Cognitive Skill Formation in Early Childhood

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Research reported in this publication was also supported by the Eunice Kennedy Shriver National Institute of Child Health & Human Development of the National Institutes of Health under Award Number P01HD065704. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. Support also received from the Human Capital Research Collaborative, the University of Minnesota Faculty Grant-in-Aid program and the Center for Urban and Regional Affairs (CURA) Faculty Interactive Research Program. Davis also acknowledges the support of the USDA National Institute of Food and Agriculture, Hatch Multistate Project NE-1049 and Minnesota Agricultural Experiment Station Project MIN-14-081. The funding sources had no involvement in the study design, collection, analysis and interpretation of the data, writing of the report, or the decision to submit the article for publication.

Outline

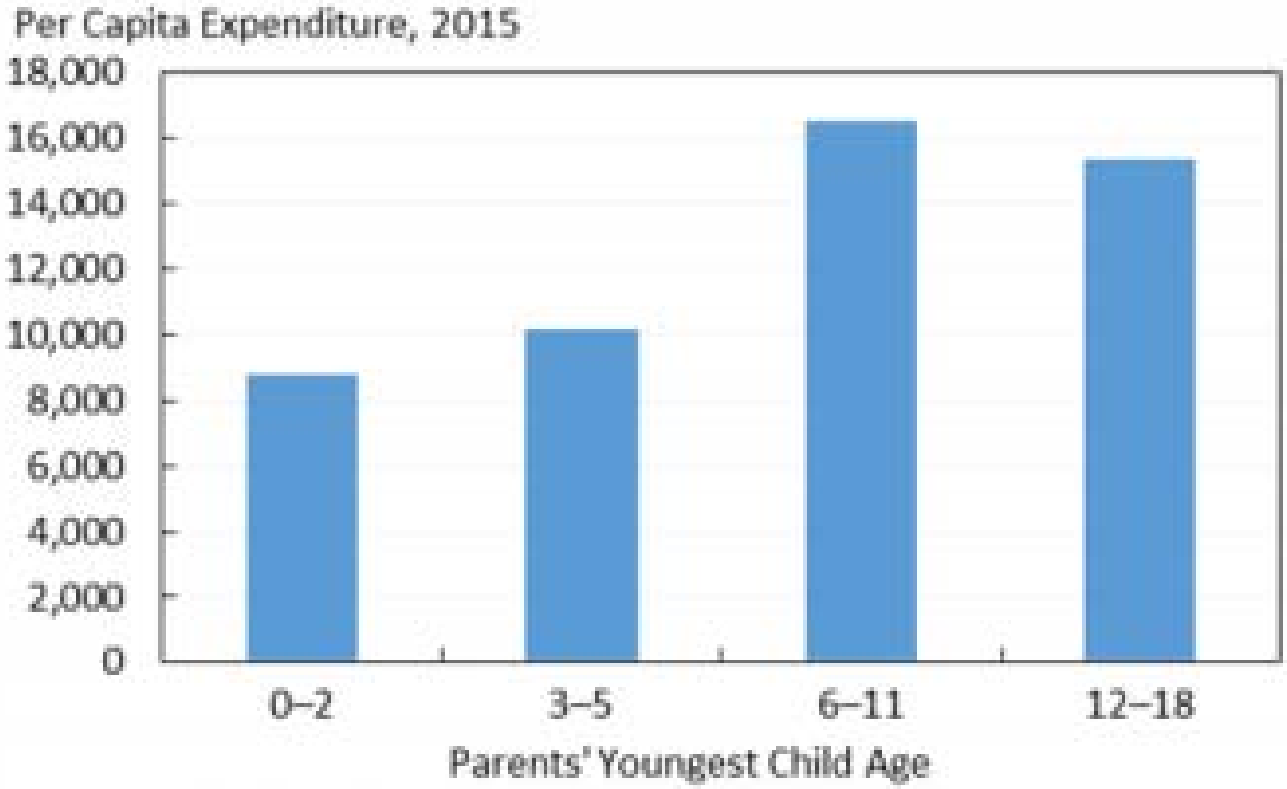
- We ask the most of families when they have the least
- The income-based cognitive skill gaps that develop under status quo are not inevitable.
- Aim to improve understanding of how subsidies affect ECE service demand & supply
  - View experimental evidence through theoretical lens that takes quality of child experience seriously.
  - Towards estimates of how supply responds

