The rate of return to the HighScope Perry Preschool Program

Heckman, J. J., Moon, S. H., Pinto, R., Savelyev, P., and Yavitz, A.

Setup

The Generalized Roy Model

Potential Outcomes

$$Y_1 = \mu_1(X) + U_1$$

$$Y_0 = \mu_0(X) + U_0$$

Observed Outcome

$$Y = DY_1 + (1 - D)Y_0$$

Choice

$$D = \mathrm{I}[\mu_D(X, Z) - V > 0]$$

Treatment Status

D	self-selected
ξ	assigned
A	actual

Key Identifying Assumptions

$$(Y_1, Y_0) \perp\!\!\!\perp D$$

$$(Y_1, Y_0) \perp\!\!\!\perp \xi$$

$$(Y_1, Y_0) \perp\!\!\!\perp A$$

When do we have to worry about compliance?

$$
\begin{aligned}
&E(Y \mid A=1) - E(Y \mid A=0) \\
&\qquad = E(Y_1 \mid A=1) - E(Y_0 \mid A=0) \\
&\qquad\qquad\qquad\qquad\qquad\qquad \text{(by full compliance)} \\
&\qquad = E(Y_1) - E(Y_0) \qquad\qquad \text{(by randomization)} \\
&\qquad = ATE = TT = TUT
\end{aligned}
$$

What if we can only deny program participation to individuals who are willing to participate?

$$
\begin{aligned}
E(Y \mid D=1, A=1) - E(Y \mid D=1, A=0) & \\
&= E(Y_1 \mid D=1, A=1) - E(Y_0 \mid D=1, A=0) \\
&= E(Y_1 \mid D=1) - E(Y_0 \mid D=1) \\
&= TT \neq ATE \neq TUT
\end{aligned}
$$

Issues

- Compliance
- Imperfect Randomization
- Ethical Concerns
- Feasibility
- Expenses
- External Validity

Challenges to Scaling Experiments

- market equilibrium effects
- spillovers
- political reactions
- context dependence
- randomization or site-selection bias
- piloting bias

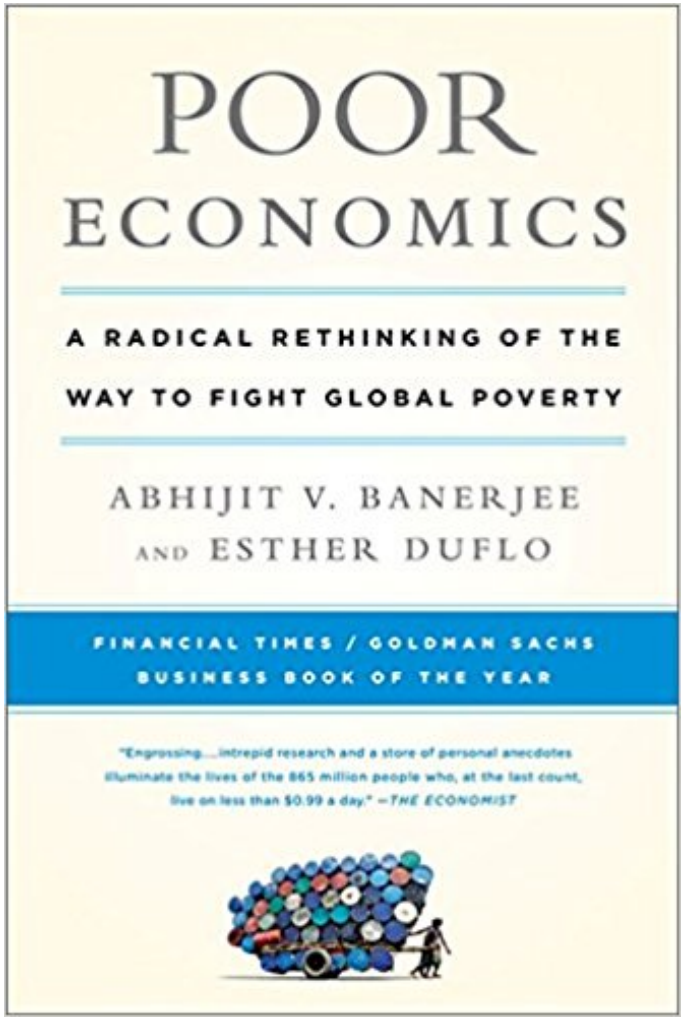
See Banerjee et al. (2017) for a discussion of these challenges and their attempts to address them in their work.

