

Early Childhood Education

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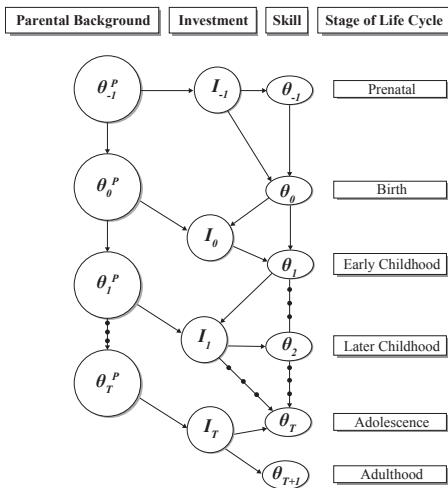
Why might ECE be effective?

The theoretical basis for the effectiveness of ECE:

- ① *Skills are multiple.*
- ② *Skills are self-productive.*
- ③ *Skills complement each other.*
- ④ *Skills complement investment.*

The Formation of Skills over the Life Cycle

Figure 1: Graphical Representation of the Technology of Skill Formation

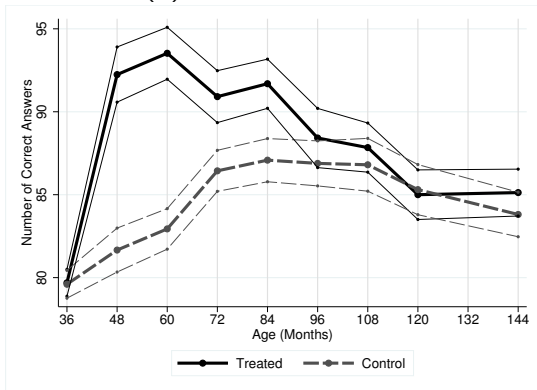


Note: This figure illustrates the technology of skill formation, where links in the technology are represented by arrows. Dots represent periods that are not depicted in the diagram.

- Despite notable short-term effects on cognition, most of the gains dissipate by the end of elementary school
- Present evidence from Perry Preschool Project

Figure 2: Dynamics of IQ in PPP

(a) Standardized IQ

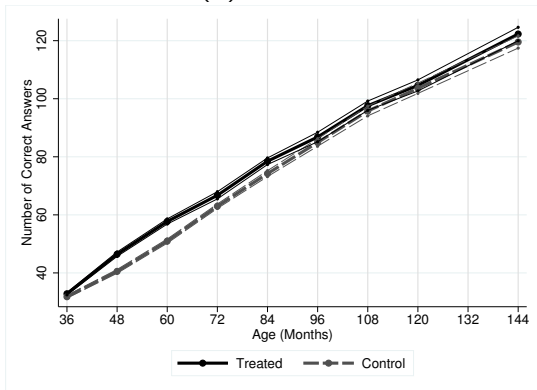


Source: Reproduced from Hojman (2015).

Note: The solid line represents the trajectory of the treated group, and the dotted line represents the trajectory of the control group. Thin lines surrounding trajectories are asymptotic standard errors. It shows standardized IQ as measured by the Stanford-Binet test in each year. IQ is age-standardized based on a national sample to have a US national mean of 100 points and standard deviation of 15 points. In Figure 2, the scores are not standardized. The scores in it represent the raw scores, or the sum of the number of correct questions in each year.

Figure 2: Dynamics of IQ in PPP, Cont'd

(b) Raw IQ



Source: Reproduced from Hojman (2015).

Note: The solid line represents the trajectory of the treated group, and the dotted line represents the trajectory of the control group. Thin lines surrounding trajectories are asymptotic standard errors. It shows standardized IQ as measured by the Stanford-Binet test in each year. IQ is age-standardized based on a national sample to have a US national mean of 100 points and standard deviation of 15 points. In Figure 2, the scores are not standardized. The scores in it represent the raw scores, or the sum of the number of correct questions in each year.

