The Importance of State Human Capital[*]

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Abstract

While many U.S. states emphasize the role of human capital for their economic development, little direct information linking education to growth and incomes is available. This paper begins by developing new detailed measures of state human capital based on information about the school attainment and cognitive skills of state natives, internal migrants, and immigrants in the current state workforce. We combine census micro data on school attainment with cognitive skills constructed from state (or country) of origin achievement test scores. Achievement scores are adjusted to allow for selectivity in the quality of migrants. These new human capital measures are used in a development accounting framework calibrated with standard production parameters. Differences in human capital account for 20-30 percent of today's variation in GDP per capita across states. The contribution of human capital is almost evenly split between school attainment and cognitive skills.

Keywords: Economic Growth, Human Capital, Cognitive Skills, Schooling, US States

JEL codes: I21, J24, O47

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THE IMPORTANCE OF STATE HUMAN CAPITAL

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Overview

- Interest in source of state income differences
- Identify the role of human capital
  - Policy concerns of states
  - State investments
- Measurement issues in human capital
  - Attainment insufficient
  - Students v. work force
  - Immigrants
- Preliminary development accounting

Understanding Aggregate Income Differences

- Considerable international evidence on growth and development
  - Jones (2002), Barro and Sala-i-Martin (2004), Aghion and Howitt (2009)
- Consistent emphasis on human capital
  - Sala-i-Martin, Doppelhofer, and Miller (AER 2004)
- Variety of disputes
  - Causation
    - Bils and Klenow (AER 2000)
  - Form of model
    - ➢ Augmented neoclassical growth theories
      - Mankiw/Romer/Weil (QJE 1992)
    - ➢ Theories of endogenous growth
      - Lucas (JMonE 1988); Romer (JPE 1990); Aghion/Howitt (1998)
    - ➢ Theories of knowledge diffusion
      - Nelson/Phelps (AER 1966); Benhabib/Spiegel (HbEcoGro 2005)

Measurement of Human Capital

- Literacy (Romer 1991)

- School enrollment and attainment (Mankiw/Romer/Weil QJE 1992; Levine/Renelt AER 1992; Barro/Lee JMonE 1993)

➤ Surveys: Temple (2001); Krueger/Lindahl (JEL 2001); Pritchett (2006)

- Cognitive skills
  - Hanushek/Kimko (AER 2000); Barro (AER 2001); Woessmann (JESur 2003); Bosworth and Collins (2003); Coulombe/Tremblay (TopMac 2006); Ciccone/ Papaioannou (RES 2009)

➤ Survey: Hanushek/Woessmann (JEL 2008)

U.S. State Differences in Income and Growth

- Large historical differences in regions and states
- Limited broad analysis of level and growth
  - Turner, Tamura, and Mulholland (2013)

Development Accounting

- *Aggregate production function*
  - $Y = K^{\alpha}(hL)^{1-\alpha}A^{\lambda}$

- $\dfrac{Y}{L} \equiv y = \left(\dfrac{k}{y}\right)^{\alpha/(1-\alpha)} hA$ (with Harrod-neutral productivity)

- Allows decomposition of variance in income per capita
  - $\dfrac{cov\left(\ln(y), \ln\left(\left(\frac{k}{y}\right)^{\alpha/(1-\alpha)}\right)\right)}{var\left(\ln(y)\right)} + \dfrac{cov(\ln(y), \ln(h))}{var(\ln(y))} + \dfrac{cov(\ln(y), \ln(A))}{var(\ln(y))} = 1$

Note: Klenow and Rodrriguez-Clare(1997) and Gundlach et al. (2002)

Human Capital Measurement

➢ $h = e^{rS+wT}$

- Use existing estimates to weight attainment and cognitive skills:
   - r=0.1 (Card 1999)
    - w=0.2 (Hanushek and Zhang 2009)

Measurement of State Data

- y= state GDP per capita (2007)
  - Exclude AK, WY, and DE
- IPUMS data for S
- Cognitive skills
  - Raw data
    - NAEP by state and parental education
    - International assessments by country
  - Alternative composites
    - State of birth: aggregate and by education level
    - International scores: mean and 75th, 90th percentile

