Human Capital Accounting in the United States: 1994-2006

Michael Christian

Wisconsin Center for Education Research

May 7, 2010

Human capital accounting

- Presents a human capital account for United States for 1994-2006
  - Adaptation of Jorgenson-Fraumeni approach
- Human capital stock is huge
  - 16 times size of stock of physical assets
- Issues with data, education investment

Jorgenson-Fraumeni model

- Human capital is expected lifetime incomes in PDV of all persons in U.S.
  - Lifetime income measured as per capita average by age, sex, and education
  - Market income: value of time spent at work
  - Non-market income: value of time not spent at work, school, or personal maintenance
  - Time valued at wage rate, with adjustments for taxation

Measuring lifetime income

- Lifetime income at a given age computed using lifetime income the next age older

$$life_{y,s,a,e} = yi_{y+1,s,a,e} + [(1+r)^{-1}(1+g)sr_{y,s,a+1}] \times$$
$$[senr_{y+1,s,a,e}\ life_{y,s,a+1,e+1} + (1 - senr_{y+1,s,a,e})life_{y,s,a+1,e}\ ]$$

Lifetime income = Yearly income + Time preference, income growth, survival probability x

(Probability of schooling x Lifetime income one year older one more year ed + Probability of not schooling x Lifetime income one year older)

Measuring lifetime income

- Start with lifetime income at oldest age and work backward
  - Original J-F accounts: lifetime income 0 at 75
  - Here: PDV of constant income stream at 80
  - Gets lifetime income for every age/sex/ed cell

- Yearly income only earned at ages 15+
- Schooling only takes place at ages 5-34

Human capital stock

- Stock of human capital sums per capita lifetime incomes over persons in a year

$$hc_y = \sum_s \sum_a \sum_e pcount_{y,s,a,e} life_{y,s,a,e}$$

Human capital stock = $\sum$ No. persons by sex, age, education X Per capita lifetime income by sex, age, education

- Can be broken down into market, non-market components

Human capital stock

- Changes in human capital break down into revaluation and net investment

$$\Delta hc_y = \sum_{s,a,e} pcount_{y,s,a,e} \Delta life_{y,s,a,e} + \sum_{s,a,e} \Delta pcount_{y,s,a,e} life_{y+1,s,a,e}$$

Change in human capital = Revaluation: change due to change in lifetime incomes + Net investment: change due to change in size and distribution of population

Human capital net investment

- Changes in net investment break down across causes of changes in population

$$\sum_{s,a,e} \Delta pcount_{y,s,a,e} life_{y+1,s,a,e}$$ Net investment

$$= \sum_{s,a,e} births_{y,s,a,e} life_{y+1,s,a,e}$$ = Investment from births: change in human capital due to change in population from births

$$+ \sum_{s,a,e} education_{y,s,a,e} life_{y+1,s,a,e}$$ + Investment from education: change in human capital due to change in population from schooling

$$+ etc....$$ + Deaths, aging, migration, etc.

Data required for model

- Population
- Average yearly market income
- Average yearly non-market income
  - Work hours, school hours, hourly wage rate
- School enrollment rate
- All by year, age, sex, education
- All from CPS in this application
- Survival rate from CDC

Adaptations to J-F

- Net investment broken down into 5 parts
  - Investment from births
  - Depreciation from deaths
  - Investment from education net of aging of enrolled
    - Net of aging because gross was unrealistic
  - Depreciation from aging of non-enrolled
  - Residual net investment