Long-Term Outcomes

Table 1: Life-Cycle Outcomes, PPP and ABC

	PPP			ABC		
	Age	Female	Male	Age	Female	Male
Cognition and Education						
Adult IQ	-	-	-	21 ^c	10.275	2.588
	-	-	-		(0.005)	(0.130)
High School Graduation	19 ^a	0.56	0.02	21 ^c	0.238	0.176
		(0.000)	(0.416)		(0.090)	(0.100)
Economic						
Employed	40 ^a	-0.01	.29	30 ^c	0.147	0.302
		(0.615)	(0.011)		(0.135)	(0.005)
Yearly Labor Income, 2014 USD	40 ^a	\$6,166	\$8,213	30 ^c	\$3,578	\$17,214
		(0.224)	(0.150)		(0.000)	(0.110)
HI by Employer	40 ^a	0.129	0.206	31 ^b	0.043	0.296
		(0.055)	(0.103)		(0.512)	(0.035)
Ever on Welfare	18–27 ^a	-0.27	0.03	30 ^c	0.006	-0.062
		(0.049)	(0.590)		(0.517)	(0.000)

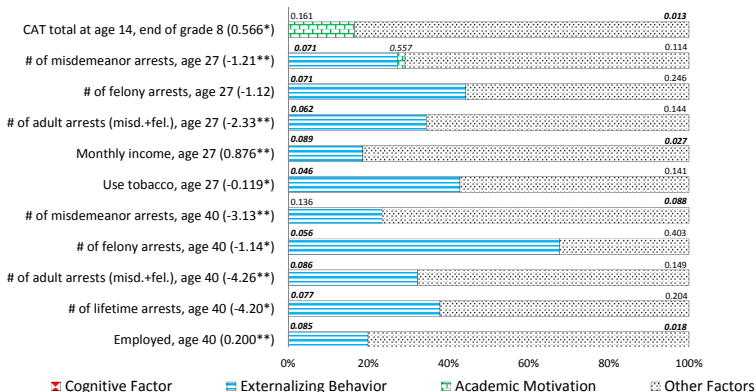
Table 1: Life-Cycle Outcomes, PPP and ABC, Cont'd

	PPP			ABC		
	Age	Female	Male	Age	Female	Male
Crime						
No. of Arrests^d	≤40 ^a	-2.77 (0.041)	-4.88 (0.036)	≤34 ^c	-5.061 (0.051)	-6.834 (0.187)
No. of Non-Juv. Arrests <i>One-sided permutation</i>	≤40 ^a	-2.45 (0.051)	-4.85 (0.025)	≤34 ^c	-4.531 (0.061)	-6.031 (0.181)
Lifestyle						
Self-reported Drug User	-	-	-	30 ^c	0.031 (0.590)	-0.438 (0.030)
Not a Daily Smoker	27 ^a	0.111 (0.110)	0.119 (0.089)	-	-	-
Not a Daily Smoker	40 ^a	0.067 (0.206)	0.194 (0.010)	-	-	-
Physical Activity	40 ^a	0.330 (0.002)	0.090 (0.545)	21 ^b	0.249 (0.004)	0.084 (0.866)
Health						
Obesity (BMI >30)	-	-	-	30-34 ^c	0.221 (0.920)	-0.292 (0.060)
Hypertension I	-	-	-	30-34 ^c	0.096 (0.380)	0.339 (0.010)

Connecting Short-Term and Long-Term Effects

- The puzzle: why do early childhood education programs have long-term effects if the effects on cognition dissipate?
- Heckman et al. (2013) find that short-term effects on non-cognitive skills mediate later-life outcomes.