Fraction Living in State of Birth
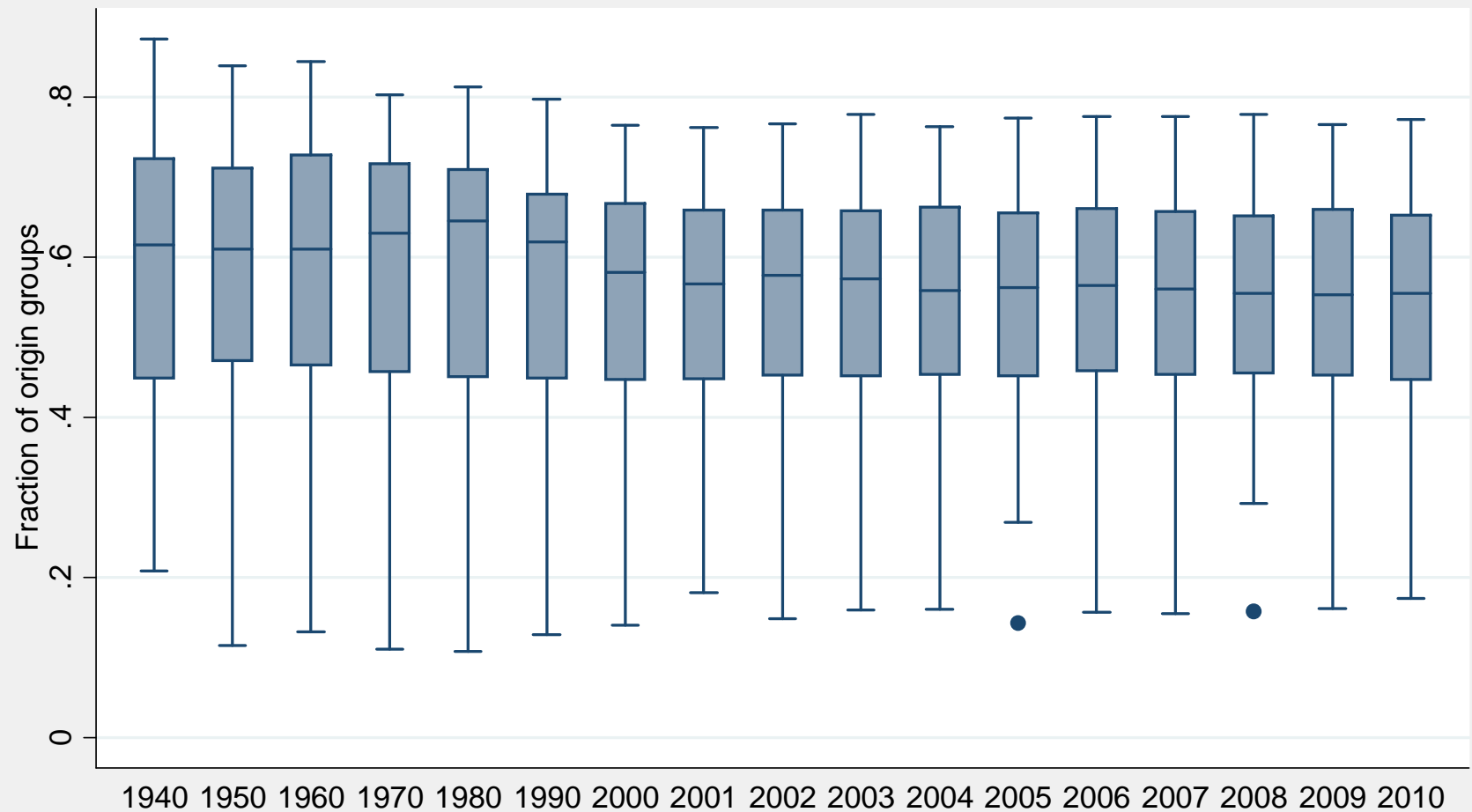
Fraction U.S. Origin
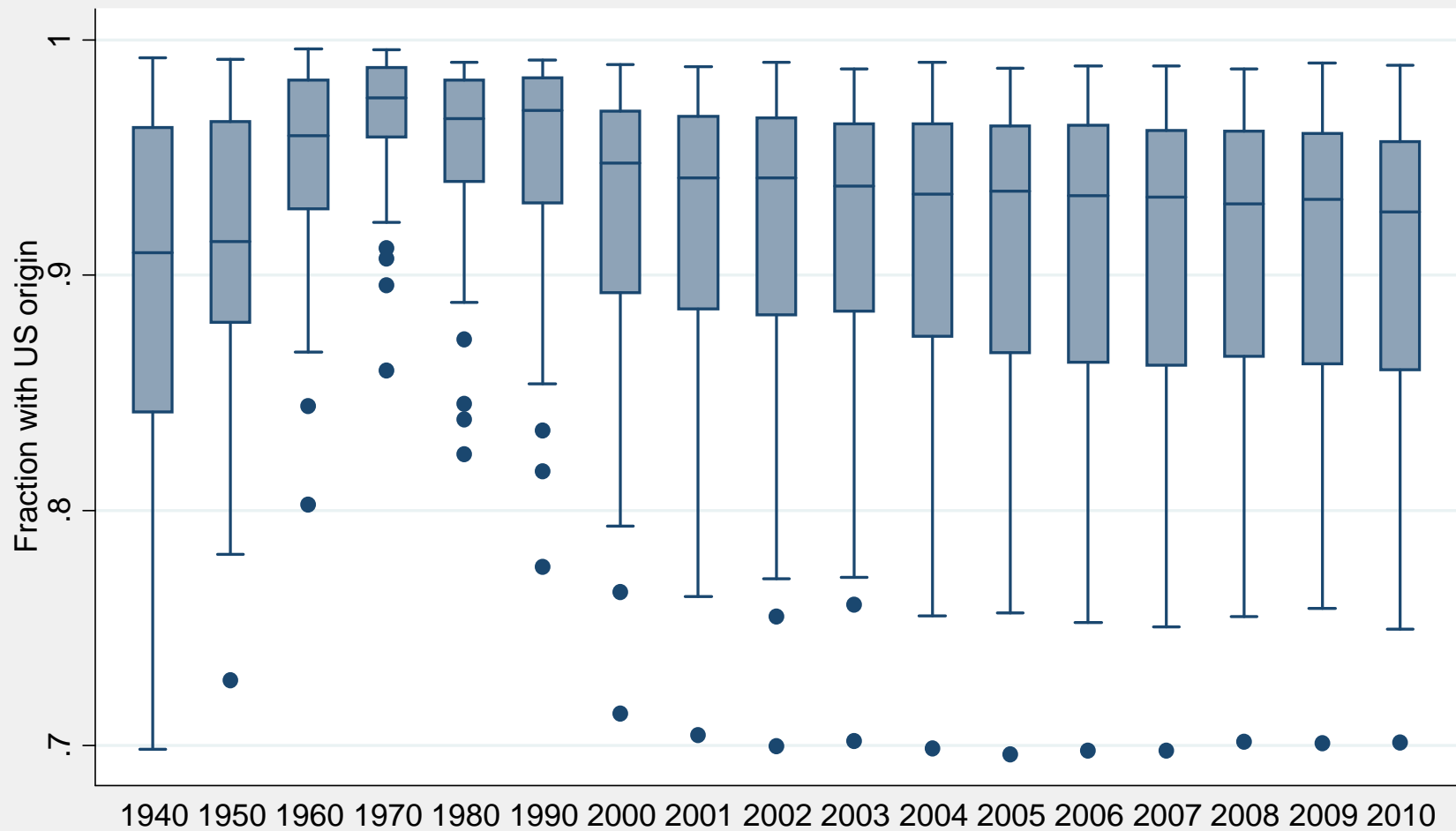
Development Accounting (covariance)

