

**Early Childhood Education:  
How Important are the Cost-Savings to the  
School System?**

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## EXECUTIVE SUMMARY

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Investments in Early Childhood Education can be set with a balance sheet framework, which relates the costs with the benefits. We set out this balance sheet in detail.

We describe the medium-term benefits or cost-savings from Early Childhood Education in: reducing the incidence of special education; preventing grade repetition; improving educational productivity; and enhancing children's well-being.

We estimate the medium-term cost-savings to the state from investment in Early Childhood Education programs. Using conservative assumptions and data from high-quality published studies, we estimate present value cost-savings ranging from \$2,591–\$9,547 per child participating in the program.

We estimate the medium-term cost-savings to New York state from investment in a universal Early Childhood Education program. For each age cohort there will be present value cost-savings of between \$555 million and \$828 million over the period K–12. These figures represent between 1.9% and 2.84% of total expenditures.

We calculate the cost-offset to the school system from investment in universal Early Childhood Education. Between 41% to 62% of an initial investment in Early Childhood Education would be offset by medium-term savings elsewhere in the education system.

Finally, we discuss the medium-term and long-term benefits of investments in ensuring every child obtains a 'sound basic education'.

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# EARLY CHILDHOOD EDUCATION: INVESTMENT FOR THE FUTURE

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Early childhood education (ECE) is an investment. It is one which enhances the lives of the young children involved and has a number of widespread benefits to society in general. This short document outlines the key aspects of this investment, adopting an economic perspective.

An economic appraisal compares the initial costs of an investment with the stream of benefits/cost-savings over time. Each money amount must be expressed in present value terms, from the start of the investment. To offer a complete picture, the entire stream of benefits/cost-savings should be considered, whether these accrue to the child, the family, the state, or society, and whether they are recouped immediately or when the child matures. This picture can be set out in the form of Template Balance Sheet (see Section 2).

In calculating the returns to ECE, our aim here is modest. The focus is not primarily on the academic advantages that ECE may generate for the children who participate, although these gains have been extensively documented in prior studies. Rather, **we focus on the medium-term cost-savings to a state education system from investing in Early Childhood Education.** We review the academic literature on these issues (see Section 3).

Using the published research as a foundation, we then calculate **the medium-term cost-savings to New York state's education system from investing in universal Early Childhood Education** (see Section 4). We employ sensitivity analysis to see how the amount of cost-savings vary, depending on what assumptions are used.

Finally, it is appropriate to set these cost-savings into the full context of education policy. Specifically, we **consider the long-term benefits to a society committed to providing every child with a ‘sound basic education’, with particular focus on New York state** (see Section 5).

Before setting out this investment appraisal, it is important to recognize that early childhood education comes in many forms. The most well-known is Head Start, but ECE may be full-day or half-day; it may include home visits, or center-based programs which involve parents; it may be a summer program or year-round; teachers and centers may be licensed or accredited; programs may be universal or targeted to certain children; and the programs may be short-term or sustained in duration. Throughout this discussion, investment in ECE is assumed to be in a well-resourced, good quality program for a reasonable period of time.

# TEMPLATE BALANCE SHEET

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To offer a full economic appraisal of Early Childhood Education, it is helpful to formally set out the costs and benefits/cost-savings in a Template Balance Sheet. This balance sheet is set out as Figure 1.

The left-hand side of the balance sheet describes the program investment costs, and gives examples of targeted programs which have been provided in various settings. These programs vary in pedagogy and resource usage, but each is intended to improve the educational outcomes of children in early childhood. In some states (e.g. Georgia and Oklahoma) universal pre-Kindergarten programs are offered, with a mix of public and private provision.

The right-hand side of the balance sheet describes the benefits/cost-savings to the different agents involved in ECE. We distinguish three agents – the child, the child’s family, and the society/economy – as recipients of an array of benefits in the short, medium, and long-term. We can think of the short-term as ‘within a few years’, the medium-term as ‘within a decade’, and the longer-term as ‘during adulthood’. Each of the benefits has been established in a number of high-quality research studies, published in peer-reviewed academic journals. (Not every benefit was obtained in each study, however; details for individual ECE programs are given in program-specific citations<sup>1-17,19</sup> and reviews<sup>18</sup>).

The short-term benefits are obtained primarily by the child participant, in terms of improved academic achievement (test or IQ scores), higher quality health (e.g., greater likelihood of being immunized) and nutrition, and lower probabilities of being neglected or abused. The children’s families also benefit, in having more time to enter the labor force. In turn, the society/economy benefits as income tax revenues are boosted.