We ask most when families have least

- Most private responsibility early

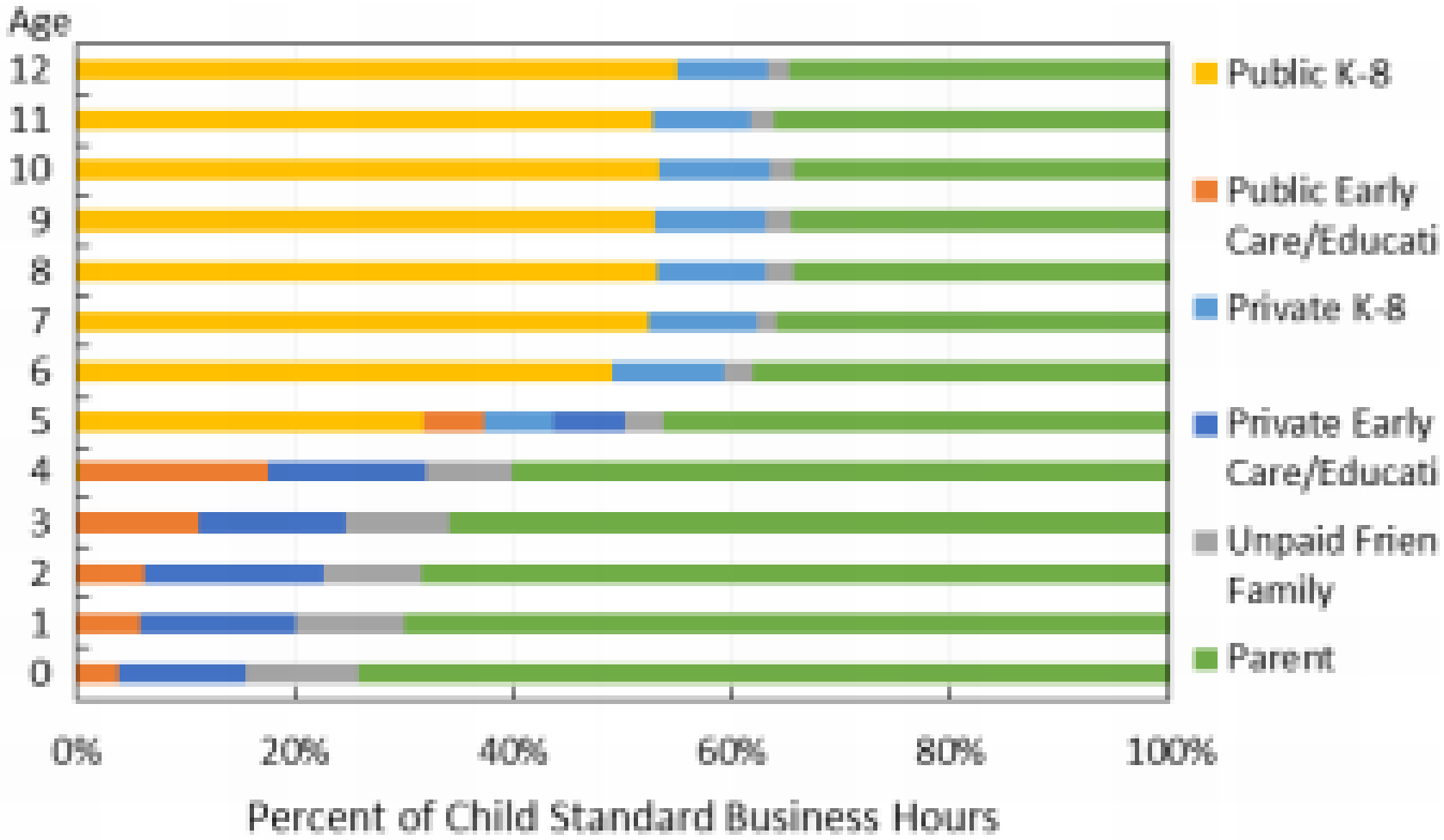
- Least resources early

Least public investment in youngest: public expenditure per child

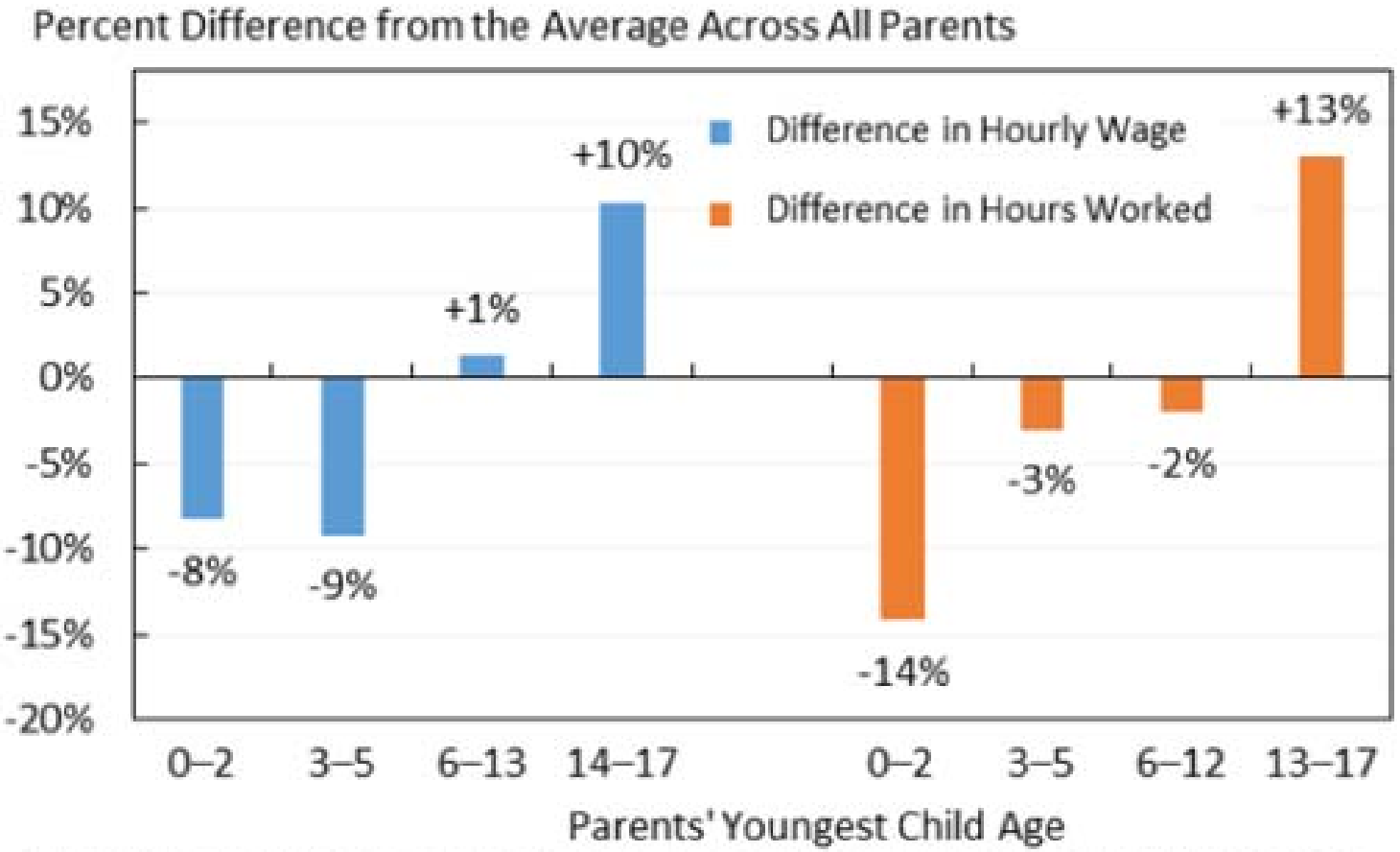


Note: Federal funding includes refundable portions of tax credits but not reductions in taxes. State funding includes state earned income tax credits but no other tax provisions.
Source: Edelstein et al. (2016); Edelstein et al. (2012); CEA calculations.

Publicly-financed ECE:
5 hours/child-wk under age 5



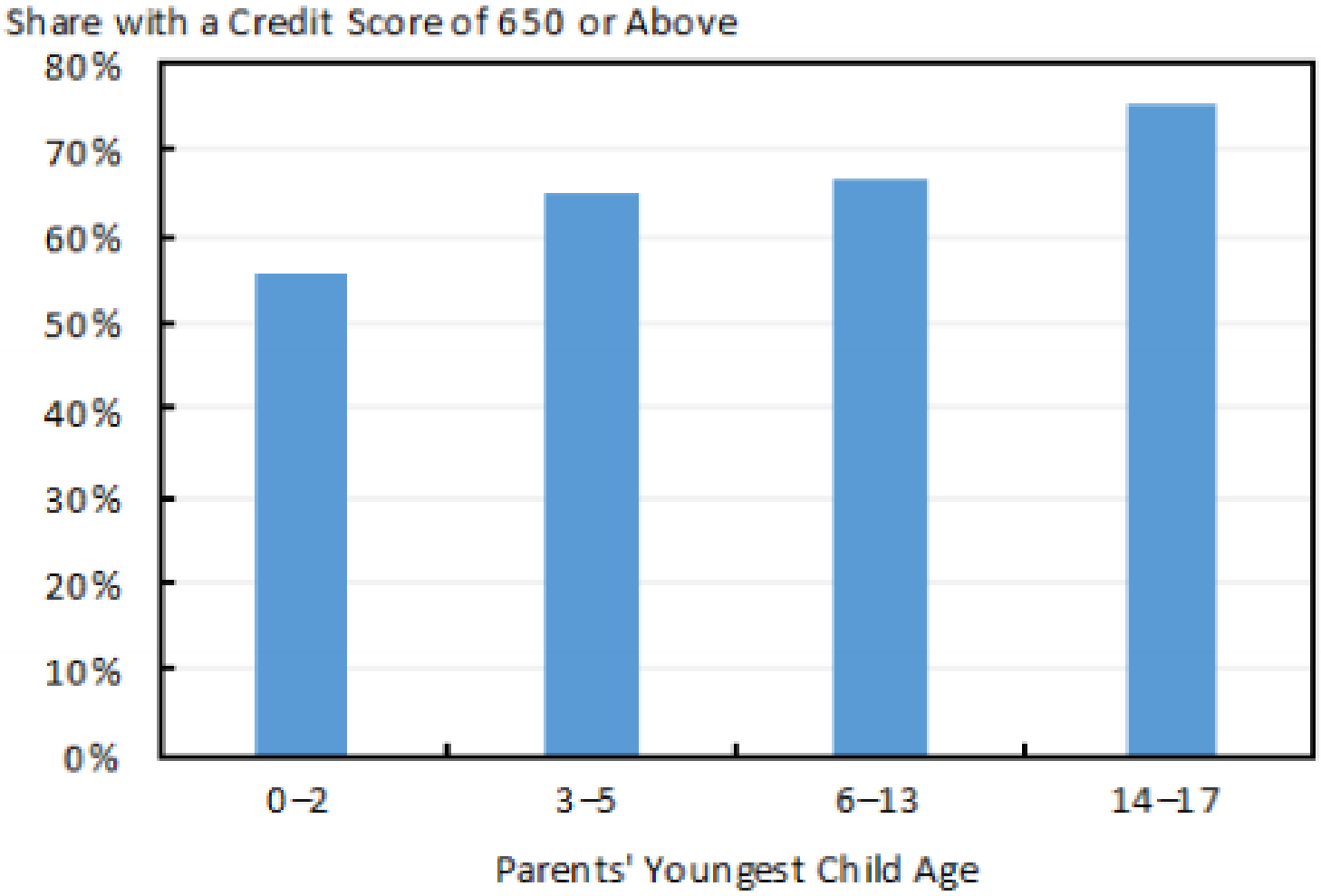
Current earning power



Note: Hours worked refers to average hours spent in work related activities. Hourly wage refers to the median hourly wage.

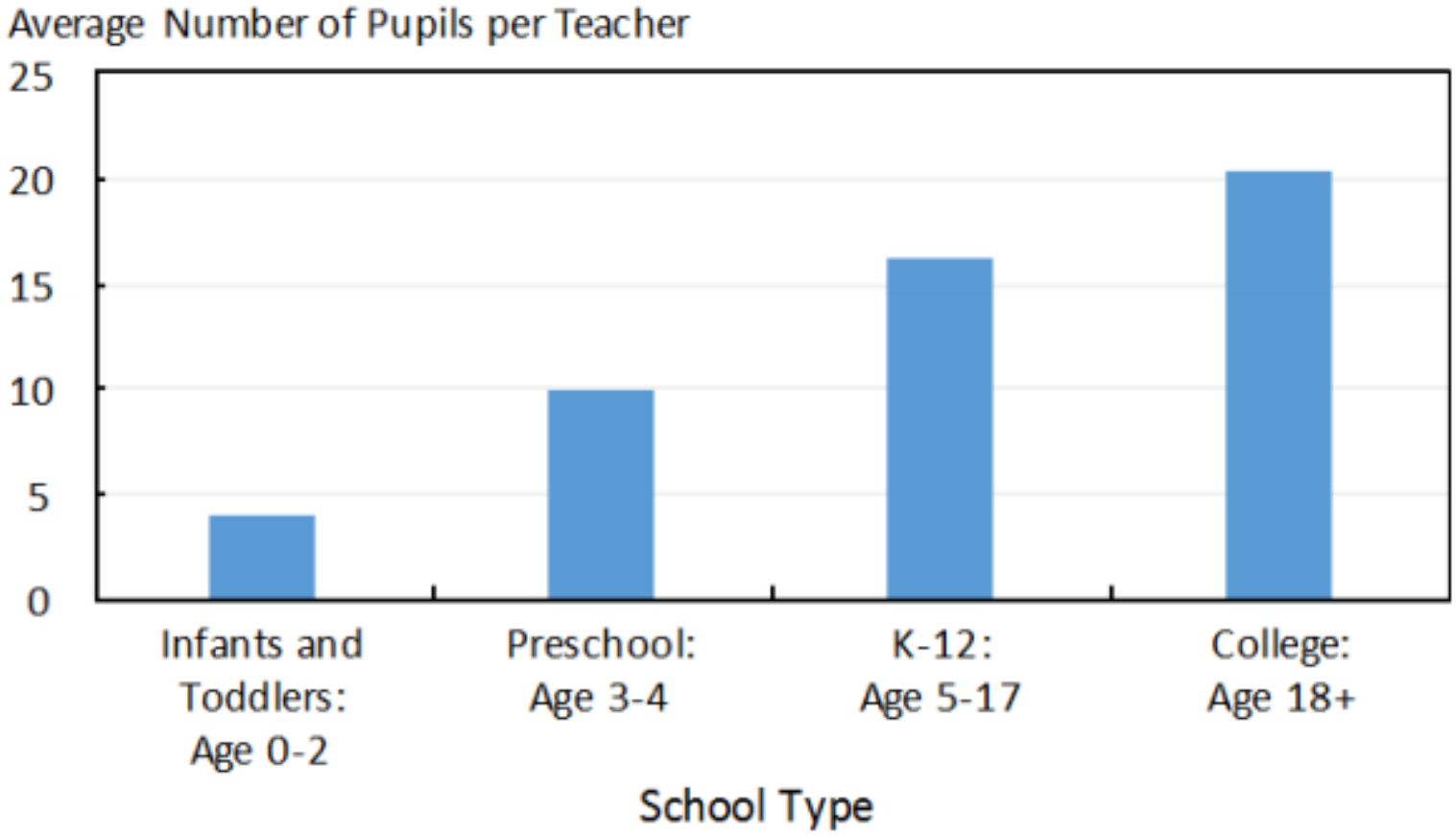
Source: CPS 2016; American Time-Use Survey 2015; CEA calculations.

Access to future income



Source: American Life Panel's 2012 Survey of Consumer Payment Choice; CEA calculations.

