The Economic Benefits of Investments in Early Education for Hawai'i

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SUMMARY

Early education is a good investment for children. Research shows high-quality early education helps children's cognitive growth and enhances their future prospects.

Taxpayers also benefit from early childhood education. Educational expenditures on special education, grade retention, and remediation during the K–12 years are lower. Tax revenues are higher; government expenditures on crime, health, and welfare are lower.

However, high-quality programs for all children require adequate resources. Many states do not allocate sufficient funds to ensure all children may benefit and to guarantee high-quality programs. This report gives a cost-benefit analysis of introducing statewide early education provision for Hawai'i, one of the few states across the U.S. that does not offer publicly funded early education.

The Hawai'i *Early Learning Educational Task Force* has set out a ten-year plan to offer early education across the state. The *ELETF* vision is for "an early learning system that provides quality learning experiences, parental choice, access, affordability, sustainability, and a foundation for school success." Such a high-quality program to cover all four-year-old children in the state would cost an additional $145 million annually. Spending per child would be approximately $12,000.

The benefits of this early education investment to state taxpayers in Hawai'i—in the form of higher government revenues and lower spending—are likely to be significant. As the program is fully implemented, state fiscal benefits almost exactly offset the investment costs.

In addition, substantial savings to the federal government—primarily through higher tax payments—are anticipated. Adding both state and federal fiscal benefits together, the benefit-cost ratio would be 1.5:1 under full implementation. The fiscal benefits would be 50% greater than the costs.

If the social benefits of early education—such as the value to Hawai'i of a lower crime rate and a more productive economy—are counted, the case for investments in early education becomes compelling. The social benefit of early education is 4.2 times the cost of the investment.

These economic calculations suggest that expanding early childhood education would make very good sense for the state of Hawai'i.

1. INTRODUCTION

> "Supporting the early development of all our children must become a national priority . . . Every dollar spent on early childhood education is a dollar invested, not a dollar consumed."
>
> —U.S. Rep. George Miller (D-Calif.), Chairman of the House Education and Labor Committee, *Forbes* magazine, January 2008

Early childhood education is an investment. By enhancing their cognitive development and making them more proficient learners, early education is the foundation for children to be more productive citizens in adulthood (Gormley, 2007a; Magnuson et al., 2007). Research shows that the academic benefits of high quality, model programs are very strong (Barnett and Belfield, 2006). In addition, there is now considerable research showing the effectiveness of large-scale, statewide programs (Henry and Gordon, 2006; Gormley et al., 2004; Gilliam and Zigler, 2004; Wong et al., 2008). Finally, Head Start, which serves the most disadvantaged young children, has also been found to be beneficial for children both in the short and long run (Currie, 2007).

These private benefits to children also generate public benefits. Both taxpayers and the local community gain. Taxpayers gain because more productive citizens pay more taxes and rely less on government health and public assistance programs; they are also less likely to be involved in the criminal justice system. The local community gains through enhanced economic growth and safer, more prosperous neighborhoods. Thus, there appears to be strong potential for government investments in early education to yield significant benefits over the long term.

However, not all children have access to early education. There are differences by income, race, and locality (Bainbridge et al., 2005). Increasingly, state programs are being developed to ensure wider access to early education, particularly for families who cannot afford it. Yet, state policies vary dramatically. Here the focus is on state policy in Hawai'i.

Hawai'i has recently proposed a significant commitment toward investments in early education. In 2006, the Legislature passed Act 259 which established a task force to set out a plan for early learning for children aged 0 to 5 across the state. *The Early Learning Educational Task Force* (ELETF) set out a ten-year plan to offer early education in centers, in family child care homes, and through family-child interaction learning programs. The ELETF vision is for "an early learning system that provides quality learning experiences, parental choice, access, affordability, sustainability, and a foundation for school success." The plan is intended to address the fact that Hawai'i is one of the remaining states in the nation that does not provide state-funded early education before kindergarten.

Relative to other states across the nation, Hawai'i nonetheless scores well in terms of child welfare outcomes. Overall, it is ranked 11th in the Annie E. Casey Kids Count database. However, almost ten percent of children are growing up in a household where the head is a high school dropout and six percent live in extreme poverty.

Importantly for Hawai'i, educational metrics—in terms of school readiness and K–12 outcomes—are less encouraging. The 2007 *Hawai'i State Readiness Assessment* found that many children were not fully prepared to start school. By fourth grade, Hawai'i children score below national norms in reading, math and science. The state high school graduation rate is close to the national rate; but this means that only two-thirds of high school students are graduating on time (Swanson, 2004).

In this economic analysis, we investigate whether investments in early education would be beneficial for the state of Hawai'i. The analysis begins with a description of the current early education system in Hawai'i along with the proposal set out by the Early Learning Educational Task Force (ELETF, 2008). This proposal includes detailed estimates of the costs of early education programs. We then calculate the economic benefits of this proposal. We calculate these benefits from the perspective of the child, the taxpayer, and the state. To determine likely returns, the analysis employs Hawai'i-specific and national data sources, as well as evidence from high-quality research studies. Finally, we compare the costs and the benefits to determine whether early childhood investments offer a positive return.

2. EARLY CHILDHOOD EDUCATION IN HAWAI'I

2.1 Existing early education opportunities

Currently early education in Hawai'i is limited, both in terms of enrollments and in funding.[1]

As of 2005, there are 83,000 children aged 0–5 across the state, with 18,000 four-year-olds. Licensed arrangements are few; there are 386 preschools, 39 infant/toddler centers, 447 family child care homes, and 7 group homes (excluding military arrangements). These arrangements cover only one-in-four children and less than 100 centers meet NAEYC accreditation standards.

Opportunities for early education in Hawai'i are directed more toward disadvantaged children. Some children in low-income families access early education through the Open Doors Project or Head Start, which is federally funded. The Open Doors Project operates in a similar way to the childcare subsidy program. But because income eligibility is assessed on a monthly basis, the project does not necessarily offer continuous enrollment to families. Notably, even with Head Start, many disadvantaged four-year-olds in Hawai'i currently have no access to publicly funded

early education. (Head Start is not perfectly targeted and is not funded to ensure all at-risk children receive places).

Spending on early education across the state was $100 million in 2003 (nominal prices). Spread across 83,000 children this amounts to only $1,200 per child (NIEER, 2007). Moreover, almost all of this spending was federally funded, primarily for DHS child care ($32 million), Head Start ($19 million), and Early Head Start ($4 million); and Kamehameha Schools preschools ($14 million), which are funded through a private trust for Native Hawaiian children. Even though Hawai'i introduced the Pre-Plus program to help fund facilities within local public schools in 2002, state contributions for early education remain very low.

These enrollments and amounts of funding are almost certainly sub-optimal from the state's perspective. According to the *NIEER 2006 Yearbook*, Hawai'i is 1 of only 12 states that do not offer state-funded early education; and many states that have programs are expanding them to cover more children. Hence, the imperative to establish high-quality early education for more children in Hawai'i is powerful.