**Figure 1**  
**Template Balance Sheet**  
**for Early Childhood Education Programs**

Investment Costs	Benefits/Cost-savings
<p>Well-resourced, good quality Early Childhood Education program for a reasonable period of time</p> <p>Examples include:</p> <ul style="list-style-type: none"> <li>▪ Head Start</li> <li>▪ Perry Pre-School Program</li> <li>▪ Infant Health/Development Project</li> <li>▪ Abecedarian EC Intervention</li> <li>▪ Chicago Child-Parent Center and Expansion Program</li> </ul>	<p><u>Short-term:</u></p> <p><i>For child:</i></p> <ul style="list-style-type: none"> <li>▸ Enhanced academic achievement</li> <li>▸ Improved health/nutrition</li> <li>▸ Increased well-being / less abuse</li> </ul> <p><i>For parent/family:</i></p> <ul style="list-style-type: none"> <li>▸ Child-care time free for parent</li> </ul> <p><i>For society/economy:</i></p> <ul style="list-style-type: none"> <li>▸ Income tax revenues from parents</li> </ul> <hr style="border-top: 1px dashed black;"/> <p><u>Medium-term:</u></p> <p><i>For society/economy:</i></p> <ul style="list-style-type: none"> <li>▸ Greater school system efficiency: <ul style="list-style-type: none"> <li>–Reduction in special education</li> <li>–Reduction of grade repetition</li> <li>–Higher student learning productivity</li> </ul> </li> <li>▸ Reduction in abuse/neglect</li> <li>▸ Lower reliance on public healthcare</li> </ul> <hr style="border-top: 1px dashed black;"/> <p><u>Long-term:</u></p> <p><i>For child:</i></p> <ul style="list-style-type: none"> <li>▸ Higher likelihood of graduation/colleegenrollment</li> <li>▸ Higher wages/employment probability</li> <li>▸ Lower teen-pregnancy/delinquency</li> </ul> <p><i>For society/economy:</i></p> <ul style="list-style-type: none"> <li>▸ ‘Sound Basic Education’</li> <li>▸ Increased income tax revenues</li> <li>▸ Lower welfare dependence</li> <li>▸ Reductions in delinquency/crime</li> </ul>

*Notes:* For studies which report these items, see citations [1]–[19].

Research on universal programs shows positive impacts with respect to the short-term benefits of children's cognitive development. Using a regression discontinuity method for universal pre-K in Oklahoma, researchers estimate an average gain in overall test scores (language and cognitive skills) of 16%. These effects are especially evident for African American and Hispanic students, and for students who are free-lunch eligible.<sup>19</sup> Similarly positive – but not as powerful – academic effects are found in evaluations of the universal pre-K provision in Georgia.<sup>13</sup>

These short-term benefits to the child represent a foundation for benefits later on. The second panel of the Template Balance Sheet itemizes the benefits and cost-savings in the medium-term. (Some of the short-term benefits to the child may also persist into the medium-term). **These medium-term benefits to the school system are important in making a case for universal early childhood programs.** For the school system there are efficiency gains in three important domains. These cost-savings arise from:

- Reductions in special education
- Reductions in the incidence of grade repetition
- Improvements in learning productivity within the classroom and the school

The first two cost-savings are readily established. The third benefit is obtained because students who have enhanced academic achievement will be easier to educate and because these students now engender a more positive peer effect in promoting learning within the classroom. We pay particular attention to this last benefit, although all three benefits to the school system are considered in detail below. (Additional medium-term benefits are obtained for welfare services, where there is a lower incidence of abuse or neglect to respond to, and where there is less reliance on public healthcare provision).

There are longer-term benefits from investment in ECE, and these are itemized in the right-hand side bottom panel of the balance sheet. Again, there are strong benefits to the participant as a result of improved school performance throughout childhood. These benefits include: graduation, with an increased possibility of college enrollment; labor market gains, such as higher wages or employment probabilities; and

social advantages, such as lower rates of teen pregnancy and less involvement in the criminal justice system.

In addition, there are widespread spill-over effects for society and the economy. Broadly, we can think of these benefits as ones that should be created by equipping citizens with a ‘sound basic education’. Such an education not only improves the economic well-being of the individual child, but it has broader impacts for citizens across the state. Individuals may participate more in civic and social activities (e.g., voting or joining volunteer groups); and these may enhance the quality of life in the community. For the government Treasury, there are longer-term benefits from higher income tax revenues and cost-savings from lower welfare and public assistance payments and from reduced budgets for policing and the justice system.