No way to do it cheaply & well: parent's income or another adult



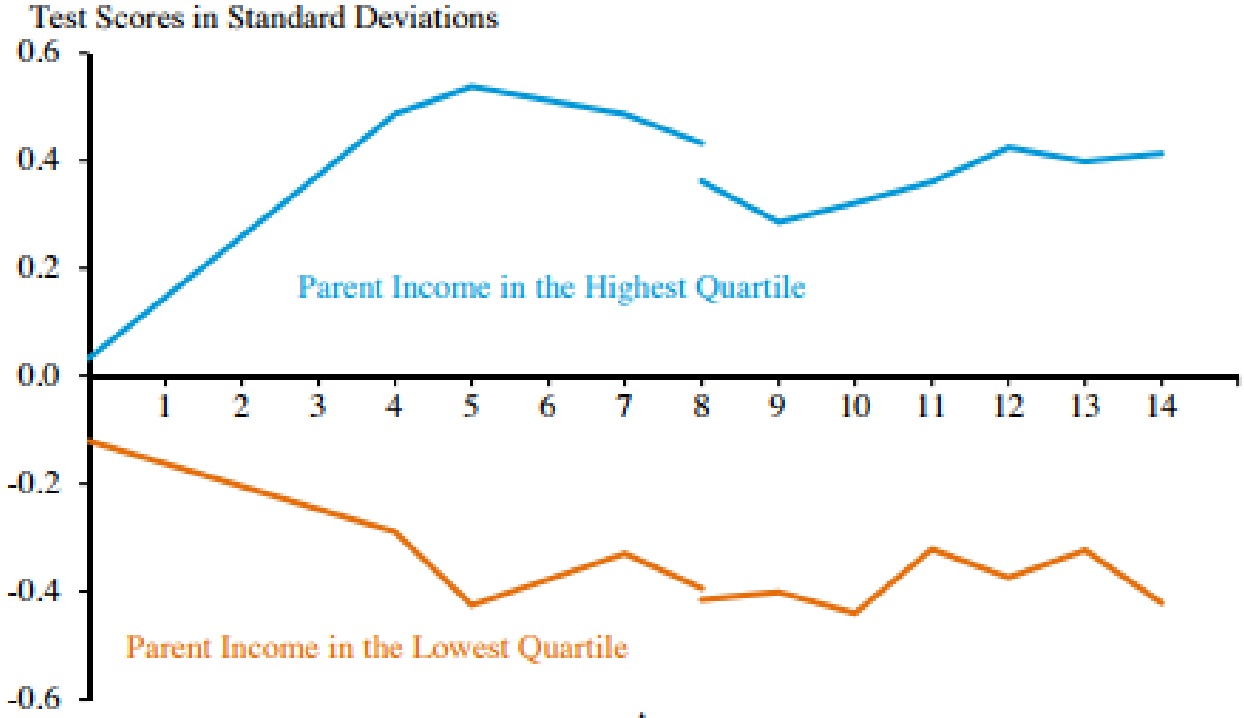
Note: Infant and toddlers encompasses Early Head Start, preschool encompasses Head Start, and college encompasses institutions that predominantly grant certificates or associate or bachelor degrees.
Source: HHS; Department of Education; College Scorecard 2016; CEA calculations

Gaps open early but are not inevitable

Income-based gaps open early & stabilize

Figure 4-7

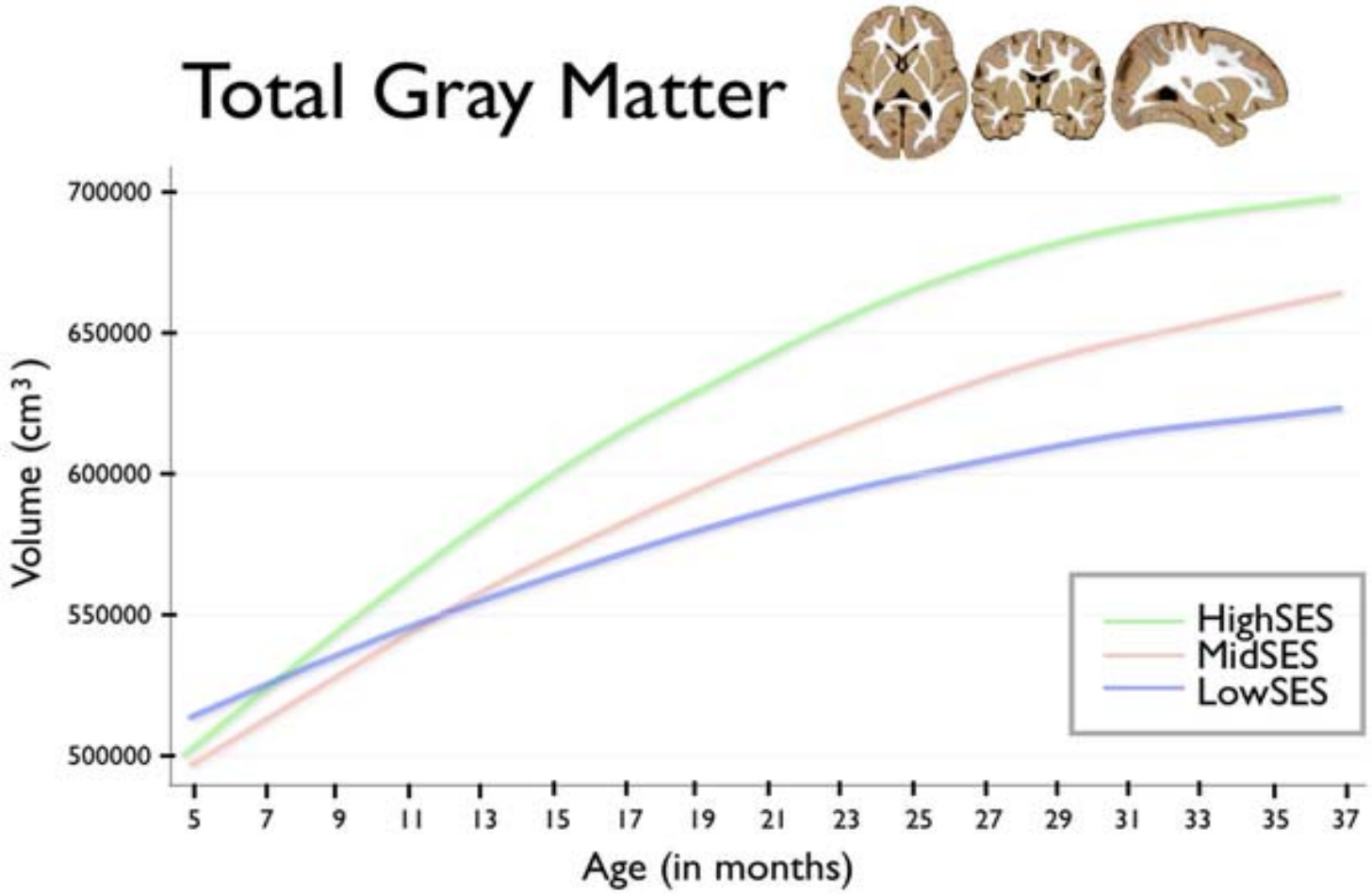
Achievement Gap is Largely Set by Age 5



Note: IQ scores are available through age 8. After age 8, math test scores are shown. A three year moving average is used for math scores.
Source: U.S. Collaborative Perinatal Project from Fryer and Levitt (2013) (through age 8); NLSY79 Child and Young Adult Supplement from Cunha et al. (2006) (after age 8); CEA calculations.

Council of Economic Advisers (2016) Economic Report of the President: Chapter 4

Income-based gaps open very early



Hanson JL, Hair N, Shen DG, Shi F, et al. (2013) Family Poverty Affects the Rate of Human Infant Brain Growth. PLoS ONE 8(12): e80954. doi:10.1371/journal.pone.0080954
http://www.plosone.org/article/info:doi/10.1371/journal.pone.0080954

PLOS | ONE

Is it possible to prevent these gaps from appearing?

The experimental treatment: IHDP

The Infant Health & Development Program (IHDP) recruited a sample at birth and randomly assigned a treatment.
[Brooks-Gunn et al, 1994; McCarton et al, 1997; Gross et al, 1997]

Age 0-12 months: offer of weekly home visit from staff

12–36 m: access to child development center (CDC)

- Free
- Full-day
- High-quality, Abecedarian curriculum
- Free transportation
- Home visits reduce to monthly

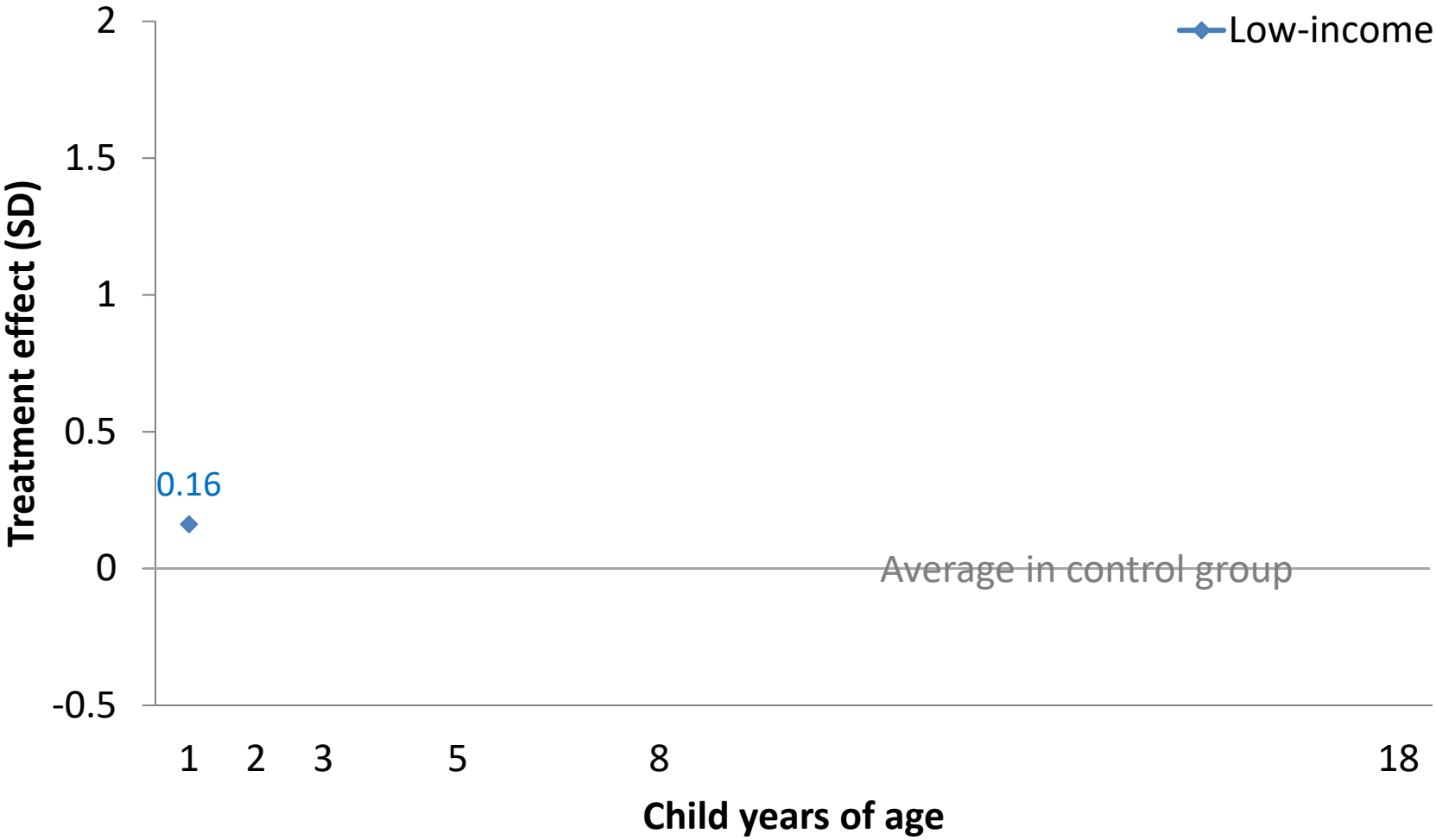
The experimental sample (N = 985)

