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The Economics of Investing in Universal Preschool Education in California

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Preface

There is increased interest in California and other states in providing universal access to publicly funded preschool education for one or two years prior to kindergarten entry. In considering such a program, policymakers and the public focus on the potential benefits from a universal preschool program, as well as the estimated costs. This study, conducted by RAND Labor and Population, a unit of the RAND Corporation, aims to inform such deliberations by conducting an analysis of the economic returns from investing in preschool education in the state of California. Specifically, we focus on the following two questions:

- What are the expected direct costs and benefits for the public sector and society as a whole of implementing a high-quality universal preschool program in California?
- What are the other potential indirect economic and noneconomic benefits for California that may be associated with such a program?

The analysis builds on prior research at RAND on the costs and benefits of early childhood programs, and it draws on other related studies that have examined the economic returns from preschool programs. The analysis is tailored, as much as possible, to account for the California context in terms of demographics, costs of public-sector programs and services, and other aspects of the California economy.

Funding for this project was provided by The David and Lucile Packard Foundation as part of their "Preschool for All" program. This

study should be of value to decisionmakers in the public and private sectors, as well as the public more generally, who are interested in the returns to society and other stakeholders from investing in preschool education in California and throughout the United States.

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Summary

Research has shown that well-designed early education programs serving disadvantaged children in the year or so prior to kindergarten entry can generate benefits to government and the rest of society that outweigh the costs of the program services. As a result of this evidence and the conviction that children benefit from structured programs preparing them for school entry, enthusiasm for public-sector investment in preschool education has been growing among business leaders, policymakers, and the public.

Within this context, there is growing interest in universal preschool education in California. In considering such a program, policymakers and the public focus on the potential benefits from a universal preschool program, as well as the estimated costs. This study aims to inform such deliberations by conducting an analysis of the economic returns from investing in preschool education in California. In particular, we focus on two questions:

- What are the expected direct costs and benefits for the public sector and society as a whole of implementing a high-quality universal preschool program in California?
- What are the other potential indirect economic and noneconomic benefits for California that may be associated with such a program?

We summarize our analysis here. After a brief overview of the status of preschool education in the United States, we review the research on the benefits of preschool education so that we can infer potential

benefits a high-quality universal program would generate in California. We then present our benefit-cost analysis and consider other economic benefits, as well as noneconomic benefits, from such a program. We conclude with the implications for policy. With respect to our two questions above, our key findings are as follows:

- Using our preferred assumptions, a one-year high-quality universal preschool program in California is estimated to generate about $7,000 in net present value benefits per child for California society (public and private sectors) using a 3 percent discount rate. This equals a return of $2.62 for every dollar invested, or an annual rate of return of about 10 percent over a 60-year horizon.
- Assuming a 70 percent participation rate in the universal preschool program, each annual cohort of California children served generates $2.7 billion in net present value benefits to California society (using a 3 percent discount rate).
- These estimates from our benefit-cost model are sensitive to assumptions about the distribution of benefits that accrue to more- and less-disadvantaged children from participating in a high-quality preschool program. When we consider a range of assumptions from the more conservative to the less conservative (where our baseline results above fall in between), we find that California is estimated to gain at least two dollars for every dollar invested and possibly more than four dollars.
- Our estimates of benefits to society are likely understated because we do not account for some potential benefits due to data limitations. These include reductions in the intangible costs experienced by victims of child maltreatment and crime, improved health and well-being of preschool participants, and the potential intergenerational transmission of favorable benefits. When we incorporate the best available estimates of intangible victim costs, net present value benefits increase nearly 50 percent for California society and 36 percent for U.S. society, and the rate of return increases about 3 percentage points.
- Other potential economic and noneconomic benefits to California are not incorporated in the benefit-cost analysis. Broader

benefits from investing in a universal preschool program include near-term labor force benefits for California businesses in terms of labor force recruitment, participation rates, and workforce performance, as well as longer-term benefits for the state in terms of economic growth and competitiveness and economic and social equality.

The Status of Preschool Education in the United States

Preschool education is increasingly the normative experience of 4-year-olds in the United States, and to a lesser extent, of 3-year-olds as well. As of 2001, 43 percent of U.S. 3-year-olds and 66 percent of 4-year-olds were enrolled in some form of preschool program. These percentages are three times as high for 3-year-olds and twice as high for 4-year-olds as they were in 1970. However, the current enrollment rates are subject to large variations across groups of children, depending on race/ethnicity, family income, parental education, and other factors. For example, enrollment rates are lowest for Hispanic children, and lower for families with incomes below poverty compared with families at the top of the income scale. One of the sharpest contrasts is by mothers' education, with just 38 percent of 3- to 5-year-olds whose mothers have less than a high school education enrolled in early education programs compared with 70 percent of those whose mothers have at least a college degree.

Preschool education is funded through the federal government, state and local governments, and private sources. The federal government supports preschool education targeted to disadvantaged children primarily through the Head Start program, which serves about 900,000 3- and 4-year-olds annually. Thirty-eight states provide further funding for another 700,000 children, primarily 4-year-olds. All but two of those target their funding to disadvantaged children. Only Georgia and Oklahoma have preschool programs available to all 4-year-olds whose families choose to enroll them, but other states and localities are aiming for universal programs in the future. California's program

for children at risk of school failure reached 9 percent of the state's 4-year-olds in 2002–2003, about one-seventh the state-funded program enrollment rate in Oklahoma in the same year.

The state preschool programs vary considerably in quality and per-child spending. Twelve of the thirty-eight states with programs met fewer than five of the ten research-based quality standards identified by the National Institute on Early Education Research (NIEER). For example, only about half of the state programs (20 out of 38) require the lead classroom teacher to have a bachelor's degree, a requirement in every state kindergarten program. California does not meet this standard, nor does it meet five of the other ten standards.

To evaluate the costs and benefits of a high-quality universal preschool program in California, we make assumptions about the key features of such a program. Table S.1 summarizes these features. Notably, the benefits and costs we calculate for universal preschool in California are for a part-day, voluntary program enrolling all 4-year-olds. We also assume that NIEER standards associated with high-quality programs (e.g., class sizes, staff ratios, and staff qualifications) are met.

The Benefits of Preschool Education

We now review the benefits of preschool education, so that we may put them in monetary terms. Benefits for disadvantaged children—which are the most studied and where results are more dramatic—are discussed separately from benefits for lower-risk children. We conclude by quantitatively inferring total benefits for a universal California program. First, however, a few words about acceptable program evaluation approaches are in order.

Methods for Program Evaluation

An extensive literature provides evidence of the potential effects of center-based early childhood programs that serve children in the year or two prior to kindergarten entry. This literature cannot be taken at face value; studies using appropriate methodologies must be culled, as must those measuring a range of outcomes over a period of time.

Table S.1
Features of a Universal Preschool Program in California

Feature	Specifics
Eligibility	Voluntary program for all age-eligible children
Children served	Program enrolls 4-year-olds
Program intensity	Approximately 525 hours per year
"Wraparound" care	Extended-day care available financed by other sources
Class size and staff-child ratios	Maximum class size of 20; staff-child ratio of 1:10
Teacher qualifications	Head teacher in each classroom has bachelor's-level education with an early childhood education credential; assistant teacher in each classroom has associate's-level degree
Facilities	Programs use existing or new facilities run by private or public providers
Financing	Full funding with public funds

SOURCE: Based on Golin et al. (forthcoming).

By "appropriate methodologies," we mean that evaluations must use either experimental or strong quasi-experimental methodologies. In the first of these, children are randomly assigned to either the program being evaluated or to no program. The progress of both sets of children is tracked over the course of time and compared. While experiments are the "gold standard" for evaluation, they are not always practical. Quasi-experimental studies involve comparing educational and other outcomes between children who happen to take a preschool program and children who happen not to. Here, the children are not assigned randomly, so the two groups of children may differ in important ways. However, efforts to control or account for these differences using the best nonexperimental methods can increase the confidence that the impacts of the program, and not some other confounding factor, have been measured. In both cases, the more helpful evaluations measure not only short-term educational benefits but also those accruing over the long term, even into adulthood, and attend to nonacademic benefits—socio-emotional functioning, physical health, crime reduction—as well.

Benefits for Disadvantaged Children

A number of preschool program targeting disadvantaged children have been evaluated using scientifically sound techniques. Of those, the most relevant to an analysis of a high-quality universal program in California is the Chicago Child-Parent Centers (CPC) program. The CPC program is large scale, publicly funded, and has been operating for over 30 years. It is a half-day program with well-qualified staff and good staff-child ratios. The quasi-experimental Chicago Longitudinal Study compared almost 1,000 low-income minority children born in 1980 who went through the CPC with 550 children who did not (most of whom did not attend any other preschool). Most children in both the CPC program and comparison groups faced risks to healthy development—e.g., living in a family with only one parent and/or having an unemployed parent.