This Template Balance Sheet can be used to account for all the benefits from investment in ECE. Cost-benefit ratios can be calculated. Each benefit can then be investigated, while maintaining an overall perspective of its importance in comparison to other benefits and in justifying the costs of investment.

Several studies have been undertaken which utilize this balance sheet approach to assessing the economic importance of ECE. Each of these studies show benefits which outweigh – by a considerable margin – the costs of the program. These studies have been reviewed elsewhere, so only a brief summary is offered here:

- **Perry Pre-School Program**  
Evaluation of this program shows that for every \$1 investment, \$2.54–\$8.74 was recouped in terms of benefits over the entire period.<sup>17</sup>
- **Head Start**  
Costing exercises for a large-scale version of this program have focused on the short-term and medium-term benefits. It is estimated that just these benefits alone would be enough to offset 40-60% of the total costs.<sup>1</sup>

- **Abecedarian Early Childhood Intervention**

Evaluation of this program indicates that for every \$1 investment, between \$2–\$3.66 was recouped in terms of benefits over the entire period. The internal rate of return to this intervention is of the order of 7%.<sup>3</sup>

- **Chicago Child-Parent Pre-School Center and Expansion Program**

Evaluation of this program indicates that for every \$1 investment, \$7.14 was recouped in benefits.<sup>4</sup>

In each case, the child and family were net beneficiaries from participation in ECE programs. (Also, each of these programs was targeted and not universal). Importantly, the largest proportion of the benefits was obtained by the ‘society/economy’, in the form of medium-term and long-term cost-savings.

# MEDIUM-TERM COST-SAVINGS

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Here, we report a range of estimates of the medium-term cost-savings to the society/economy from investment in Early Childhood Education. (For simplicity, no distinction is made between federal, state, and local government financing responsibilities).

We focus on cost-savings which arise from increased efficiency in the school system, such as reductions in special education and grade retention, and improvements in learning productivity. Such medium-term cost-savings are important to government agencies (Departments of Education), which need to consider the impact of ECE programs on their overall expenditures, particularly within a narrow time frame.

Below we review published studies which have attempted such calculations for targeted ECE programs. Table 1 reports published estimates from four separate studies. The studies are listed in column 1. The calculation method is as follows. For each cost-saving, we follow a two-step procedure to calculate: (a) the size of the effect (e.g. in lowering special education rates) from participation in ECE; and (b) the per-child cost-saving. We multiply these amounts together. For each study, we report in column 2 the impact of participation in ECE programs, and the respective unit-cost savings. All money figures are in 2003 dollars and are expressed in present value terms.

### *3.1 Cost-savings in Special Education*

The main medium-term impact of ECE is the reduction in the incidence of special education.<sup>1-4,7,9,12</sup> Review of this literature indicates that reductions in the incidence of special education range from

**Table 1**  
**Estimates of Medium-Term Cost-Savings to State**  
**from ECE Programs**

Source	Calculation of Cost-saving	Cost-saving per Child in ECE Program
<b><u>Special Education (SE):</u></b>		
[1]	SE falls by 28%, from 12% to 9%; SE costs \$9,040 extra for 11 years; $d=5\%$	\$2,060
[7]	SE falls by 40%, from 25% to 15%; SE costs \$5,971 extra per year; $d=3\%$	\$4,744
[12]	SE falls by 43%, from 28% to 16%; SE costs \$14,335 extra per year; $d=5\%$	\$7,996
<b><u>Grade Repetition (GR):</u></b>		
[1]	GR falls by 28%, from 20% to 14%; GR year costs \$6,780; $w=0.6$ ; $d=5\%$	\$193
[7]	GR falls by 39%, from 38% to 23%; GR year costs \$4,494; $w=1$ ; $d=3\%$	\$785
<b><u>Special Education + Grade Repetition:</u></b>		
[3]	SE falls by 25%, from 33% to 25%; SE costs \$9,720 extra per year; $d=5\%$  GR falls by 44%, from 43% to 24%; GR year costs \$7,405; $d=5\%$	\$5,987
<b><u>Abuse / Neglect (AN):</u></b>		
[7]	AN falls by 50%, from 10% to 5%; AN costs \$10,113; $d=3\%$	\$338
<b>TOTAL COST-SAVINGS PER CHILD</b>		<b>\$2,591 – \$9,547</b>

*Notes:  $d$  denotes discount rate applied.  $w$  denotes weighting of benefits from repeating a year. Economic values are in 2003 dollars.*

6% to 48%, with a representative estimate of 12%. The three studies in the top panel of Table 1 show a reduction in special education of 28%, 40%, and 43% from educational settings where the initial incidence of special education is 12%, 25%, and 28%, respectively.