Test score specification	Total human capital	Test scores	Years of schooling
Baseline (local average adjusted for internal migrants)	0.184***	0.067**	0.117***
+ Adjustment of locals by education category	0.195***	0.078***	0.117***
+ Adjustment of internal migrants by education category	0.206***	0.089***	0.117***
+ Adjustment of international migrants			
By education category in country of birth	0.154***	0.038	0.117***
By 75th percentile in country of birth	0.187***	0.070**	0.117***
By 90th percentile in country of birth	0.229***	0.111***	0.117***

Development Accounting (Five-State)

Test score specification	Total human capital	Test scores	Years of schooling
Baseline (local average adjusted for internal migrants)	0.259	0.109	0.149
+ Adjustment of locals by education category	0.268	0.119	0.149
+ Adjustment of internal migrants by education category	0.280	0.131	0.149
+ Adjustment of international migrants			
By education category in country of birth	0.219	0.070	0.149
By 75th percentile in country of birth	0.305	0.108	0.149
By 90th percentile in country of birth	0.339	0.156	0.149

Development Accounting with Age Projections (covariance)

Test score specification	Total human capital	Test scores	Years of schooling
Baseline (local average adjusted for internal migrants)	0.184***	0.067**	0.117***
+ Adjustment of locals by age category	0.210***	0.094***	0.117***
+ Adjustment of internal migrants by age category	0.225***	0.109***	0.117***
+ Adjustment of international migrants			
By 75th percentile in country of birth	0.206***	0.089***	0.117***
By 90th percentile in country of birth	0.248***	0.131***	0.117***

Development Accounting with Age Projections (Five-State)

Test score specification	Total human capital	Test scores	Years of schooling
Baseline (local average adjusted for internal migrants)	0.259	0.109	0.149
+ Adjustment of locals by age category	0.295	0.145	0.149
+ Adjustment of internal migrants by age category	0.313	0.164	0.149
+ Adjustment of international migrants			
By 75th percentile in country of birth	0.290	0.141	0.149
By 90th percentile in country of birth	0.339	0.190	0.149

Preliminary Conclusions

- Systematic long run differences in income related to human capital
- Measurement of human capital important
  - Cognitive skills (measured by test scores) significant
  - Cognitive skills and attainment roughly equal in decomposition
- Accounting for immigrant skills important
- Consideration of selective internal and international migration necessary