As discussed in the body of our study, several features of the CPC evaluation design and the associated analyses generate high confidence that the evaluation is measuring true program effects, without bias due to selectivity into the program. The evaluation, which has followed children until age 20 or 21, shows that the CPC program had a range of statistically significant, meaningful effects:

- Advantages in reading achievement scores as late as age 14
- Lower likelihood of retention in grade by age 15
- Reduced use of special education through age 18
- Lower incidence of child abuse and neglect from ages 4 to 17
- Lower likelihood of involvement in the juvenile justice system by age 18
- Greater likelihood of high school completion by age 20.

Children participated in the program for either one or two years; evaluations showed that the second year produced smaller incremental benefits beyond those obtained from the first year.

Three other targeted preschool programs with sound evaluations generally corroborate these findings:

- The Early Training Project, implemented in Murfreesboro, Tennessee, between 1962 and 1965 with 65 black children of low

socioeconomic status randomly assigned to the program or a control group. Advantages of the project, measured as of age 19, include a lower rate of special education use and a higher rate of high school completion.

- The High/Scope Perry Preschool Project, which studied 123 black children (randomly assigned to treatment and control groups) with low IQs and socioeconomic status in Ypsilanti, Michigan, from 1962 to 1967. Educational advantages of this high-quality program were similar to those in the Early Training Project, but long-term follow-ups also showed less contact with the criminal justice system and a higher employment rate and earnings average when the participants were observed at both ages 27 and 40.
- Head Start. A nationally representative experimental study has only recently been initiated. The results for earlier studies have been mixed, though some do show educational advantages similar to the Early Training and Perry Preschool projects. Longer-term studies indicate higher rates of high school completion and college attendance for whites and a lower rate of criminal justice system involvement for blacks.

Further useful information is provided by a meta-analysis by the Washington State Institute for Public Policy of 48 evaluations of targeted preschool programs published between 1967 and 2003. This analysis generally confirms the gist of the findings summarized above. The CPC program evaluation results fall between the meta-analysis (on the low side) and the Perry Preschool evaluation (on the high side), and the CPC program is large scale and similar in important respects to what we assume for a high-quality universal preschool program in California. We thus base our estimates of the benefits of such a program for disadvantaged children on the CPC program results.

Benefits for More-Advantaged Children

The literature is more limited in providing scientifically sound evidence of the long-term benefit of high-quality preschool programs for more-advantaged children. Because disadvantaged children have more room for improvement on school achievement and other measures,

one might suspect that preschool would be more important for them and less helpful for more-advantaged children. However, because the latter are more numerous, small gains might accumulate to substantial benefits across the whole population.

We identified one experimental evaluation of preschool for lower-risk children. In that program, a university-affiliated preschool, boys showed higher achievement test scores in several domains than boys who did not participate, whereas girls did not show higher achievement. In the absence of longer-term follow-up, this study is silent about whether these advantages translate into improved outcomes in other domains, such as educational attainment, earnings, crime, and delinquency.

The Georgia and Oklahoma universal preschool programs have been assessed in short-term quasi-experimental evaluations. The Georgia evaluation showed that children participating in the state program progressed at a rate similar to those participating in Head Start or private programs. However, these groups were not compared with children not participating in preschool. Likewise, the Oklahoma evaluation has indicated gains from participating in the state program in cognitive test scores as of kindergarten entry. The measured gains accrued to diverse groups of children defined by race/ethnicity and eligibility for free or reduced-price lunches (a proxy for poverty status), but again there was no control group with no participation in the state preschool program.

Evidence for short-term preschool benefits also comes from studies of participants in the Early Childhood Longitudinal Study. The use of statistical models with extensive controls heightens confidence in the findings, which suggest higher school readiness and kindergarten performance among preschool participants than among nonparticipants. Notably, the data indicate stronger effects for more-disadvantaged children—whether defined by poverty status, low maternal education, single-parent headship, or mothers who do not speak English—compared with their more-advantaged peers.

These studies suggest that, at least in the short-term (e.g., in terms of school readiness or early test scores), more-advantaged children may also benefit from high-quality preschool programs but to a lesser

extent than more-disadvantaged children. We identified one quasi-experimental study of longer-term benefits of untargeted preschool. This study found that children participating in preschools not targeted to disadvantaged children were no better off in terms of high school or college completion, earnings, or criminal justice system involvement than those not going to any preschool.

Potential Benefits from a California Program

From the preceding review of the evidence for preschool benefits, we infer a set of potential benefits from a one-year high-quality universal preschool program in California, which we can then convert into monetary terms to compare with the costs of such a program. Simplistically, we might take the CPC program benefits and assume those would be realized by the average child attending a universal program in California. Such an assumption would be too optimistic for two reasons. First, the CPC program was for disadvantaged children, while a universal program would include many lower-risk children, for whom benefits have been found to be lower. Second, most children in the comparison group in the CPC program evaluation did not go to preschool. In California, 65 percent of 4-year-olds are already in preschool. To the extent that those children are realizing some benefits from their preschool attendance, the gain from switching to a state program would be less than the gains resulting from the CPC program. We thus adjust the CPC program benefits for these two differences.

Indicators suggesting risk of school failure apply to a sizeable fraction of California children. For instance, 18 percent of children under 5 live with a single parent, 13 percent are Hispanic and living in poverty, and nearly half have a foreign-born parent. Based on analyses presented in the body of our study, we assume that 25 percent of California children of preschool age are high risk, like the CPC program children; 55 percent are low risk; and 20 percent are in between. Based on the Georgia and Oklahoma experience, we postulate that 70 out of every 100 California 4-year-olds will enroll in a universal state program. Of those, we calculate that 18 will be high-risk children, 14 medium risk, and 38 low risk. (Another 10 children out of every 100 are assumed to be in the private preschool system for a total participation rate among all 4-year-olds of 80 percent.)

The benefits gained by these children depend on what their preschool experience would have been without the program. We base our calculations on current and predicted enrollment in public and private programs. Of the 70 children enrolling in the universal program, we estimate that 15 would not have gone to preschool in the absence of such a program, 33 would have gone to another public program, and 22 would have gone to a private program.

The percentages of the CPC program benefit assumed to be realized are given in Table S.2 and discussed more fully in the body of our study. As suggested by the percentages in the table, we assume that children otherwise attending no preschool (first column) would realize the highest benefits. In particular, we assume high-risk children who move from no preschool to preschool would experience 100 percent of the CPC program gains, while medium- and low-risk children would experience 50 percent and 25 percent of the CPC program gains, respectively. Children otherwise attending current public programs would realize some benefit (if not low risk) because we assume the new state program would be higher in quality than most current public programs. Finally, children otherwise attending private programs (third column) are assumed not to experience any gain in the quality of their preschool experience—hence no gain from switching to the public program. Some might argue that these assumptions are too conservative, while others might claim they are not conservative enough. As we discuss below, we reestimate our model using both more- and less-conservative assumptions than those in Table S.2.

By applying the CPC program gains according to the Table S.2 percentages across a single-year cohort of 4-year-old California children, the total benefits can be calculated. As seen in Table S.3, we estimate that there would be 13,764 fewer children ever retained in a grade if the universal program were implemented, 62,563 fewer years spent in special education, 10,010 additional high school graduates, 4,737 fewer cases of abuse or neglect, and 7,329 fewer children against whom a juvenile petition would ever be filed. These absolute changes are roughly estimated to represent reductions over current levels ranging from 9 percent (child maltreatment) to 19 percent (grade repetition).

Table S.2
Percentages of CPC Program (Maximum) Benefits Realized by Children of Differing Risk and Alternative Preschool Destination

	What Kind of Preschool the Child Would Have Attended Without a Universal Program		
Risk	**None**	**Public**	**Private**
High	100%	50%	0%
Medium	50%	25%	0%
Low	25%	0%	0%

Table S.3
Estimated Impacts for a California Single-Year Cohort of 4-Year-Olds Participating in Universal Preschool

Outcome	Change Assuming Distribution of Benefits Among Participants
Education processes and attainment	
Reduction in the number of children ever retained in grade	13,764
Reduction in the number of children ever using special education	9,116
Reduction in the number of child years of special education use	62,563
Increase in the number of high school graduates	10,010
Increase in the number of child years of education	29,494
Child maltreatment	
Reduction in the number of children with report of child abuse or neglect	4,737
Juvenile crime	
Reduction in the number of children with a juvenile petition (court filing)	7,329
Reduction in the number of children with a juvenile petition (court filing) for a violent offense	5,631
Reduction in the number of juvenile petitions (court filings)	29,494

NOTES: The California annual cohort of 4-year-olds is assumed to be 550,000 children, and 70 percent of children are assumed to participate in the universal preschool program.

Benefit-Cost Analysis

We now convert preschool benefits into dollar terms and compare them with program costs. We begin with an overview of benefit-cost methodology, show how the benefits and costs of a California universal preschool program were estimated, and present the results under varying assumptions.