2.2 Expanding and enhancing early education in Hawai'i

The first step is to design an early education program. Across the U.S., there is considerable variety in how early education programs are structured: some are well funded and others offer only a partial subsidy; some allow private centers to operate and others are restricted only to the public school system (Fuller et al., 2006). One important decision is whether to offer programs to all children (universal) or to target participation to at-risk students (defined as those likely to drop out of high school). The merit of a universal over a targeted program is debatable, depending in part on how programs are implemented and funded.

For Hawai'i, we follow the policy recommendations as set down by the Task Force (ELETF, 2008). This ELETF proposal is set out in Table 1. It is intended to cover 65% of four-year-olds within ten years. (This proportion does not include Head Start, special education, Kamehameha schools, or children in military establishments; adding these would raise the coverage rate to at least 80%.) The first rows of Table 1 show proposed enrollments. In the initial year there would be 500 places and by the tenth year enrollment would be increased to 12,480. Based on demographic projections for Hawai'i, full early education would mean 12,480 places after ten years.[2]

Early education programs must be high quality to ensure they are beneficial. Specifically, such programs are most effective when: they are of reasonable duration; teachers are well qualified and well trained; group sizes are small; and when centers fully comply with accreditation standards (Robin et al., 2006; Early et al., 2006; Loeb et al., 2004). As set out in detail in the ELETF Report (2008, pp.33–41), the proposed

program for Hawai‘i is designed to meet these requirements. The program would also include accountability mechanisms and preschool choices for parents, creating incentives for improvements over time. High-quality outcomes from this program should therefore be obtained.

The ELETF Report also calculates the cost of providing early education at this scale for a full school day and school year. (a separate costing exercise is performed for a calendar year, but the research evidence is based on school year calendars, so the school year costs are used here).[3] For Hawai‘i, total and per-child costs are given in the lower panels of Table 1. Both operating costs and capital costs are reported, with the costs of capital at approximately 15% of operating costs. In the first year of the program, operating costs are estimated at $9.1 million; by the final year, they have risen to $145.1 million. If capital costs are included, the total costs for full enrollment are $156 million.

Per-child costs are also reported, although these must be interpreted carefully because the early years include significant expenditures to build capacity. With low enrollment and high investment in the early years, the unit costs of early education are initially be $18,514. But these fall to $11,605 with full enrollment and all investments in infrastructure accounted for. These costs compare closely with the annual cost of K–12 schooling in Hawai‘i and so cohere with the parity-funding formula recommended by Barnett and Robin (2006). This large-scale program is therefore almost equivalent to adding an extra grade to the education system. Importantly, this amount of resource should guarantee high-quality early education programs for the children who enroll; it would make Hawai‘i one of the leading investors in early education across the U.S. Nevertheless, at full implementation this investment amount still represents less than 3% of total state general fund expenditures in 2007 (NASBO, 2007).

How this proposal would be funded is not addressed here. Across the U.S., funding has been obtained from a variety of sources: some states have earmarked revenue streams whereas others have used federal funds, such as TANF or CCDF money (Gilliam and Marchessault, 2005; Greenberg and Schumacher, 2003). For Hawai‘i, it may be feasible to draw on more than one funding source; a full description of the possible sources is given by Vast (2003). The ELETF Report recommends that the proposal should be funded through the state’s Department of Health, Department of Human Services, Department of Education, and the Department of Labor and Industrial Relations (which funds Head Start). It also proposes financial aid for families below an income threshold, with a sliding scale for payments above the threshold. Given the diverse benefits of early education, this multi-source approach would appear to be the most efficient.

Table 1 — Proposal for universal early education for four-year-olds in Hawai'i

	Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Year 6*	*Year 7*	*Year 8*	*Year 9*	*Year 10*	*Full*
Four-year-olds in Hawai'i	17,700	17,800	18,000	18,200	18,400	18,600	18,800	18,900	19,000	19,200	19,200
Program enrollment	500	820	1,140	2,660	4,360	6,000	7,660	9,340	10,920	12,480	12,480
Total operating cost ($ millions)	$9.11	$13.22	$17.64	$34.88	$54.24	$71.71	$87.9	$107.56	$124.44	$145.16	$144.83
Per-child operating cost	$18,214	$16,118	$15,476	$13,111	$12,441	$11,952	$11,475	$11,516	$11,395	$11,631	$11,605
Total cost ($ millions)	$9.26	$13.59	$18.01	$45.81	$65.24	$82.69	$98.88	$118.55	$135.06	$156.06	$144.83
Per-child cost	$18,514	$16,568	$15,800	$17,221	$14,962	$13,782	$12,909	$12,692	$12,368	$12,505	$11,605

Notes: 2008 dollars. Enrollment does not include Head Start participants or children receiving services through the Department of Special Education, Kamehameha Schools preschools, and programs on military installations. Total cost includes capital costs. Source: Comprehensive cost estimate for school year (ELETF, 2008, p.73).

3. ECONOMIC BENEFITS OF EARLY EDUCATION IN HAWAI'I

3.1 Identifying the economic benefits

Prior research has identified many private, fiscal, and social benefits from preschool programs. Indeed, in his recent testimony to the House Committee on Education and Labor, Brookings Institution scholar Ron Haskins concluded that "there is no body of evidence on any social intervention that holds as much promise of producing as wide a range of positive effects as high-quality preschool programs" (January 23, 2008). For policymakers, the key question is not whether to invest in early education, but how to do so most effectively.

The private benefits of early education are substantial. First, children are better prepared for school and this eventually leads to higher educational attainment and higher earnings in adulthood. Second, children experience higher personal well-being. They are more likely to be screened for health conditions, to be immunized, and to receive improved nutrition. As well, early education has been associated with better emotional and mental health and with lower rates of maltreatment.

These private benefits convey fiscal benefits to taxpayers in at least four domains. First, there are efficiency gains to the public K–12 school system: special education and grade retention rates are reduced, and, because students are better prepared, schools can provide education more efficiently. Second, tax revenues are higher: the private earnings advantages mean higher income tax payments. Also, when children are in early education, their parents are freed up to work. Third, there are budgetary savings to the criminal justice system: by enhancing economic opportunities for children, early education raises the opportunity cost of crime. Finally, there are savings in health and welfare budgets: with higher personal well-being, children are less likely to rely on publicly funded health and welfare services.

In addition, there are benefits to the entire state of Hawai'i. These benefits include the private gains to children and their families and the fiscal benefits (net of double-counting between these two beneficiaries). But the state also benefits in two additional domains. First, there are savings to all citizens from reductions in crime. Although the government incurs an economic burden, the main burden of crime falls on the victims via reduced quality of life and monetary losses. As well, all persons make preventative private expenditures for insurance and other protections. Second, there are externalities from education on economic growth: workers with more human capital also make their co-workers' more productive and attract more investment into the state. We make approximate calculations of these social benefits to provide a full accounting of the economic consequences of early education.

Finally, we do not count as a benefit the employment and revenues of the early education sector. In fact, these are substantial: the industry employs 9,400 persons and generates over $240 million in annual economic activity (Traill et al., 2005). However, these effects might be regarded as transfers from one sector to another.

