

Intergenerational Human Capital Transmission

Diego Daruich

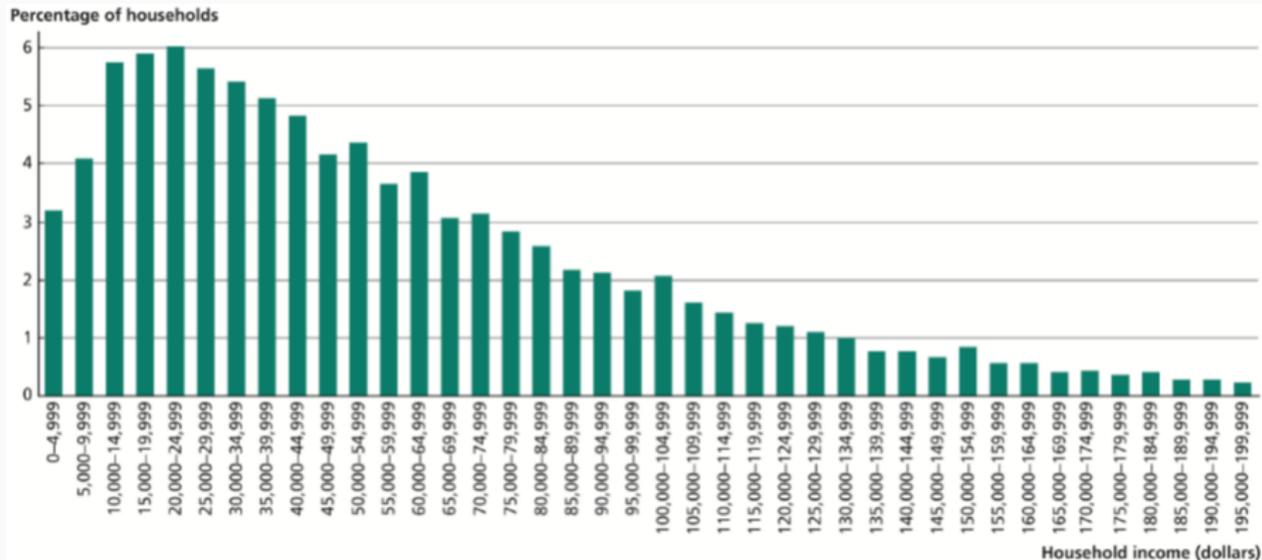
Federal Reserve Bank of St. Louis

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Inequality

Distribution of Household Income



Source: DeNavas-Walt, Proctor and Smith (2010).

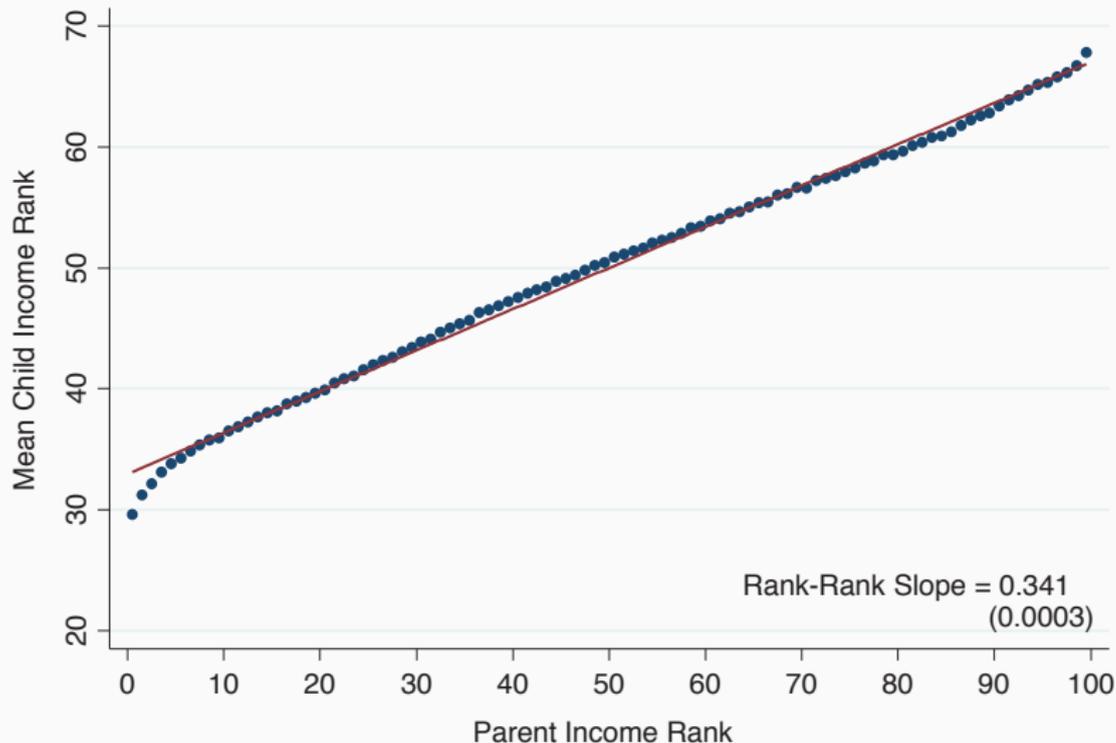
How is inequality emerging?

Two extreme alternatives:

- Opportunities are equally distributed but individuals put different effort
- Opportunities are unequally distributed from very early on in life