Overview

We begin by reviewing the essential elements of benefit-cost methodology and summarizing the findings of other benefit-cost studies of preschool programs. In benefit-cost analysis, the stream of benefits flowing from a project and the costs accruing to it over a number of years are expressed in common units—typically, dollars inflated or deflated to a common base year and discounted to the present. Discounting is done by applying a constant annual rate—we use 3 percent—to all future benefits and costs to account for people's preference for near-term benefits (and distaste for near-term costs) over longer-term benefits. The results of the analysis can then be expressed in terms of net benefits (the present value of benefits minus that of costs), a benefit-cost ratio, or an internal rate of return on the "investment" in the program. While benefit-cost analysis is a powerful tool, we must keep in mind its disadvantages: Some benefits may not be measured in the program evaluations, others are not easily translated into dollar values, and this type of analysis does not account for distributional concerns or altruistic values that people may place on benefits to others.

The various types of preschool benefits—educational attainment, lower child maltreatment rates, lower involvement in crime—can be either expressed as or converted into dollar-denominated forms. For example, lower grade retention can be measured in terms of fewer years spent in K–12 education, and a year of K–12 education has a cost. Lower child maltreatment rates generate savings through reductions in the costs of the child maltreatment system and in medical and other tangible costs to victims. Some unobserved benefits can be projected from benefits observed in the evaluations. For example, increased educational attainment

has a payoff in the form of increased lifetime earnings. The various benefits (and costs) accrue to different stakeholders, namely various levels of government, program participants, and the rest of society (nonparticipants). For example, increased earnings are realized by program participants, and those generate higher taxes for government.

Using this approach, it has been shown that the CPC program generated $47,559 in benefits to society as a whole for the average child participating over the course of a year and a half, versus program costs of $6,692 (in 1998 dollars discounted to the present at 3 percent per year). The benefit-cost ratio is thus 7.14[1]. The benefit-cost ratio for the Perry Preschool program, which also served children for about one and a half years on average, has been estimated as a ratio of almost 9 as of the child's age 27, when the large but difficult-to-value savings in intangible costs of crime are included, and a ratio of 4 when they are not. The recent age 40 follow-up suggests a benefit-cost ratio for Perry that exceeds 17. (For both programs, the ratio is higher for one year of preschool compared with two years.) The 48-study meta-analysis mentioned above yielded a composite benefit-cost ratio of 2.36 for targeted preschool programs, while a recent estimate for a universal preschool program in Ohio suggests a ratio that ranges from 1.38 to 1.91.

Estimating Benefits in Dollar Terms

In most cases, the preschool benefits given above can be expressed in dollar terms (we convert all figures to 2003 dollars). Wherever possible, we use data for California to estimate the benefits (in some cases, costs) associated with the following domains:

- *Remedial education services and educational attainment.* Dollar values are identified for government savings due to the reduction in grade repetition and the decrease in years of special education. The increase in the high school graduation rate and the increased college attendance concomitant with the latter result in offsetting higher public education costs.

[1] This and similar ratios throughout the text are the return for each dollar invested. In this case, the return for every dollar invested is $7.14.

- *Child welfare.* We estimate the savings to government and victims associated with reduced child abuse and neglect. These are based on the cost to the child maltreatment system of a substantiated case, as well as the tangible costs to the victim associated with treating physical injuries or resulting mental conditions.
- *Criminal justice.* The savings to government and victims of crime are estimated for the reduction in juvenile crime. In the case of the latter, we restrict our savings estimates to tangible victim costs. In addition, there is a probability of an adult criminal career, with an associated estimated cost, that can be linked with the measured reduction in juvenile crime, so savings in terms of adult justice system and tangible victim costs can be projected (in our case up to age 44).
- *Compensation and taxes.* The CPC program results include differences in educational attainment between those attending preschool and those not. From data on mean annual earnings by level of educational attainment and age, we infer the lifetime earnings gains to preschool participants (up to age 65). These earnings differentials also allow the calculation of differences in taxes accruing to the government.
- *Value of child care.* We value the time the child spends in preschool at the minimum wage to yield a benefit to participating families from the time they now have available for work or other activities.

For all domains, we differentiate between benefits to California state and local governments versus the federal government. For example, taxes from increased earnings produce more income tax revenue for California, as well as income and Social Security taxes for the federal government.

The total benefits we estimate by summing the preceding categories must be regarded as conservative, because there are some benefits we omit. For example, welfare use in families with children attending preschool were not measured in the CPC program evaluation. Lower welfare use should result in savings to government and nearly offsetting losses to participants. The CPC program evaluation also did not mea-

sure gains to mothers of participating children, such as improved educational level, occupational status, and earnings. Such improvements have not been demonstrated for preschool but have occurred with longer-term, more intensive center-based child care. Children's higher educational attainment could also result in health improvements over their life course, better consumption choices in adulthood, improved fertility choices, and second-generation effects. Again, demonstrations of such effects for preschool are limited, but other research suggests these benefits for participants, and the associated government savings, could be sizeable. Finally, intangible crime costs (e.g., pain and suffering and fear of crime) have been estimated as 1.4 to more than 3 times the tangible costs, while the ratio for child abuse is almost 8. While such benefits are not included in our baseline model, we do incorporate them as part of a sensitivity analysis.

Estimating Costs

Our cost estimates follow closely those already established in another recent study of a universal preschool program in California. We make certain assumptions regarding day length, weeks per year, classroom space required and amortization, instructional staff required (at a child-staff ratio of 10:1), administrative staff required, and salaries. The resulting cost is approximately $5,700 per child per year. This must be offset by the money now spent on preschool in California to obtain an incremental cost to compare with the incremental benefits anticipated. Our estimate is that current spending would offset $1,100 in spending per child in a universal preschool program with a 70 percent participation rate. The marginal cost of $4,600 per child, when discounted, equals the $4,339 figure reported as program costs in our results below.

Benefit-Cost Results Under Alternative Assumptions

We begin with the results under the assumed distribution of benefits given in Table S.2. This is followed by more- and less-conservative assumptions. We also incorporate the value of reduced intangible victim costs, and we allow for the effects of migration out of state and for the possibility of charging a fee on an income-dependent sliding scale.

Table S.4 shows the various categories of costs and benefits in 2003 present value dollars that accrue to California society as a whole and U.S. society as a whole under the baseline assumptions. Results for each are shown per child and per single-year age cohort. Total benefits to California society as a whole from universal preschool in California are estimated to total nearly $11,400 per participating child. That is the estimated gain in benefits over those now realized in California's various preschool programs at current participation levels. It is offset by the $4,339 in incremental costs to yield $7,036 in net benefits per child, for a 2.62 benefit-cost ratio. The internal rate of return (IRR) for California society is estimated at 10.3 percent. In other words, Californians would earn an annual rate of return (or interest) of about 10 percent over a 60-year horizon on the upfront preschool investment. Net benefits for California society, in present value terms, from serving a single-year age cohort total $2.7 billion. After adding benefits—mainly the increased federal income and Social Security taxes—that accrue to the federal government alone, net benefits to U.S. society as a whole for a single-year age cohort total $3.6 billion in present value dollars. The United States benefit-cost ratio is 3.15 and the IRR is 11.2 percent.

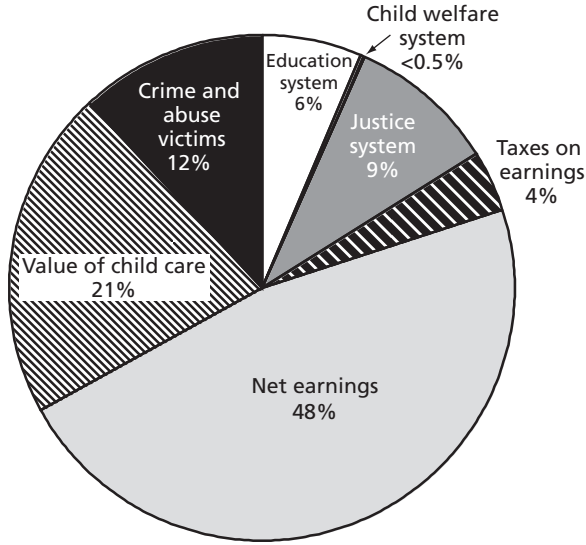
However, benefits (and net benefits) are distributed unevenly across the various stakeholders. As seen in Figure S.1, 19 percent of the benefits to California society are realized by the public sector in the form of savings to the education, child welfare, and justice systems and in the form of higher taxes. Forty-eight percent of the benefits are in the form of increased earnings (net of taxes and higher education costs) of participants in adulthood, while another 21 percent of the benefits stem from the value of child care to the parents. The remaining 12 percent of benefits accrue to participants and the rest of society in the form of savings from reduced child abuse and crime. After accounting for costs, net benefits are highest for the groups that bear none of the costs: Participants themselves gain the most, followed by nonparticipants (other members of society), and the federal government. Net benefits are negative for California state and local governments, which are assumed to bear the full costs of the program. However, as we discuss in the concluding section of the Summary, investments in public education are not necessarily justi-