For experiment, uniquely diverse ethnically & economically

But only included children born:

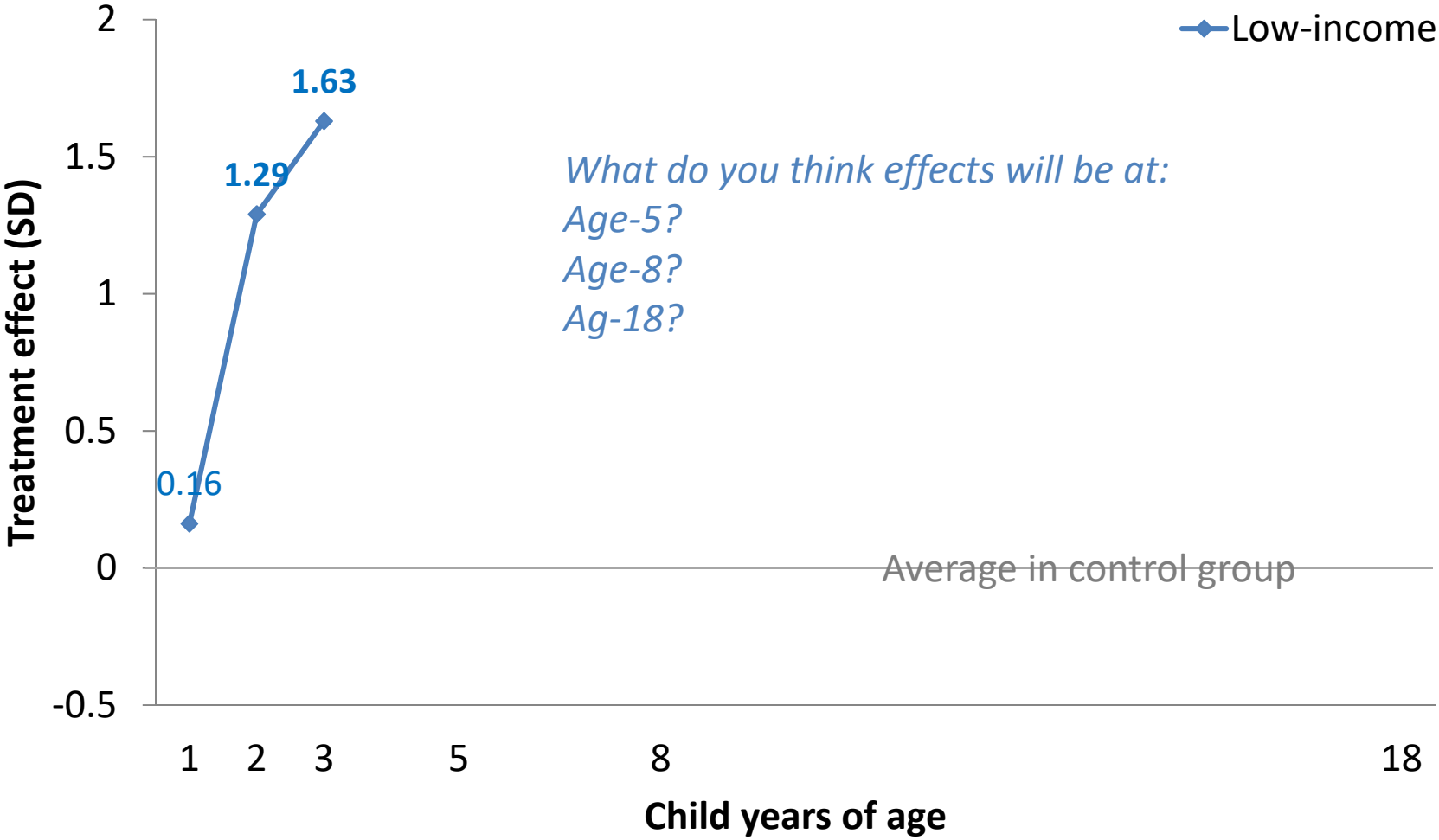
- Low-birth weight (LBW): ≤ 2500 g = 5.5 lbs
- Premature: ≤ 37 weeks
- In 8 research hospitals around U.S.
- Starting January 7, 1985 until fully enrolled
- Control = 608; Treatment = 377

Among high LBW: little effect on "IQ" at start of child-care intervention



Duncan & Sojourner (2013) *Journal of Human Resources* : using ECLS-B weights

During child-care intervention: enormous effects on IQ measures



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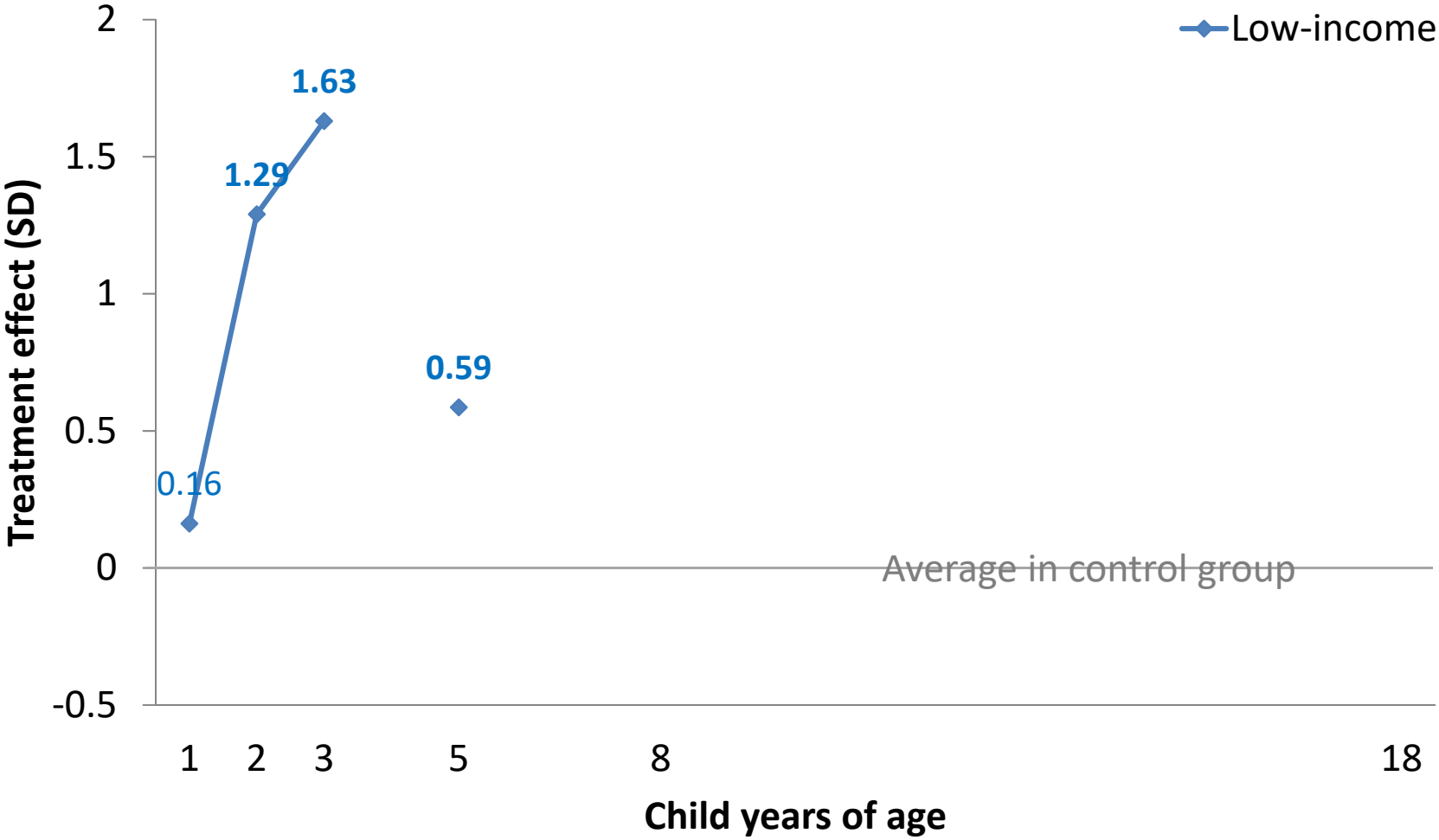
2 years after intervention end: large, positive effect at school-entry