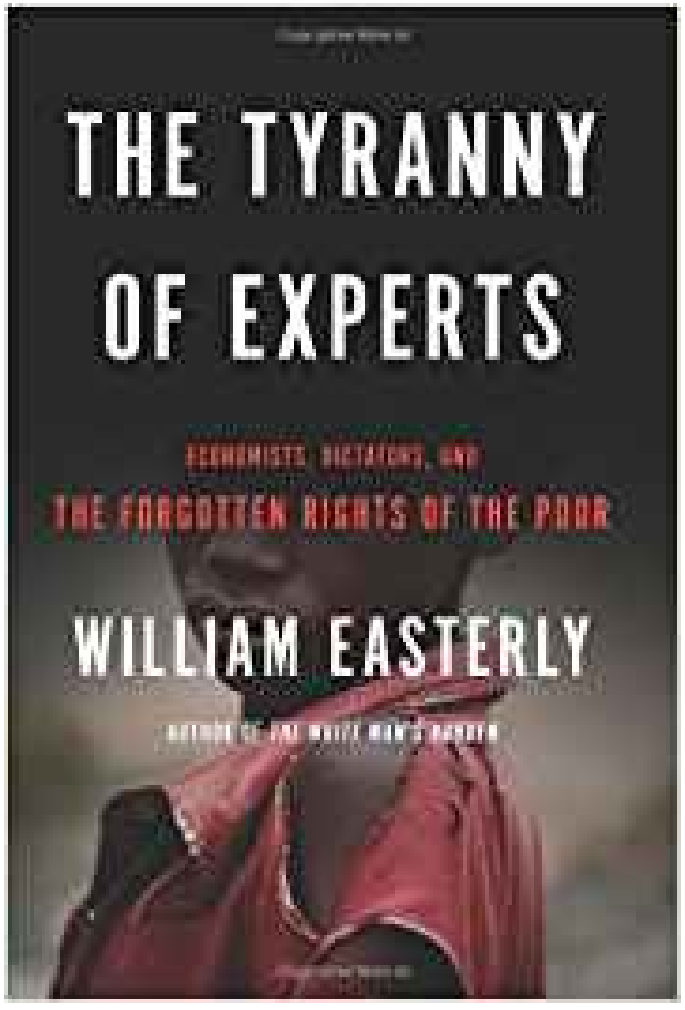
The Abdul Latif Jameel Poverty Action Lab

> *The Abdul Latif Jameel Poverty Action Lab (J-PAL) is a network of 158 affiliated professors from 51 universities. Our mission is to reduce poverty by ensuring that policy is informed by scientific evidence. We do this through research, policy outreach, and training across six regional offices worldwide.*

See their website for an impressive amount of resources for running experiments.

Figure: Book Recommendations





Paper

This paper estimates the rate of return to the HighScope Perry Preschool Program, an early intervention program targeted toward disadvantaged African-American youth. Estimates of the rate of return to the Perry program are widely cited to support the claim of substantial economic benefits from preschool education programs. Previous studies of the rate of return to this program ignore the compromises that occurred in the randomization protocol. They do not report standard errors.

The rates of return estimated in this paperaccount for these factors. We conduct an extensive analysis of sensitivity to alternative plausible assumptions. Estimated annual social rates of return generally fall between 7 and 10%, with most estimates substantially lower than those previously reported in the literature. However, returns are generally statistically significantly different from zero for both males and females and are above the historical return on equity. Estimated benefit-to-cost ratios support this conclusion.

- Heckman, J. J., Moon, S. H., Pinto, R., Savelyev, P., & Yavitz, A. (2010b). The rate of return of the High-Scope Perry Preschool Program. *Journal of Public Economics*, *94*(1), 114–128.

Part of a whole sequence ...

- Heckman, J. J., Pinto, R., Shaikh, A. M., & Yavitz, A. (2011). Inference with imperfect randomization: The case of the Perry Preschool Program. *NBER Working Paper*, *16935*.
- Heckman, J. J., Moon, S. H., Pinto, R., Savelyev, P., & Yavitz, A. (2010a). Analyzing social experiments as implemented: A reexamination of the evidence from the HighScope Perry Preschool Program. *Quantitative Economics*, *1*(1), 1–46.
- Heckman, J. J., Karapakula, G., & Pantano, J. (2017). Intergenerational effects of the Perry Preschool Project. *Unpublished Manuscript*.

HighScope Perry Preschool Program

- Perry Elementary School in Yipsilanti, Michigan in early 1960s
- beginning at age three and lasting two years
- 2,5 hours preschool program on weekdays during the school year
- weekly home visits by teachers
- curriculum based on supporting children's cognitive and socio-emotional development
- follow-up interviews at age 15, 19, 27, and 40

Challenges

- the randomization was compromised
- there are not data on participants past age 40 and it is necessary to extrapolate out-of-sample to obtain earnings profiles pat that age to estimate the lifetime impacts
- some data are missing for participants prior to age 40
- there is difficulty in assigning reliable values to non-market outcomes such as crime

Selected Contributions

- We account for compromised randomization in evaluating this program.
- We develop standard errors for all our estimates of the rate of return.
- We use state-of-the-art methods to extrapolate missing future earnings.

Figure: Descriptive Statistics

Table 2
Descriptive statistics.