Table S.4
Present Value Costs and Benefits for Universal Preschool in California in Baseline Model, Dollars per Child and Dollars per Cohort of 4-Year-Olds

Source of Costs or Benefits	Benefits (Costs) to Society—California Only		Benefits (Costs) to Society—U.S. Total	
	Dollars per Child	Dollars per Cohort (millions)	Dollars per Child	Dollars per Cohort (millions)
Program costs	–4,339	–1,671	–4,339	–1,671
Program benefits				
Education outcomes (measured)	876	337	992	382
Child welfare outcomes (measured)	102	39	141	54
Juvenile crime outcomes (measured)	1,220	470	1,220	470
Value of child care (measured)	2,406	926	2,406	926
Total measured benefits	4,604	1,772	4,759	1,832
College attendance (projected)	–173	–67	–173	–67
Labor market earnings (projected)	5,801	2,234	7,940	3,057
Adult crime outcomes (projected)	1,143	440	1,143	440
Total projected benefits	6,772	2,607	8,910	3,430
Total benefits	11,375	4,379	13,669	5,262
Net benefits	7,036	2,709	9,329	3,592
Benefit-cost ratio ($/$1)	2.62		3.15	
Internal rate of return (%)	10.3%		11.2%	

NOTES: Unless otherwise indicated, all amounts are in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. Dollars per child figures are from the final two columns in Table 3.2. Dollars per cohort figures assume a cohort of 4-year-olds of 550,000 children and a 70 percent preschool participation rate. Numbers may not add because of rounding.

Figure S.1
Distribution of Present-Value Benefits for California Society in Baseline Model



SOURCE: Table 3.2. See Appendix A for details.

NOTES: The percentage distribution is per child based on 2003 dollars. The dollars are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. California values exclude benefits/costs to the federal government. Numbers may not add because of rounding.

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fied because they generate a positive return for the state and local government sector but because they generate positive net benefits to society as a whole.

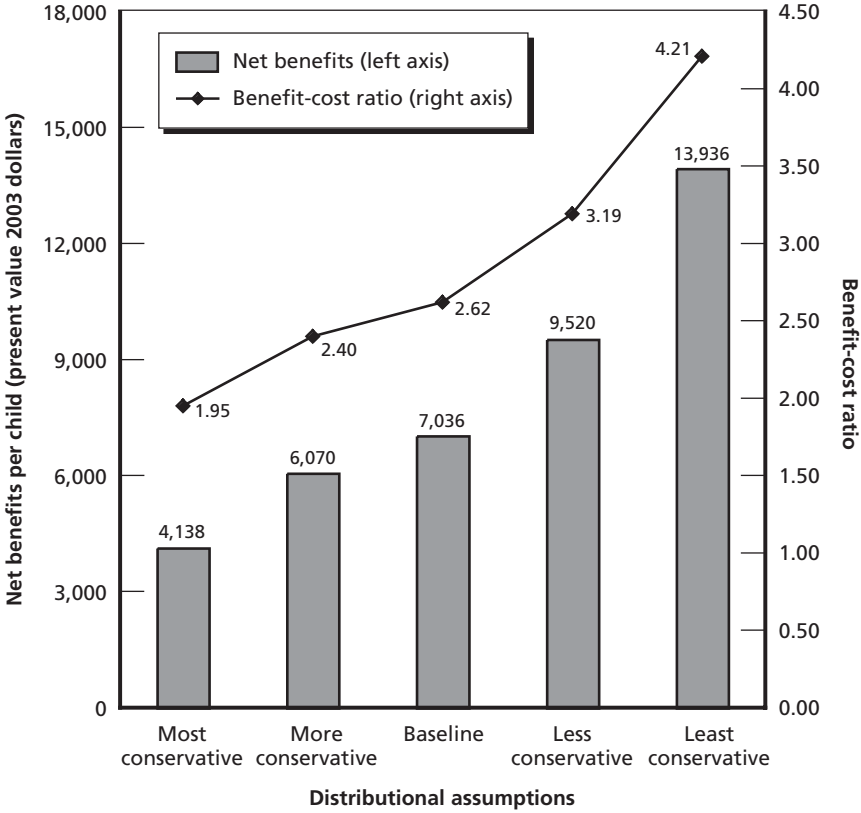
We made two assumptions that were more pessimistic and two that were more optimistic regarding the distribution of benefits, relative to those shown in Table S.2. The most pessimistic assumption was that no benefits would accrue to low- and medium-risk children. The most optimistic assumption was that children moving from other public preschools to the universal program would realize the same benefit gain as those moving from no preschool. There was also some assumption of benefits for low- and medium-risk children moving from private schools. Figure S.2 shows the net benefits per child and benefit-

cost ratio, both for California society, as the distributional assumptions range from more conservative to less conservative. (The baseline model falls in the middle.) For the least conservative assumption, the benefit-cost ratio is just over 4, but even for the most conservative assumption, it is just under 2. Net benefits increase more than threefold in going from the more conservative to less conservative assumptions. The IRR for California society (not shown) increases from 7.9 percent to 14.8 percent. Figures for the United States as a whole follow a similar pattern and are even larger.

These results from the baseline model include only the tangible benefits from reducing child maltreatment and crime. Intangible benefits associated with reduced pain and suffering, fear of crime, and so on are not included in the baseline model. However, because some other benefit-cost analyses of preschool programs include estimates of these benefits, we present them here. These benefits accrue only to participants (as potential victims of child maltreatment) and the rest of society (as potential victims of crime), so there is no effect on the bottom-line figures for the public sector. For California and U.S. society as a whole, the inclusion of intangible victim costs raises the net present value benefits by about $3,400 per child. This is nearly a 50 percent increase in net benefits for California society and a 36 percent increase for U.S. society. The benefit-cost ratio increases to 3.40 for California (from 2.62) and 3.93 for the U.S. (from 3.15). The IRR ranges from 14.2 to 14.8 percent, about 3 percentage points higher than in the baseline model. While these results suggest the magnitude of potential underestimation of our benefit-cost results, there is considerably more uncertainty about the dollar value attached to these intangible victim costs. Thus, we continue to be conservative in excluding them for the additional sensitivity analyses we conduct.

The results presented so far do not take migration into account. Approximately 1.4 percent of Californians move out of state every year. This migration presents the possibility for a significant drain of California preschool benefits to other states while Californians pay all the costs. Under the baseline benefit distribution assumptions from Table S.2, the benefit-cost ratio when migration is taken into account is 1.89, as opposed to almost 2.62 when migration is ignored. Of course, if

Figure S.2
Benefit-Cost Results for California Society with Alternative Distributional Assumptions



SOURCE: Table 3.5. See Appendix A for details.

NOTES: Net benefits are per child in 2003 dollars and are based on the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. California values exclude benefits/costs to the federal government.

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other states adopt similar high-quality universal preschool programs, in-migration of persons having attended preschool in other states will offset California's losses from out-migration.

Thus far, we have assumed that a universal preschool program would be free to anyone who wanted to participate. What if a fee were charged, perhaps on a sliding scale reflecting ability to pay? If families of

low-risk children paid 50 percent of the cost, those of medium-risk children 25 percent, and those of high-risk children nothing, the weighted-average present-value fee per child would be approximately $1,700 for a one-year preschool program. This would drop the state cost per child by the same amount and allow the state to almost break even—i.e., net benefits, negative without a fee, would be just about zero.

We present results separately from the perspectives of California governments (state and local), of all government combined, of California society as a whole, and of the U.S. society as a whole. In interpreting these results, we note that investments made by state and local governments are not always justified in terms of the in-state government savings or in-state societal benefits that accrue. Indeed, if that were the case, states and localities would under invest in many programs that have larger societal benefits beyond the state's own borders (just as individuals would under invest if there are societal benefits of an investment beyond the private returns to the individual). Thus, while it is of interest to consider net benefits from the California state perspective—either in the form of California government savings or benefits for California society—it is also important to consider the benefits to all levels of government and U.S. society as a whole.

Indirect Benefits

While the benefit-cost analysis presents an economic case for investing in a one-year high-quality universal preschool program in California, there are benefits it does not account for, some economic and some not. These include near-term labor force benefits for California businesses and longer-term benefits for the state in terms of economic growth and competitiveness and economic and social equality.

Labor Force Benefits

Demographic trends will soon slow the rate of labor force expansion in California, as they have already done in the last several decades. This slowdown in the growth rate of the labor force will cause pressure to increase the size of the labor force in order to sustain rates of economic growth experienced in the past. A preschool program could affect labor

force recruitment and participation rates, as well as workforce performance, through its effects on the parents of preschool participants.