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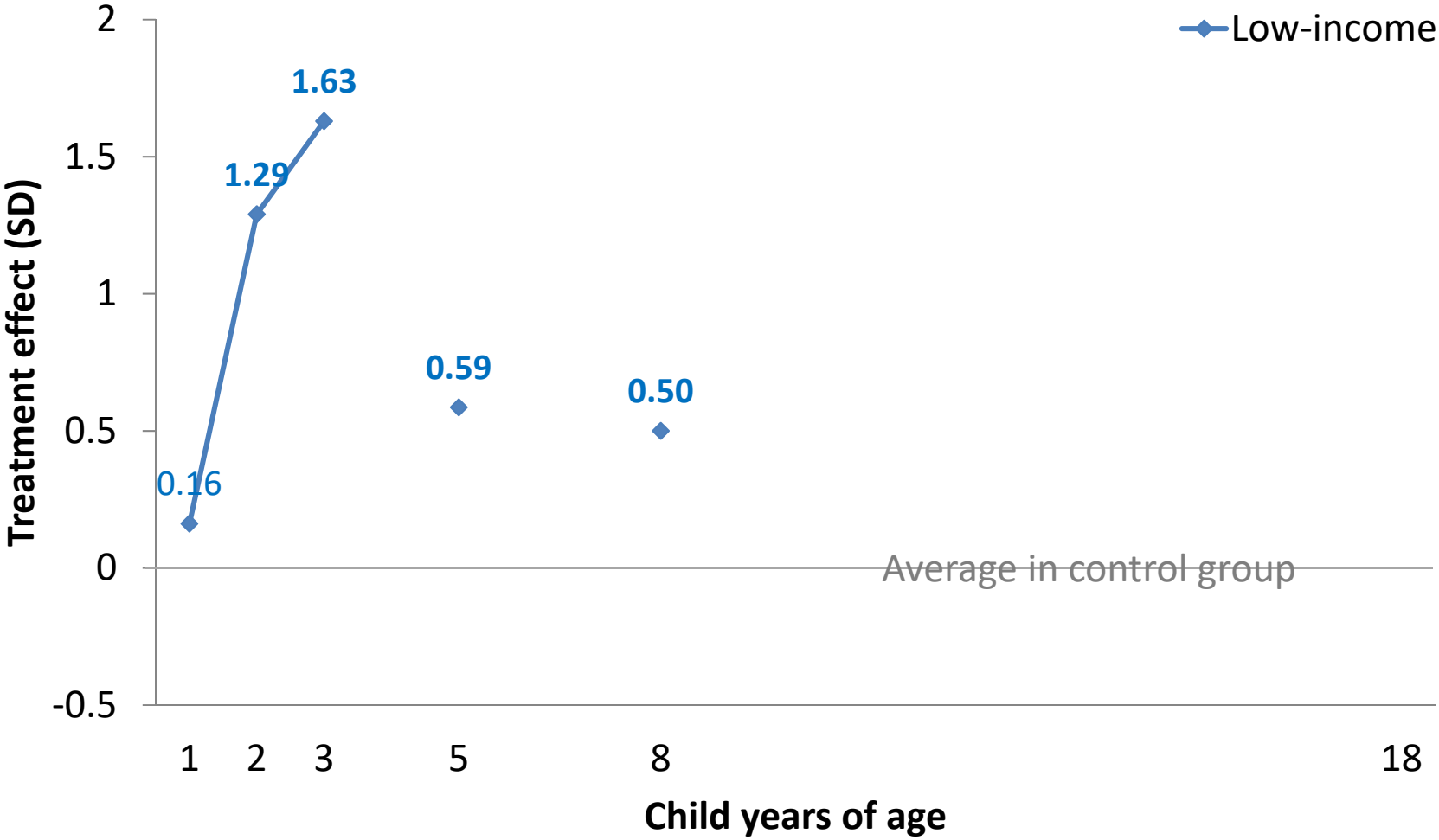
5 years after intervention end: large, positive effect



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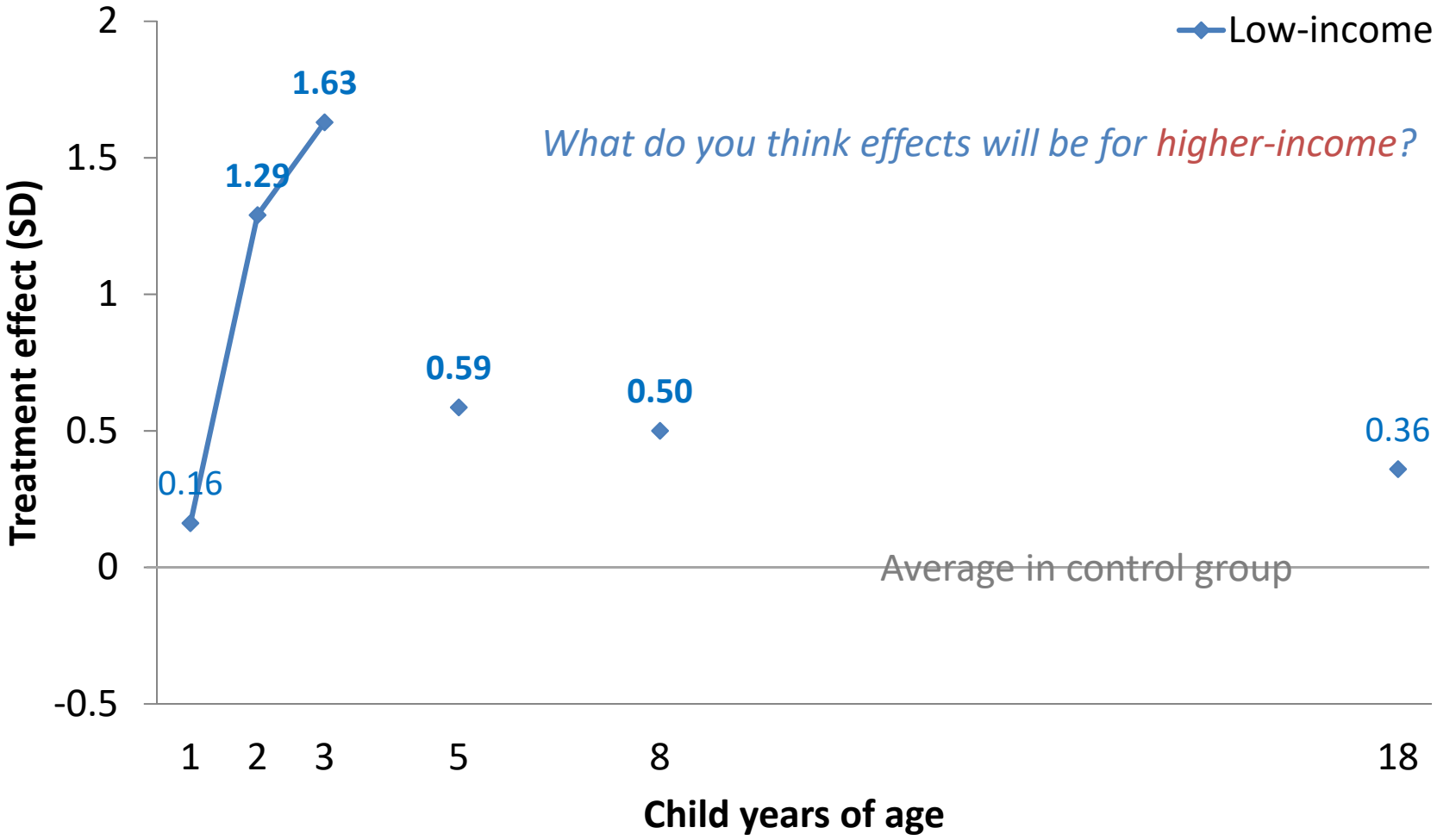
15 years after intervention end: evidence of persistence for low-income



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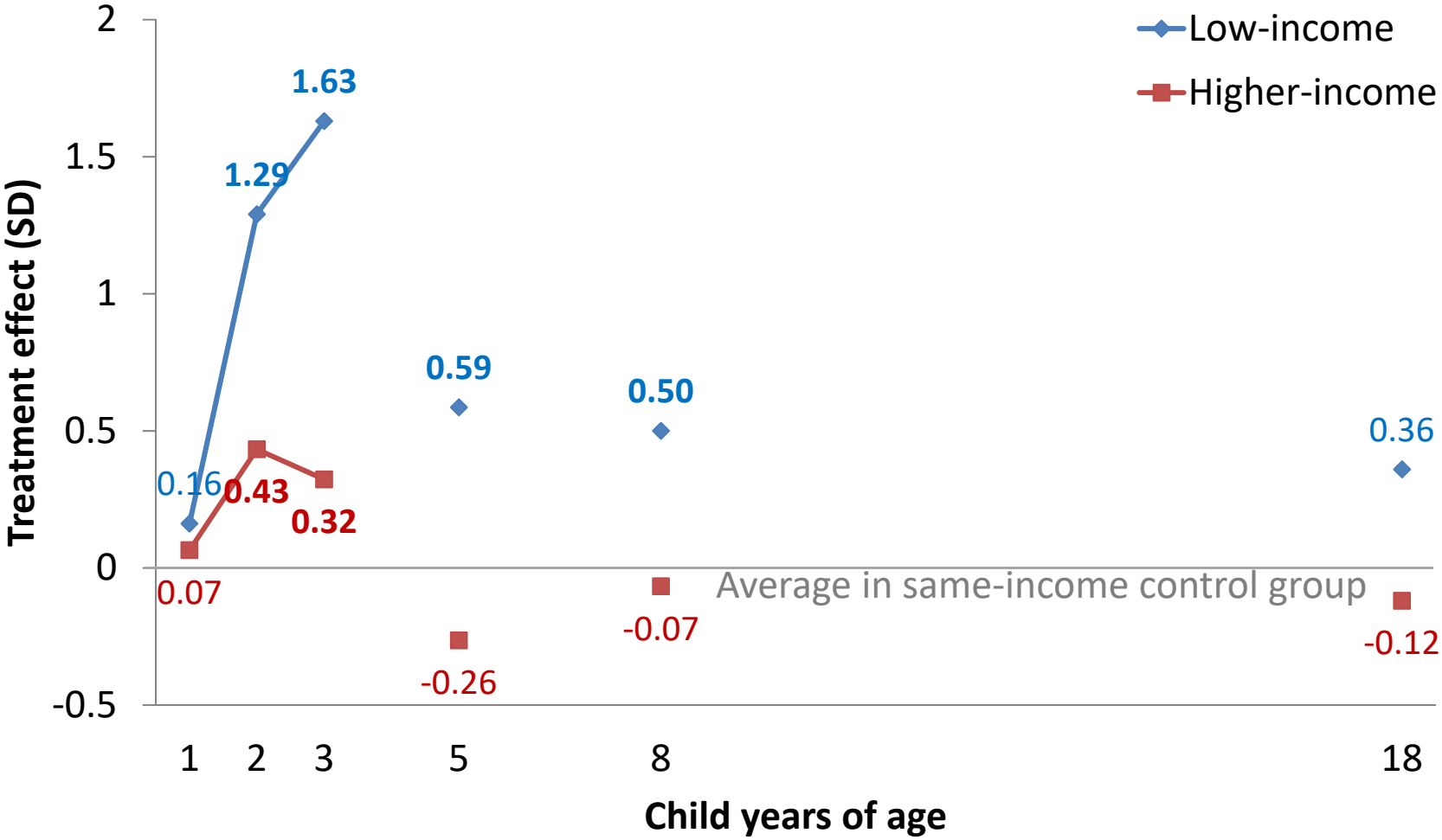
For higher-income, effect on IQ trends much weaker



