


THE DOLLARS AND CENTS OF INVESTING EARLY: *Cost–Benefit Analysis in Early Care and Education*



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Cost–benefit analysis, the measure of an investment’s benefits relative to its costs, is used in businesses every day to prioritize investments based on their expected pay-offs. Investors choose project proposals that are likely to yield the most expected revenue, relative to costs, rather than projects that are expected to yield less. When cost–benefit analyses are done well and followed carefully, investors profit.

How can cost–benefit analysis help us understand the impact of investments in infants and toddlers on children, their families, and society? Cost–benefit analysis is an objective (some might say cold and calculating) tool that

- demonstrates whether the benefits of early education programs to participating children and families and the nonparticipating public outweigh costs;
- evaluates which early education investments accrue the most benefits relative to costs; and
- has shown that early education investments can yield higher returns than many other investments in human capital and traditional “brick and mortar” economic development initiatives, such as sports stadiums and office towers.

Cost–benefit analysis can be used to translate the impact of early education and care into the language of business and economics. For policymakers and business leaders, cost–benefit analysis has helped quantify the benefits of investing in our youngest children.

Cost–Benefit Analysis Highlights the Impact of Early Care and Education Programs

In public sector decision making, cost–benefit analysis offers practical advice to policymakers who are considering alternative programs while facing scarce resources. Using these tools, decision makers can rank program options according to their effectiveness by measuring their benefits relative to their costs in monetary terms (Levin & McEwan, 2001). Cost–benefit analysis is a major departure from traditional measures of effect size (a measure of how big a difference the program makes), which take into account only program effects while ignoring their costs.

Several recent reports have highlighted the use of cost–benefit analysis to document the payoffs of education and human service programs (Aos, Lieb, Mayfield, Miller, & Pennucci, 2004; Carneiro & Heckman, 2003; Galinsky, 2006; Heckman, 2000; Reynolds & Temple, 2006).



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abstract

Cost-benefit analysis of pre-kindergarten education programs demonstrates that the highest per child benefits stem from programs that focus on economically disadvantaged children. Indeed, studies have shown that these children make significant gains in cognition, social-emotional development, and educational performance when they participate in high quality early education programs relative to children who don't participate. The economic benefits of these gains include increased earnings of the participants and public savings due to reduced crime and reduced need for rehabilitation and treatment. Cost-benefit analysis also shows that these benefits are higher than those from public investments like sports stadiums or office towers. Elements that determine a successful early childhood program include well-trained and well-paid staff members as well as a high intensity of services.

Early education studies as well as neuroscience and developmental psychology strongly suggest the first few years of life are critical for learning in both cognitive and noncognitive domains. Investments in early education are thus vital to the success of later investments made in K-12 schools. When faced with a fixed budget, policymakers should reallocate their investments from later years to early years. Business leaders and business-minded policymakers are speaking up about the economic wisdom of investing in early childhood programs, but progress on early childhood initiatives has not been steady.

The application of cost-benefit analysis to early education programs shows that these programs can provide substantial benefits relative to costs. (In this article, early education refers to the education and care experiences during the first 5 years of life before kindergarten.) Although early education programs are implemented for children at all levels of socio-economic status, programs identified as having the highest per child benefits are those that focus on economically disadvantaged children (Reynolds & Temple, 2006).

Center-based early education programs are designed to promote children's cognitive, psychological, and social-emotional development. Many programs also provide family services and parenting education ranging from home visits and social service referrals to promoting family-school partnerships. Home-based programs or family support programs are also prominent and provide services typically from birth to age 3.

Several studies have found that participation in early education is associated with positive short- and long-term outcomes in health and well-being. Evaluations of four seminal programs reveal significant effects on many indicators of well-being that persist into adulthood. These effects translate into high economic returns. These programs are:

- The High/Scope Perry Preschool (Schweinhart et al., 2005);
- Chicago Child-Parent Centers (Reynolds, Temple, Robertson, & Mann, 2002);
- Abecedarian Project (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002); and
- The Nurse Family Partnership (NFP; Olds et al., 1998).

The Perry and Chicago programs are part-day programs for 3- and 4-year-olds. Abecedarian provides full-time educational day care for children from about 3 months to 5 years old. The NFP includes home visits by nurses for parents and children beginning in the womb and continuing through age 2. The parents and children who participated in these studies were from disadvantaged families, such as families with low-income and parents with less than a high school education. The interventions affect both parents and children.