One approach for expanding the size of the future workforce is to increase the attractiveness of the state of California to potential workers. The quality of K–12 education is known to be a quality-of-life factor in relocation decisions, particularly for skilled workers and the firms employing them. A high-quality universal preschool program would be expected to draw such workers and firms to California, although the research base does not support a quantitative estimate of this potential effect.

Another way to keep the state's labor force growing is to draw on more women with young children who do not currently participate at high rates, in part because they lack access to or cannot afford high-quality child care. Studies have shown a relationship between higher participation rates, as well as greater work hours, and the availability of public kindergarten programs. It would seem reasonable to hypothesize that a universal preschool program would have a similar benefit.

Finally, a universal preschool program would essentially provide reliable, accessible high-quality child care. By minimizing disruptions due to unreliable child care providers and by providing a safe, secure, and stimulating environment, a universal preschool program could help working parents experience less disruption in their work schedules, lower levels of stress, and diminished concern about the well-being of their children during working hours. A number of studies suggest this in turn would lead to reductions in employee absenteeism and workforce turnover, both costly drags on productivity. With about 15 percent of the California female workforce having children under age 6 as of 2000, the potential gains to employers of a universal preschool program in terms of the performance of today's workers are likely to be modest but still meaningful.

Macroeconomic Benefits

We have already quantified the future earnings benefits related to educational attainment gains by preschool participants. Here we consider the implications of educational gains for overall economic growth and competitiveness in the global economy. These are social returns earned

in the future from the investment in the preschool education of children today.

Higher educational attainment of the population has been quantitatively associated with faster economic growth, as has the quality of schooling as measured by achievement test scores. The investment in the human capital of the workforce can raise economic growth by making labor a more productive input in the economy and by improving the ability of the workforce to develop, implement, and adopt new technologies. Even small differences in economic growth rates over time can have a large cumulative impact on future per-capita income and living standards.

The education and skills of the workforce increasingly determine the ability of an economy to compete in the global marketplace. California, with the sixth largest economy in the world and one on the leading edge of globalization, is no exception. The rising return to education in California, evidenced by the doubling of the wage premium earned by a college graduate relative to a high school graduate in the past 30 years, signals the strong demand for a highly skilled workforce as a result of technological change and globalization. Yet, the challenges of producing a highly skilled workforce are especially salient in California, given the high proportion of immigrants to the state and the corresponding large fraction of minorities and those with limited English language skills.

Many of the United States' economic competitors in Europe make substantial investments in high-quality early care and education. The United Kingdom, France, and Italy, among others, serve almost all 4-year-olds through voluntary programs fully supported with public funds. Compared with those in other developed countries, U.S. students and adults do not score well on tests of school achievement and workplace literacy, and disparities in U.S. scores are wider than in most other countries. A connection between subpar, widely dispersed test results and less-than-universal early education is at least plausible. An investment by California in preschool education could help the state boost education and skill levels so that it remains competitive in the international economy and with other states making such investments.

Consequences for Economic and Social Equality

Income disparities between low- and high-income families have been growing in the United States and in California in recent decades. One contributor to this trend has been the increase in education's returns to income, and in California, the diversity of the state's demographic makeup also affects the distribution of income. Beyond differences in economic well-being, the rise in inequality has wider implications in terms of disparities that affect family functioning, neighborhood quality, education, health, crime, and political participation. Improving educational attainment for future cohorts of California children will help reduce income disparities, lower poverty, and narrow the gaps in economic and social outcomes across racial and ethnic groups. A universal preschool program that raises educational attainment overall, and improves educational outcomes for more-disadvantaged children, will contribute toward such benefits.

Conclusions

The benefit-cost analysis undertaken in this study indicates that there can be substantial returns for California society from investing in a one-year high-quality universal preschool program. Our baseline estimate, which is arguably conservative, is that every dollar invested by the public sector beyond current spending will generate $2.62 in returns. And this estimate does not account for an array of other benefits not captured in our analysis because of data limitations. Those benefits include lower intangible losses from crime and child abuse and neglect averted, reduced reliance on public welfare programs, improved labor market outcomes for parents of preschoolers, improved health and well-being of preschool participants, and the intergenerational transmission of favorable benefits. Broader economic and noneconomic benefits are expected in other areas as well, including labor force recruitment and participation rates, workforce performance, economic growth, international competitiveness, and the distribution of economic and social well-being. We conclude with consideration of a few issues relevant to policymakers and their constituents considering such an investment.

Preschool as Economic Development

Given the mounting evidence of long-term economic benefits from investing in high-quality preschool education, this policy is increasingly framed by economists and business leaders in the context of economic development strategies more generally. To promote economic activity, a larger tax base, and better jobs, states and localities spend an estimated $20 billion to $50 billion annually on local infrastructure, business assistance, and workforce education and training. Yet little effort has been devoted to rigorously examining the economic impact of such investments, and the little available evidence for some of them is not promising. In many cases, economists who study these policies note that jobs would have been created anyway, or jobs gained in one community are at the expense of another community with no net positive gain. In contrast, preschool has been scientifically demonstrated to generate a wide range of benefits, which can be conservatively valued as exceeding program costs.

In addition to the size of the returns potentially associated with high-quality early childhood investments, it is worth noting that these investments may have additional advantages over typical investments designed to promote economic development. Notably, in the case of early childhood investments, the net gains to government and society as a whole are not zero sum but constitute real benefits in terms of lower government outlays, a more skilled future workforce, and a more responsible future citizenry. Moreover, these conclusions rest on scientific evidence that these outcomes are attributable to the investment in preschool education itself and would not occur under the status quo.

Key Choices for States Funding Preschool Programs

We have made certain assumptions regarding a preschool program in California. Faced with alternatives, in other words, we have made choices that some policymakers might make differently. Let us briefly consider the implications of some of those choices for the economics of preschool investments:

- *Universal Versus Targeted.* A program targeted at disadvantaged children would be expected to produce higher returns per dollar

invested than a universal program because the impacts of preschool are generally larger for at-risk children. However, there are disadvantages to targeted programs: administrative costs of determining eligibility and addressing changes in eligibility over time, stigma associated with participation, unavoidability of missing some children who could benefit but do not meet the criteria or are confused about eligibility rules. Universal programs avoid these problems and allow children to participate in economically integrated programs. Political support may also be stronger for programs available to all children, and they may be more likely to be funded at the level required for high quality. If the program is to be universal but funding constraints preclude immediately achieving that goal, it might be phased in through a focus in the early years on communities with large numbers of high-risk children.

- *One Year or Two.* Some high-quality preschool programs, including the Chicago CPC, have served children for more than one year. It appears from evidence collected to date that the second year generates smaller benefits than what is gained from the first year. In other words, benefit-cost analyses show a higher return per dollar invested for a one-year program than for a two-year program. This suggests that, when resources are limited, it is more beneficial to serve a greater number of children in a high-quality one-year program rather than serving a smaller number of children for two years.
- *Preschool Quality.* There have been no scientifically sound studies comparing the long-term benefits of high-quality preschool programs and preschool programs that save money by cutting back on such features as teacher qualifications and staff-child ratios. Presumably, benefits would be less, but by how much is unknown.

Policymakers must also decide upon a number of implementation issues, e.g., the ability to use existing funding streams, which agency to put in charge, the range of providers offering state-sponsored preschool programs, and methods for ensuring program quality. Effects on benefits and costs are possible but of unknown extent.

Extending the Investment in Public Education

For a variety of reasons, public-sector investments in K–12 education have been justified as a critical investment in human capital with long-term benefits at the individual and societal levels. Notably, the investment made today at the K–12 level is a universal benefit available to all children, regardless of the ability of their families to finance the educational investment privately. The arguments supporting K–12 investment could be extended to universal preschool, which also pays off to individual participants and society at large.

While preschool enrollment rates have been rising over time, in our current system of mixed public- and private-sector financing, a substantial fraction of children do not attend one or more years of preschool prior to kindergarten entry. Moreover, enrollment rates are relatively low for disadvantaged children, a group that has been demonstrated to receive long-lasting benefits from a high-quality preschool experience. And many of the children who are currently enrolled in preschool programs do not receive the same high-quality experience associated with programs that have demonstrated significant benefits. The bottom line is that benefits from preschool participation for children, their families, and society as a whole go unrealized.

A one-year high-quality universal preschool program, available to all children, regardless of circumstance, can allow families who choose to participate to reap the reward from a high-quality program. Public funds are used to make an investment that has a long-term payoff for society as well, whether in the form of lower government outlays or a higher future standard of living. In this way, society collectively makes an investment today that pays off down the road.

