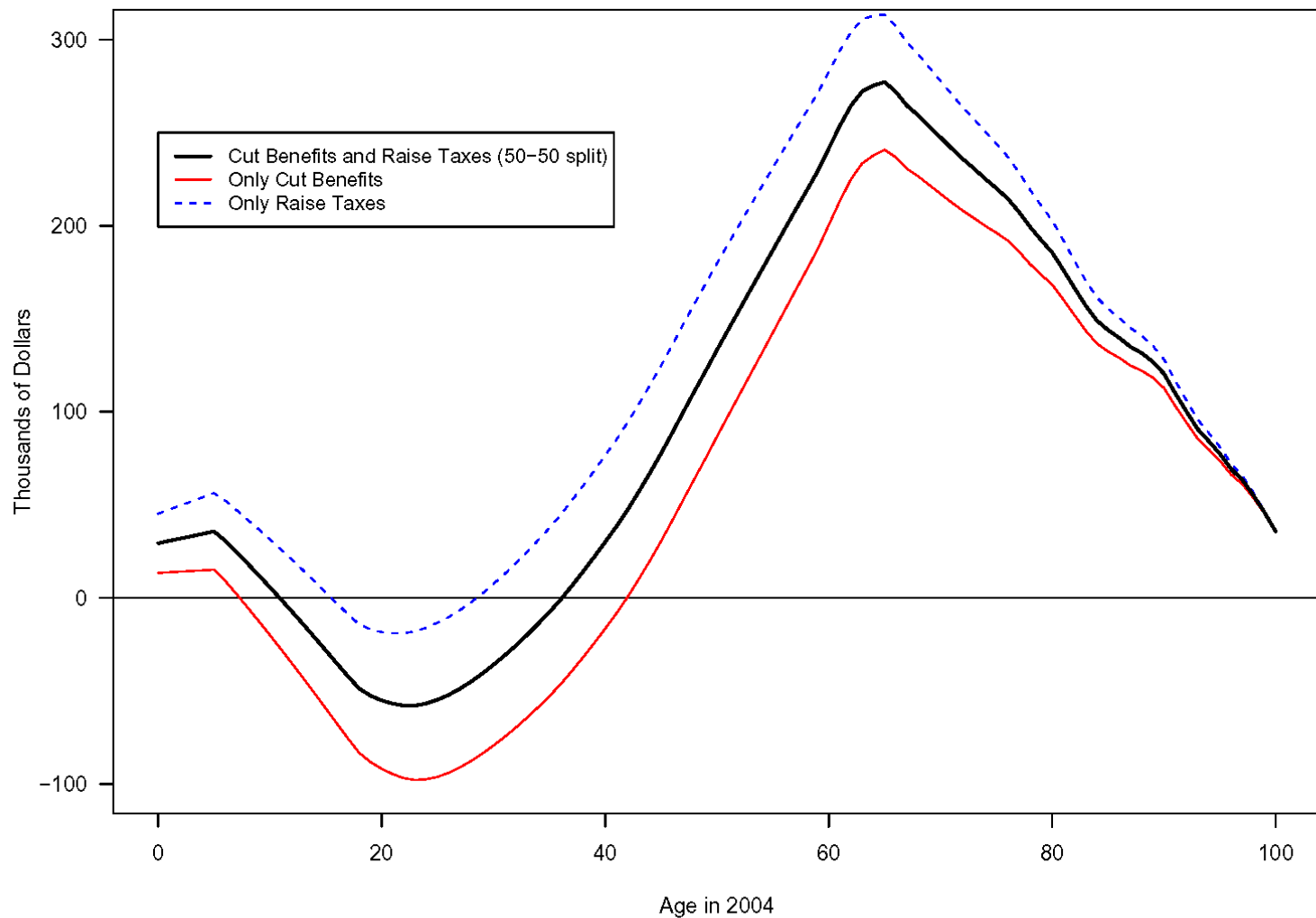