Adaptations to J-F

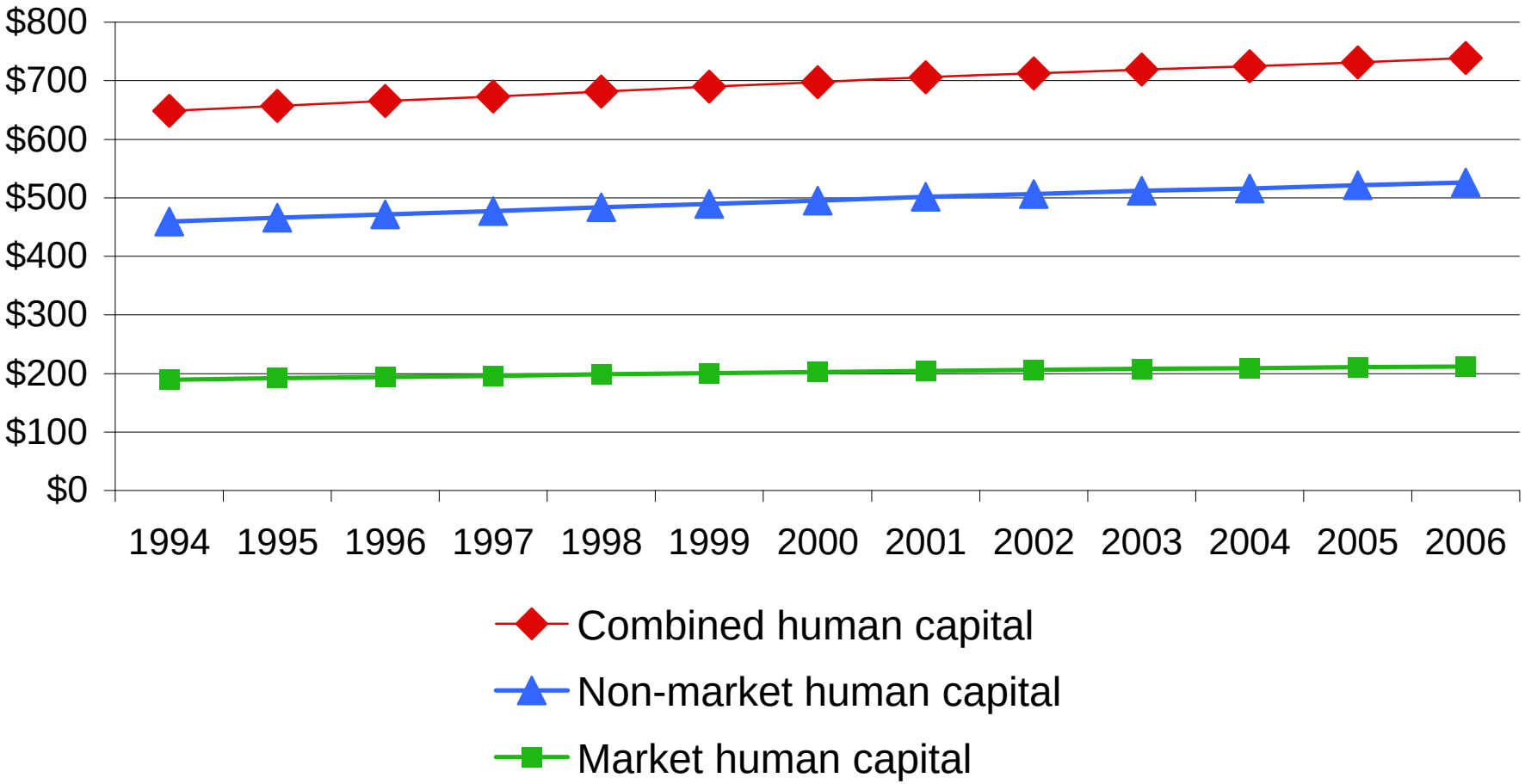
- Level of education
  - CPS no longer measures education by year
  - Year of education imputed from ages 0-34
  - Five levels for 35+ (<HS, HS, some, BA, MA)
  - Wage rates only rise across the five levels

- Investment before revaluation
- Pre-tax wage used for market income
- Oldest people age 80, can earn income

Human capital stock is huge

- Stock is $738 trillion in 2006
  - $536T non-market, $212T market
  - Non-market share consistently about 70%
  - 16x stock of physical assets
- Real growth is 1.1% annual 1994-2006
  - Population growth is the cause
  - Slower than physical assets (19x in 1994)