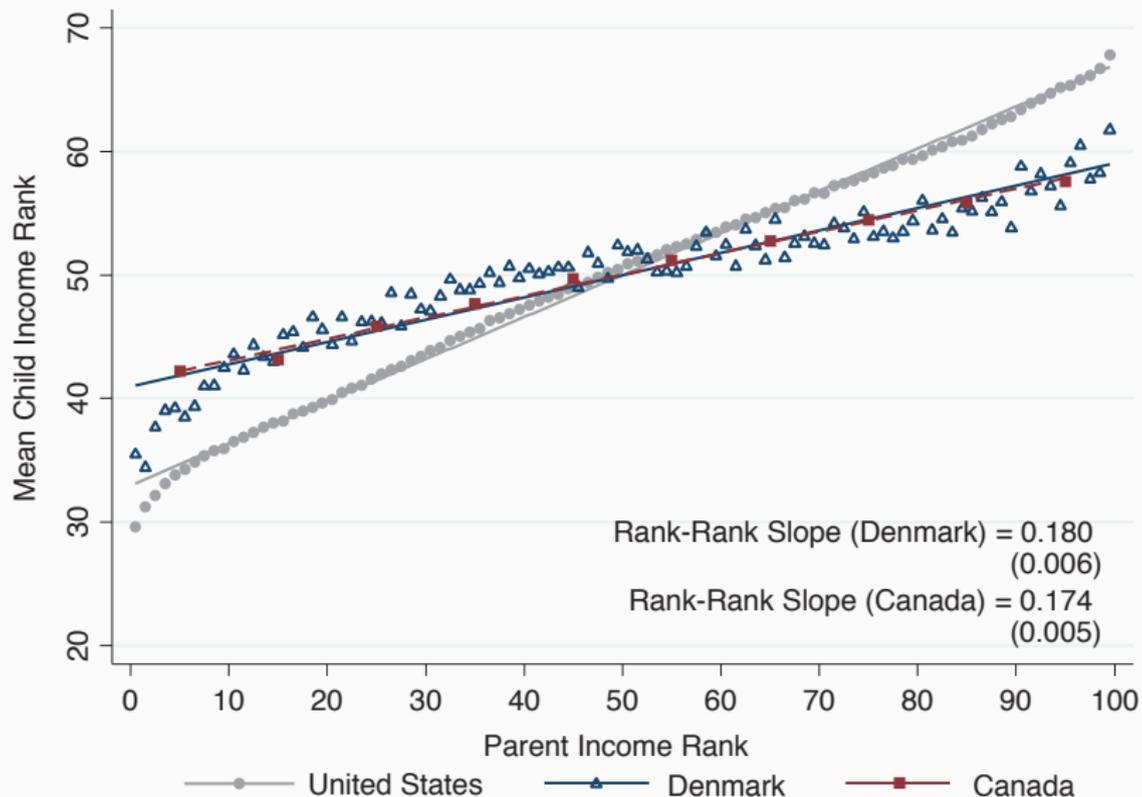
Intergenerational mobility of earnings (Chetty et al, 2014)

A. Mean Child Income Rank vs. Parent Income Rank in the U.S.



Intergenerational mobility of earnings (Chetty et al, 2014)

B. Cross-Country Comparisons



Human capital persistence

How persistent is human capital across generations?

Two typical measures of human capital:

- Education
- Skills (test scores)

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- **Education**
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Education persistence

Mulligan (1999) average of 8 estimates

- Correlation of years of schooling is 0.29 in the US

Probability of graduating college (PSID):

- Over 50% for children of college graduates
- Under 20% for other children

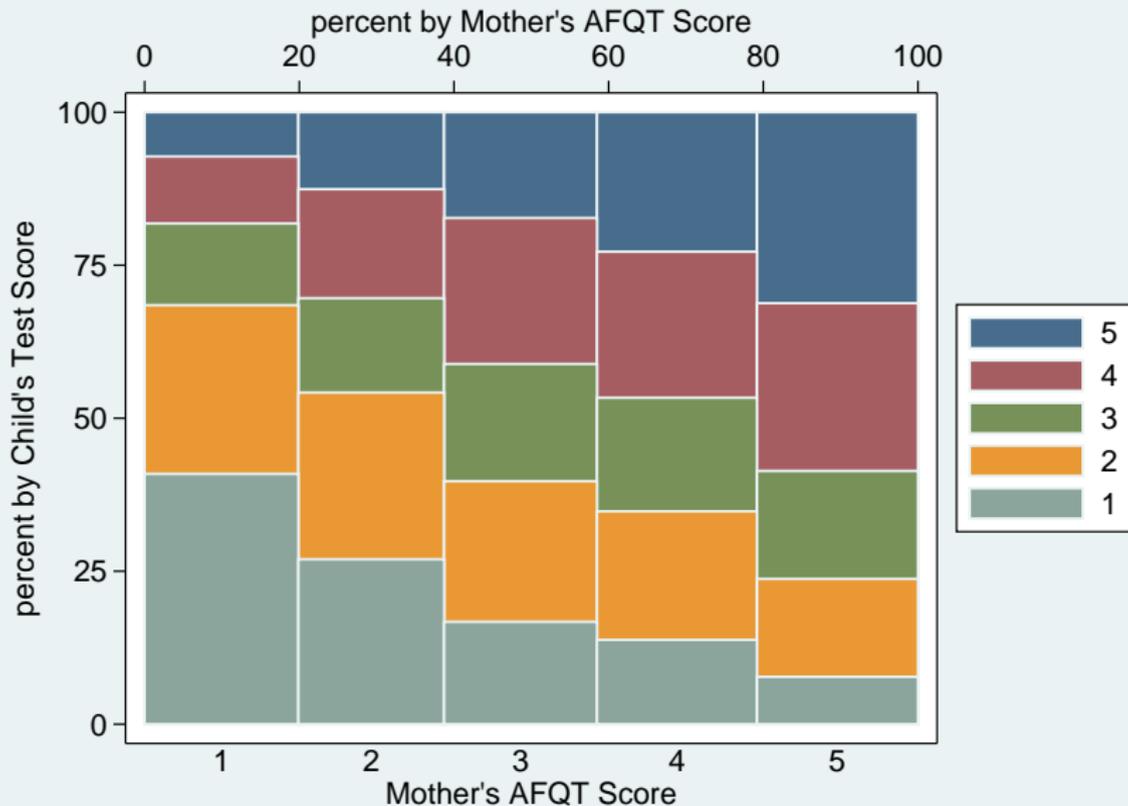
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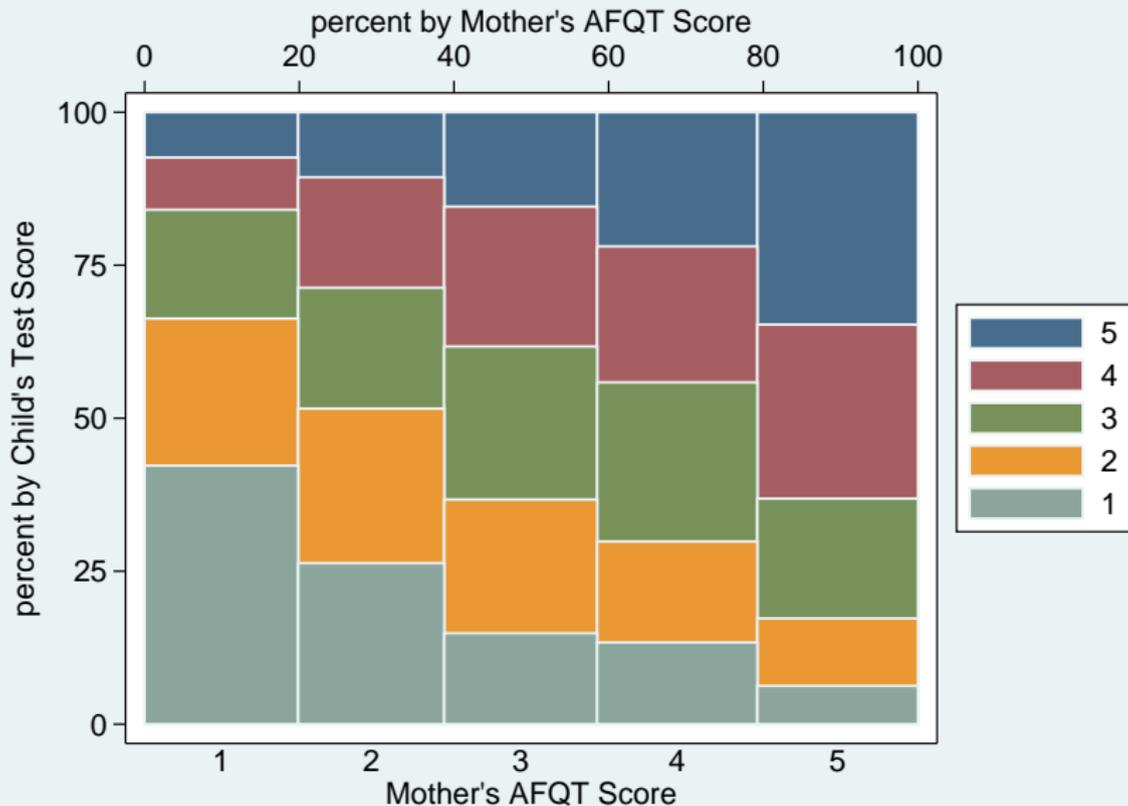
Two typical measures of human capital:

- Education
- **Skills (test scores)**

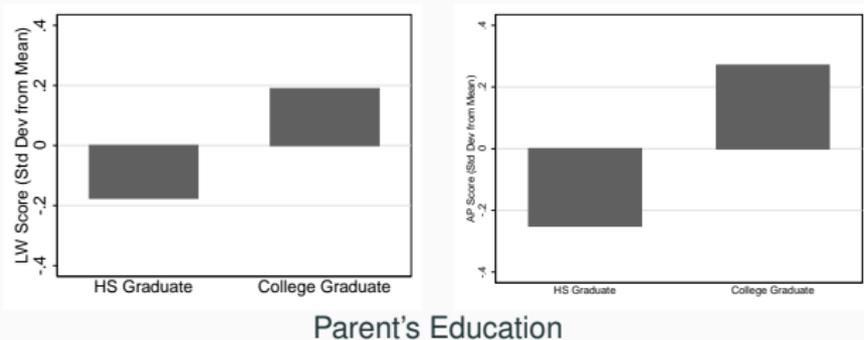
Skills persistence: Reading Test (NLSY79)



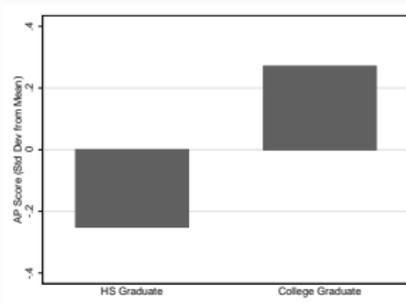
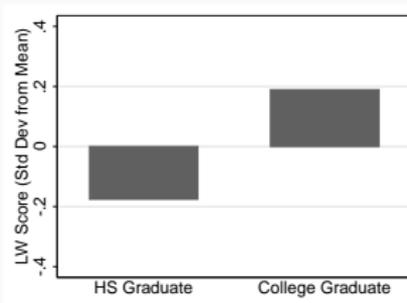
Skills persistence: Math Test (NLSY79)



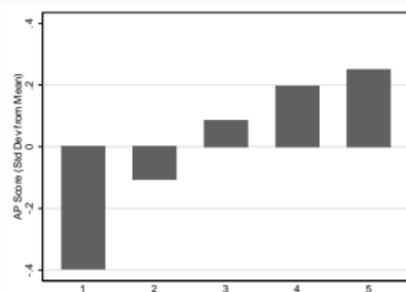
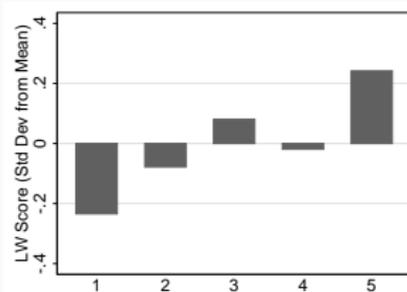
Skills persistence (PSID-CDS)



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Parent's Education



Parent's Permanent Income (Quintile)

Notes: Score trend by age is removed. Average test score is used for each individual. Income: calculated using all family income while child's age < 12. **Source:** PSID + CDS.

Outline

Sources of inequality

Large-Scale Policy Implications

Sources of inequality (Hugget, Ventura and Yaron, 2011)

Study sources of inequality using a risky human capital model

- **Three “initial conditions” (at age 23):**
 - Initial human capital
 - Learning ability
 - Financial wealth
- **Versus labor shocks (e.g., wage shocks and effort)**

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Over 60% of lifetime inequality driven by initial conditions

- Initial human capital is 10 times more important than the rest
- Keane and Wolpin (1997): over 90%

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But...

“This article is silent on the prior forces which shape the individual differences that we analyze at age 23”

“Initial conditions”

What factors determine “initial conditions”?

- Human Capital
 - Skills (which?), ability to learn, education
- Assets
- Networks
- Health
- ...

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What determines human capital?

Standard elements that determine human capital

A combination of endowed abilities, environment and investments interacting in (likely very) complicated ways

- **Initial draw**

- What is the initial age?

- **Production function of human capital**

- How does human capital change over life?

- **Investments**

- Parental and government investments
- Adult education, experience, and on-the-job learning
- Return to investments

- **Environment**

- Peer group effects
- Neighborhood effects

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It is hard to measure skills at birth or genetics (and their importance)

What % of outcome variation can be accounted for by genetic variation?