Evaluations of these programs included well-matched comparison groups for assessing long-term outcomes. They accounted for differences in outcomes between participants and nonparticipants primarily using random assignment or

a quasi-experimental design in the case of the Chicago program (Reynolds et al., 2002). The programs were also subjected to cost-benefit analysis.

Benefits for Children

Findings from these four studies show that disadvantaged children make significant gains in cognition, social-emotional development, and educational performance when they participate in a high quality early education program relative to children who don't participate. (See Table 1.) Some impacts appear relatively quickly, affect parenting, and lead to fewer substantiated cases of abuse and neglect than would have been expected. Other

TABLE 1. COST-BENEFIT ANALYSIS STUDIES OF EARLY EDUCATION PROGRAMS

	Program description	Research design	Example of findings (Participant group compared with control group)
Carolina Abecedarian Project (Chapel Hill, N.C.) 1972–1977	Ages of interest: 3 months through 4 years. Center-based preschool, full day.	Random assignment. 57 treated, 54 controls. Assessed through age 21.	Higher reading and math achievement, lower rates of grade retention and special education, more likely to enroll in a 4-year college, women more likely to delay having first child, higher participant and maternal earnings.
Chicago Child-Parent Center 1983–1985	Ages of interest: 3–4 years. Center-based preschool, half day, intensive parent program.	Quasi-experimental design. 989 treated compared with 550 from randomly selected schools and matched on demographic variables. Assessed through age 21.	Higher reading and math achievement, lower rates of child maltreatment, lower rates of grade retention and special education, more likely to complete high school and attend 4-year college, higher earnings, and lower rates of juvenile arrests, adult convictions and incarceration.
Nurse Family Partnership: Elmira Prenatal/Early Infancy Project (Elmira, N.Y.) 1978–1982	Ages: Prenatal through 2 years. Registered nurses provided health and parenting information to mothers at home.	Random assignment. 116 treated, 184 controls. Assessed through age 15.	Decreased rates of arrest, convictions, probation violations, and alcohol use for child by age 15; reductions in welfare costs, child maltreatment, substance abuse, and convictions for mothers; higher earnings for mothers.
High/Scope Perry Preschool (Ypsilanti, Mich.) 1962–1967	Ages: 3–4 years Center based preschool, 2½ hours per day, weekly home visit with mother.	Random assignment. 58 treated, 65 controls. Assessed through age 40.	Higher reading and math achievement, less special education, more likely to graduate from high school, fewer criminal arrests and months in prison, more likely to be employed and own homes, higher earnings, and less welfare assistance.

Note: Child-Parent Centers and Abecedarian Project had school-age programs up to either second grade or third grade.

impacts, embodied in the child, take more time to materialize, such as increased graduation rates, reductions in juvenile and adult crime, and higher earnings in the workforce. Similar benefits were frequently found across programs. For example, children who attended the Abecedarian, Chicago, and Perry programs were more likely to have higher earnings in the workforce.

Economic Benefits

Economic benefits were primarily attributed to increased earnings of the participants (and resulting tax revenues) and public savings due to reduced crime, averted crime victim costs, and reduced need for rehabilitation and treatment. The crime-related savings are the largest economic benefits by far for the Perry Preschool (Schweinhart et al., 2005), as well as for the Chicago program (Reynolds et al., 2002). NFP also substantially reduces crime and builds earnings capacity among mothers and children as they grow up (Karoly et al., 1998). The Abecedarian study did not find statistically significant effects on reducing crime due in part to the relatively low crime rate in the study area at the time (Masse & Barnett, 2002).

Cost-Benefit Analysis

The benefit-cost ratios of all these programs exceeded \$1, the point at which the investment pays for itself, rang-

ing from \$3.78 per dollar invested for Abecedarian to \$10.15 and \$17.07 per dollar invested for the Chicago and Perry programs. (See Table 2.) The programs' net economic benefits ranged from about \$30,724 per participant for NFP and up to \$276,405 per participant for the Perry program. The larger economic returns for the Perry program are partly due to the longer period of time over which participant outcomes have been documented. The other programs have just begun their long-term adult follow-ups, and may also reveal similar long-term benefits. Not only are the benefit-cost ratios well above \$1, estimated internal rates of return (the dollar yield per year for each dollar invested) ranged from 7% for Abecedarian up to 23% for NFP. These rates of return are favorable compared with investments in both the public and private sectors.