Cost-savings to the state from pre-K programs come from reduced spending on special education.

Critically, special education programs are resource-intensive: most recent national estimates indicate that such students obtain 1.9 times as much resources as students in regular education programs. The three studies in the top panel of Table 1 assume that special education students require between \$5,971 and \$14,335 per year in additional educational resources. However, some of these costs are incurred many years later, e.g. when the student is in special education in, say, 10<sup>th</sup> grade. It is therefore necessary to discount costs incurred in later years relative to costs incurred now.

The final column presents the results of these calculations. The cost-saving per child from participation in an ECE program is estimated at between \$2,060 and \$7,996. This is clearly an important cost-saving from ECE programs.

### *3.2 Cost-savings in Grade Repetition*

The second medium-term impact of ECE is the reduction in grade retention.<sup>1,3-5,7</sup> Review of this literature indicates reductions in the incidence of grade repetition range between 6% and 23%, with a representative estimate of 21%. As shown in column 2 of Table 1, the two available studies assume reductions of 28% and 39%, from school systems where the grade repetition rates are 20% and 38%, respectively.

Unit-costs of grade repetition are assumed between \$6,780 and \$4,494. (Typically, students repeat first grade). However, some students may benefit from being retained, so one study weights the benefits only by a factor of 0.6.

The middle panel of the final column in Table 1 shows the published estimates of the cost-savings from reducing grade repetition. These amounts are reasonably sized, ranging from \$193–\$785 per child.

### *3.3 Cost-savings in other Domains*

Using very similar methods, the third panel reports on one study which calculates the combined cost-savings from special education and grade repetition. These amount to \$5,987 per child, which is broadly in the range of the other studies which conducted separate analyses.

In addition, our review of the literature showed one estimate of the cost-savings from reduced abuse/neglect. For completeness, we report this estimate in the fourth panel of Table 1. These cost-savings have been estimated at \$338.

### *3.4 Cost-savings from Improved Learning Productivity*

We are not aware of any study that traces the impact of learning productivity on the costs of schooling, and then links this to ECE programs. This is surprising, given the strong effects of ECE on students' academic achievement: where students enter school better prepared academically, one would expect this to increase the efficiency of the school in educating those children.

Box 1 outlines the main pathways through which increases in learning productivity should translate into cost-savings for a school system. There will be classroom and school-wide consequences.

If children are better prepared for school, they will learn more efficiently and effectively. This reduces the pressure on school resources and budgets.

More able students should perform more capably in the classroom, leading to more efficient teaching and use of curriculum materials (as well as raising the satisfaction levels of teachers where students are less disruptive). An important impact of a universal program, however, is

**Box 1**  
**Increased Learning Productivity and Cost-Savings**  
**from Universal Early Childhood Education**

**Positive Impact of Early Childhood Education on School Behaviors**

**Cost-Savings for the School**

In the classroom:

Individual student impacts:

- Academic proficiency → *More efficient teachers/instructors* (less down-time/remediation, more instruction time)
- Classroom contributions
- Responsiveness to instruction

Peer impacts:

- Peer-learning interactions → *More satisfied teachers/instructors* (less tension / more control over class conditions)
- Peer norms and values toward study / education → *More efficient use of curriculum materials* (care of books, equipment, learning instruments)

In the school:

- Behavior in school → *Slower depreciation of physical capacity* (less vandalism, wear and tear)
- *Lower maintenance expenditures* (policing/custodial/supervisory tasks)
- Attendance rates → *More efficient administration system* (fewer truancy/absenteeism investigations, more accurate attendance keeping)
- Well-being / safety in school → *More efficient school management* (less time arbitrating disputes)
- *More efficient student counseling systems* (less time on student welfare issues)

that, with a critical mass of better prepared students, there will be peer effects. Simply, more able students enhance the learning of their classmates (e.g., by not interrupting or disrupting class discussions). These effects are well-established: peers influence the aspirations, values, and learning abilities of their classmates. For example, a third-grader in a class where the average student scores 1 point higher posts a math/reading score which is 0.6 points higher.<sup>20</sup> (See Appendix 1 for further discussion). Thus, classes with more prepared and motivated students will have higher learning productivity. The result will be more efficient and satisfied teachers – spending more time on educational matters and less on ‘crowd control’, remediation, and preservation of order – and better use of curriculum materials. The impact on teacher efficiency is especially important because payments to teachers are the largest component of the schools’ budget.