3.2 Method of calculating the economic benefits

We calculate the expected benefits across the series of domains. These are: private earnings gains; the four fiscal benefits, separated by state and federal origins; and two social benefits (economic competitiveness and crime reduction). Our main focus is on the fiscal benefits. Under a strict interpretation, and leaving aside issues of equity, the fiscal return should determine the optimal amount of public funding: if taxpayers gain an economic benefit, public funds should be committed. An alternative perspective might include the social benefits too, but we do not rely on this view. Also, as we show below, these social benefits are calculated with far less precision.

The calculation method has two straightforward stages. First, the impacts of the proposed early education program on each of the four categories are calculated. Second, the economic consequences of those impacts are assessed. For example, if early education reduces special education placement by s and the unit cost of special education is $\$x$, the economic savings are therefore $\$sx$. The savings are allocated to state and federal governments proportionately based on relative spending. All money values are expressed in present values at age 5 so that they can be compared with the costs of the program. We apply the conventional discount rate of 3.5% as recommended by Moore et al. (2004) for public investments. All figures are in 2008 dollars. (For case studies from other states, see Karoly and Bigelow, 2005; Belfield, 2005).

Importantly, we are calculating net effects beyond the baseline level of provision. It is not therefore critical that the baseline is specified very accurately. (Indeed, preschool policies change frequently, so a stable baseline is hard to pin down). The critical calculation is of the additional benefits from extra spending to see whether this proposal passes a cost-benefit test.

The challenge is to place numerical values on each of the impacts and unit costs. Hawai'i-specific data is used where available for both the impacts and the costs and expenditures.[4] Where there is uncertainty about the values, we apply sensitivity tests. We also adopt a conservative method to reduce the possibility that we have overstated the impacts from early education. The conservative assumptions and sensitivity analysis are discussed in detail in Section 5 below.

We might anticipate that the benefits of preschool would exceed the costs. Several studies have calculated the economic returns and each one shows the total economic benefits outweigh the costs by a significant margin. New evaluations of the High/Scope Perry Preschool Program show that for every $1 investment, $12.90 was recouped in terms of benefits over the lifetime. For the Abecedarian Early Childhood Intervention, an economic evaluation indicates that for every $1 investment, between $2.56–$2.99 was recouped in terms of benefits over the entire period (3% or 5% discount rate). For the Chicago Child-Parent Preschool Center (CPC) Program, every

$1 investment, $7.14 was recouped in benefits. For Head Start, costing exercises for a large-scale version show benefits that exceed the costs; even short-term and medium-term benefits offset 40–60% of the total costs. Finally, regional economic analyses strongly support investments in preschool over alternative economic development policies (see respectively, Belfield et al., 2006; Masse and Barnett, 2002, Table 8.2; Reynolds et al., 2002; Currie 2001; Ludwig and Miller, 2006; and Bartik, 2006).

The economic benefits for Hawai'i's program are unlikely to be as large as has been found for these model programs (although the Chicago CPC program was reasonably large scale). These were very intensive programs targeted to at-risk groups of children, whereas this proposal is for a much larger statewide program (albeit with significant funding). However, recent research has found that preschool benefits all children, regardless of background (Gormley, 2007a). Disadvantaged children do benefit the most, but all children benefit. In addition, large statewide programs have been found to boost achievement (Wong et al., 2008).

Our general approach is therefore as follows. We identify at-risk students as those who are unlikely to complete high school; from Swanson (2004), this is 33% of each age cohort in Hawai'i. We assume that these children would obtain the benefits associated with the three high-quality experimental method studies. The remaining children, 67% of the cohort, are designated as having a high likelihood of high school graduation and as such are assumed to reap fewer benefits from early education. Their benefits are held to be a fraction of the benefits for at-risk children based on results in Temple and Reynolds (2007) and Gormley (2007b): specifically, this fraction is 0.4. So, if early education reduces special education for at-risk students by 20%, the corresponding impact for all other students is 8%. In addition, there are more at-risk children who are in special education; the impact of early education is even greater for these children.

4. THE ECONOMIC BENEFITS OF EARLY EDUCATION FOR HAWAI'I

Below we calculate the economic benefits of the proposed policy. Sections 4.1–4.4 calculate the efficiency gains to the school system, increased tax revenues, and lower government expenditures on crime and child health and welfare. Section 4.5 summarizes these fiscal benefits. Section 4.6 calculates the social benefits. Money values are expressed per child in present values and 2008 dollars.

4.1 Efficiency gains to the education system

Investments in preschool reduce rates of special education and grade retention and they also make children more proficient learners. Each of these efficiency gains is important for the public school system.[5] In 2005, Hawai'i spending per student for direct educational services was $10,252; the district also commits resources for an

array of supplemental programs, including: smaller learning communities, vocational education, after school instruction, and programs to satisfy NCLB requirements. Annual appropriations for Comprehensive Student Support alone are $412 million for 2007–09, with appropriations for Instructional Support of another $39 million.[6] Even small improvements in student proficiency may therefore have important economic consequences.

Full details of the efficiency gains—and the research evidence used to derive them—are given in Appendix Table 1.

The rate of special education in Hawai'i is 10%, with a higher proportion of these students at-risk of educational failure (the national average is 13.2%). The proposed policy reduces the rate by 21% for at-risk children (and so by 8.4% for other children).[7] The state grade-retention rate is 10%. This rate is predicted to fall by 25% for at-risk children (and so by 10% for other children). Finally, early education raises the overall productivity of the education system. Teachers "prefer" instructing less-disruptive children; these teachers are less likely to be absent or quit and will accept lower wages (as do private school teachers). Better student behavior reduces spending on security, policing, and custodial services as well as on programs for substance abuse, truancy, and absenteeism. Also, pressure on remedial education is lessened if students are more proficient. Our calculation of the economic benefits arising from these productivity gains is adapted from Belfield and Schwartz (2006).

Table 2 — Economic benefits to the education system from early education

	Per At-Risk Child	*Per Child (Other)*
State PV benefits per child	$4,419	$1,178
Federal PV benefits per child	$542	$141

Notes and Sources: See Appendix Table 1. PV denotes present value.

Table 2 summarizes the total economic benefits to the education system from these three impacts. These benefits are separated by child status (at-risk or other) and by level of government (state or federal). The dollar benefits are present values for a child aged 5. The amounts are not trivial, amounting to $4,419 for the state per at-risk child and $1,178 per child (other). The economic benefits of early education are significantly higher for at-risk children: these children are more likely to be in special education, retained in grade, and eligible for remedial programs. Also, the economic benefits accrue mainly to state government, reflecting the heavier burden of funding for education in a state with a single school district.

4.2 Increases in tax revenues

Tax revenues go up with expanded early childhood education programs: families can more easily enter the labor market; and the preschool participants themselves will enter adulthood as more productive workers. Both effects raise incomes and so increase tax payments.

In later adulthood, preschool participants will have higher earnings primarily because they have accumulated more education. Indeed, preschool programs have been found to have very powerful effects on high school graduation rates, particularly for minority children. For those who newly enroll, the average estimate is of a 25% reduction in the high school dropout rate (Barnett and Belfield, 2006). However, this impact is not informative about the impact of early education on children who would have graduated anyway. It is not reasonable to assume that these children would get zero benefit from early education.