Outcome	Age	Female		Male	
		Control	Treatment	Control	Treatment
Sample size		26	25	39	33
Mother's age	At birth	25.7	26.7	25.6	26.5
		(1.5)	(1.2)	(1.1)	(1.1)
Parent's HS grade-level	3	9.1	9.4	9.6	9.5
		(0.4)	(0.5)	(0.3)	(0.4)
Stanford–Binet IQ	3	79.6	80.0	77.8	79.2
		(1.3)	(0.9)	(1.1)	(1.2)
HS graduation (%)	27	31%	84%	54%	48%
		(9%)	(7%)	(8%)	(9%)
Currently employed (%)	27	55%	80%	56%	60%
		(10%)	(8%)	(8%)	(9%)
Yearly earnings[a] ($)	27	10,523	13,530	14,632	17,399
		(2068)	(2200)	(2129)	(2155)
Currently employed (%)	40	82%	83%	50%	70%
		(8%)	(8%)	(8%)	(8%)
Yearly earnings[a] ($)	40	20,345	24,434	24,730	32,023
		(3883)	(4752)	(4495)	(4938)
Ever on welfare (%)	18–27	82%	48%	26%	32%
		(8%)	(10%)	(7%)	(8%)
Ever on welfare (%)	26–40	41%	50%	38%	20%
		(10%)	(10%)	(8%)	(7%)
Arrests, murder[b]	≤40	0.04	0.00	0.05	0.03
		(0.04)	(–)	(0.04)	(0.03)

Program Costs and Benefits

- Cost
  - Initial Program Costs
- Benefits
  - Education
  - Employment and Earnings
  - Criminal Activity
  - Tax Payments
  - Welfare System

Figure: Summary of Lifetime Costs and Benefits

Table 3
Summary of lifetime costs and benefits (in undiscounted 2006 dollars).

		Crime ratio[a]	Murder cost[b]	Male	
				Treatment	Control
Cost of education[c]	K–12/GED[d]			107,575	98,855
	College, age ≤27[e]			6705	19,735
	Education, age >27[e]			2409	3396
	Vocational training[f]			7223	12,202
	Lifetime effect[g]			−10,275	
Cost of crime[h]	Police/court			105.7	152.9
	Correctional			41.3	67.4
	Victimization	Separate	High	370.0	729.7
		Separate	Low	153.3	363.0
		By type	Low	215.0	505.7
	Lifetime effect[g]	Separate	High	−433	
		Separate	Low	−283	
		By type	Low	−364	
Gross earnings[i]	Age ≤27			186,923	185,239
	Ages 28–40			370,772	287,920
	Ages 41–65			563,995	503,699
	Lifetime effect[g]			145,461	
Cost of welfare[j]	Age ≤27			89	115
	Ages 28–40			831	2701
	Ages 41–65			1533	2647
	Lifetime effect[g]			−3011	

Figure: Main Results

Table 1
Selected estimates of IRRs (%) and benefit-to-cost ratios.

Return		To individual			To society[a]		
Murder cost[b]					High ($4.1M)		
		All[d]	Male	Female	All[d]	Male	Female
Deadweight loss[c]							
IRR	0%	7.6	8.4	7.8	9.9	11.4	17.1
		(1.8)	(1.7)	(1.1)	(4.1)	(3.4)	(4.9)
	50%	6.2	6.8	6.8	9.2	10.7	14.9
		(1.2)	(1.1)	(1.0)	(2.9)	(3.2)	(4.8)
	100%	5.3	5.9	5.7	8.7	10.2	13.6
		(1.1)	(1.1)	(0.9)	(2.5)	(3.1)	(4.9)
Discount rate							
Benefit–cost ratios	0%	–	–	–	31.5	33.7	27.0
					(11.3)	(17.3)	(14.4)
	3%	–	–	–	12.2	12.1	11.6
					(5.3)	(8.0)	(7.1)
	5%	–	–	–	6.8	6.2	7.1
					(3.4)	(5.1)	(4.6)
	7%	–	–	–	3.9	3.2	4.6
					(2.3)	(3.4)	(3.1)

Public Impact

Every dollar we invest in high-quality early childhood education can save more than seven dollars later on – by boosting graduation rates, reducing teen pregnancy, even reducing violent crime.

- Barack Obama (2013)

PRESENTING

THE HECKMAN EQUATION

INVEST in early education for disadvantaged children

+ DEVELOP cognitive skills, social abilities and healthy behaviors early

+ SUSTAIN early development with effective education through to adulthood

= GAIN a more capable and productive workforce

LEARN MORE ABOUT THE BENEFITS OF
QUALITY EARLY CHILDHOOD EDUCATION AT HECKMANEQUATION.ORG

This handbook chapter provides the most recent overview on early childhood education.

- Elango, S., Garcia, J. L., Heckman, J. J., & Hojman, A. (2016). Early childhood education. In R. Moffitt (Ed.), *Economics of means-tested transfer programs in the United States* (Vol. II, pp. 235–298). Chicago, IL: University of Chicago Press.

Appendix

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