- **Twin Studies:**

- Compare within-pair correlations of identical twins and fraternal twins
- Branigan et al (2013): 40% of education variation explained by genetic factors

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- Compare correlation between adoptive and non-adoptive siblings
- Limitation: Adopting process takes time, so child spends many (important) months either with genetic parents or in orphanage
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Neither of them allows for interaction between pre-birth and environment

- **Using data on genetic factors and education/labor outcomes**
 - Only very recent literature
 - Papageorge and Thom (2018)
 - 10% of education variation related to genes variation
 - Controlling for parental education reduces gene-education association
 - But interaction with childhood environment seems key
 - Gene-college association is stronger for high SES children
 - Gene-HS association is smaller for high SES children

Note that causality is not claimed by any of these studies

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Production Function of Human Capital

Cunha, Heckman, Schennach (2010)

- Pre-natal environment is hard to distinguish from genetics
- Instead: How malleable are skills to investments at different ages?
- **Estimate production function of skills**

$$\underbrace{\theta'_k}_{\text{Next period child's skills}} = \left[\alpha_{1j} \underbrace{\theta_k^{\rho_j}}_{\text{Current child's skills}} + \alpha_{2j} \underbrace{\theta^{\rho_j}}_{\text{Parent's skills}} + \alpha_{3j} \underbrace{I^{\rho_j}}_{\text{Parental investments}} \right]^{1/\rho_j} \exp(\nu)$$

- Endogeneity concerns: use instrumental variables
- **Results**
 - Find 0.2 correlation between parents' skills and children's skills at birth
 - More importantly: Skills are malleable, particularly early on

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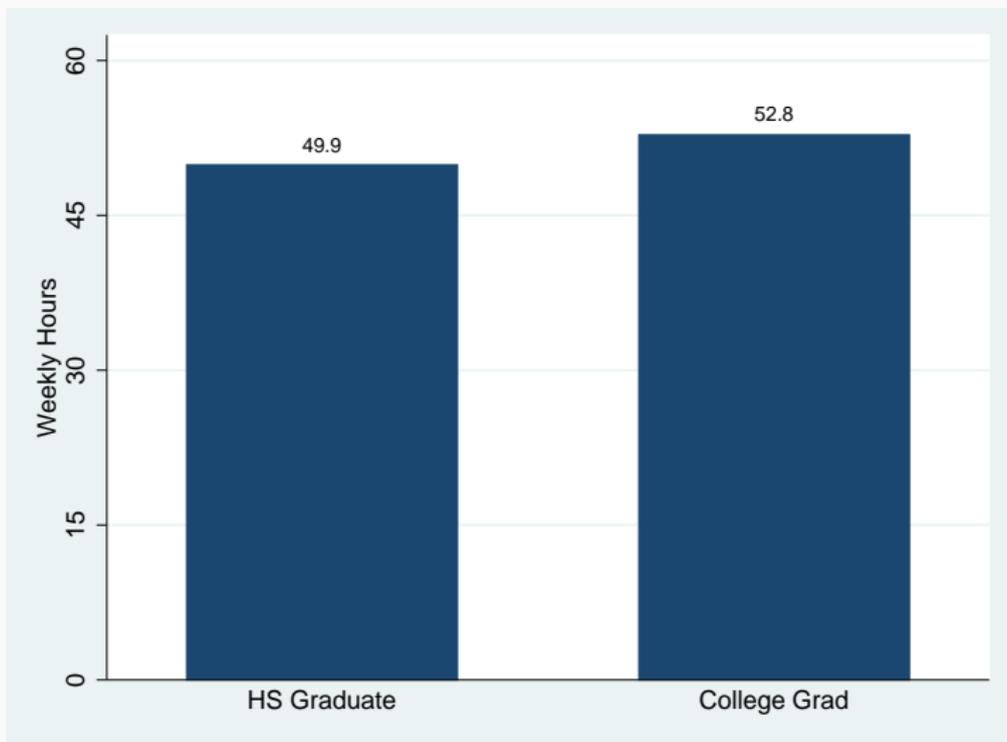
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Active time with parents

- Using time diaries I calculate “active” time with parents.
- “Active:” parent is performing activity with kid.
Assumption: If two parents are active, double the hours.

Active time with parents: by mother's education



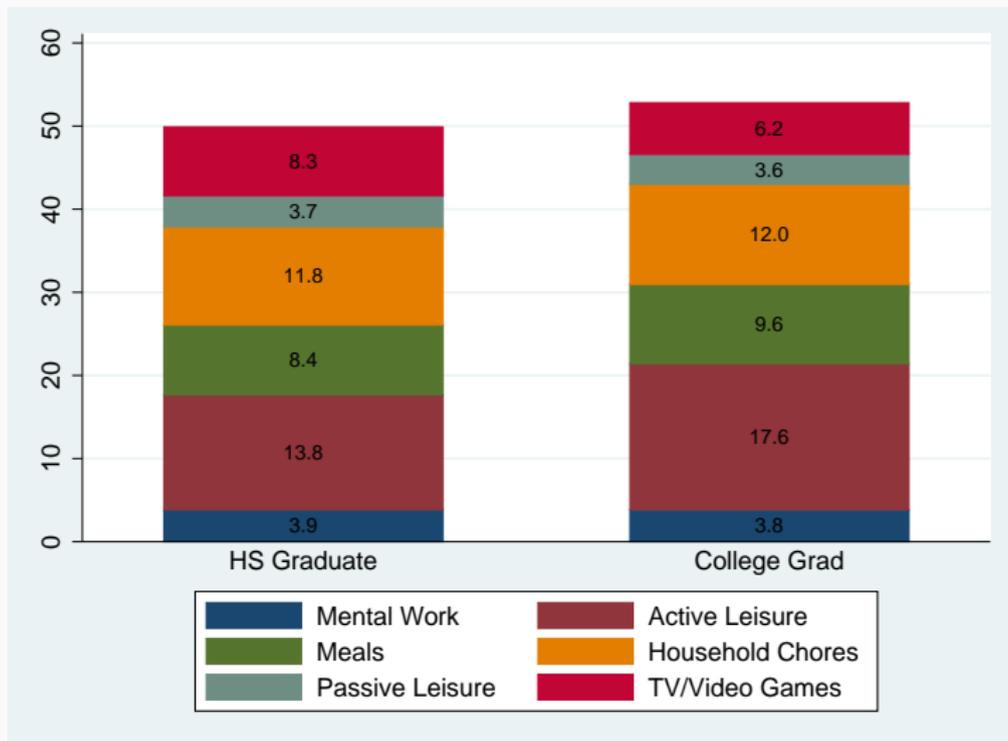
Notes: Time trend by age is removed. Average for each child is approximated for age 4.

Source: PSID + CDS.