Our estimates of the educational attainment impact of preschool are taken from the Perry Preschool program (Belfield et al., 2006). This program classifies the preschool treatment and control groups by educational status at age 40 (i.e., 35 years after preschool). The distribution of attainment for the preschool group was: 23% dropout; 68% high school graduate; 4% some college; and 5% BA plus. In comparison, the distribution of attainment for the control group was: 40% dropout; 56% graduate; 3% some college; and 2% BA plus.[8] We apply this matrix of attainment differences to the proposed program for Hawai'i, taking account of incomes by education level in the state.

Earnings data from the Current Population Survey (CPS) show that—as they leave school—each new graduate will earn significantly more than a high school dropout over the lifetime. These are big differences and a substantial body of research has shown that they are causal and not simply correlations. Many investigations, including those by Rouse (2007) and Carneiro and Heckman (2003), have concluded that the observed differences in earnings across education levels may be interpreted as causal effects from extra education. Economists have compared earnings of twins with different education levels, for example; they have also examined how changes in the law have forced people to accumulate more education. Thus, we can apply these earnings gains as a measure of the private benefits of early childhood education for each marginal graduate.

Table 3 — Education and earnings in Hawai'i

	Annual earnings	*Lifetime PV earnings*	*Gain in lifetime PV earnings over dropout*
High school dropout	$17,460	$245,240	
High school graduate	$26,610	$366,730	$121,500
Some college	$34,950	$490,900	$245,660
BA or above	$65,310	$917,330	$672,090

Notes: Incomes of Persons in Hawai'i, 2003-05. Persons aged 25-80+. Lifetime estimates projected assuming one percent annual productivity growth. Present values (PV) are expressed at age 5, discount rate of 3.5%. Rounded to ten dollars.
Source: Current Population Survey, Annual Social and Economic Supplement, http://www.census.gov/hhes/www/cpstc/cps_table_creator.html

Table 3 shows earnings across four education levels. Data are from the CPS restricted to Hawai'i respondents; to ensure a sufficient sample size, data are pooled from 2003–05 (up-rated to 2008 dollars). More highly educated persons earn significantly more: annual earnings of high school dropouts are $17,460; this compares with $26,610 for high school completers, $34,950 for those who have some college education, and $65,310 for those who complete a four-year college.

Over the lifetime, these educational disparities become very large. Column 2 shows lifetime present value earnings, and the final column shows the net gains over a high school dropout. These differences are substantial: if a student graduates from high school, this is equivalent to an earnings advantage over a dropout of $121,500 (measured at age 5). The gains are even greater for those who progress on to college and complete a BA degree.

Of key interest for this cost–benefit analysis is the additional tax paid over the lifetime. Additional taxes are paid by parents of children in early education who are able to participate in the labor market; but the largest component is the tax paid by the children in subsequent adulthood. These taxes are composed of extra federal income tax, extra state income tax, and extra excise taxes.

Federal income tax payments are calculated based on the average taxes paid at each income level.[9] As the federal income tax is moderately progressive, highly educated persons pay proportionately more tax. Based on incomes by education level in Hawai'i, we calculate the average federal income tax payment as a proportion of income at: 0.105 (dropouts); 0.113 (graduates); 0.115 (some college); and 0.13 (college graduation). We apply these rates to the lifetime income profiles across education levels to calculate lifetime federal income tax payments.

State and local income tax payments are calculated from DBEDT economic analyses for Hawai'i (undated and 2003). These reports yield an estimate that 11% of

incomes are paid in state and county taxes (average of Tables 4, 10, and 11 in the two DBEDT analyses). An alternative estimate based on Tax Review Commission data 2005–07 yields almost exactly the same figure.[10]

Table 4 — Economic benefits in incomes and tax revenues from early education

	Per At-Risk Child	*Per Child (Other)*
Total PV income gains per child	$43,009	$18,129
State PV tax revenue benefits per child	$4,371	$1,994
Federal PV tax revenue benefits per child	$5,776	$2,412

Notes and Sources: See Appendix Table 2. Amounts include parental time to participate in the labor market.

Applying the impact of preschool on attainment, the additional lifetime income per child and the additional state and federal tax payments are reported in Table 4. These tax gains include the gains from freeing up time for families to participate in the labor market. These amounts are substantial. For at-risk children, the total tax revenue benefits almost equal the costs of the program.

4.3 Savings to the criminal justice system

Preschool helps reduce both juvenile and adult crime; it may be because of behavioral changes or it may simply be because higher incomes reduce the pressure to commit crime. This effect of early education on crime is particularly important for two reasons. First, Hawai‘i has a very high rate of incarceration and consequently prison spending: the prison population is over 6,000 persons and annual corrections expenditures are almost $205 million or 4% of total general fund expenditures (Pew Trusts, 2008). Second, minority males are disproportionately incarcerated; this affects their ability not only to support themselves but also their families (Petit and Western, 2004).

Table 5 — Economic benefits for the criminal justice system from early education

	Per At-Risk Child	*Per Child (Other)*
State PV crime savings per child	$7,806	$4,290
Federal PV crime savings per child	$3,845	$1,281

Notes and Sources: See Appendix Table 3.

The crime savings are derived from the impacts of the Chicago CPC program, but with the weighting for at-risk versus not at-risk status of 0.4 applied. The Chicago CPC program generates present value savings of $6,400 per participant in terms of juvenile and adult crimes averted (adjusting for Hawai'i prices and expressed in 2008 dollars).[11] Full information is given in Appendix Table 3.

As shown in Table 5, there are significant present value savings from reduced criminal activity. These amounts are much greater for at-risk children, reflecting both the greater impact of early education and the greater likelihood that such children will become involved in the criminal justice system as juveniles and adults.

4.4 Savings in child health and welfare expenditures

Preschool increases children's health and well-being.[12] These impacts will affect reliance on welfare programs and health support services, especially cases of abuse/neglect (Newacheck and Kim, 2005). Based on the Chicago CPC program impacts and adjusted for spending in Hawai'i, three areas of saving are identified: government-funded child welfare programs, health programs, and state abuse/neglect services. Currently, governments spend large amounts of resource on addressing these key areas of child development. For 2007–09, Hawai'i annually spends $96 million on family health, $69 million on child/adolescent mental health, $31 million on alcohol/drug abuse, and $19 million on community health. This appropriation does not include $458 million for health and $97 million for adult mental health services.

Table 6 — Economic benefits for child health and welfare expenditures from early education

	Per At-Risk Child	*Per Child (Other)*
State PV child health and welfare benefits per child	$1,530	$612
Federal PV child health and welfare benefits per child	$510	$204

Notes and Sources: See Appendix Table 3.

Using the cost estimates from the Chicago CPC, the estimated savings in child health and welfare are also significant. It is also important to note that these savings do not include any savings in adulthood as a result of healthier childhood, even as the lifetime health status is strongly positive correlated.[13]

4.5 Total fiscal benefits of early education

The total fiscal benefits of early education are the sum of the savings to the school system, the Departments of Taxation, the Department of Budget and Finance, as well as government agencies responsible for health, welfare, and child services.

Table 7 — Total economic fiscal benefits from early education

	Per At-Risk Child	*Per Child (Other)*
Fiscal benefits per child (state)	$18,486	$8,074
Fiscal benefits per child (federal)	$10,672	$4,039
Total fiscal benefits	$29,158	$12,113

Notes and Sources: See Tables 1, 3, 4 and 5.