Box 1 also itemizes the impacts of better prepared students on school behavior, attendance rates, and their well-being and safety. These are all aspects of the educational process which require resources. As examples, if there is less vandalism, then costs of building maintenance are reduced, and if students are more obedient, principals will spend less time on disciplinary matters.

In summary, gains in learning productivity are likely to reduce pressures on instructional budgets (e.g. teacher salaries) and managerial expenditures. And, these gains will accrue particularly for universal programs where there are more peer effects.

### *3.5 Overall Medium-term Cost-savings*

We can add up each of the cost-savings in Table 1. **In summary, estimates of the medium-term cost-savings to the state from investment in ECE programs range from \$2,591–\$9,547 per child participant.** This cost-saving is the sum of the cost-savings from reductions in special education, grade repetition, and abuse/neglect. It represents the amount by which expenditures of public dollars would be reduced over the full schooling period of each child. Insofar as it does not include the benefits to educational productivity within the classroom because of better prepared students and peer effects, it is likely to be a

conservative estimate. (Set against these cost-savings are the additional expenditures arising from students staying in school for longer. However, where these expenditures are incurred, they serve to improve outcomes as well; they are not simply additional costs).

# MEDIUM-TERM COST-SAVINGS FOR NEW YORK STATE

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Estimates in the previous Section are based on studies of targeted programs in particular local settings. To some extent, these estimates reflect a representative expected cost-saving only for targeted ECE programs. Here, we build on this evidence to estimate a set of cost-savings specific to New York state from universal ECE provision.

New York state may be expected to benefit *more* from ECE programs than would be inferred from a nationally representative study. It has higher rates of special education placement and grade retention than the national average, and higher costs. For example, the incidence of special education is higher in New York state: the public school proportion is 15.3%, compared to the national average of 13.2%.<sup>21</sup> New York state special education students are less likely to be placed in mainstream settings. Also, average per-pupil spending on each year of regular education is approximately \$9,000–\$11,010, considerably higher than the national average of approximately \$7,500.<sup>22</sup> In turn, per-pupil spending on special education in New York state is proportionately higher, at between \$14,400–\$20,919.<sup>23</sup> These factors would lead us to expect greater cost-savings in New York state.

In contrast, because the effects reported in Table 1 are for targeted programs they are likely to *overstate* impacts of a universal program. For example, the starting rates of special education for participants in the Abecedarian Early Childhood Intervention were 43%, considerably higher than any state-wide proportion.

To provide an indicative estimate of the impacts for New York state, we therefore follow the methods applied in Table 1 but use New York

state data where available. To take account of the possible overstatement (from using impacts from targeted programs), we use much more conservative estimates of the impacts on special education and grade repetition.

#### *4.1 Cost-Savings for New York State*

To accurately estimate cost-savings, we compare an entire state education system without ECE programs to one with a universal ECE program. In modelling, it is important to be cautious in our assumptions and to apply sensitivity analysis. Therefore, we report two different models which assume ECE impacts as {1} ‘conservative’ and {2} ‘representative’. The likely cost-savings will be somewhere within this range; they are unlikely to be below these amounts.

Table 2 details the calculation of medium-term cost-savings for New York state education budgets. We assume a cohort of students entering kindergarten in 2003. The first column of numbers indicates New York state expenditures if there is no universal ECE.

We compare the budgets of an education system with universal pre-K to a system without pre-K.

The savings from pre-K investment amount to \$555 million to \$828 million.

The second two columns are the estimated expenditures if there is universal ECE. Cost-savings are calculated over the duration of K–12 education. Again, present value amounts are used and money values are expressed in 2003 dollars (and no distinction is made between government branches).

The top part of Table 2 describes New York state education’s system. Each year there are 240,180 students entering kindergarten. (We assume that only 75% of these children attend kindergarten, but then 100% progress into first grade). Depending on which track these students follow, they will receive present value expenditures over the next 12 years of: \$108,431 if they do not repeat a grade or receive special

educational services; \$114,520 if they do repeat a grade but do not receive special educational services; or \$185,593 if they receive special educational services. These costs are based on data from the NY State Department of Education.<sup>23</sup>

Without ECE programs, 68.2% of students are in regular classes, 16.5% of students are in regular classes but repeat a grade, and 15.3 of students are in special education classes (based on NY state data). From these proportions, we calculate the present value expenditures on this cohort as \$29,120 million over K–12 schooling.