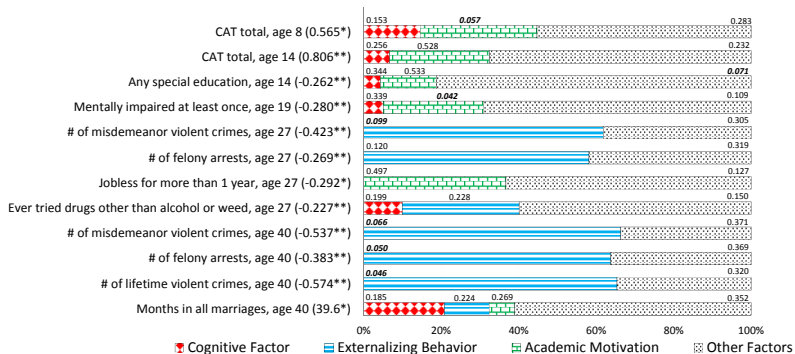
Figure 3: Decompositions of Treatment Effects of PPP on Male Adult Outcomes



Source: Reproduced from Heckman et al. (2013).

Note: The total treatment effects are shown in parentheses. Each bar represents the total treatment effect normalized to 100 percent. One-sided *p*-values are shown above each component of the decomposition. See the Web Appendix of Heckman et al. (2013) for detailed information about the simplifications made to produce the figure. "CAT total" denotes California Achievement Test total score normalized to control mean 0 and variance of 1. Asterisks denote statistical significance: * – 10% level; ** – 5% level; *** – 1% level. Monthly income is adjusted to thousands of 2006 dollars using annual national CPI (BLS).

Figure 4: Decompositions of Treatment Effects of PPP on Female Adult Outcomes



Source: Reproduced from Heckman et al. (2013). See note in Figure 3.

Table 2: Evidence Across Studies of the Impacts of Head Start

Study	Currie and Thomas (1995)	Garces et al. (2002)	Ludwig and Miller (2007)
Dataset	C-NLSY	PSID	Multiple
Subpopulation	AA	AA, mother edu. \leq high school	
Years of birth	1979-1987	1966-1977	1960-1975
Impacts			
IQ/achievement, ages 3-4	-	-	-
	-	-	-
Behavior, ages 3-4	-	-	-
	-	-	-
IQ/achievement, ages 5-6	0.46	-	-
	(0.129)	-	-
IQ/achievement, ages 7-21	0.201	-	-
	(NA)	-	-
Grade retention ever	-0.008	-	-
	(0.098)	-	-
High School grad. (no GED)	-	0.00	0.117
	-	(0.071)	(0.080)
Attended some college	-	0.031	0.028
	-	(0.067)	(0.019)

Table 2: Evidence Across Studies of the Impacts of Head Start, Cont'd

Study	Deming (2009)	Carneiro and Ginja (2014)	Feller et al. (2014)	Kline and Wal- ters (2014)
Dataset	C-NLSY	C-NLSY	HSIS	HSIS
Subpopulation	AA	Males		
Years of birth	1979-1986	1977-1996	1998-1999	1998-1999
Impacts				
IQ/achievement, ages 3-4	-	-	0.230 (0.038)	0.375 (0.047)
Behavior, ages 3-4	-	-	-	-
IQ/achievement, ages 5-6	0.287 (0.095)	-	-	-
IQ/achievement, ages 7-21	0.031 (0.076)	-	-	-
Grade retention ever	-0.107 (0.056)	-	-	-
High School grad. (no GED)	0.067 (0.044)	-	-	-
Attended some college	0.136 0.049	-	-	-

Table 2: Evidence Across Studies of the Impacts of Head Start, Cont'd

Study	Zhai et al. (2014)	Perry Preschool (Various sources)	Abecedarian (Various sources)
Dataset	HSIS		
Subpopulation		AA, low child IQ at entry & SES	98% AA, low mother IQ, & low SES
Years of birth	1998-1999	1959-1964	1972-1977
Impacts			
IQ/achievement, ages 3-4	0.30^a	-	0.880^b (0.147)
Behavior, ages 3-4	0.35-0.19^a	-	-
	-	-	-
IQ/achievement, ages 5-6	-	0.763^c (0.127)	0.427^c (0.227)
IQ/achievement, ages 7-21	-	0.084^c (0.059)	0.300^c (0.213)
Grade retention ever	-	-	-0.244^b
	-	(0.151)	-
High School grad. (no GED)	-	0.56^d (0.093)	0.185^b (0.210)
Attended some college	-	-	-
	-	-	-