As shown in Table 7, the full set of fiscal benefits is substantial. The benefits per at-risk child are $29,158, and for other children the benefits are $12,113. Benefits are split between the state and federal governments.

4.6 Social benefits of early education

The social benefits of education include the fiscal and private gains, augmented by savings from reduced crime and by increases in economic competitiveness. (We do not include the social value of improved health because of a lack of data.) However, these social costs are hard to estimate precisely and so should be regarded more cautiously.

First, we include the gains (net of taxes) in income for the participants in early education. These gains were already calculated in order to estimate the fiscal benefits (see Appendix Table 2).

Second, the state economic burden from higher crime rates has been estimated: Ludwig (2006) calculates they are 4.5 times larger than the fiscal costs; calculations from research by Miller et al. (1996) yield a factor of 2.5. Following convention, the more conservative ratio is applied here.

Table 8 — Economic benefits to society from early education

	Per At-Risk Child	*Per Child (Other)*
Fiscal benefits per child (state)	$18,486	$8,074
Net income gains per child	$30,602	$11,823
Crime externalities	$29,125	$9,708
Productivity externalities	$11,323	$4,374
Total benefits for Hawai'i	$89,536	$33,979

Notes and Sources: See Table 7 and Appendix Table 2.

Third, reviewing the literature, McMahon (2006) values the economic competitiveness externalities at 37-61% of the total market returns to education. So, if the net private earnings advantage is $1,000, the externality is conservatively $370.[14] Thus, a 0.37 weighting is applied to the net earnings gain.

Table 8 reports the social gains for Hawai'i from early education programs. The first row reproduces the anticipated fiscal benefits to the state government. The second row reports the net earnings accrued. The third row gives the savings to victims of crime derived as a proportion of the fiscal crime savings. The fourth column is the externalities to economic growth. The final row reports the total present value gain to the state as the sum of these four entries.

These social benefits are very large numbers: for at-risk students the social benefits are $89,536 and for other children at $33,979. This reflects two facts: the primary beneficiary of additional education is the individual, and the main burden of crime is on the victim and not the taxpayer. If we applied a social benefit-cost calculus, the case for investments in early education would be compelling.

5. BENEFIT–COST ANALYSIS OF INVESTMENTS IN EARLY EDUCATION IN HAWAI'I

5.1 Fiscal costs and benefits of early education

The return on investments in early education is calculated by comparing the present value benefits and the present value costs. However, because there are multiple agencies involved and because the program is intended for at-risk children initially and then all children, there are many perspectives from which to evaluate the returns.

Table 9 summarizes the fiscal benefit–cost analysis. All the fiscal benefits are summarized for a single age cohort of four-year-olds. The first row reports the total costs (including capital) across each of the ten years and for the fully adopted program

(final row). The second panel reports the fiscal benefits for the state only and for the state and federal government combined. The combination of state and federal benefits represents a full fiscal evaluation, but it may not be appropriate if state taxpayers take a narrow perspective. However, some federal government spending stays within the state, and this component will have direct economic value in terms of jobs created.

The second panel shows the net present values of benefits over costs, assuming a 3.5% discount rate. Critically, these are all positive, meaning that the economic benefits exceed the costs with the exception of one year. Certainly, the net present value for the state under full implementation is almost zero, but this value is based on a calculation that applies conservative assumptions; assumes zero federal dollars spent in Hawai'i; and adopts a narrow perspective for public investments. The conservativeness of the assumptions is considered in detail below, along with sensitivity checks on the benefit-cost ratios.

Critically, only the fiscal benefits to the state are being considered; benefits to individual children and their families are excluded (as are broader statewide impacts and the employment effects of a vibrant preschool sector of the economy). In this respect, the cost-benefit comparison allows us to determine the optimal amount of public funding of preschool. But it is far short of an assessment based on the full benefits.

The final panel of Table 9 shows the benefit–cost ratios. If only the state benefits are counted, the benefit–cost ratio is close to 1; that is, the impact on state finances is neutral. If federal benefits are added in, the benefit–cost ratio rises from between 1.85 and 1.42. This federal plus state number is the more appropriate measure (and is the one typically used in other cost–benefit analyses). So, under full implementation, the benefits are 1.53 times the costs. Regardless of the period of implementation, these full fiscal benefits of investment should exceed the costs. If the net present value each year is counted, these investments from early education would pay for themselves from a fiscal perspective.

Of course, multiple state agencies would share the fiscal benefits. For the Hawai'i Department of Education, the investment in preschool would not pay for itself, but every dollar invested would be offset by significant savings elsewhere in the school system. The Department of the Budget and Finance and the Department of Corrections would also gain significantly from the investment. Importantly, some of the benefits would accrue to federal agencies and not just state agencies: income tax revenues are paid primarily to the federal government, which also funds some criminal justice and health services. The fact that multiple agencies and departments benefit suggests that co-funding is appropriate.

Table 9 — Net fiscal economic gains from investments in early education

	Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Year 6*	*Year 7*	*Year 8*	*Year 9*	*Year 10*	*Full*
Per-child cost C	$18,514	$16,569	$15,800	$17,221	$14,962	$13,781	$12,909	$12,692	$12,368	$12,505	$11,605
Fiscal benefits B:											
State only	$18,486	$18,486	$18,486	$17,445	$16,403	$15,362	$14,321	$13,280	$12,239	$11,510	$11,510
State + federal	$29,158	$29,158	$29,158	$27,453	$25,749	$24,044	$22,340	$20,635	$18,931	$17,738	$17,738
Net present value (B–C):											
State only	$(28)	$1,917	$2,686	$223	$1,441	$1,581	$1,412	$588	$(130)	$(995)	$(95)
State + federal	$10,644	$12,590	$13,358	$10,232	$10,787	$10,263	$9,431	$7,943	$6,563	$5,233	$6,133
Benefit-Cost ratio (B/C):											
State only	1.00	1.12	1.17	1.01	1.10	1.11	1.11	1.05	0.99	0.92	0.99
State + federal	1.57	1.76	1.85	1.59	1.72	1.74	1.73	1.63	1.53	1.42	1.53

Notes: 2008 dollars. Row 1 is from Table 1; cost includes capital. Columns vary according to the proportion of at-risk and not at-risk children enrolled in early education.

5.2 Social costs and benefits of early education

Table 10 shows the returns to investment if a broader social perspective is adopted. This perspective is legitimate if citizens value overall economic well-being and if they care about reducing crime, for example.

Unsurprisingly, early education easily passes a social benefit–cost appraisal: not only are there fiscal benefits, but there are also benefits to the citizens of the state, in terms of reduced crime and positive economic competitiveness. There are also gains in income for the participants; these may be valued independently, if citizens wish to support children's development. The net present values are extremely large. For every dollar invested, the socal gain is almost $7.35 in return in the first year; the benefit-cost ratio falls to 4.17:1 under full implementation.