With the introduction of universal ECE programs, there are three impacts: students are less likely to be in special education or repeat a grade, and they are likely to be more productive as learners. Two models are used. (Rounded numbers are used in the expositions; for the calculations we use numbers to 6 decimal places).

**{1} The Conservative Model.** This model uses the impacts from Table 1 to estimate the fall in grade repetition and special education. As noted earlier, these impacts are high, because the programs are targeted. So, we assume that a universal impact would only be one-quarter as large as the average of the impacts from Table 1. Grade repetition is assumed to fall by 9.25%, leaving only 15.0% of New York state students repeating a grade. Special education is assumed to fall by 8.5% to 14.0%. As shown in the middle panel of Table 2, this means 71% of students are in the regular track. Finally, we assume that the improvement in learning productivity generates only a 1% cost-saving of the total educational budget.

**{2} The Representative Model.** This model uses the representative impacts from summary reviews referred to in Section 2. Grade repetition is assumed to fall by 21%, leaving only 13.0% of New York state students repeating a grade. Special education is assumed to fall by 12%, resulting in 13.5% of students now in this category. These impacts leave 73.5% of students in the regular track. And, we assume the improvement in learning productivity generates a 1.5% cost-saving system-wide.

**Table 2**  
**Estimates of Medium-Term Cost-Savings**  
**from Universal ECE Programs for New York State School System**

	Cohort Entering Kindergarten		
	Without ECE	With Universal ECE Programs	
		{1} Conservative Model	{2} Representative Model
Students entering kindergarten	240,180	240,180	240,180
<b>PV K-12 Cost Per Student In:</b>			
Regular education (non-repeater)	\$108,431	\$108,431	\$108,431
Regular education (repeats 1 grade)	\$114,520	\$114,520	\$114,520
Special education	\$185,593	\$185,593	\$185,593
<b>Students Per Category (%):</b>			
Regular education (non-repeater)	68.2	71.0	73.5
Regular education (repeats 1 grade)	16.5	15.0	13.0
Special education	15.3	14.0	13.5
<b>PV K-12 Total Expenditure (\$ million):</b>	\$29,120	\$28,856	\$28,729
<b>PV Cost-Saving (\$ million):</b>			
Reduction in grade repetition		\$22.32	\$50.68
Reduction in special education		\$241.02	\$340.26
Increase in learning productivity		\$291.20	\$436.80
<b>TOTAL PRESENT VALUE COST-SAVING (\$ million)</b>		<b>\$554.54</b>	<b>\$827.74</b>
<b>COST-SAVING AS % TOTAL EXPENDITURES</b>		<b>1.90%</b>	<b>2.84%</b>

*Notes: PV indicates Present Value figures, discounted over the child's educational span from K-12 at a discount rate of 3%. Economic values are in 2003 dollars.*

It is important to note that all these assumed impacts are considerably below the observed impacts identified in Table 1.

Investment in pre-K may generate savings later on in a child's education.

Thus, these calculations are not open to the charge of overstatement. Unfortunately, cost-savings from enhanced learning productivity are the hardest to estimate, because there is no prior literature on impacts (or cost-savings) traceable to ECE programs. The main anticipated saving would be in instructional expenditures. Ideally, we would use an estimate of the salary premium that must be paid to teachers who – holding all other things constant – work in low-achieving schools. However, in practice there is no straightforward link between the characteristics of the students and a teacher's pay.<sup>26</sup> Teachers' salaries vary little whether the students are high or low ability. Rather, lower-qualified teachers are typically found in lower-performing schools. And, more efficient schools receive greater funds; this makes high-ability classes look more expensive.<sup>27</sup> Notwithstanding, teaching students who are better behaved and better prepared academically can be thought of as a 'fringe benefit' which would otherwise have to be paid as salary. (See Appendix 2 for further discussion of the link between costs and student preparedness).

We trace through the implications for total expenditures from the different student compositions as a result of ECE programs. The difference in total expenditures between the first column and the columns for models {1} and {2} represents the cost-savings to New York state. The impact of lower grade repetition is to generate cost-savings of between \$22.32 million and \$50.68 million. The impact of reduced special education is to generate cost-savings of between \$241.02 million and \$340.26 million. Gains in learning productivity amount to between \$291.20 million and \$436.80 million.

