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The rate of return to the HighScope Perry Preschool Program

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ABSTRACT

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 paper account 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.

1. Introduction

President Barack Obama has actively promoted early childhood education as a way to foster economic efficiency and reduce inequality.[4] He has also endorsed accountability and transparency in government.[5] In an era of tight budgets and fiscal austerity, it is important to prioritize expenditure and use funds wisely. As the size of government expands, there is a renewed demand for cost–benefit analyses to weed out political pork from economically productive programs.[6]

The economic case for expanding preschool education for disadvantaged children is largely based on evidence from the HighScope Perry Preschool Program, an early intervention in the lives of disadvantaged children in the early 1960s.[7] In that program, children were randomly assigned to treatment and control group status and have been systematically followed through age 40. Information on earnings, employment, education, crime and a variety of other outcomes are collected at various ages of the study participants. In a highly cited paper, Rolnick and Grunewald (2003) report a rate of return of 16% to the Perry program.[8] Belfield et al. (2006) report a 17% rate of return.

Critics of the Perry program point to the small sample size of the evaluation study (123 treatments and controls), the lack of a substantial long-term effect of the program on IQ, and the absence of statistical significance for many estimated treatment effects.[9] Hanushek and Lindseth (2009) question the strength of the evidence on the Perry program, claiming that estimates of its impact are fragile.

The literature does little to assuage these concerns. All of the reported estimates of rates of return are presented without standard errors,

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[4] See Dillon (2008).
[5] Weekly address of the President, January 31, 2009, as cited in Bajaj and Labaton (2009).
[6] The McArthur Foundation has recently launched an initiative to promote the application of cost–benefit analysis in the service of making government effective. See Fanton (2008).
[7] See, e.g., Shonkoff and Phillips (2000) or Karoly et al. (2005). No other early childhood intervention has a follow-up into adult life as late as the Perry program. For example, the benefit–cost study of the Abecedarian Program only follows people to age 21, and relies heavily on extrapolation of future earnings (Barnett and Masse, 2007).
[8] The rate of return estimates presented in Rolnick and Grunewald (2003) are based on cost and benefit estimates reported in Schweinhart et al. (1993).
[9] See Herrnstein and Murray (1994, pp. 404–405). Heckman et al. (2009b) show statistically significant treatment effects for males and females using small sample permutation tests. They also find close agreement between small sample tests and large sample tests in the Perry sample.

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

Return		To individual			To society[a]			To society[a]		
Murder cost[b]					High ($4.1M)			Low ($13K)		
		All[d]	Male	Female	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	9.0	12.2	9.8
		(1.8)	(1.7)	(1.1)	(4.1)	(3.4)	(4.9)	(3.5)	(3.1)	(1.8)
	50%	6.2	6.8	6.8	9.2	10.7	14.9	8.1	11.1	8.1
		(1.2)	(1.1)	(1.0)	(2.9)	(3.2)	(4.8)	(2.6)	(3.1)	(1.7)
	100%	5.3	5.9	5.7	8.7	10.2	13.6	7.6	10.4	7.5
		(1.1)	(1.1)	(0.9)	(2.5)	(3.1)	(4.9)	(2.4)	(2.9)	(1.8)
Discount rate										
Benefit–cost ratios	0%	–	–	–	31.5	33.7	27.0	19.1	22.8	12.7
					(11.3)	(17.3)	(14.4)	(5.4)	(8.3)	(3.8)
	3%	–	–	–	12.2	12.1	11.6	7.1	8.6	4.5
					(5.3)	(8.0)	(7.1)	(2.3)	(3.7)	(1.4)
	5%	–	–	–	6.8	6.2	7.1	3.9	4.7	2.4
					(3.4)	(5.1)	(4.6)	(1.5)	(2.3)	(0.8)
	7%	–	–	–	3.9	3.2	4.6	2.2	2.7	1.4
					(2.3)	(3.4)	(3.1)	(0.9)	(1.5)	(0.5)

Notes: Kernel matching using NLSY data is used to impute missing values for earnings before age-40, and PSID projection for extrapolation of later earnings. For details of these procedures, see Section 3. In calculating benefit-to-cost ratios, the deadweight loss of taxation is assumed to be 50%. Nine separate types of crime are used to estimate the social cost of crime; see the Appendix, Part H for details. Standard errors in parentheses are calculated by Monte Carlo resampling of prediction errors and bootstrapping; see the Appendix, Part K for details. Lifetime net benefit streams are adjusted for compromised randomization. For details, see Section 4.