Cost-benefit analysis not only demonstrates the relative size of benefits to costs, it also shows *who* benefits. Although the children and parents participating in these programs benefited from free child care and higher earnings, the nonparticipating public benefited more so due to higher tax revenue, reduced crime costs, and reductions in special education and grade retention in schools. Averaged across all four programs, the public return on investment represents well over half of total benefits.

Although not subjected to cost-benefit analysis, many other early education programs have demonstrated positive effects on early and later school performance that may lead

TABLE 2. COST-BENEFIT ANALYSIS STUDIES OF EARLY EDUCATION PROGRAMS PER CHILD, 2005 DOLLARS*

	Average total costs	Average total benefits	Net benefits (benefits-costs)	Benefit-cost ratio (benefits/costs)	Internal rate of return
Carolina Abecedarian Project	\$38,934	\$147,149	\$108,215	\$3.78 to \$1	7%
Chicago Child-Parent Center	\$8,018	\$81,399	\$73,381	\$10.15 to \$1	22%**
Nurse Family Partnership: Elmira Prenatal/Early Infancy Project (Subgroup of high-risk mothers)	\$7,572	\$38,296	\$30,724	\$5.06 to \$1	23%**
Perry Preschool	\$17,198	\$293,579	\$276,381	\$17.07 to \$1	18%

*All dollar figures in article were converted to 2005 dollars using the Consumer Price Index.

** Calculated by Grunewald; other figures come from studies. Internal rates of return for NFP and Chicago are higher than Perry while their benefit-cost ratios are lower due to the timing of when benefits occurred.



to significant levels of benefits relative to costs. Examples include Early Head Start (Love et al., 2005), the Syracuse Family Development Research Program (Lally, Mangione, Honig, & Wittner, 1988), projects in the Cornell Consortium for Longitudinal Studies (Consortium for Longitudinal Studies, 1983), and state-funded programs in Oklahoma (Gormley, Gayer, Phillips, & Dawson, 2005).

Lessons Learned From Cost–Benefit Analyses

What elements determined a successful program?

- Early education staff members were well-trained and earned competitive salaries. Teachers for the Perry and Chicago programs had at least a bachelor's degree with certification in early childhood education, and the Abecedarian teachers earned salaries that were competitive with those of public school teachers. NFP staff were registered nurses.
- Comprehensive services were provided in the form of center-based education for children and support services for families through home visits, intensive school involvement, or health and nutrition services. For example, the Chicago program emphasized partnerships with families and community resources.
- Programs were characterized by a high intensity of services, including a relatively large amount of time per week and total duration, and low ratios of participants to staff compared with less intensive early education programs. Children in the Perry and Chicago programs had close to 1,000 hours of participation while participants in the Abecedarian project had almost 5,000 hours of exposure. Child-to-staff ratios were small and ranged from about four to eight children per staff member. In NFP, nurses maintained a caseload of fewer than 25 families. In addition, each program had a core set of principles that were implemented with high fidelity and quality and were appropriate to the developmental needs of the family.

The costs of intensive home visitation are relatively high, especially if implemented by professional staff. For example, the estimated cost for the NFP program is \$9,678 per family over a 2½ year period. The cost for implementing a relatively low-intensity home visiting program like some applications of Healthy Families America is nearly two thirds less. However, the benefit–cost ratio for the

COST–BENEFIT ANALYSIS AND INTERNAL RATE OF RETURN

A cost–benefit analysis assigns monetary values to a project's benefits and costs over time, discounting the future value of net benefits at a given interest rate (discount rates in the early education studies ranged from 3% to 4%). Although cost data is available on budgets and expense forms, benefits are sometimes tricky to capture in monetary terms. For example, citizens with higher levels of education are more likely to participate in democracy and civil society—a benefit for society as a whole—but difficult to measure in dollars. Total net benefits is the difference between total discounted benefits and discounted costs. A positive number corresponds with a benefit–cost ratio (benefits divided by costs) over \$1, the point at which an investment “breaks even” or pays for itself

The internal rate of return is the annual interest rate received for an investment consisting of payments and revenue that occur at regular periods. The internal rate of return is useful when comparing returns among dissimilar public and private investments. The rule is to invest in projects where the return is high relative to the alternative. For example, rates of return for the early education studies compare favorably with the U.S. stock market, which on average earned between 5% and 7%, adjusted for inflation, over the past few decades.