Adding up these individual cost-savings, we report that **with a universal ECE program a present value amount of between \$554.54 million and \$827.74 million would be saved from these expenditure**

**items.** When we express these cost-savings as proportions of total expenditures they amount to **between 1.9% and 2.84% of total expenditures.**

**Table 3**  
**Cost-Benefit Calculations from Universal ECE Programs**  
**for New York State School System**

Investment Costs	Benefits/Cost-savings
Children: 240,180 Participation rate: 80% Per child cost for 1 year of ECE: \$7,000	<u>Short-term:</u> For child, parent/family, society/economy ----- <u>Medium-term:</u> For society/economy from greater school system efficiency: <i>Present value cost-saving</i> \$554.54 million – \$827.74 million  <i>Offset against expenditures</i> = 41.23% – 61.54% -----
<i>Present value total expenditures</i> \$1345.01 million	<u>Long-term:</u> For child, for society/economy

The above calculations show positive cost-savings from investments in good quality, universal ECE programs, but only refer to the medium-term cost-savings to state budgets. They do not take account of the costs of ECE programs, nor do they assess either the short-term benefits to the child, or the medium-term benefits to welfare services, or the long-term benefits to society. Also, they are based on conservative assumptions about impacts. In these respects, the estimates should be considered merely as a guide to the value of investment in ECE from the perspective of a state Treasury.

Of course, these gains are only incurred after a substantial investment has been made into Early Childhood Education programs. The net economic impact of ECE therefore needs to be substantiated. Table 3 sets this full cost-benefit calculation into context, using the Template Balance Sheet. Again, we assume a cohort entering kindergarten in 2003.

Table 3 shows on the left-hand side the present value expenditures for a one year ECE program costing \$7,000 per child. (This figure is based on downward extrapolation of costs in 1<sup>st</sup> grade and kindergarten). If 80% of families are assumed to participate the total expenditure is \$1,345 million. To set against this investment are the short-, medium-, and long-term benefits. All that we have estimated here are the medium-term cost-savings from greater school system efficiency, of \$554.54–\$827.74 million.

Notwithstanding, **these medium-term cost-savings offset between 41.23% and 61.54% of the total expenditures on ECE programs.** In other words, any commitment to universal ECE should require only a moderate total investment. Between two-fifths and three-fifths of the commitment would be recouped from redistribution of resources which would no longer be required as part of other education programs.

# LONG-TERM BENEFITS: A ‘SOUND BASIC EDUCATION’

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Above, we have set out the fundamental components of an investment appraisal for Early Childhood Education programs in the form of a Template Balance Sheet. Published research indicates that targeted programs represent a powerful investment which yields high returns to children and society. At the school level, these returns come in the form of lower special education placements, lower grade repetition, and enhanced learning productivity. Per affected child, these impacts are powerful. When we look at New York state, we find that there are also important medium-term benefits from ECE programs; these benefits represent cost-savings of around 1.9%–2.84% of total educational expenditures. Finally, we compare these savings to the investment outlay for ECE: roughly, between two to three fifths of the investment by the school system would be recouped by savings elsewhere.

In this Section, we set the ideas embodied in the Template Balance Sheet and reflected in the above calculations within the broader context of state education policies. We focus on New York state, where there are a number of pertinent issues.

First, New York state is mandated to provide each student with a ‘sound basic education’. As established in the New York Supreme Court decision of 2001 in *Campaign for Fiscal Equity (CFE) vs the State of New York*, this **‘sound basic education’ refers fundamentally to the outcomes that students obtain**, not merely to issues of resource or input sufficiency. Educational programs must be justified insofar as they do actually generate the types of benefits set out in the Template Balance Sheet. Given their strongly positive impacts on children’s cognitive

development and educational achievement, ECE programs are an important way to satisfy the mandate of a ‘sound basic education’.

Second, a **‘sound basic education’ is intended to cultivate productive citizens**, i.e. to foster both their individual and public capacities. As expressed in *CFE vs. the State of New York*, “Beyond voting and jury service, productive citizenship implies engagement and contribution in the economy as well as in public life”. This connotes both private and societal consequences. As is evident from the Template Balance Sheet, ECE programs have impacts on both individual and social capacities in the long-term. Through higher attainment and enhanced labor market prospects, ECE programs can help children to develop into economically independent adults. Through changes in teen pregnancy rates and delinquency probabilities, the individuals’ social orientation is affected. And through lower welfare dependence and reduced burdens on the criminal justice system, there are broader gains for society as a whole. In fact, in the case of the Chicago Child-Parent Center Programs these longer-term benefits are estimated to be over twice as large as the medium-term cost-savings. Similarly, estimates for the Perry Pre-School Project indicate that the social returns are considerably greater than the private ones, with longer-term benefits included.<sup>17</sup>

Third, even where additional funding is made available, there is still a critical question as to where to allocate these funds. Economic reasoning suggests that such funds must be allocated to educational programs which yield the highest rate of return. The Template Balance Sheet establishes a framework against which all educational investments can be compared before resource allocations are decided.