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What drives different effects? Matters for policy and science

- Differences in parental choices
  - Take-up offer of subsidized care
  - Quality and quantity of parental care
  - Quality and quantity of other, non-parental care

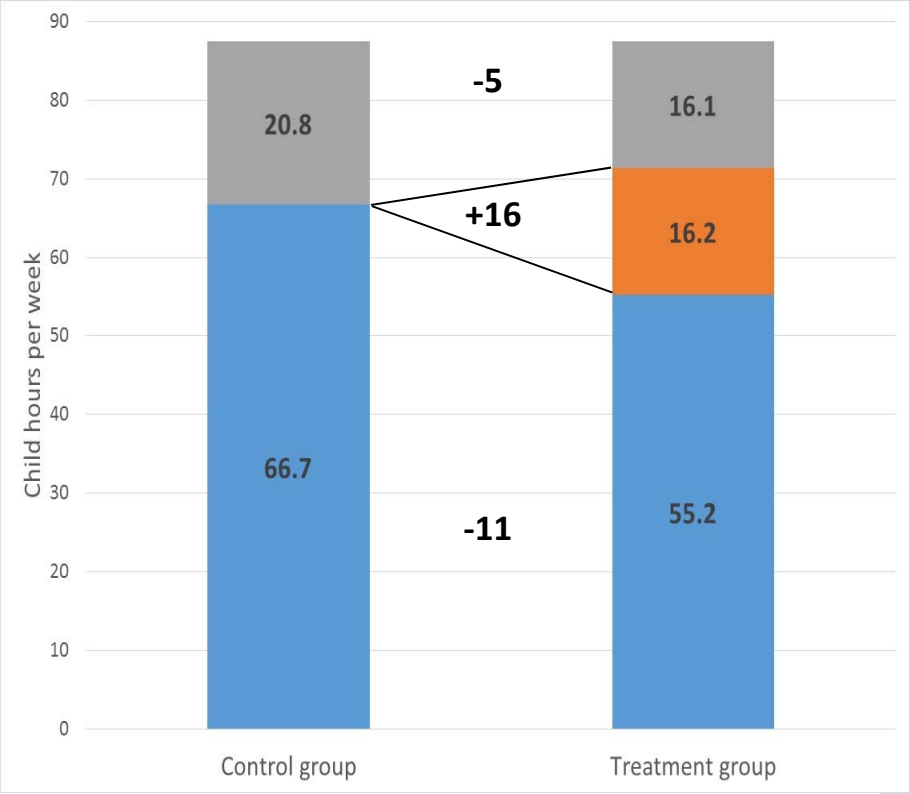
- Differences in parental constraints or tastes. Many possible channels. Hard to see in most data.

- IHDP: rich data up to 36 months. Use to get insight into how demand responds to subsidy offer.

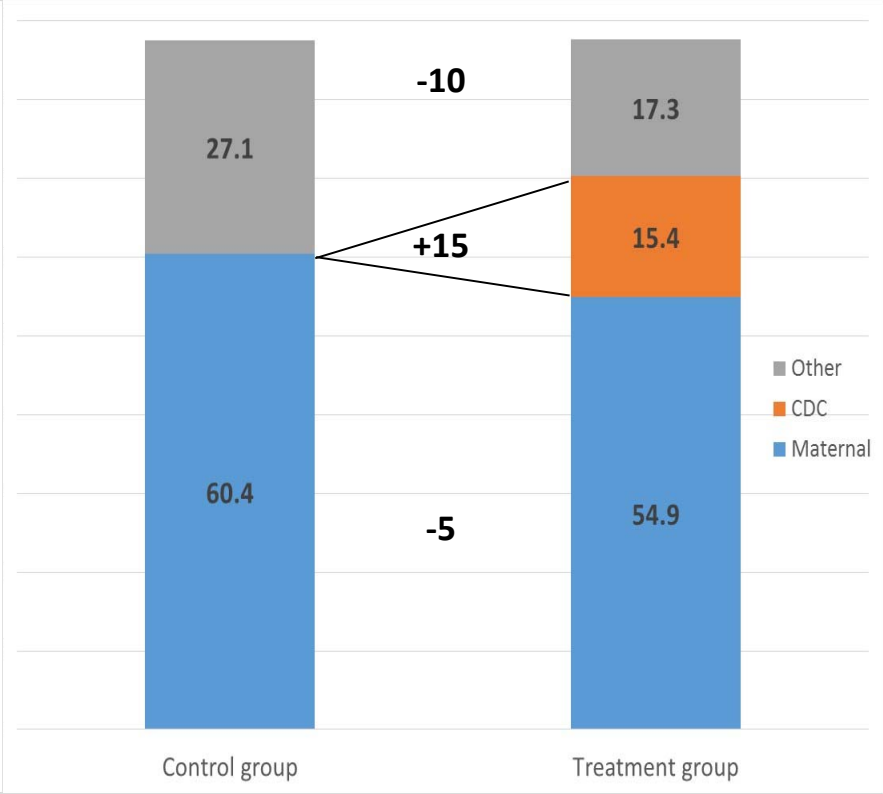
Differential effects on allocation of child time?

Effects on child-time allocation: differential crowd out

Low-wage tercile



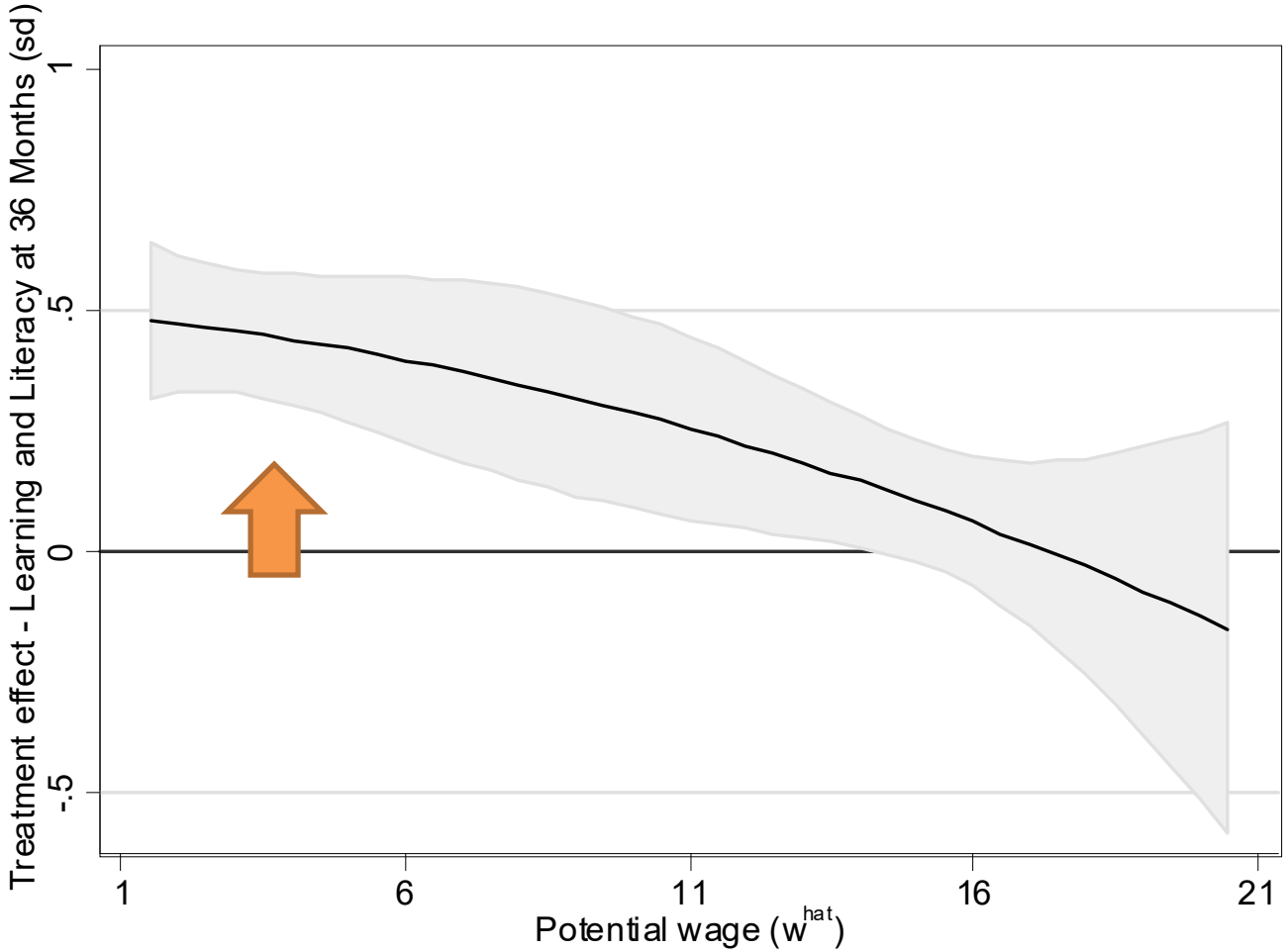
High-wage tercile



Chaparro, Sojourner & Huey (forthcoming) Differential effects from access to high-quality early care

Any effects on maternal-care quality?
For whom?

Effects on **maternal-care quality** are large, decline in wage



Chaparro, Sojourner & Huey (forthcoming) Differential effects from access to high-quality early care

Key features of economic model

- Single-period postnatal decisions influence child cognitive skill
  - One child & one mother
  - Child skill depends on initial endowment & post-natal care
  - Child time budget: needs maternal or nonmaternal care
  - Maternal time budget: parenting, earning, or other
  - Maternal and non-maternal care of chosen qualities & quantities
  - Cost of non-maternal care increases in quality & quantity
  - Maternal-care quality depends on given productivity & effort choice
  - Maternal productivity in earnings and parenting correlated
  - Endogenous take-up of offer of ``treatment'' CDC care

- Represents policy as offer of (quality-quantity-price) of care.