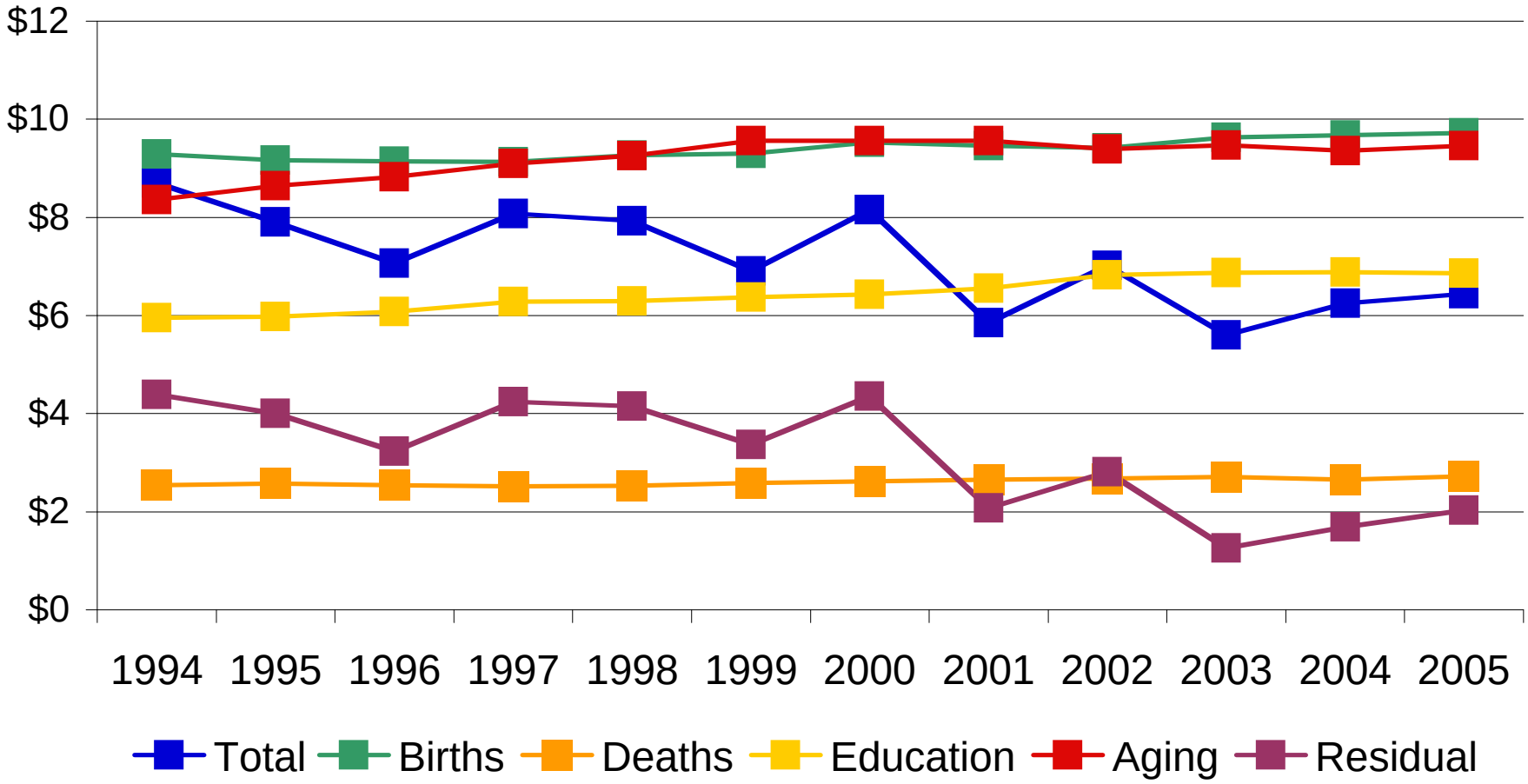
Real human capital stock (in trillions of 2006 dollars)



Investment in human capital

- In 2005:
  - Investment from births: $9.7 trillion
  - Investment from education net of aging: $6.9 trillion
  - Depreciation from deaths: $2.7 trillion
  - Depreciation from aging of non-enrolled: $9.5 trillion
  - Residual net investment: $2.0 trillion

Net human capital investment (in trillions of 2005 dollars)



Investment in education

- Investment in education is net of aging
  - Combined effect of moving up a year in education and of becoming one year older
  - Effect of moving along age-ed profile
- Why not measure gross investment?
  - Effect of education separate from aging