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Abbreviations

AIR	American Institutes for Research
CCDF	Child Care and Development Fund
CED	Committee for Economic Development
CLS	Chicago Longitudinal Study
CPC	Child-Parent Centers (Chicago program)
CPI	Consumer Price Index
CPI-U	Consumer Price Index—All Urban Consumers
CPS	Current Population Survey
DCFS	Department of Child and Family Services
DHHS	U.S. Department of Health and Human Services
ECLS	Early Childhood Longitudinal Study
IALS	International Adult Literacy Survey
IRR	Internal rate of return
IWPR	Institute for Women's Policy Research
NAEYC	National Association for the Education of Young Children
NCES	National Center for Education Statistics
NHES	National Household Education Survey
NIEER	National Institute on Early Education Research
OECD	Organisation for Economic Co-Operation and Development
PISA	Programme for International Student Assessment
TANF	Temporary Assistance for Needy Families

CHAPTER ONE

Introduction

While an increasing fraction of U.S. children participate in some form of preschool program prior to entering kindergarten, such an experience is far from universal. As of 2001, 43 percent of U.S. 3-year-olds and 66 percent of U.S. 4-year-olds were enrolled in a day care center, Head Start program, preschool, nursery school, prekindergarten, or other early childhood program (National Center for Education Statistics [NCES], 2002). Moreover, preschool participation rates are lower among children in poor families compared with their nonpoor counterparts: 47 percent versus 59 percent for poor and nonpoor 3- to 5-year-olds, respectively. For many of these children across the income spectrum, the preschool program would not meet the standards associated with high-quality programs, such as lead teachers with at least a bachelor's degree or a well-regarded comprehensive age-appropriate curriculum (Barnett et al., 2004). The tremendous variation in preschool program experiences reflects our current system of mixed public and private financing of preschool education and differences in quality across and within public and private providers.

As preschool enrollments have continued to grow, there is mounting evidence of the benefits of preschool programs to participating children and their families, particularly when such programs serve at-risk children. Studies have demonstrated that well-designed early education programs serving disadvantaged children in the one or two years prior to kindergarten entry can generate benefits to government and the rest of the society that outweigh the cost of the program services, with returns of at least seven dollars for every dollar invested (Karoly et al., 1998; Karoly et al., 2001; Reynolds et al., 2002). High-

quality program evaluations demonstrate that participating children use less special education, repeat fewer grades of school, graduate high school at higher rates, have higher earnings, use less welfare as young adults, and have lower rates of crime and delinquency. These benefits translate into government savings in the form of higher tax revenues and lower outlays for special services, social welfare programs, and the criminal justice system. Society as a whole benefits as well from higher net income to participants and lower costs of crime. These programs have also been analyzed in terms of their return on investment, which compares favorably with other strategies for economic development (Rolnick and Grunewald, 2003).

In part, as a result of this evidence and general convictions that children benefit from structured programs that prepare them for school entry, there is growing enthusiasm on the part of business leaders, policymakers, and the public for public-sector investments in preschool education. For example, in 2002, the influential Committee for Economic Development (CED), an independent research and policy organization of 250 leaders in business and education, endorsed universal access to high-quality preschool education for children as young as age 3 (CED, 2002). A year later, the Business Roundtable and Corporate Voices for Working Families, two other high profile organizations of business leaders, called for expansion of high-quality early childhood programs serving 3- and 4-year-olds.[1] Yet, to date, only two states—Georgia and Oklahoma—have funded programs that come close to offering universal access to high-quality preschool programs, although several other states are moving in this direction (Barnett et al., 2004).

Within this context, there is growing interest in universal preschool education in California. In considering such a program, policymakers and the public focus on the potential benefits from a universal preschool program, as well as the estimated costs. This study aims to inform such deliberations by conducting an analysis of the economic benefits of investing in preschool education in California. In particular, we focus on two questions:

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[1] See Business Roundtable and Corporate Voices for Working Families (undated).

- What are the expected direct costs and benefits for the public sector and society as a whole of implementing a high-quality universal preschool program in California?
- What are the other potential indirect economic and noneconomic benefits for California that may be associated with such a program?

To address the first question, we conduct a benefit-cost analysis of a possible universal preschool program in California. This analysis builds on prior RAND benefit-cost studies, as well as other analyses in the literature. The analysis is tailored, as much as possible, to account for the California context in terms of demographics, costs of public-sector programs and services, and other aspects of the California economy. To address the second question, we draw on the research literature to assess the broader benefits of a universal preschool program, beyond those identified in the benefit-cost analysis.

To set the stage for our analysis, in the remainder of this chapter, we provide a brief overview of the status of preschool education in the United States, with a focus on enrollment rates and patterns and the extent of state support for preschool education. We then describe the features we assume for a universal preschool program in California that provides the basis for the rest of the study's analysis.

In the second chapter, we review the research base on the benefits of preschool education, drawing on evidence from programs that have received rigorous evaluation. We focus on programs that have the key features that we have assumed for a program in California so that we have greater confidence that outcomes observed for these programs might be replicated in a California program. While much of the evidence base on the effectiveness of preschool programs comes from those that serve disadvantaged children, we also identify research that suggests more-advantaged children can benefit as well.

The third chapter presents our benefit-cost analysis of a universal preschool program in California. We discuss the costs associated with the assumed California program, as well as the dollar returns to the government and society as a whole from the expected benefits. This analysis requires that we make a number of key assumptions, so our

analysis presents results based on alternative assumptions to examine the robustness of our findings.

In the fourth chapter, we consider other economic and noneconomic benefits from a universal preschool program in California, beyond those identified in Chapter Three. In this arena, there is less-rigorous research to draw on, so our conclusions are naturally more speculative. Nevertheless, we think it is relevant to consider how a universal preschool program would affect labor force participation rates, workforce recruitment and retention, economic growth and international competitiveness, and economic and social inequality, among other outcomes.

The final chapter offers a summary of our results and draws out the implications for policy. In particular, we frame an investment in high-quality universal preschool in the context of local economic development strategies. We also review a number of policy choices facing decisionmakers implementing publicly funded preschool education programs. Finally, we consider an investment in universal preschool education in light of the long-standing commitment to public education in the United States.

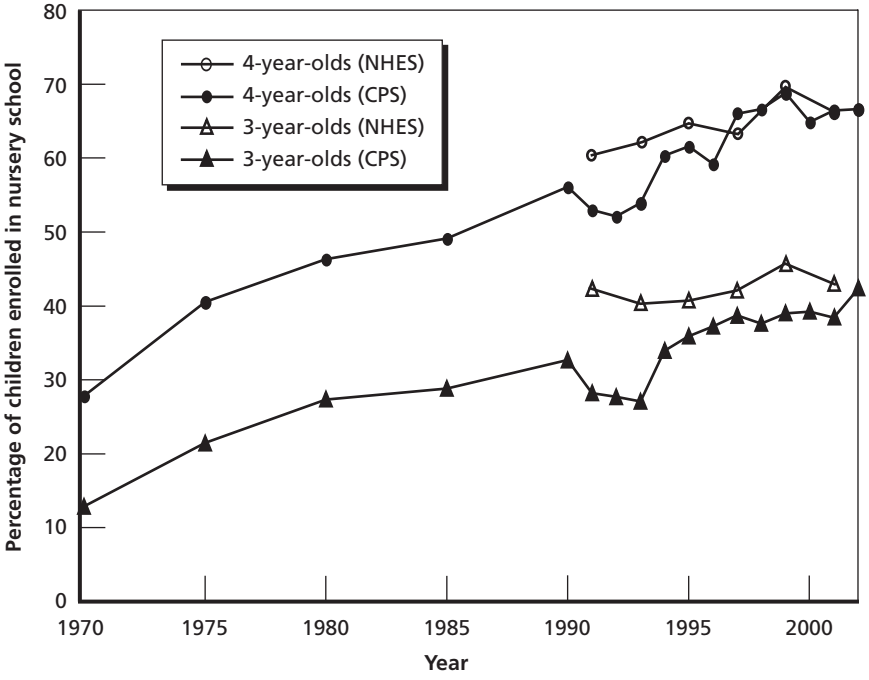
The Status of Preschool Education in the United States

Preschool education is increasingly the normative experience of 4-year-olds in the United States and, to a lesser extent, of 3-year-olds as well. Data from the October Current Population Survey (CPS) track the enrollment rate of 3- and 4-year-old children in prekindergarten programs (the questionnaire refers to "nursery schools"). As seen in Figure 1.1, fewer than one in three 4-year-olds participated in prekindergarten programs as of 1970, a figure that had more than doubled by 2002. The participation rate for 3-year-olds tripled over the same time period, from 13 percent in 1970 to 42 percent in 2002. According to the CPS data, preschool enrollment has increased more rapidly in public programs compared with private programs. In 1970, about one-third of nursery school enrollments were in public programs compared with about one-half as of 2002.[2]

[2] These figures are based on enrollment of children ages 3 to 5 in nursery schools. See U.S. Census Bureau (2003b), Table 237, and U.S. Census Bureau (2004b), Table 4.