These decisions are critical, because recent legislation and policy developments indicate that **an increase in financing may be necessary, so as to ensure that each child has adequate resources for a ‘sound basic education’**.<sup>28</sup> If funding amounts are increased, then cost-savings from ECE programs may be higher than estimated above: as the per-student expenditures on special education and grade repetition are adjusted upwards, then the cost-savings from reducing their incidence correspondingly rise.

In conclusion, whether funding is increased or not, there should be a strong incentive to make investments which – besides the many benefits to children, their families, and taxpayers – also yield substantial cost-savings to the education system.

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## APPENDICES

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### Appendix 1: Peer Effects

A key assumption in the model is that peer effects exist. Early students show a clear positive association between peer ability and own achievement: Summers and Wolfe (1977) report increases in 6<sup>th</sup> grade test scores with a higher proportion of high-achieving students in the class; Henderson et al. (1976) find a positive impact on individual math scores from increases in the mean ability of students in the class.

This relationship between peer quality and own performance has been found repeatedly in subsequent studies. This evidence base includes analysis: from specific educational programs, e.g. METCO in Boston (Angrist and Lang, 2002); within schools (Betts and Shkolnik, 1999a; Zimmer, 2003); across districts (Glewwe, 1997); and within higher education institutions (Sacerdote, 2001; Zimmerman, 2002). A range of methods (correlational, random assignment, and fixed effects), datasets, time periods, and functional forms have been applied (see Arnott and Rowse, 1987; Betts and Shkolnik, 1999b). For ethnographic evidence, see Ogbu (2003). International evidence yields similar conclusions (McEwan, 2003; Zimmer and Toma, 2000; Robertson and Symons, 2003).

The most recent evidence from schools indicates strong peer effects on learning. As examples for US schools:

- Hanushek et al. (2003) find a 0.1 standard deviation increase in peer average achievement leads to an increase in own achievement of 0.02 standard deviations.
- Hoxby (2000) finds a third-grader in a class where the average student scores 1 point higher posts a math/reading score which is 0.6 points higher.

These results indicate that, where all students improve as a result of universal pre-K, there will be a significant spill-over effect in terms of enhanced outcomes from peer effects. The precise magnitude of peer effects will vary across classes and schools, so a conservative approximation is used for this study.

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## **Appendix 2: Cost Functions and Student Achievement**

It is assumed that a school which enrolls better-prepared and more proficient children will be more efficient and be able to reduce the financial pressure on some expenditure items. Of particular interest is the impact of better-prepared students on the teaching profession, because teachers make up the single largest component of a school's expenditures.

However, school systems allocate resources according to historical formulas and in some cases according to need and ability. High ability students may be located in wealthier communities which allocate more funds to schooling. Therefore, it is very difficult to identify the saving from having a more able student cohort.

Analysis of school budgets in New York state shows very little difference in the amount of and patterns of expenditures of high-performing versus low-performing schools (see Rubenstein and Iatarola, 2001). At most, the difference appears to be that high-performing schools allocate proportionately more of their resources outside the classroom than low-performing schools do.

Similarly, analysis of teacher salaries in New York state shows very little difference between teachers' pay in high-performing schools versus low-performing schools (Lankford et al., 2002). Also, econometric investigation is extremely weak at explaining the variance in teachers' salaries in terms of the characteristics of the school or students (Boyd et al., 2003). Teacher pay is often set through collective bargaining, based on experience and credentials (Ballou and Podgursky, 1997). Empirically, it is hard to estimate the compensating wage differential needed to attract teachers to work in schools with lower-performing students.

One area where there is evidence of school quality on teachers is the relationship between job conditions and teacher tenure or turnover (Mont and Rees, 1996; Stinebrickner, 1998; Theobald, 1990; Theobald and Gritz, 1996). Where the conditions for teaching are worse, teachers are strongly motivated to leave the profession (or exit to a more desirable

school). High teacher turnover is one example of inefficiency caused by under-prepared students: hiring costs are non-trivial and on-the-job training is also costly; as well, losing a teacher means losing site-specific capital (such as knowledge of how the school operates). Thus, we assume that there will be savings in turnover costs when the students are better-prepared for school and so where working conditions are better. A precise estimate of this efficiency gain is not possible, so a conservative impact is assumed in the models.

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