Active time with parents: Categories definitions

- **Mental Work:** Homework, computer work, museums, reading (and being read to), conversations, and letters.
- **Active Leisure:** Volunteering, religious practice, child/family organizations, entertainment, playing games, sports, other computer.
- **Meals:** at home or away.
- **Household chores:** Household activities (cooking, laundry,...), caring for other children, shopping, care to self and others (e.g., showering, dressing).
- **Passive Leisure:** Radio, music, phone, “laying around”...
- **TV/Video Games.**

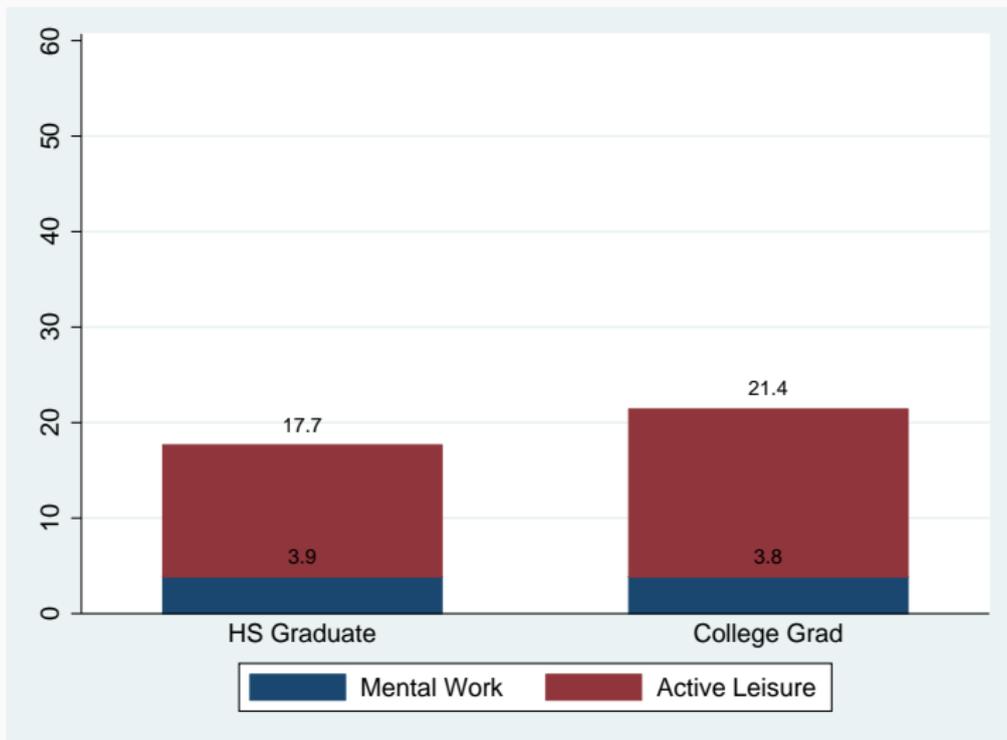
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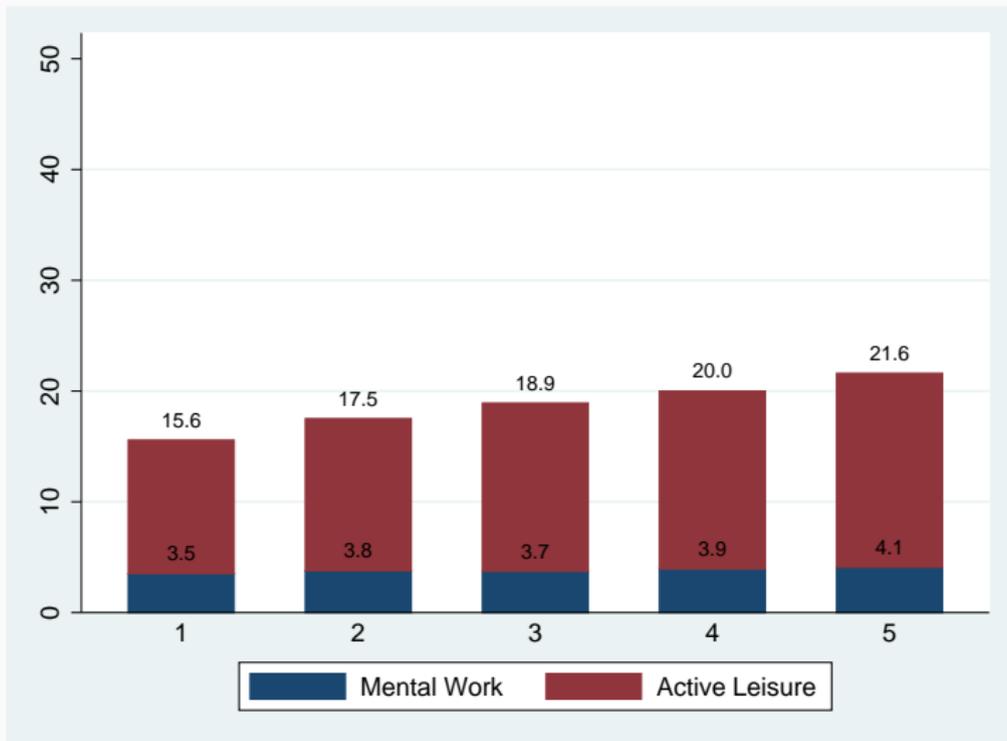