Gross education investment

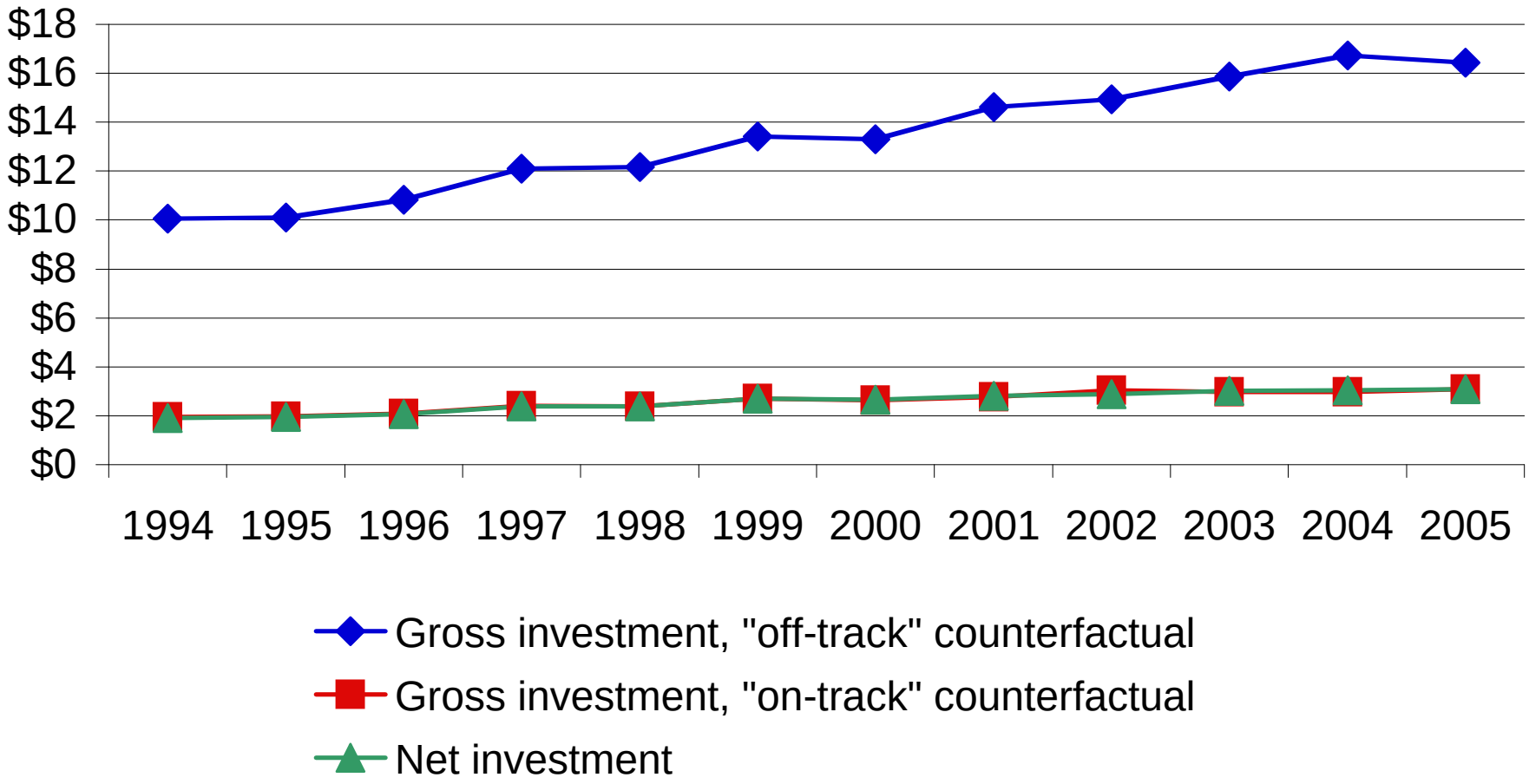
- Actual stock minus counterfactual stock in which nobody attends school for a year
  - What would human capital stock be if nobody went to school?
  - What would people who went to school have done if they missed a year?

- Measures of gross educational investment sensitive to answer to second question

If we all missed a year of school

- CF1: We would become like people who actually missed a year of schooling
  - We all fall “off track”
  - Become much less likely to finish school
  - Huge impact on human capital: $16T market
- CF2: We would enroll in school next year with the same probability as a year ago
  - We mostly stay “on track” and finish school
  - Smaller impact: $3.1T market

Market component of investment in human capital



Net educational investment

- Does not require strong counterfactual
  - Follows people along the course they followed

- Safer route, at least given this data set
  - Gross investment may be OK if there were more direct payoffs to non-degree years; importance of being "on track" weaker

Avenues for future work

- Better adapting to available data
  - Improve imputation of education
  - Some data in the basic CPS I did not use
- Resolving education issue
  - Smaller payoffs to diplomas and degrees
  - Some direct payoff to intermediate years