A potentially more comprehensive measure of early childhood education enrollment comes from the National Household Education Survey (NHES), conducted since 1991 by the National Center for Education Statistics (NCES). These data, also plotted in Figure 1.1, measure enrollment in the spring in day care centers, Head Start, nursery school, prekindergarten, and other center-based early childhood programs. As seen in the figure, as of 2001, the two data sources provide very similar estimates of enrollment rates, especially for 4-year-olds. The CPS data provide a lower enrollment estimate in the first half

Figure 1.1
Preschool Enrollment Rates for U.S. 3- and 4-Year-Olds: 1970–2002



SOURCE: CPS data—1970–1990: U.S. Census Bureau (2003b), Table 237; 1991–2002: U.S. Census Bureau (various years), Table 3 or Table 2; NHES data—NCES (2002), Table 1-1.

NOTES: CPS data are as of October in each year. The CPS enrollment rates include a small fraction of 3- and 4-year-old children who are reported to be in kindergarten. NHES data are as of the spring of each year. The NHES enrollment rates are based on children who were reported not to have yet entered kindergarten.

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of the 1990s, especially for 3-year-olds for whom "nursery school" as defined in the CPS is less likely to fully capture the range of early childhood education options.

Preschool education in the United States is funded through federal, state, and local government funds, as well as private sources, and it is delivered by both public and private providers. The federal government supports targeted preschool education primarily through the Head Start program.[3] Head Start began as an experimental eight-week pilot project in the summer of 1965 serving 500,000 low-income 4- and 5-year-old children through both a center-based program and home visits (Zigler and Muenchow, 1992). At that time, there were few models for such childhood programs, and only 18 states provided even public kindergarten programs. Since its inception, the Head Start program has evolved to serve primarily low-income children ages 3 and 4, typically in school-year programs, either part day or full day. The program focuses on early learning activities, as well as child health, nutrition, and safety. A high priority is placed on parental involvement. In the 2003 federal fiscal year, approximately 910,000 children were served in 19,200 centers at an average annual cost of $7,092 per child (Head Start Bureau, 2004). Nearly 13 percent of these children had one or more physical or mental disabilities.

State-Funded Preschool Programs

The increasing rates of preschool participation and the growing sharing in public programs reflect greater involvement on the part of the states in funding early education programs. In 1980, just ten states funded prekindergarten programs, primarily for low-income children ages 3

[3] There are several other sources of federal support for early care and education (Wolfe and Scrivner, 2003). A portion of federal Title I funds (under the Elementary and Secondary Education Act) also supports public preschool education programs that meet Head Start performance standards. These funds support a smaller fraction of preschool-age children than Head Start, at a considerably lower cost per participating child. Federal funds from the Child Care Development Fund also support child care services for preschool-age children in low-income families, although these funds do not necessarily support education-based programs. The federal government also subsidizes care for preschool-aged children through several provisions in the tax code (namely the Dependent Care Tax Credit and Dependent Care Assistance Program), although these benefits go primarily to middle- and upper-income families.

to 4 (Gilliam and Zigler, 2004). During the 2002–2003 school year, 38 states funded such programs, spending about $2.5 billion for programs mostly serving 4-year-olds (Barnett et al., 2004). Some 738,000 children were served, a figure below the number of children enrolled in Head Start the same year.

Most states that provide preschool funding do so for more-disadvantaged populations, targeting funding to low-income or disabled children by supplementing federal Head Start funding or through separate state programs.[4] Two exceptions are Georgia and Oklahoma, both of which are providing universal access to preschool programs. Georgia's program, initiated in 1995 with funding from the state lottery, provides funding for all interested 4-year-olds through a mixture of public and private providers (Henry et al., 2003b). Programs, which operate in all school districts, serve children for a full day (at least 6.5 hours), 5 days a week during the academic year. Reimbursement rates per child vary with teacher qualifications and the location (i.e., metropolitan versus nonmetropolitan areas) and type of program (i.e., public versus private). Teachers are required to have only state certification in early childhood education.

Oklahoma's program, expanded from a targeted program in 1998, reimburses school districts for all 4-year-olds who enroll in prekindergarten in those districts that offer such classes.[5] As of the 2000–2001 school year, 90 percent of school districts participated in the state program, with most offering full-day classes that operate during the academic year. The state funding formula accounts for whether a child has special needs or comes from a low-income family and also accounts for the length of the program day. Teachers are required to have a college degree and a certificate in early childhood education (Gormley and Phillips, forthcoming).

Several other states and localities are in the early stages of adopting universal preschool programs. New York is committed to a universal program, although it has not been fully funded on the original

[4] For details on state preschool programs, see Barnett et al. (2004).

[5] Districts may partner with Head Start or private programs to provide preschool classes.

phase-in schedule, while West Virginia is in the process of phasing in a universal program by 2012. Florida voters approved a constitutional amendment providing an entitlement to free, high-quality prekindergarten education by 2005, but the legislature and governor have yet to fund such a program. Los Angeles County plans to begin a ten-year phase-in of a universal preschool program for all 4-year-olds starting in 2005.[6] When fully implemented, the Los Angeles County program, which expects to serve 100,000 children annually, will be one of the largest in the country.

While state involvement has grown, there remains tremendous variability across the states in the number of children reached by state programs, in the quality of program services, and in the resources devoted to preschool education. Table 1.1 provides data compiled by the National Institute on Early Education Research (NIEER) on enrollment rates, quality standards, and spending per enrolled child for each of the 50 states during the 2002–2003 school year. (The states are ranked by enrollment of 4-year-olds in state-funded programs.)

Oklahoma and Georgia, the two states with voluntary universal preschool programs, had the highest enrollment rates in state-funded prekindergarten programs (59 and 54 percent, respectively), although these two programs exclusively serve 4-year-olds. Another 16 states enroll between 10 and 43 percent of all 4-year-olds, while 20 states have enrollment rates in the single digits for the same age group. At most, 15 percent of 3-year-olds were enrolled in state-funded programs. On average, enrollment rates for 4-year-olds and 3-year-olds increase more than twofold and fivefold, respectively, when enrollment in publicly funded Head Start and IDEA (Individuals with Disabilities Education Act) grant programs are counted as well.

The programs delivered with state funding are far from uniform. Table 1.1 shows the number of research-based quality standards defined by the NIEER that were met by each of the 38 states with funded programs (out of ten total standards). These standards, which define

[6] More information on the Los Angeles Universal Preschool (LAUP) program can be found at http://www.laup.net/index.html.

Table 1.1
State Prekindergarten Programs, 2002–2003 School Year

	Enrollment Rate (%)					
	State Pre-K		State Pre-K + Head Start + IDEA Grants			
State	4-yr-olds	3-yr-olds	4-yr-olds	3-yr-olds	No. of Quality Standards Met	$ per Child Enrolled in State Pre-K
OK	59.4	0.0	82.4	16.4	8	2,368
GA	54.3	0.0	68.1	11.6	6	3,824
TX	43.0	4.1	57.6	14.7	3	2,746
SC	32.3	1.9	51.1	16.4	8	1,303
NY	29.7	0.6	56.2	14.1	8 / 5 [a]	3,347
WV	28.9	9.5	57.9	27.4	5	3,309
KY	27.7	10.5	60.8	29.5	7	2,484
MD	26.3	2.0	39.9	11.5	8	936
WI	24.8	1.0	43.0	14.8	6 / 3 [b]	2,881
IL	24.4	8.0	41.5	19.9	9	2,905
NJ	24.1	14.6	35.4	23.2	9 / 5 [c]	8,739
LA	20.9	0.0	43.2	17.1	7 / 8 / 6 [d]	3,922
MI	19.2	0.0	39.2	13.6	n.a.	3,306
KS	14.7	0.0	32.6	13.1	4	1,721
CO	13.8	1.5	28.7	10.3	4	2,864
ME	10.8	0.0	39.4	17.6	3	1,875
MA	10.5	10.6	25.5	20.9	6	4,104
CT	10.4	3.4	24.2	12.7	4	5,601
VT	9.8	7.0	26.6	19.9	6	1,197
OH	9.5	6.2	26.6	19.1	7 / 5 [e]	4,514
CA	8.7	2.2	25.0	11.2	4	3,317
DE	8.5	0.0	24.6	10.1	7	5,287
WA	6.9	1.8	21.8	10.0	6	3,897
VA	6.3	0.0	20.1	8.0	5	3,090
HI	6.2	0.0	21.1	10.8	5	3,478
AR	6.1	2.4	35.3	19.9	10	2,998
OR	5.8	3.0	22.7	13.4	6	6,525
NC	5.6	0.0	21.9	8.9	9	4,819
AZ	5.1	0.0	23.7	9.9	4	2,432
IA	4.5	1.3	20.5	12.1	5	2,925
MO	4.3	2.4	22.2	16.1	4	2,198
TN	3.2	1.1	22.0	10.1	8	4,573
NE	2.5	1.5	20.2	14.2	6	1,909
NM	2.5	0.8	28.3	14.3	4	1,765
AL	2.2	0.0	23.8	11.9	8	3,638
MN	2.1	1.3	18.0	12.1	8	6,672
PA	1.8	0.0	18.9	11.7	2	n.a.