Table 10 — Net economic gains from investments in early education

	Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Year 6*	*Year 7*	*Year 8*	*Year 9*	*Year 10*	*Full*
Per-child cost C	$18,514	$16,569	$15,800	$17,221	$14,962	$13,781	$12,909	$12,692	$12,368	$12,505	$11,605
Social benefits S	$89,536	$89,536	$89,536	$83,397	$77,259	$71,121	$64,983	$58,845	$52,707	$48,410	$48,410
Net present value (S–C)	$71,022	$72,967	$73,736	$66,176	$62,297	$57,340	$52,074	$46,153	$40,339	$35,905	$36,806
Benefit-Cost ratio (S/C)	$4.84	$5.40	$5.67	$4.84	$5.16	$5.16	$5.03	$4.64	$4.26	$3.87	$4.17

Notes: 2008 dollars. Row 1 is from Table 1, cost includes capital. Columns vary according to the proportion of at-risk and not at-risk children enrolled in early education.

5.3 Sensitivity checks on key assumptions

Projections regarding future costs and benefits clearly depend on the assumptions applied within the model.[15] More conservative assumptions for the benefits will of course lead to lower returns. Above, our approach has been to apply the best available social science evidence and Hawai'i-specific data. Although this evidence and these data are not perfect, they are better than any alternative *ad hoc* assumptions. To test the plausibility of our conclusions further, we apply two approaches: one is to list ways in which the assumptions are conservative or optimistic; in the following subsection we present results from sensitivity tests on key assumptions.

The applied assumptions might be interpreted as conservative in three ways: a "high" program cost is used, some of the benefits are underestimates, and some benefits are omitted. An additional way in which the cost-benefit analysis may be interpreted as conservative is that the emphasis is placed on the fiscal returns and not the social returns (Table 9). Essentially, a fiscal analysis places zero weight on improved economic opportunities for disadvantaged children, or on improved health, or reductions in crime. Yet, support for other public investments (such as roads or sports stadiums) often relies on calculations of social savings (such as time for commuters or extra revenues to merchants).

The cost of the program might be considered as "high" in several respects. First, the duration of the program is full day and full school year, and the estimate of the resources needed for the program are relatively high compared to other state programs. Given a positive correlation between spending and outcomes, the corresponding benefits from this program should be greater.[16] Second, the resource estimate includes capital costs. Finally, zero fees (even from parents in the wealthiest quartile) and zero federal subsidies are assumed in the model. The ELETF Report (2008) recommends that a sliding scale of fees be introduced, but it does not state an explicit scale. Also, other states have used federal funding to support early education programs. On both on equity and efficiency grounds it might be appropriate to levy some fees and or allocate federal monies. Clearly, any fees or federal subventions would sharply increase the benefit–cost ratio.

The benefits from the program are probably underestimated. One of the main benefits is the earnings gain that accrues as a result of more education. Hundreds of studies indicate that more education leads to higher earnings. In fact, Heckman et al. (2008) have recently argued that cross-sectional calculations underestimate the impact of education on earnings over the lifecycle. Also, the trend in earnings premiums associated with education is upward: if recent decades are any guide, more attainment will be associated with even greater returns to education in future decades. Despite aggregate increases in the stock (supply) of education in the workforce, demand appears to be rising even faster. Another way in which the lifetime earnings estimates are too low is that they assume only 1% per annum productivity

growth; projections for social security payments assume a productivity growth rate of 1.6%, which itself is below the average productivity growth rate over the last two decades.

Moreover, our estimates only include the earnings gain from education. But, there are two other important dimensions in the labor market that are influenced by education levels. Employment rates are higher: across the U.S., the Current Population Survey (CPS) shows only 53% of dropouts are employed, compared to 69% of high school graduates. Also, employment-related benefits are more common: only 29% of employed dropouts have pension plans and 21% have health plans; the respective rates for high school graduates are 50% and 41% (Rouse, 2007). Neither of these dimensions is counted in the analysis of the labor market benefits of education. Finally, the CPS (the dataset used here to derived earnings differences) is recognized as underestimating the returns to education: the CPS counts GED-holders as high school graduates, even as GED-holders' skill levels and attainment are closer to those of dropouts (Cameron and Heckman, 1993).

Some of the benefits from education are not included here. Perhaps the main excluded benefit relates to adult health gains associated with more education. Cutler and Lleras-Muney (2006) give an exhaustive empirical review for over 30 separate measures of health, controlling for background characteristics. More education is strongly and negatively associated with almost all conditions of poor health (including heart conditions, strokes, hypertension, high cholesterol, depression, and diabetes, but not cancer) as well as with a range of behaviors that might lead to ill health (such as smoking).[17] Further, higher levels of parental education are associated with better health for children; these intergenerational effects are not counted here either. Other benefits that are not counted in this analysis are: values of parental time not associated with increased participation in the labor market; changes in adult welfare receipt; and employment and output effects in the early education sector.

Finally, we consider how these results may be optimistic. The main in which this would happen is if the program effects were weaker than for other programs. Based on the volume of evidence cited in the Introduction, we have no reason to expect this. The other way in which the results would be optimistic is if there is a very weak relationship between service demand and costs; for example, if a reduction in special education students had no impact on special education spending. Under this logic, however, there would be no point in seeking efficiency gains for any public investments.

On balance, the above results seem much more likely to be conservative than optimistic.

5.4 Sensitivity tests on benefit–cost ratios

We now explore how changing the assumptions changes the benefit–cost ratio. We apply further sensitivity tests to see if the overall conclusion is robust. These tests are derivations of the benchmark case. Appendix Table 4 reports these sensitivity tests in full. We focus only on the fiscal returns because implausibly conservative assumptions would drive the social returns below the program costs. We also note that these sensitivity tests do not cover all of the assumptions referred to in the previous section; and they only make one change for each test.

Test 1U applies an alternative method for calculating taxes. As noted above, we rely on the EDEBT reports for state and county taxes but also find a very similar estimate if we directly calculate only some state and county taxes (specifically income and excise taxes). However, this direct calculation is based on only 78% of total state revenues, so it is possible that tax impacts are being significantly under-counted. The difficulty is in identifying whether these taxes are paid by residents or non-residents. We can calculate a rough estimate of the impact if we assume that residents pay all non-income taxes in the same proportion, including the excise taxes. (This is probably an understatement because non-residents are unlikely to pay much property tax).

Test 2U adapts the benchmark by applying income tax rates from the NBER TAXSIM (Version 8) program. Using the average incomes from Table 3, we calculated the federal and state income tax liabilities for Hawaiian residents. The calculations were performed assuming these residents were filing either as singles or as families with zero spousal income. The latter filing status results in smaller tax liabilities, but even this status yields federal and state tax rates that are higher than those used in the benchmark model.[18] Similarly, an alternative source for tax impacts puts the state tax rate at 11% of incomes, also higher than the rate applied in the benchmark case. If we apply these TAXSIM rates, the tax revenue benefits increase as per model 2U.

Table 11 — Net fiscal gains from investments in early education: Average after full implementation

	Average estimate (benchmark, 1U, 2U, 1L)
Per-child cost C	$11,605
Fiscal benefits B:	
State only	$11,420
State + federal	$18,232
Net present value (B–C):	
State only	–$323
State + federal	$6,627
Benefit-Cost ratio (B/C):	
State only	0.98
State + federal	1.57

Notes: 2008 dollars. Benchmark case from Table 9. See Appendix Table 4 for alternative scenarios.