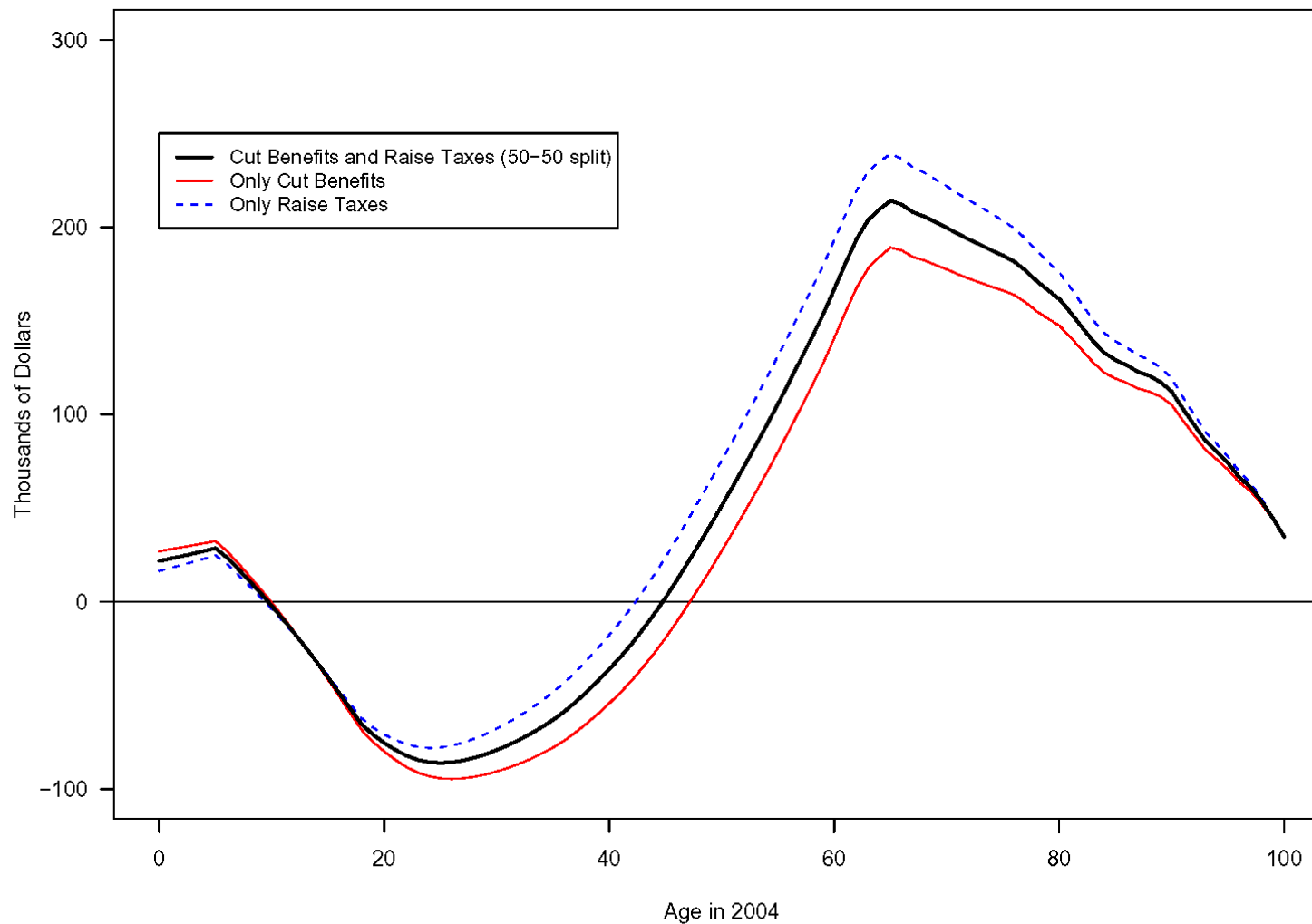