Disadvantaged youth are a better social investment than stock market equity.

more expensive NFP programs is \$5.06 compared with only \$0.62 for Healthy Families America (Small, Reynolds, O'Connor, & Cooney, 2005). Cost-benefit analysis helps discern which type and intensity of early education investments are most cost-effective.

Of course, many questions of research and policy significance remain. We list only a few: Can the available findings generalize to more economically advantaged groups? Do only programs of the highest quality achieve high economic returns? How much difference do program timing in the child's life and duration make? Do particular curricula or instructional activities promote greater effectiveness and cost-effectiveness? How do relationships among program staff, parents, and children affect outcomes? Which cognitive and noncognitive factors as well as post-program environments increase the persistence of positive effects over time? Do these factors vary by outcome?

Early Investments as an Economic Development Strategy

Evidence from the early education studies described above, neuroscience, and developmental psychology strongly suggest that the first few years of life are critical for learning in both the cognitive and noncognitive domains. Furthermore, skill acquisition is a dynamic process in which skill begets skill (Cunha, Heckman, Lochner & Masterov, 2006; Heckman, 2000). Therefore, early investments in human capital are vital to the success of later investments made in K-12 schools, post-secondary institutions, and job training programs.

Adverse early environments are powerful predictors of failure in school and in adulthood. Early in life, children's cognitive and noncognitive abilities begin to differ according to their socio-economic status. The gaps widen slightly in the early years of schooling, and stay constant after age 8 (Carneiro & Heckman, 2003; Cunha, et al., 2006; Heckman, 2000). Remediation for disadvantaged early environments becomes more costly the later it is attempted. By the time children reach adulthood, the return on investment in human capital for adults deficient in cognitive and noncognitive abilities is relatively low. Conversely, the return on investments in human capital for adults with strong abilities is relatively high (Carneiro & Heckman, 2003; Cunha, et al., 2006; Heckman, 2000).

The implications of early education for human capital development are clear: The optimal time to invest is when children are very young. Cost-benefit analyses are finding that investments targeted to low-income school-age children do not have a return as high as investments made earlier in children's lives. For example, a cost-benefit

analysis of a class size reduction experiment found that benefits to participants were more than two times costs (Krueger, 2003), but lower than the benefit-cost ratios of early education programs. An alternative analysis (Carneiro & Heckman, 2003) showed that benefits were less than costs, that is, while smaller classes raised the adult earnings of students, the earnings gains did not offset the costs of hiring additional teachers. In addition,

cost-benefit results from the school-age component of the Chicago Child-Parent Center program and an evaluation of Big Brothers/Big Sisters show benefit-cost ratios above \$1 (\$1.66 and \$1.01, respectively), but much lower than benefit-costs ratios for early education programs

(Reynolds & Temple, 2006). These findings do not mean that school-age or later programs should be discontinued. The findings do mean that new funds that become available for investment in human capital will have the highest return when invested in early education. Faced with a fixed budget, policy makers should reallocate their investments from later years to early years.

Investments in early education have the potential to increase U.S. workforce productivity, that is, the amount produced per labor hour. With increased earnings as an outcome measure, early education studies show that, participants in early education programs have more skills and higher earnings as adults—presumably because of higher productivity—than do nonparticipants. Given the amount of information available from the early education studies, the causal pathways that give rise to the greater productivity (as to the greater well-being) of early education participants should be a focus of future research (Reynolds, Ou, & Topitzes, 2004).

The U.S. economy has benefited from its productive workforce. The percentage of the population with a college degree increased substantially from 1980 to 2000 while productivity has been above trend since the mid-1990s. However, the growth in the percentage of population with a college degree is expected to slow between 2000 and 2020. In recent years, the high school dropout rate has increased in the United States, while in developing countries, particularly India and China, secondary and post-secondary graduation rates have increased (Heckman & Masterov, 2004). Investing in early education is an effective strategy to boost long-run prospects for productivity.