[a] The sum of returns to program participants and the general public.
[b] "High" murder cost accounts for the standard statistical value of life, while "Low" does not.
[c] Deadweight cost is dollars of welfare loss per tax dollar.
[d] "All" is computed from an average of the profiles of the pooled sample, and may be lower or higher than the profiles for each gender group.

leaving readers uncertain as to whether the estimates are statistically significantly different from zero.

The paper by Rolnick and Grunewald (2003) is based on the age-27 data. It does not conduct a sensitivity analysis for the effects of alternative assumptions, nor does it present a standard error for the estimated rate of return.[10] The study by Belfield et al. (2006) is based on the age-40 data we use. It does not report standard errors for its estimates. It conducts a limited sensitivity analysis.[11]

Any computation of the lifetime rate of return to the Perry program must address four major challenges: (a) the randomization protocol was compromised; (b) there are no data on participants past age 40 and it is necessary to extrapolate out-of-sample to obtain earnings profiles past that age to estimate lifetime impacts of the program; (c) some data are missing for participants prior to age 40; and (d) there is difficulty in assigning reliable values to non-market outcomes such as crime. The last point is especially relevant to any analysis of the Perry program because crime reduction is one of its major benefits. Unless these challenges are carefully addressed, the true rate of return remains uncertain as does the economic case for early intervention.

This paper presents rigorous estimates of the rate of return and the benefit-to-cost ratio for the Perry program. Our analysis improves on previous studies in seven ways. (1) We account for compromised randomization in evaluating this program. As noted in Heckman et al. (2009b), in the Perry study, the randomization actually implemented in this program is somewhat problematic because of reassignment of treatment and control status *after* random assignment. (2) We develop standard errors for all of our estimates of the rate of return and for the benefit-to-cost ratios accounting for components of the model where standard errors can be reliably determined. (3) For the remaining components of costs and benefits where meaningful standard errors cannot be determined, we examine the sensitivity of estimates of rates of return to plausible ranges of assumptions. (4) We present estimates that adjust for the deadweight costs of taxation. Previous estimates ignore the costs of raising taxes in financing programs. (5) We use a much wider variety of methods to impute within-sample missing earnings than have been used in the previous literature, and examine the sensitivity of our estimates to the application of alternative imputation procedures that draw on standard methods in the literature on panel data.[12] (6) We use state-of-the-art methods to extrapolate missing future earnings for both treatment and control group participants. We examine the sensitivity of our estimates to plausible alternative assumptions about out-of-sample earnings. We also report estimates to age 40 that do not require extrapolation. (7) We use local data on costs of education, crime, and welfare participation whenever possible, instead of following earlier studies in using national data to estimate these components of the rate of return.

Table 1 summarizes the range of estimates from our preferred methodology, defended later in this paper. Estimates from a diverse set of methodologies can be found in the Appendix, Part J. All point in the same direction. Separate rates of return are reported for benefits accruing to individuals vs. those that accrue to society at large that include the impact of the program on crime, participation in welfare, and the resulting savings in social costs.

This estimate of the overall annual social rate of return to the Perry program is in the range of 7–10%. For the benefit of non-economist readers, annual rates of return of this magnitude, if compounded and reinvested annually over a 65 year life, imply that each dollar invested at age 4 yields a return of 60–300 dollars by age 65. Stated another way, the benefit-cost ratio for the Perry program, accounting for deadweight costs of taxes and assuming a 3% discount rate, ranges from 7 to 12 dollars per person, i.e., each dollar invested returns in present

[10] More extensive sensitivity analyses can be found in Schweinhart et al. (1993) for the age 27 data on which Rolnick and Grunewald (2003) draw their cost and benefit estimates. See also Barnett (1996).

[11] This study builds on the cost–benefit analyses of two previous studies: Barnett (1985) uses the data up to age 19, and Barnett (1996) uses the data up to age 27. While neither study reports the rate of return to the Perry program, they show that the present value of the net benefit of the program is still positive at a very high real discount rate (11%), which implies that the rate of return is greater than this. They also explore the consequences of alternative assumptions about costs and benefits. Our analysis builds on and extends these important studies.

[12] See, e.g., MaCurdy (2007) for a survey of these methods.