Fig 10. Net present value of participating in all transfer systems by age in 2004, Discount = 5%



Caveats

- Becker-Murphy theory is consistent with our findings. That does not imply it is true.
- We should not take the theory literally in any case.
- Adding other transfers (SSI, Medicaid, AFDC, Food Stamps, EITC etc.) may alter the outcome, although we don't expect so.

Other caveats

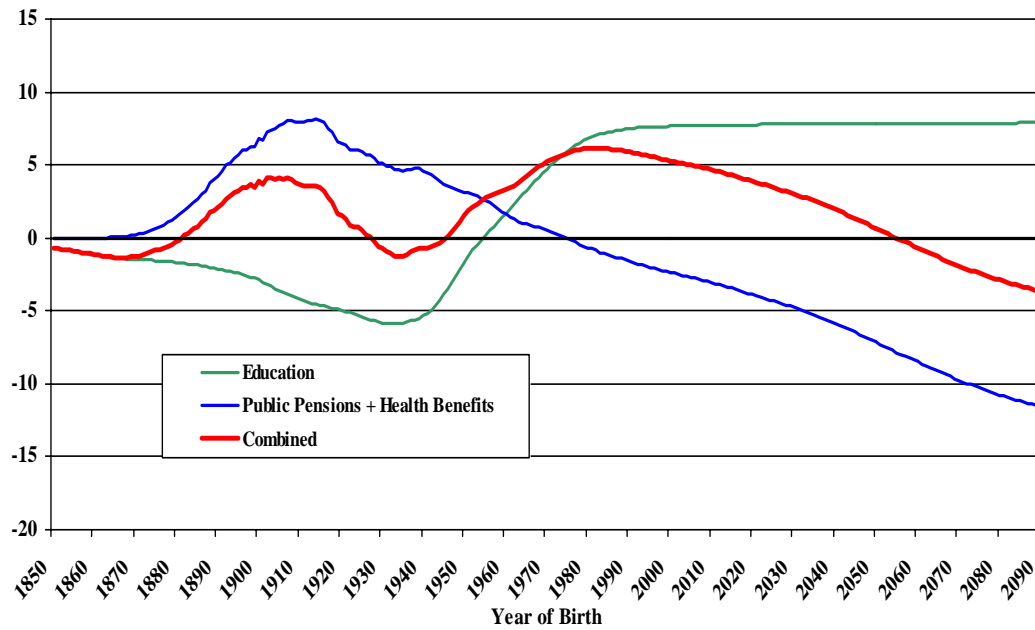
- Public education may have earned a higher private rate of return than our discount rate (return on capital), in which case generations gained more than our calculation suggests.
- Increased education may have had important externalities, and raised the rate of economic growth.
- These effects may turn the effects on all generations positive. We do not try to assess.

Education NPVs are roughly equal and opposite to the combined NPV for Social Security and Medicare.

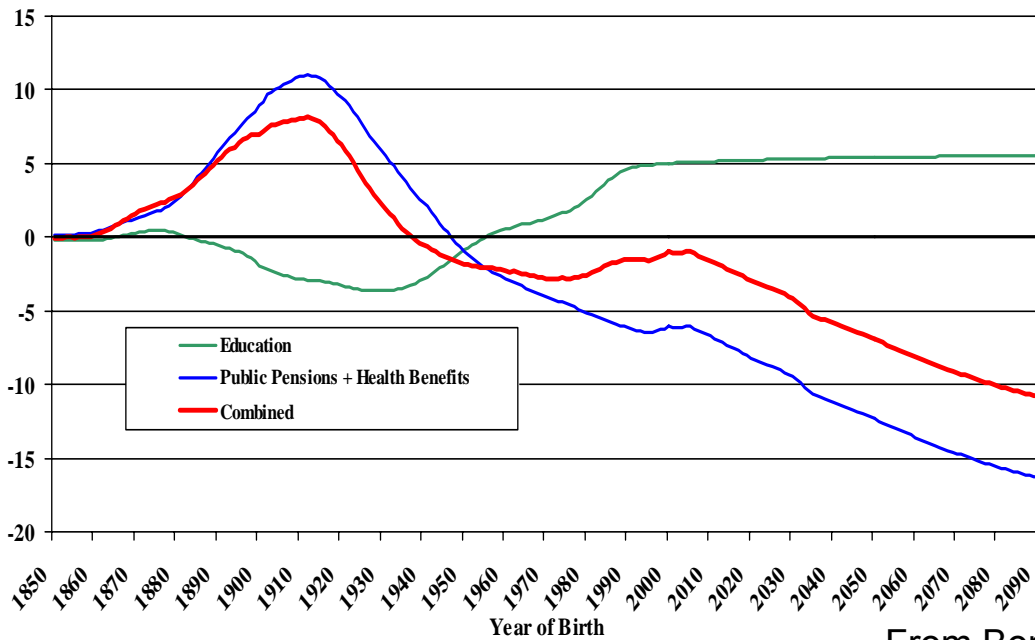
- Windfall gains for early Soc Sec and Medicare generations are halved by their losses through education
- Losses through education for generations born 1930 to 1960 are virtually eliminated by gains through Soc Sec and Medicare.
- Broadly consistent with Becker-Murphy
- Even slight spillover effect on economic growth would make all generations after 1880 gainers.