Active time with parents: by income



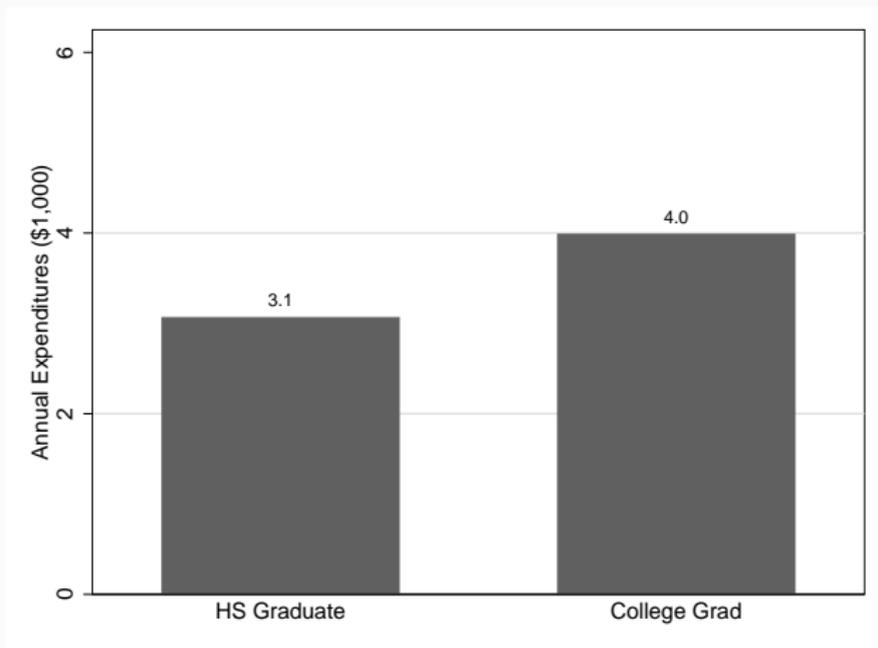
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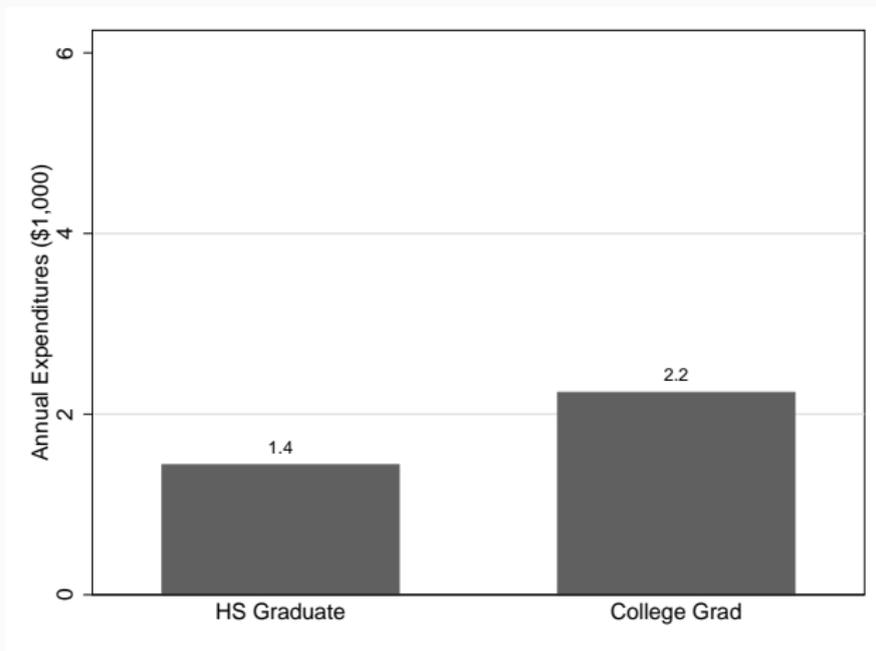
Monetary expenditures on child: by mother's education



Parent's Permanent Income (Quintile)

Includes toys, vacation, school supplies, clothes, food, and medical. Expenditures trend by age is removed. Average for each child is approximated for age 4. **Source:** PSID + CDS.

Rent (per room) expenditures: by mother's education

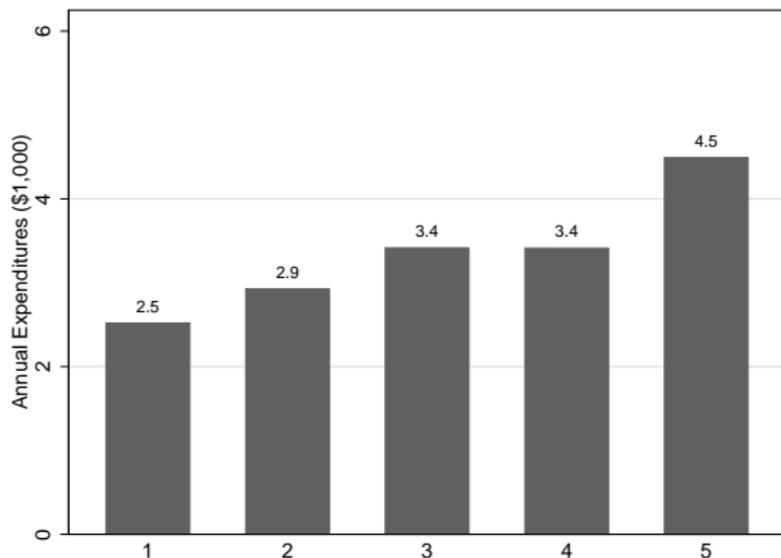


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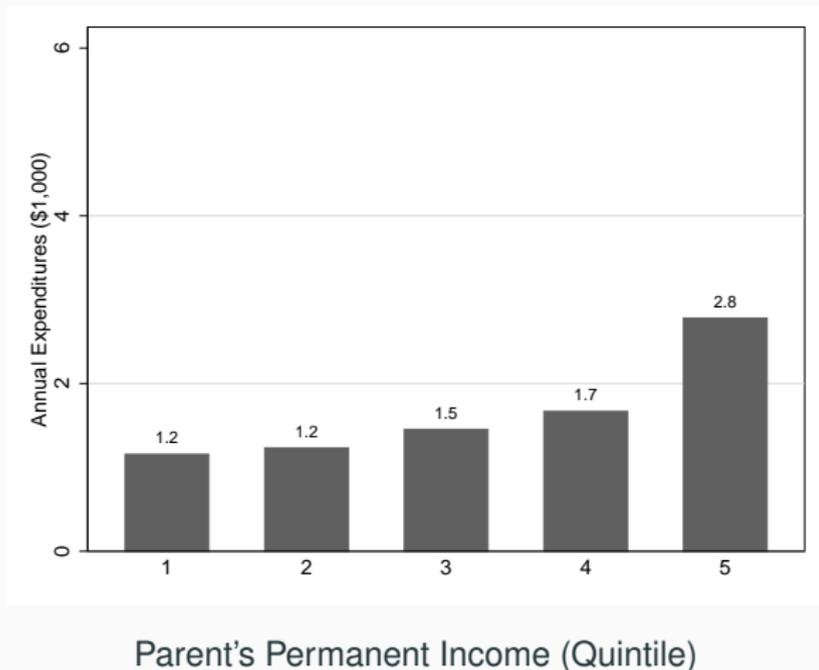
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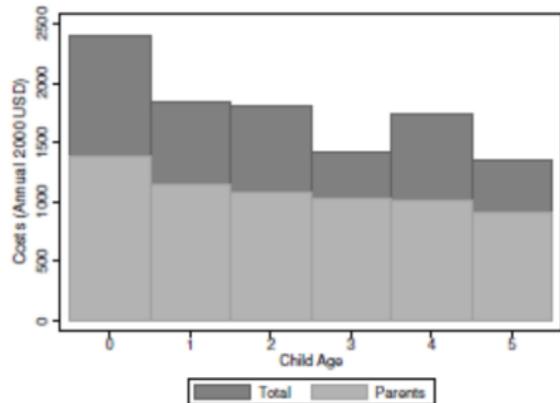
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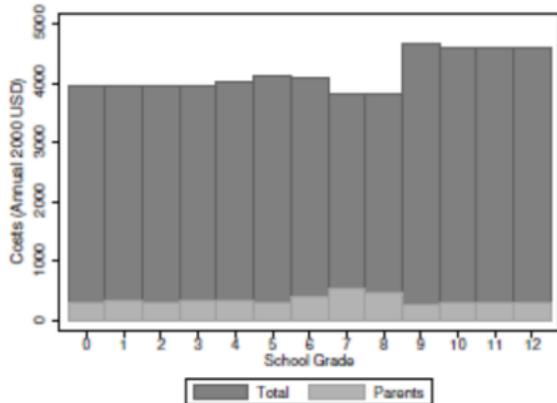
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Government Investments by Children's Age