Chaparro, Sojourner & Wiswall (in progress)

Post-natal investments ≡ quality of care

	Caretaker	Hours of Care	Quality of Care	Effective units of care
Maternal Care	Mother	r	q^r	$q^r * r$
Non-maternal Care	Free care (CDC)	t	q^t	$q^t * t$
	Other care	n	q^n	$q^n * n$

Model of maternal choices

$$\text{Max } U(c, l, h, r, e, t)$$

Utility depends on	
c	Consumption (+)
l	Leisure (+) = 24*7 – labor hours – parenting hours
h	Child's cognitive skills (+) IQ at age-3
(r,e)	Parenting quantity & instantaneous effort (?, -)
t	Hours of care in IHDP-treatment-eligible child dev. center (-)

Constraints

$$\text{Max}\, U(c, l, h, e, r, t)$$

Constraints	
Child's time	$r + n + t = T_c$
Mother's time	$r + L + l = T_p$
Budget	$c + \pi q^n n = wL + Y$
Maternal-care quality	$q^r = q^r(m, \omega, e)$
Maximum CDC time	$t \leq \bar{\tau}$
Skill production	$h = f[nonmaternal;\ maternal;\ endowment; \varepsilon]$ $= f[q^n n + q^t t;\ q^r r\ ;\ h_0;\ \varepsilon]$
Wage offer	$w = w(m, \omega)$

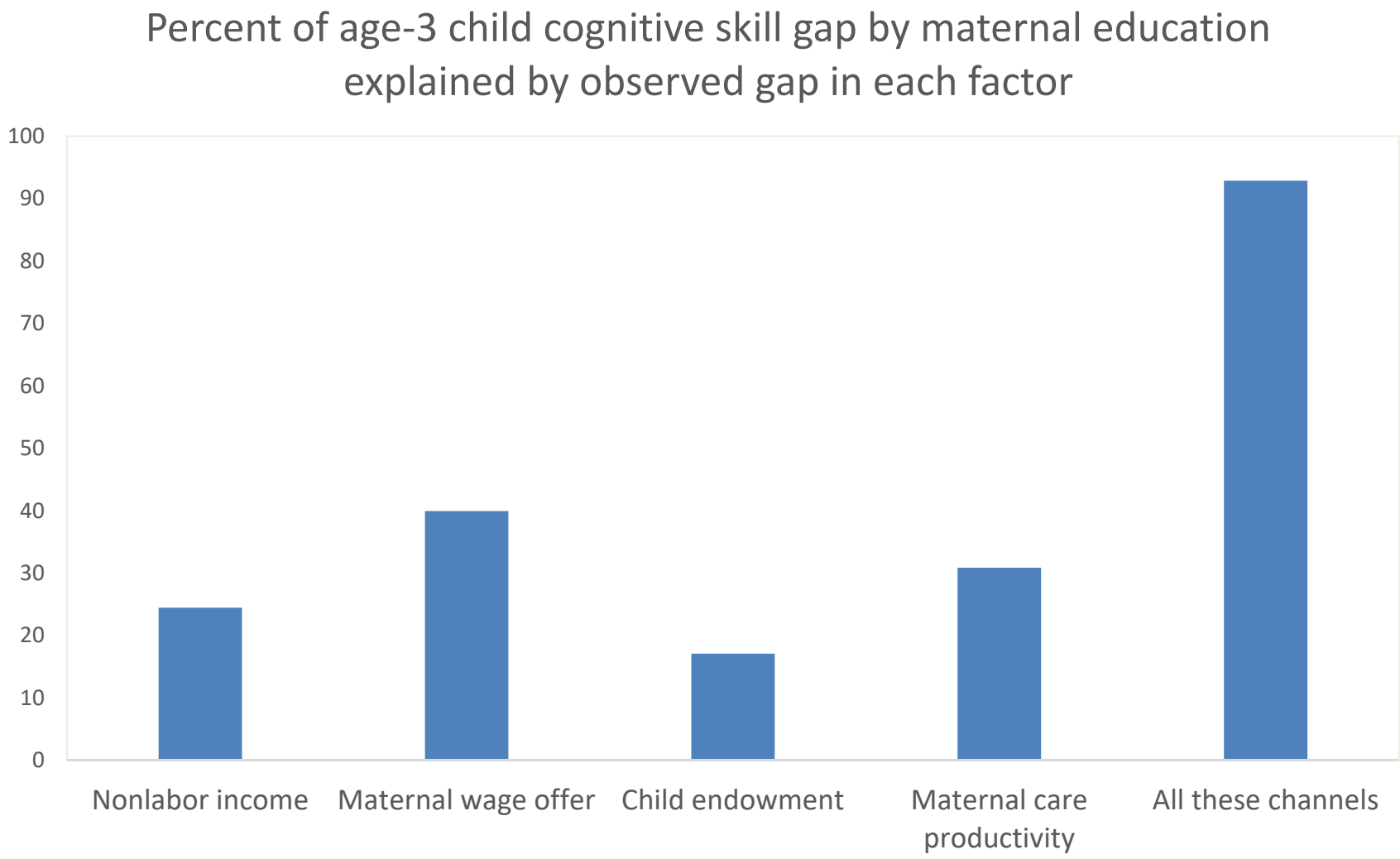
First Order Conditions (FOC)

First-order conditions	
L^*	$w = MRS_{l,c}$
e^*	$MRS_{h,c}\, f_2\, q_e^r = -MRS_{e,c}$

For each parent, maternal-care quality influenced by effort choice

- *Marginal benefit*: additional human capital
- *Marginal cost*: distaste for effort

Preliminary result: decomposition



Work in progress: counterfactual policy simulations

- Contrast predicted effects of offers of:
  - Full-time, high-quality care in-kind (IHDP)
  - Part-time, high-quality care in-kind
  - Full-time, modest-quality care in-kind
  - Voucher: allow parent choice of quantity-quality
  - … with quality floor (ELS)
  - Cash

- Allow different predictions for different types

Towards subsidies' effects on supply

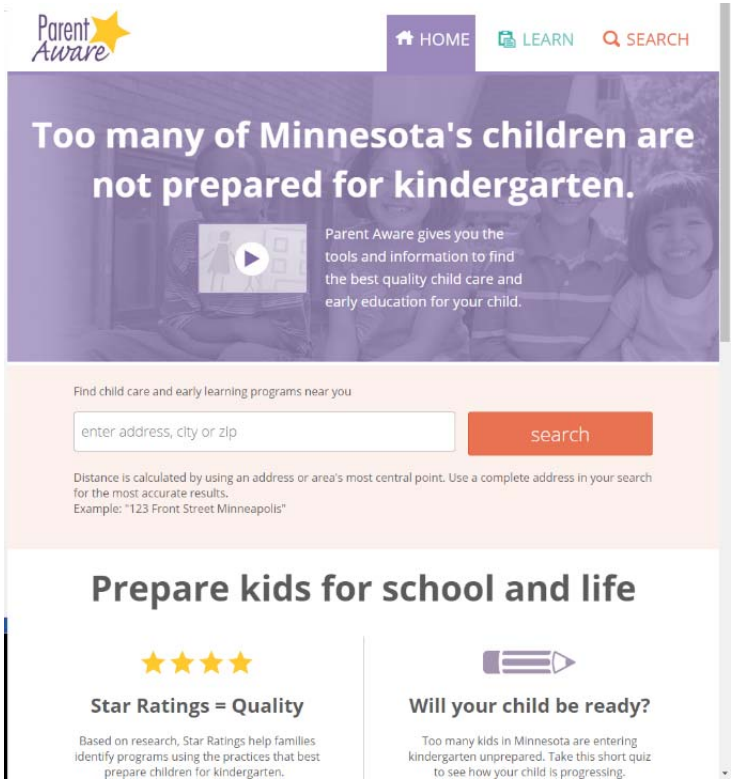
- Measure variation in MN families' access to ECE services. [Davis, Lee & Sojourner (2018) *ECRQ*]

- In progress:
  - Measure changes in MN policy Parent Aware, ELS, CCAP, (E)HS, state pre-K, all-day K.

- How do local policy changes relate to changes in local supply and access?

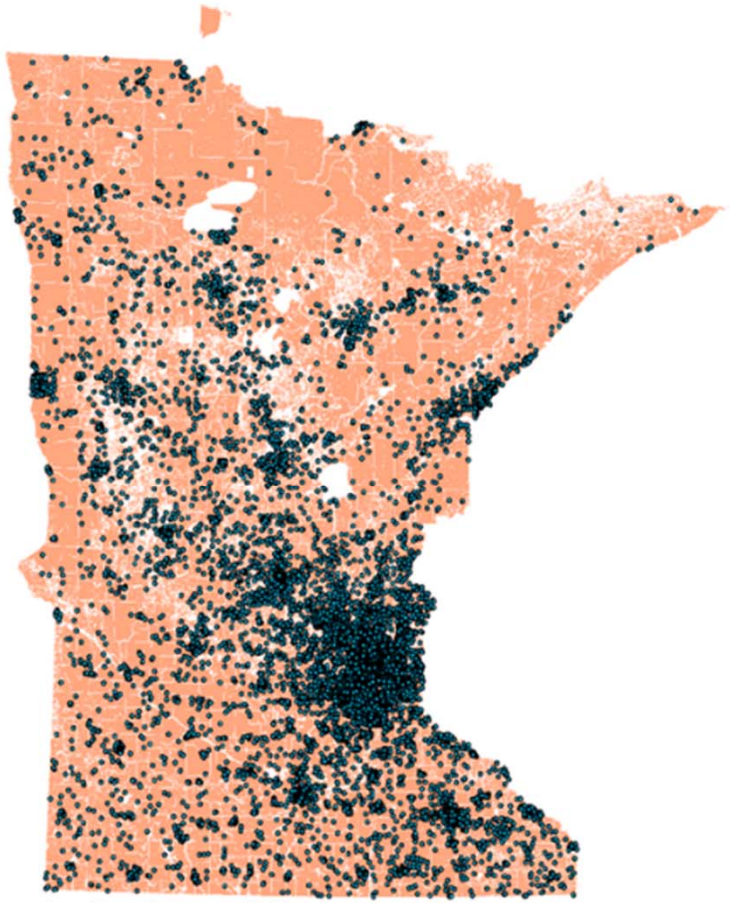
Data sources

- Providers: NACCRRAware database of licensed providers in MN 2011-’17. Includes address, capacity & price by child age.
- Quality rating: ParentAware.
- Families with young children: Census counts & types in small areas.
- Road network, lakes, parks…