Finally, test 1L adapts the benchmark but applies a discount rate of 5% instead of 3.5%. The benchmark discount rate is recommended by Moore et al. (2004), and the 5% rate is chosen arbitrarily to reflect a greater weight on present over future consumption.

The average fiscal benefit–cost ratio from the sensitivity tests and the benchmark case is given in Table 11. These figures assume full implementation and so can be compared to Table 9 above. This average ratio shows, by the final year, when all children are participating, the state fiscal benefits are just below the full costs. However, if federal benefits are counted, the net present value of the investment is strongly positive and the benefit–cost ratio is 1.6:1 under full implementation.

6. CONCLUSION

Preschool is a good investment for children. Research shows that high-quality preschool helps children's cognitive growth and enhances their future prospects. The effects are especially strong for minority children from disadvantaged circumstances.

This economic analysis has calculated the cost and benefits of early education for four-year-olds in Hawai'i. These calculations are derived using simple investment appraisal tools to determine whether the stream of benefits outweighs the initial cost. Under reasonable scenarios based on high-quality research, the economic benefits of preschool exceed the costs.

For Hawai'i, a high-quality program to cover all at-risk four-year-old children in the state would cost approximately $12,000 per-child annually. But the benefits of this preschool investment to taxpayers—in the form of higher government revenues and lower spending—would be substantial. Conservatively, these costs are offset by an equal amount of benefits, even if only state fiscal benefits are counted. If federal fiscal benefits are counted, the investment would more than pay for itself. If social benefits are included, the case for investment in early education is compelling.

Of course, preschool is not a panacea. It cannot fully compensate for disadvantage in infancy or childhood; and it may be undermined by inadequate education in elementary and secondary school or by family circumstances. Some preschools will not be as effective as they could be and government oversight is necessary to make sure that all centers are held accountable for providing high-quality programs. Nevertheless, the academic and behavioral advantages of early education are sufficiently large that it represents a solid foundation on which to improve the futures for young children in Hawai'i.

ENDNOTES

1 State-specific data taken from Temporary Early Education Taskforce, 2005, Appendix C at //www.Hawai`i.edu/hepc/ece/ECE_TF_FINAL122105.pdf and the National Institute for Early Education Research Yearbook (2006).

2 The ELETF proposal sets out a five- or ten-year plan to reach full enrollment; but the results of this economic analysis do not depend on the timeframe.

3 Various methods for calculating early education costs across states have been developed by, e.g., Manship et al., 2007; Levin and Schwartz, 2007. Here the costs of a school year - not a calendar year - are applied. Calendar-year costs are reported in ELETF. The academic research has investigated school-year programs and so it is not appropriate to apply calendar year costs when calculating the benefit-cost ratios. There is some evidence that more spending will lead to enhanced outcomes, such that a full-year program may also be a cost-effective investment.

4 Unless stated, state expenditures are taken from the Department of Budget and Finance Supplemental Budget, 2007–09, at Hawai`i.gov/budget/memos/supplementalbudget/default.htm.

5 We exclude consideration of private school students (approximately 37,200 K–12 students in Hawai`i, nces.ed.gov/surveys/pss/tables/table_2004_23.asp). These students have much higher rates of graduation than public school students and the government resource effects are significantly smaller. Also, preschool may cause some students to switch between public and private sectors, reducing the public funding necessary.

6 Average spending per pupil $10,252 (FY2005, doe.k12.hi.us/reports/ Financial-Report05-06.pdf; uprated to 2008 prices using CPI factor of 1.08). Figures for 2007 yield a higher rate of spending per pupil, so our estimates are likely to be conservative.

7 Research literature includes reduction of special education effects of between 6% and 48% (Barnett and Ackerman, 2006); the average effect is 21%, and the CDCP (2002) reports a representative estimate of 12%. We assume annual effects on special education through the K–12 years. Reynolds et al. (2002) find these persistent effects all the way to 8th grade.

8 An alternative approach is to use data from the Chicago Child-Parent Center program. Evidence from Temple and Reynolds (2007) shows that each participant has on average 0.36 years more schooling than a child who did not participate. However, this estimate is based on a survey at age 18–21, i.e. before the end of education for most high school graduates. Therefore, this attainment impact is likely to be a significant understatement.

9 These rates are taken from IRS 2005 data downloaded at www.irs.gov/pub/irs-soi/05in11si.xls.

10 Tax Review Commission Final Report 2005-07 shows the state income tax code is moderately progressive, so more educated persons do pay proportionately more: average state income tax payment as a proportion of income at: 0.0301 (dropouts); 0.0398 (graduates); 0.0441 (some college); and 0.0464 (college graduation) (Report on Hawaii Income Patterns (Individuals 2005), Department of Taxation, State of Hawaii, Hawaii.gov/tax/pubs/05indinc.pdf). These rates are applied to lifetime income profiles across education levels to calculate lifetime state income tax payments. The state General Excise Tax (GET) rate is relatively low, at 4%. However, the tax base is extremely broad, with 90% of Hawai`i's Gross State Product covered by the GET. Hawaii.gov/tax/trc/docs2007/Final%20Report-Appendix%20C.pdf. Therefore, for simplicity we apply an excise tax rate of 3.6% on gross incomes. In addition, selective excise taxes are added, assuming the burden of these is proportionate to the general excise tax. This excise tax is applied as 1.35% of gross incomes. The overall percentage of income paid in tax is just over 10%.

11 Using Census data, Lochner and Moretti (2004) estimate that each additional high school graduate yields present value cost-savings of $12,490. Finally, the Perry Preschool program shows considerable savings in crime costs: Belfield et al. (2006) report present value cost-savings of $49,070 per new high school graduate. The difference between Lochner and Moretti (2004) and Belfield et al. (2006) estimates may be in part because of the additional crimes measured in the latter study. But, these two studies do not include juvenile crime, which is a substantial component of all crime and highly correlated with adult crime.

12 On health, see CDCP (2002); Smokowski et al. (2004). On mental health and child well-being, see Hawkins et al. (2005); Reynolds et al. (2004).

13 These effects are particularly salient because of possible changes to S-CHIP and recent research on investments in children and Medicaid payments (www.brookings.edu/papers/2007/01childrenfamilies_isaacs.aspx).

14 In a review of the cross-country evidence, Pritchett (2006) calculates a very small effect, but his evidence draws upon many countries with very different economic structures from the U.S.

15 These results do correspond with those from an independent study produced for the state of California as well as similar studies done for Ohio and Massachusetts (Karoly and Bigelow, 2005; Belfield, 2005; Bartik, 2006).

16 For example, the predicted spending for Hawai`i exceeds that for all five of the programs found effective in Wong et al. (2008).

17 A literature survey by Grossman (2006) demonstrates the same result, finding that effects estimated by ordinary least squares specifications tend to be lower than those estimated using instrumental variables, especially for those with low levels of education. This suggests that cross-sectional results are probably themselves conservative.