Government vs. Parental Investments as children grow older



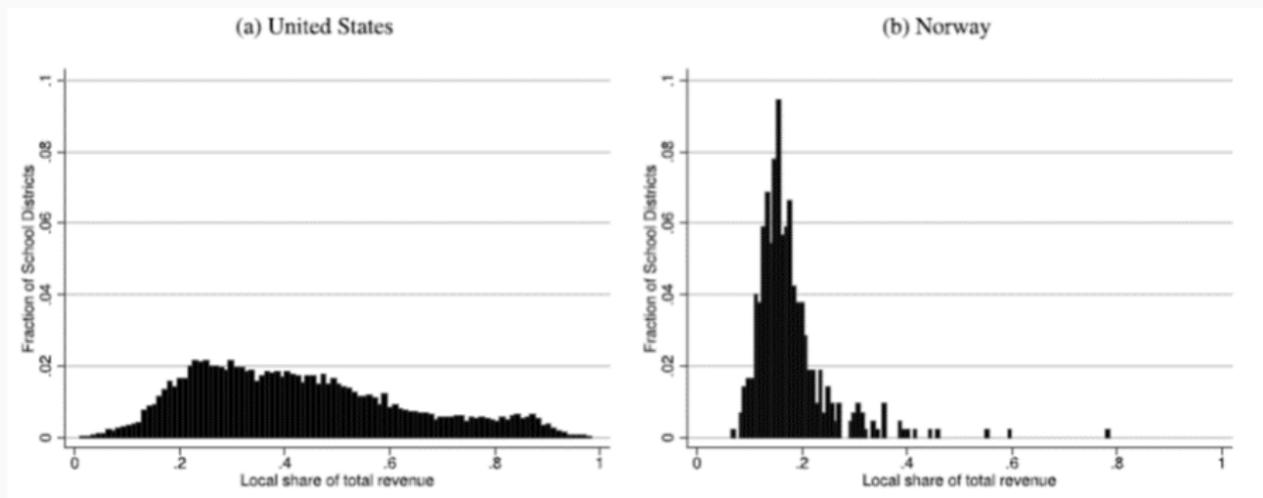
(a) Daycare costs



(b) Schooling costs

Government Investments Heterogeneity by Districts

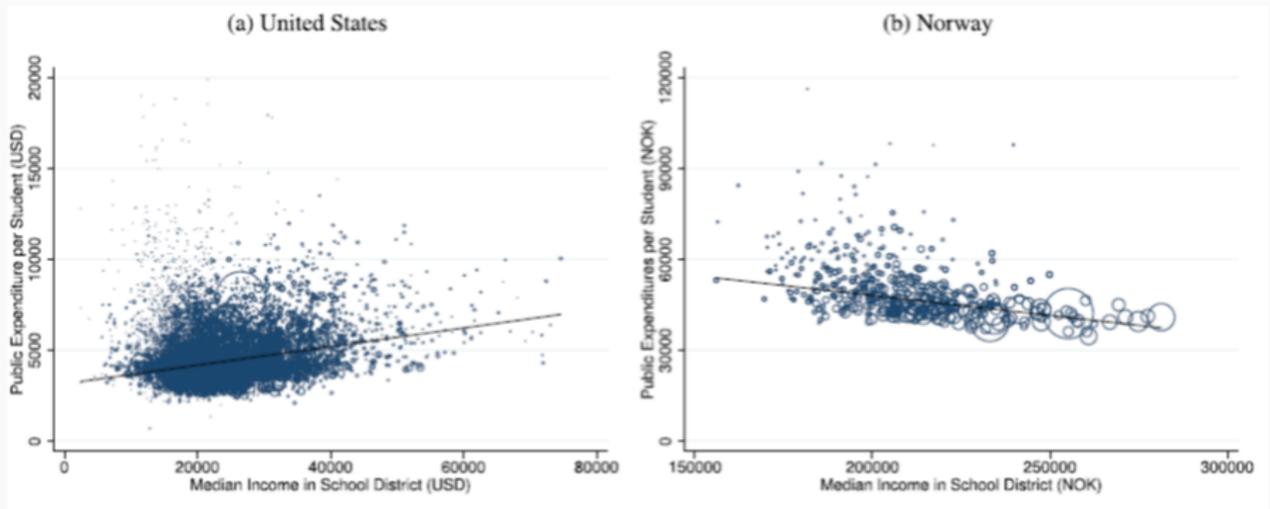
US Government investments vary substantially by school district



Source: Herrington (2015).

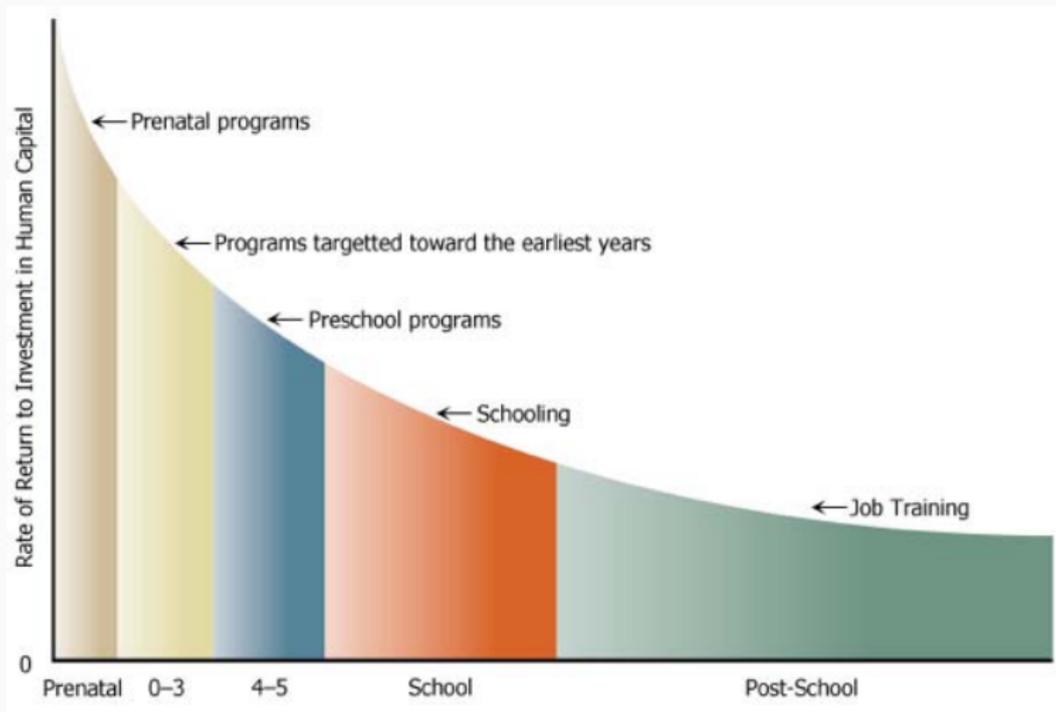
Government Investments and Median Income by Districts

...and are related to income in the district



Source: Herrington (2015).