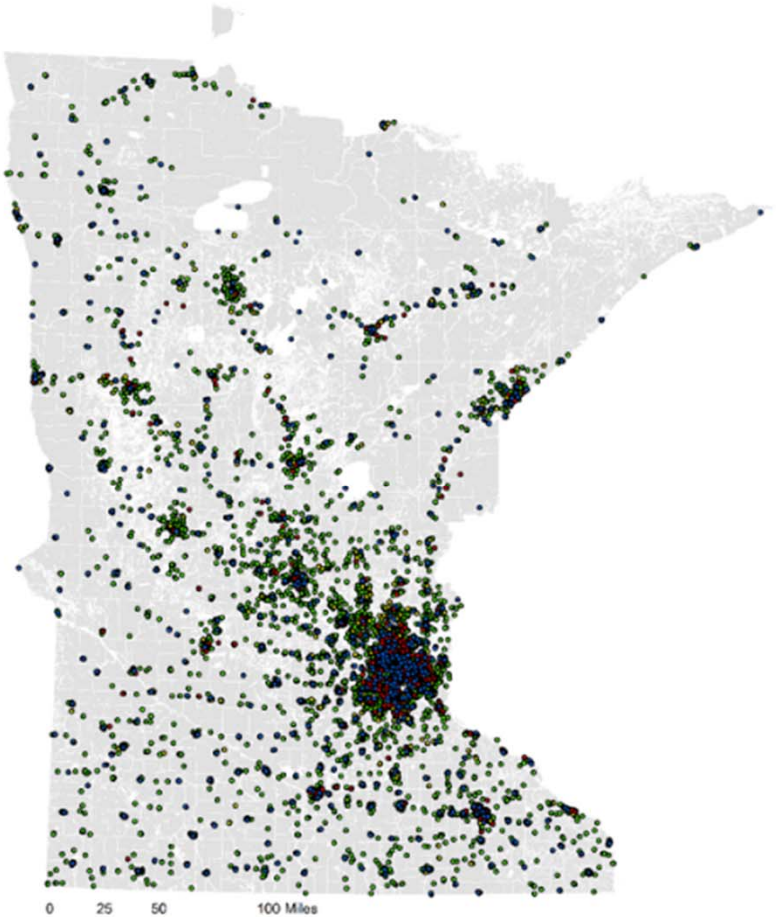
Spatial distribution of families and providers used in 2015 analysis

Synthetic Families



Source: ACS 2010-2014 5% sample

Minnesota ECE Providers



Source: NACCRAWare database

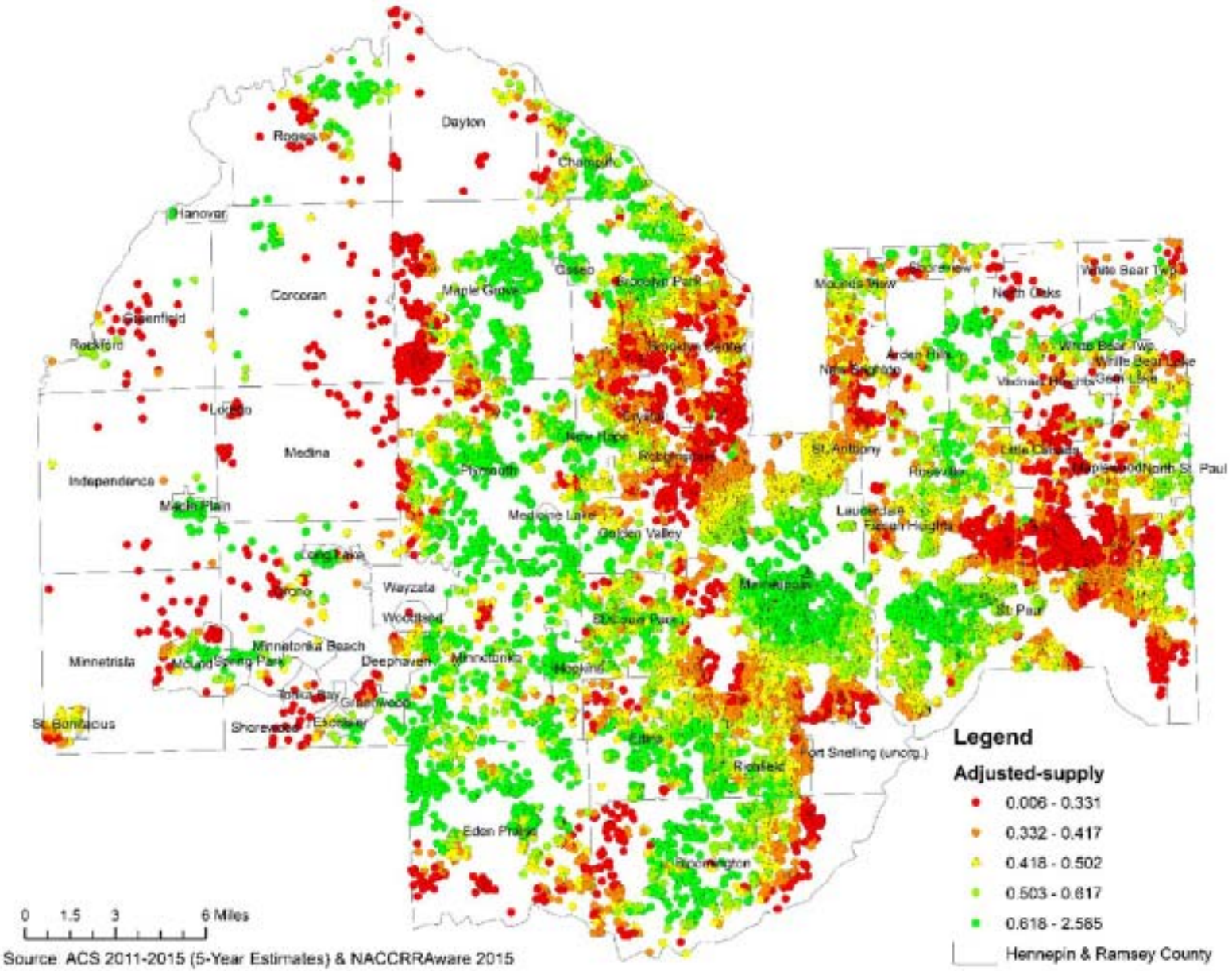


Fig. 1. Spatial distribution of families' access to supply adjusted for local child population in Hennepin and Ramsey Counties, 2015.
Note: The adjusted supply measure is calculated using the E2SFCA method with Gaussian weight beta = 4 assuming a 20-min driving time catchment area around each family location and each ECE provider.

Conclusions

- (Lack of) investment influences child development. Skill gaps are produced by our policy choices as well as parents'.

- Child time is a precious, limited resource. Use it well.

- Policy design demands attention to (differential) parental reactions & providers' reactions.

Thank you!
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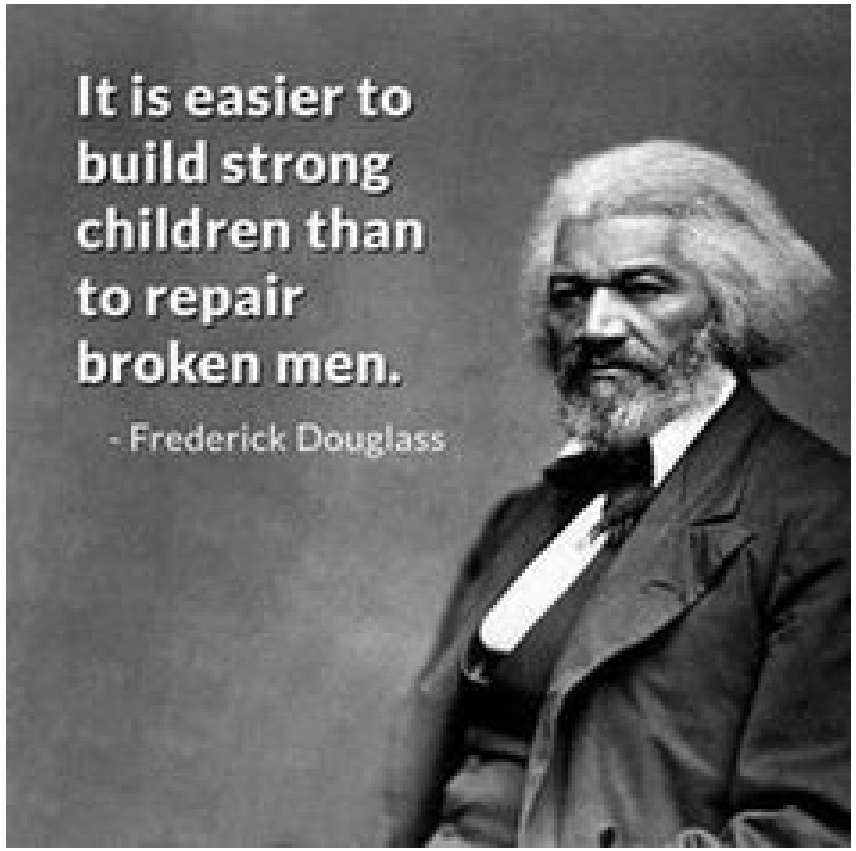

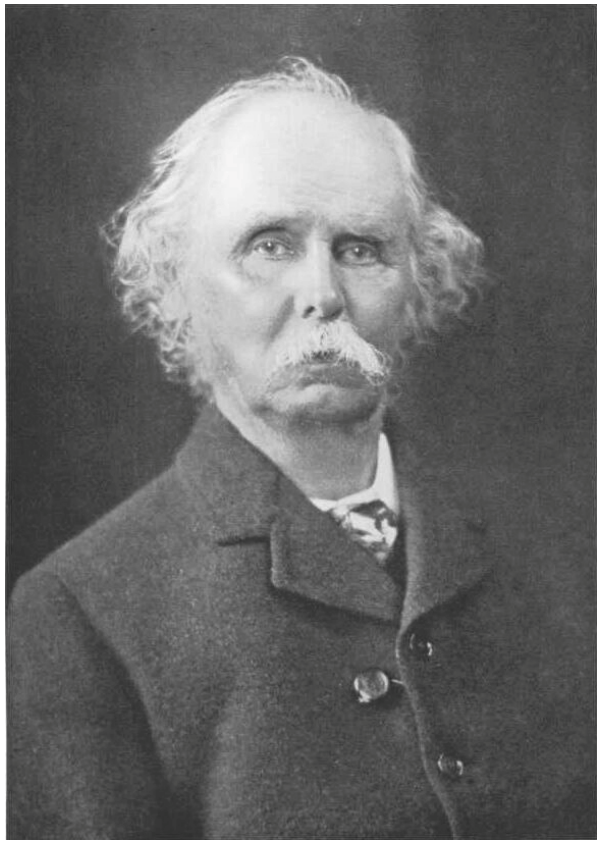

The most valuable of all capital is that invested in human beings.

- Alfred Marshall, *Principles of Economics*