13. Comparative Results for US and France

USA and France: A Comparison

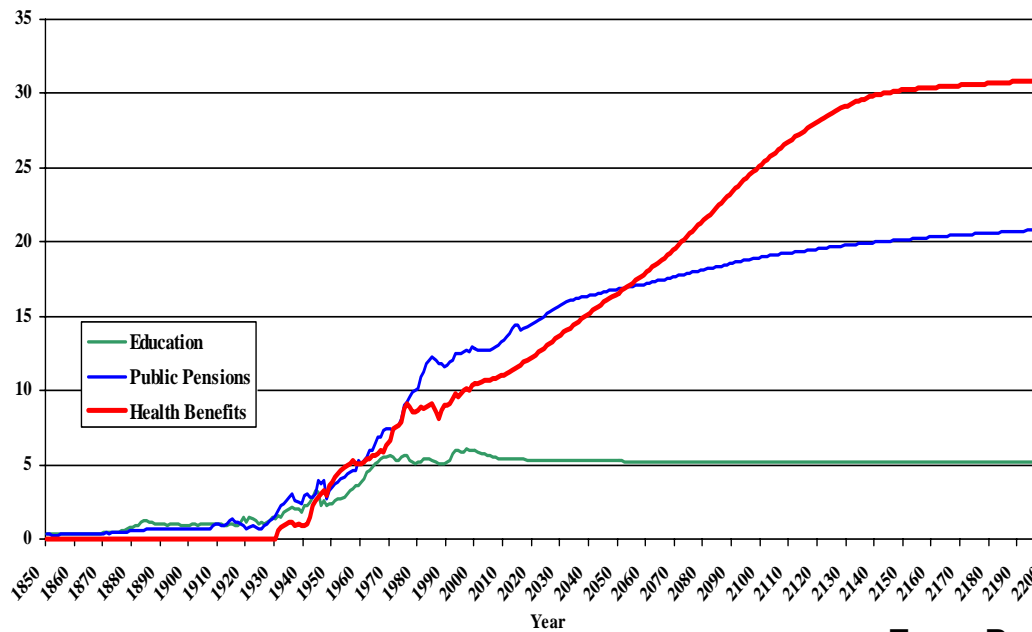
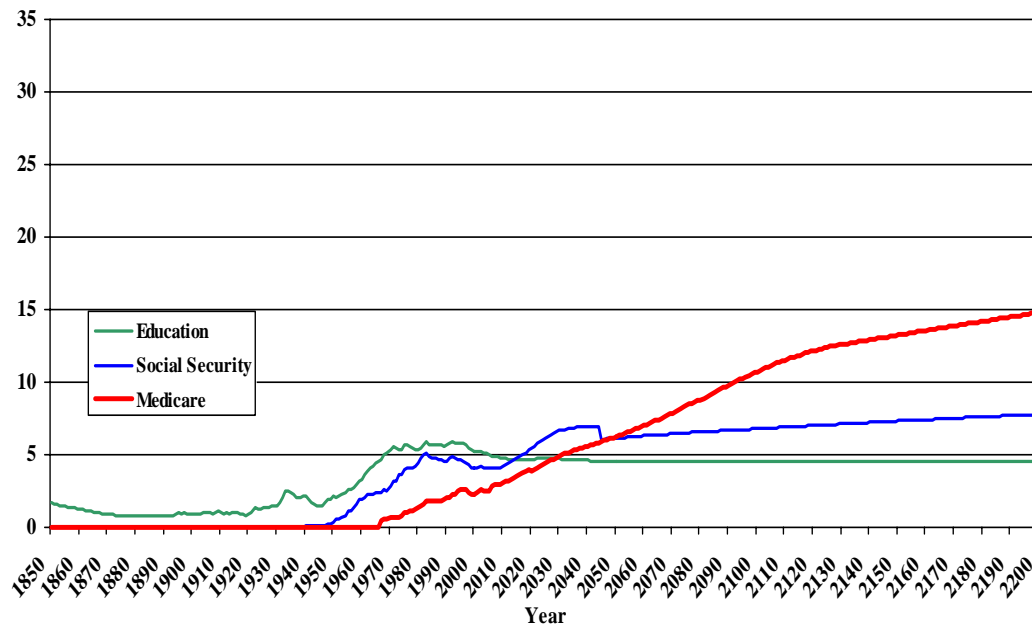


NPVs for the US



NPVs for France

USA and France: Accounting for the differences (1)



From Bommier, Lee, Miller and Zuber, Univ CA, Berkeley

END