Returns to investment at different ages (Heckman, 2008)



Early childhood development programs

Programs start with kids as young as a few weeks old

Typical goals:

- Support language, motor, and cognitive development
- Minimize high-risk behaviors
- Develop socio-emotional competencies

Large variation in program quality:

- Important to distinguish child-care from early childhood development
- High-quality programs:
 - Low child-caregiver ratios
 - Emphasize active learning experiences and one-on-one interactions
 - Prepare for classroom experience

Evaluating the Impact Of Education Programs

We can't simply do a regression of outcomes to program participation

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Example:

- Suppose rich parents are more likely to send children to school
- And rich parents also spend more time with children
- Simple regression would mix the benefit of the time with the benefit of the program

Evaluating the Impact Of Education Programs

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- Suppose rich parents are more likely to send children to school
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Another example:

- If returns are heterogenous and only some people gain from programs
- People choose to participate so only the ones gaining participate
- Simple regression would be biased by selection issues

Randomized Controlled Trial (RCT)

Randomized Controlled Trial (RCT) methodology

- Randomly divide people into treatment and control group
- Treatment group is “intervened” by some policy (e.g., free education)
- Control group is *not* intervened

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(e.g., just differences in average outcomes)

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Disadvantages:

- Can be very expensive
- Results are specific to population studied
- Mechanisms of causation are not clear
- Does the control group compensate for not being intervened?

Use RCT to estimate impact of early childhood program

Garcia, Heckman, Leaf, and Prados (2017):

- Early childhood program in 1970s, targeting disadvantaged kids
- Cost \approx \$20k per year for 5 years, i.e., total \$100k per child
- Followed up into adulthood and observe education/income

Abecedarian Program

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Results:

- College graduation rates grow by 13p.p. (about double of control group)
- Lifetime earnings (in NPV) grow by \$1.3 for every dollar invested
- Many other gains: health, crime reduction, parental income...
 - Total returns can be as high as \$7 for every dollar invested

Teach parents how to interact with children

Jamaican Study — RCT evidence

- Enrolled disadvantaged kids between 9 and 24 months old in 1980s
- 2 years of weekly 1-hour play sessions at home
- Improving the quality of the interaction between mother and child

Followed 20 years after and compare to control group

- Large increase in income (15–25%)
- Enough to catch-up to non-disadvantaged kids

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Peers and Neighborhood effects

Need to separate neighborhood effect from parental characteristics

Moving to Opportunity Program (1990s)

- Target: randomly selected families in high-poverty housing projects
- Intervention: vouchers to move to lower poverty neighborhoods

Results

- Small effect on parents and older children
- Children who move before age 13: Income increased by 31%
- Income gains are estimated to be around \$100k per child

Outline

Sources of inequality

Large-Scale Policy Implications

From Empirical Evidence to Large-Scale Policies

Early childhood investments increase education and income

- Government interventions can lead to large effects
- Based on small-scale and short-run programs
- Can we extrapolate from them?

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Consequences of *large-scale* and *long-run* policy depend on

- Crowding out effects (particularly on high-income groups)
- GE effects on capital and labor markets
- Deadweight loss of raising taxes
- Intergenerational dynamics

What is the impact of a *permanent and universal* early childhood government investment policy?

Particularly on: income, inequality, intergenerational mobility, and welfare

Use an overlapping generations (OLG) model

- with distortionary taxes
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Macro Model

- Wage depends on **skills**

+

Endogenous Intergenerational Links

- **Parental investments of time and money to build child's skills**

- **Potential role for government investments because of:**
 - Imperfect capital and insurance markets
 - Inability to write contracts with children

Skill Development in the Model

How are skills produced?

$$\underbrace{\theta'_k}_{\text{Next period child's skills}} = \left[\alpha_{1j} \underbrace{\theta_k^{\rho_j}}_{\text{Current child's skills}} + \alpha_{2j} \underbrace{\theta^{\rho_j}}_{\text{Parent's skills}} + \alpha_{3j} \underbrace{l^{\rho_j}}_{\text{Parental investments}} \right]^{1/\rho_j} \exp(\nu), \nu \sim N(0, \sigma_{j,\nu})$$

$$l = \bar{A} \left[\alpha_m \underbrace{(m + g)^\gamma}_{\text{Money}} + (1 - \alpha_m) \underbrace{t^\gamma}_{\text{Time}} \right]^{1/\gamma}$$

Key Mechanism

- Parents invest time t and money m to develop kid's skills θ_k
- Government invests g (paid by higher taxes)
 - Can increase kids skills
 - But can crowd out parental investments \Rightarrow Parents reduce investments
 - and distorts labor choices \Rightarrow High-skilled want to work less

Role for government intervention

Why is there a role for government intervention g ?

This paper: Incomplete Markets

- Borrowing constraints
 - Poor parents cannot afford the investments, even if very profitable
- Lack of insurance
 - Cannot insure against risk of investing in child

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Other ideas to explore

- Parents don't know the production function
- Parents are heterogeneous in altruism
 - Together with some market incompleteness

Results

Large long-run effects

- **Average income** grows by 8%
- **↓Inequality, ↑Intergenerational mobility**: reach Canadian/Australian levels

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Short-run small-scale policy would underestimate gains by one-half

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- **Transition**: Large increase in gains after first generation has its own children

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- **Transition**: Large increase in gains after first generation has its own children

Who does not benefit from the reform?

- Older individuals at the time the policy is introduced
- But this depends on how the transition is financed

Main takeaway

Large intergenerational persistence in the data

- In education, skills, income...

Human capital seems to play a large role in inequality

- Early investments are found to be particularly important
- Empirical evidence suggests government intervention can be beneficial

We can use models to extrapolate from specific empirical evidence

- Need to make assumptions
- Models can complement empirical studies