Table 2: Evidence Across Studies of the Impacts of Head Start, Cont'd

Study	Currie and Thomas (1995)	Garces et al. (2002)	Ludwig and Miller (2007)
Dataset	C-NLSY	PSID	Multiple
Subpopulation	AA	AA, mother edu. \leq high school	
Years of birth	1979-1987	1966-1977	1960-1975
Impacts			
Earnings, ages 23-40	-	0.051	-
	-	(0.357)	-
Idle	-	-	-
	-	-	-
Ever booked crime	-	-0.126	-
	-	(0.05)	-
Behavior Index, ages 12-13	-	-	-
	-	-	-
Depression Scale, ages 16-17	-	-	-
	-	-	-

Table 2: Evidence Across Studies of the Impacts of Head Start, Cont'd

Study	Deming (2009)	Carneiro and Ginja (2014)	Feller et al. (2014)	Kline and Wal- ters (2014)
Dataset	C-NLSY	C-NLSY	HSIS	HSIS
Subpopulation	AA	Males		
Years of birth	1979-1986	1977-1996	1998-1999	1998-1999
Impacts				
Earnings, ages 23-40	-	-	-	-
Idle	-0.030 (0.053)	-	-	-
Ever booked crime	0.051 0.050	-	-	-
Behavior Index, ages 12-13	-	-0.647 (0.582)	-	-
Depression Scale, ages 16-17	-	-0.552 (0.489)	-	-

Table 2: Evidence Across Studies of the Impacts of Head Start, Cont'd

Study	Zhai et al. (2014)	Perry Preschool (Various sources)	Abecedarian (Various sources)
Dataset	HSIS		
Subpopulation		AA, low child IQ at entry & SES	98% AA, low mother IQ, & low SES
Years of birth	1998-1999	1959-1964	1972-1977
Impacts			
Earnings, ages 23-40	-	\$6,166 ^d (8244)	\$8,499 ^b (8018)
Idle	-	-	-
Ever booked crime	-	-2.77 ^d (1.590)	-5.739 ^b (4.250)
Behavior Index, ages 12-13	-	-	-
Depression Scale, ages 16-17	-	-	-

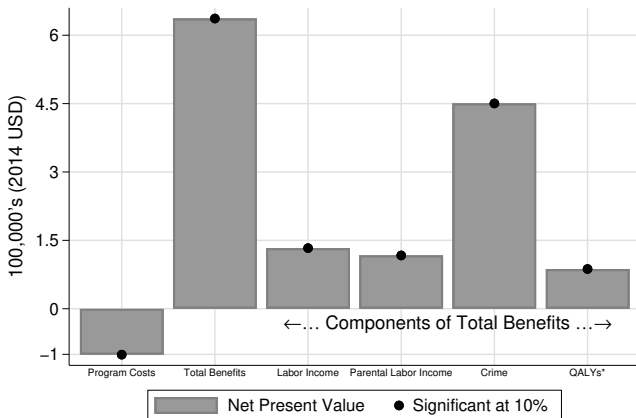
Monetizing the Findings: An Overview

- An influential program has substantial benefits on
 - a Health, the quality of life and healthy behaviors
 - b Earnings of participants
 - c Crime
 - d Education
 - e Earnings, employment and education of **mothers** through providing childcare

Monetizing the Findings: An Overview

- The overall rate of return: statistically significant 13% per annum with a benefit/cost ratio of 6.3, even after accounting for the welfare costs of taxation to finance the intervention.
- Range of estimates from extensive sensitivity analysis:
 - Estimates of overall B/C ratio range: (1.52, 17.40)
 - Estimates of overall IRR range: (8.0%, 18.3%)

Figure 5: Median Net Present Value of Main Components of the Benefit/Cost Analysis Over the Life Cycle per Program Participant, Treatment vs. Next Best



Per-annum Rate of Return: Males and Females 13.7% (s.e. 3%).
Benefit-cost Ratio: Males and Females 7.3 (s.e. 1.8).