18 Specifically, the federal/state rates are: 15%/3%, dropouts; 19%/4%, graduates; 21%/5%, some college; and 25%/6%, BA or above (calculations for Hawai`i resident filing as married, TAXSIM, Version 8). Single filing tax rates are even higher.

19 A full state tax impact proportion of 11% is reported at www.taxadmin.org/fta/rate/06taxbur.html.

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APPENDIX

Appendix Table 1 — Economic benefits to the education system from early education

		Per At-Risk Child	*Per Child (Other)*
1	Percentage of children	33%	67%
2	Special education (SE) placement	0.2	0.1
3	Change in SE placement after ECE	21%	8.4%
4	State PV extra cost per SE placement	$48,087	$48,087
5	Federal PV extra cost per SE placement	$6,557	$6,557
6	State PV benefit per student (=2*3*4)	$2,020	$404
7	Federal PV benefit per student (=2*3*5)	$275	$55
8	Placement in grade retention (GR)	0.24	0.04
9	Reduction in GR after ECE	25%	10%
10	State PV extra cost per GR	$9,302	$9,302
11	Federal PV extra cost per GR	$1,034	$1,034
12	State PV benefit per sudent	$558	$37
13	Federal PV benefit per student	$62	$4
14	State school system PV benefits per child	$1,841	$737
15	Federal school system PV benefits per child	$205	$82
16	State PV benefits per child (=6+10+12)	$4,419	$1,178
17	Federal PV benefits per child (=7+11+13)	$542	$141

Notes and Sources: All values are present values (PV) at age 5, using a discount rate of 3.5%. All prices are HI prices using CPI and Taylor and Fowler (2006) and expressed in 2008 dollars. [1] Swanson (2004). [2] Calibrated from HI overall K–12 SE rate of 13% (doe.k12.hi.us/reports/ specialeducation/stateperformanceplan/ StatePerformancePlanB0506.pdf). [3] Barnett and Belfield (2006); Barnett and Ackerman (2006). [4] and [5] Present value K–12 calculation. Average spending per pupil $10,252 (FY2005, doe.k12.hi.us/reports/ FinancialReport05-06.pdf; uprated to 2008 prices using CPI factor of 1.08). Extra spending for specific learning disabilities and speech/language impairment based on CSEF (2004) at 1.48 times average spending and email by K. Chee, Budget Specialist, Student Support Services Branch, HI DOE; state spending is 88% of total spending on SE; federal spending is 12% (email by K. Chee, Budget Specialist, Student Support Services Branch, HI DOE; compared to figures of 86% in CSEF, 2004). [8] Calibrated from the national rate of 10% , with rates for at-risk students five times those of other students (nces.ed.gov/ programs/ coe/2006/section3/table.asp?tableID=506; nces.ed.gov/pubs/dp95/97473-5.asp); HI DOE suggests a much lower rate, arch.k12.hi.us/PDFs/nclb/ AYP_Grad-Retention.pdf). [9] Temple and Reynolds (2006). [10] and [11] Average spending per pupil in first grade (see note [4]); state spending is 90% of total; federal spending is 10% (doe.k12.hi.us). [12] Product of rows 6, 7 and 8. [13] Product of rows 6, 7 and 9. [14] and [15] Belfield and Schwartz (2006, Table 10) for costs of teacher compensating wage differentials, turnover, violence prevention, absenteeism, substance abuse prevention, health services. Adjusted to 2008 prices, HI average spending per student. With state spending 90% of total spending; federal spending is 10% (doe.k12.hi.us). Not at-risk students assumed to incur only 40% of benefits.

Appendix Table 2 — Economic benefits in the labor market from early education

		Per At-Risk Child	*Per Child (Other)*
1	Additional parental earnings	$1,543	$1,543
2	State and county income and excise tax revenues from [1]	$170	$170
3	Federal income tax revenues from [1]	$170	$170
4	Additional lifetime income	$41,466	$16,586
5	State education subsidy	–$1,710	–$1,710
6	Federal education subsidy	–$190	–$190
7	State and county income and excise tax revenues from [4]	$4,561	$1,825
8	Federal income tax revenue from [4]	$5,606	$2,242
9	Total state tax benefits (=2+7)	$4,731	$1,994
10	Total federal tax benefits (=3+8)	$5,776	$2,412
11	Net income gains (=1–2–3+4–5–6–7–8)	$30,602	$11,823

Notes and Sources: All values are present values (PV) at age 5, using a discount rate of 3.5%. All prices adjusted to Hawai'i prices using CPI and expressed in 2008 dollars. Benefits for other children are assumed at 40% of at-risk benefits. [1] Average of Temple and Reynolds (2007); Danziger et al. (2004). [2] State and county income and excise tax revenue is 11% of total income (DEBDT, undated and 2003). [3] Federal income tax rate based on average of single filing and household filing, www.irs.gov/pub/irs-soi/05in11si.xls). [4] Lifetime incomes assigned according to column 3 of Table 2 in text with early education attainment differences according to Belfield et a;. (2006). [5] and [6] Calculations assume one additional year of high school, two years of two-year college, and four years of four-year college; with costs of education from Hawai'i DOE. State and federal burdens for education subsidies are 10% and 90% respectively. [7] and [8] see notes [3] and [4].

Appendix Table 3 — Economic benefits on crime, child health, and child welfare from early education

		Per At-Risk Child	*Per Child (Other)*
1	Crime savings per participant	$11,650	$3,883
2	State crime savings per participant	$7,806	$4,290
3	Federal crime savings per participant	$3,845	$1,281
4	Health savings per participant	$610	$244
5	Welfare savings per participant	$880	$352
6	Abuse/neglect savings per participant	$550	$220
7	State expenditure benefits (=4*5*6*75%)	$1,530	$612
8	Federal expenditure benefits (=4*5*6*25%)	$510	$204

Notes and Sources: All values are present values (PV) at age 5, using a discount rate of 3.5%. All prices adjusted to Hawai'i prices using CPI and expressed in 2008 dollars. [1] Temple and Reynolds (2007), calibrated for greater criminal activity of at-risk youth (based on rate for minority males) and greater impact of early childhood education on at-risk youth. [2] and [3] Proportions of criminal justice expenditures sourced at state versus federal level taken from HI Department of Budget and Finance Supplemental Budget, 2007-09 (Hawai'i.gov/budget/memos/~supplementalbudget/default.htm). [4], [5], and [6] Spending rates adapted from Belfield (2005) and Reynolds et al. (2002), adapted for per-child spending in Hawai'i. [7] and [8] State and federal expenditure ratios from HI Department of Budget and Finance, see note [2].

Appendix Table 4 — Sensitivity tests for the fiscal analysis after full implementation

	(1U) Includes all state taxes	*(2U) TAXSIM i9ncome tax calculations*	*(1L) Discount rate of 5%*
Per-child cost C	$11,605	$11,605	$11,605
Fiscal benefits B:			
State only	$11,863	$11,813	$10,495
State + federal	$18,089	$21,679	$15,423
Benefit–Cost ratio (B/C):			
State only	1.02	1.02	0.90
State + federal	1.56	1.87	1.33
Net present value (B–C):			
State only	$258	$208	–$1,110
State + federal	$6,484	$10,071	$3,818

Notes: 2008 dollars. See Table 9 for benchmark.