Cost-benefit studies not only demonstrate that early education investments are linked to productivity and economic growth, they also encourage the scrutiny of policies typically used to promote economic development. Each year, state and local governments spend billions of dollars on subsidies and tax incentives for businesses to relocate or

The application of cost-benefit analysis to early education programs shows that these programs can provide substantial benefits relative to costs.

expand in their area. However, from a national perspective, these economic development initiatives are a zero-sum game. Subsidies awarded to private businesses to relocate or expand in a local area simply shift jobs from one location to another. They take resources away from state and local governments' role of providing public goods. Relative to costs, the benefits of public investments in professional sports stadiums or office towers for private businesses, while more tangible (visible buildings) and immediate (within a year or two), are much lower than benefits of less visible early education programs (Grunewald & Rolnick, 2003).

Impact on Public Policy Agenda

Cost-benefit studies have helped move the infant and toddler agenda forward in a number of areas. In particular, cost-benefit analysis has raised interest among those who are most familiar with its method—business leaders, fiscal conservatives, and economists. The studies have shown that investing in early education can help meet long-held objectives, such as improving school performance, workforce quality, and economic development.

Business leaders and business-minded policymakers are speaking up about the economic wisdom of investing early. For example, United Way's Success by 6 initiatives have engaged business leaders to help plan and advocate for investments in early education at the community level. The Committee for Economic Development, an independent nonpartisan organization of business and education leaders, has made early learning a major initiative for promoting economic growth. PNC Financial Services, a major financial services company, has pledged \$100 million over a 10-year period toward its "Grow Up Great" program to promote school readiness among children from birth to age 5. In addition, a number of philanthropic foundations have increased their support of early education.

Minnesota Business for Early Learning (MnBEL) serves as a case study of business leader involvement at the state level. Founded in March of 2004, MnBEL comprises over 250 senior executive members representing over 100 businesses and other organizations. Motivated by the impressive evidence from the cost-benefit studies, this group has worked to create public awareness of investing early, to identify and promote family-friendly practices in the workplace, and to impact public policy. In 2005, the organization was instrumental in establishing the Minnesota Early Learning Fund (MELF), a public-private partnership to finance projects for children birth to age 5, evaluate results, particularly cost-effectiveness, and advise state government as it plans for future early education investments. The MELF board was named in April, starting with over

\$3 million in contributions from the private and public sectors.

These new voices in Minnesota and other states bring the business viewpoint on the economic benefits of early education to the national dialogue. Business leaders ask demanding questions about the accountability and cost-effectiveness of programs. They tend to be wary of proposals that are laden with bureaucracy and process. They tend to support proposals that have low overhead, provide choices for families, and follow the market-oriented principles of flexibility and competition.

Yet progress on early childhood initiatives has not been steady—despite findings from cost-benefit analysis and a substantial body of research, and invigorated interest among business leaders. At the federal level, Early Head Start and

Head Start continue to reach only a fraction of eligible low-income children. Recent cuts to the child care subsidy system will weaken the ability of low-income families to afford quality child care. At the state level, in contrast, early education has gained ground through individual states' incentives to improve quality and access to child care, parent education, and pre-kindergarten programs. Some of the largest investments in new programs have occurred in states with voter-approved increases in tobacco taxes (California) and constitutional amendments to provide early childhood services (Florida). At the local level, mayors, county commissioners, and school boards have led efforts to coordinate and leverage community resources for young children. Still, much more progress needs to be made in providing children from disadvantaged homes with enriched early learning environments.

Conclusion

Cost-benefit analysis has demonstrated the strong economic contributions of early education programs to participants and the larger society. We note, however, that cost-benefit analysis is limited by its ability to account for all benefits only in monetary values. We should not withdraw support for promising early education approaches that have not been analyzed from a cost-benefit perspective. Nevertheless, cost-benefit analysis can help evaluate which early education investments are most cost-effective to ensure that scarce resources are put to their best use. Furthermore, cost-benefit studies can be effective in securing support for early education from public sources, philanthropic organizations, and private donors. Showing the "dollars and cents of early education" gives decision makers the quantitative evidence they need to invest in infants, toddlers, and young children. It's right there on the bottom line. §

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