(continued)

Table 1.1—continued

State	Enrollment Rate (%)				No. of Quality Standards Met	$ per Child Enrolled in State Pre-K
	State Pre-K		State Pre-K + Head Start + IDEA Grants			
	4-yr-olds	3-yr-olds	4-yr-olds	3-yr-olds		
NV	1.5	0.7	11.1	6.3	4	3,686
AK	0.0	0.0	22.3	16.9	n.a.	0
FL	0.0	0.0	16.2	9.3	n.a.	0
ID	0.0	0.0	19.4	8.1	n.a.	0
IN	0.0	0.0	15.3	9.6	n.a.	0
MS	0.0	0.0	43.2	28.7	n.a.	0
MT	0.0	0.0	27.1	17.0	n.a.	0
NH	0.0	0.0	10.9	7.7	n.a.	0
ND	0.0	0.0	31.0	17.8	n.a.	0
RI	0.0	0.0	23.3	11.6	n.a.	0
SD	0.0	0.0	26.9	19.9	n.a.	0
UT	0.0	0.0	14.9	7.2	n.a.	0
WY	0.0	0.0	30.5	19.8	n.a.	0
All states	16.1	2.5	34.0	13.8	—	—

SOURCE: Barnett et al. (2004), Tables 3, 4, and 5.

NOTES: There are a maximum of ten quality standards. See Barnett et al. (2004) for details. n.a. = not applicable or not available. IDEA grants are funded through the U.S. Office of Special Education Programs as part of the Individuals with Disabilities Education Act Preschool Grants program.

[a] For Experimental Prekindergarten and Universal Prekindergarten programs, respectively.

[b] For Head Start and Four-Year-Old Kindergarten programs, respectively.

[c] For the Abbott District and Early Childhood Program Aid programs, respectively.

[d] For 8g Student Enhancement Block Grant Program, LA4/Starting Points program, and Nonpublic Schools Early Childhood Development program, respectively.

[e] For Head Start and Public School programs, respectively.

the minimal features of high-quality programs, cover education and training requirements for teachers and classroom assistants, comprehensive curriculum standards, maximum class size and staff-child ratio, and provision of related services (e.g., meals for children and vision, hearing, and health screening and referral). As seen in Table 1.1, the states serving the largest number of children do not necessarily offer the highest quality programs. One state—Arkansas—met all ten stan-

dards, while three others—Illinois, New Jersey (the Abbott District program), and North Carolina—met nine of ten standards. Twenty-six of the thirty-eight states with programs met at least five standards while just a few (three states) met three or fewer standards. Notably, just 20 state programs require the lead classroom teacher to have a bachelor's degree, a requirement in every state kindergarten program. Only 12 states have comprehensive curriculum standards. Most states with programs do require specialized training in early care and education (28 states), as well as staff-child ratios of 1:10 or better (30 states) and a maximum class size no bigger than 20 (29 states).

Even more striking is the variation across states in the state funds spent per enrolled child. As seen in Table 1.1, New Jersey tops the list at $8,739 per child, while Maryland ranks the lowest at $936 per child. Only New Jersey spent more in the 2002–2003 school year than the average Head Start funding level ($7,089 in fiscal year 2003). In many states, funding levels would be too low to sustain even a basic program, suggesting that other resources (local schools and parents) are being used to supplement the state funding (Barnett et al., 2004).

When viewed in the context of other state preschool programs, California ranks near the middle of the 38 states with state-funded prekindergarten programs. Children currently served by California's program are eligible because of various at-risk factors, such as low income, a history of abuse or neglect, or other special needs. An estimated 9 percent of 4-year-olds are enrolled in the California state program, placing California 21st among the states in terms of state-funded preschool program enrollment, with about one-seventh the state-funded enrollment rate of Oklahoma. Since California funds a small fraction of 3-year-olds (2 percent), it places 13th among states in state-funded enrollment for this age group. At the same time, California meets just four out of ten quality standards, placing it well in the bottom half of states. Among key quality standards, California does not require a bachelor's degree for preschool teachers, and there is no comprehensive curriculum standard. Spending per enrolled child is just one-third the level in New Jersey's Abbott District program.

While California lags other states in access and quality of publicly provided preschool education, there is support for moving toward a

universal preschool program. The 2002 California Master Plan for Education, developed by a joint committee of the state legislature, called for "voluntary access to formal preschool programs that offer group experiences and developmentally appropriate curricula."[7] In a 2004 poll of 1,200 California voters, 70 percent volunteered that all children would benefit from preschool education, while 75 percent supported public funding for preschool programs so that "all parents who want to can afford to enroll their children" (Hart Research Associates and The Tarrance Group, 2004). A 2000 survey of 600 adults in the state reported a similar level of support (73 percent) for a voluntary preschool program for all children (Mellman Group, Inc., 2003).

Variation in Preschool Enrollment Patterns

While participation in preschool education programs has increased over time, important differences remain in enrollment rates among population subgroups (Meyers et al., 2004). Table 1.2 reveals that, based on NHES data for 3- to 5-year-olds in 2001, enrollment rates vary substantially by race/ethnicity, poverty status, and maternal education. For example, Hispanic children are the least likely to be enrolled (40 percent), while black children are the most likely to be enrolled (64 percent). The gap is almost as large between children in families with income below poverty (47 percent) compared with those in families with incomes at or above poverty (59 percent).[8] The sharpest contrast is by mother's education, with just 38 percent of children whose mothers have less than a high school education enrolled in early education programs compared with 70 percent of those whose mother has at least a college degree. At the same time, it is striking that there is very little difference in enrollment rates between two parent and single parent families. Finally, while enrollment rates are lower when the mother is not employed or unemployed (47 percent), rates are almost identical

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[7] See *The California Master Plan for Education,* recommendation 3, available at http:// www.wascweb.org/senior/MasterEducationCA.PDF (as of February 22, 2005).

[8] Other research documents that low-income families are less likely to use center-based care for their children under 5 and more likely to rely on family child care or care from a relative. See, for example, Capizzano and Adams (2004).

Table 1.2
Preschool Enrollment Rates for U.S. Children Ages 3 to 5 by Child and Family Characteristics, 2001

Characteristic	Enrollment Rate
Total	56.4
Age	
3	43.0
4	66.2
5	72.8
Sex	
Male	53.6
Female	59.2
Race/ethnicity	
White	59.0
Black	63.7
Hispanic	39.8
Poverty status	
Below poverty	46.7
At or above poverty	59.1
Family type	
Two parents	56.5
One or no parents	56.1
Mother's education	
Less than high school	38.3
High school diploma or equivalent	47.1
Some college	62.0
Bachelor's degree or higher	69.5
Mother's employment status	
Worked 35 or more hours per week	62.9
Worked less than 35 hours per week	61.4
Looking for work	46.9
Not in labor force	46.8

SOURCE: NCES (2002), Table 1–1.
NOTES: Estimates are based on children for whom it was reported that they had not yet entered kindergarten. Children from racial/ethnic groups other than white, blank, or Hispanic are included in the totals but are not shown separately. Children without a mother in the home are excluded from tabulations of mother's education and employment status.

for mothers who work full time versus those who work part time (63 to 61 percent).

Enrollment patterns for 3- and 4-year-olds in California, based on tabulations from the October 2001 CPS, are shown in Table 1.3.[9] (Results for the country as a whole are tabulated as well.) Generally, the pattern for California mirror that for the United States as a whole, whether the latter is measured by the CPS or (as in Table 1.2) by the NHES data. For example, enrollment rates rise with the child's age and the mother's education, are a little higher for girls than for boys, and are highest for black children and lowest for Hispanics. The California data suggest a relatively higher share of enrollment is in public programs compared with the United States as a whole, where the public and private sectors nearly equally split the enrollment.

In California, enrollment rates are highest for those at the top of the income scale, but also relatively high for those at the bottom, according to 2001 CPS data. However, Lopez and de Cos (2004), working with 2000 Census data, show that participation rates rise with income, and the rates do so for all racial and ethnic groups in California.[10] Participation rates are lowest for Hispanics in all income groups and highest for blacks in all income groups except the highest ($75,000 or more). Lopez and de Cos also find that participation rates are lowest for children in families that are linguistically isolated (defined as

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[9] Lopez and de Cos (2004) provide similar tabulations for California based on the 2000 Census. Their data shows preschool enrollment rates, excluding children already enrolled in kindergarten, of 54 percent for 4-year-olds and 63 percent for 5-year-olds. However, since their tabulations are based on information as of April, the children in their sample are on average about six months older than the children sampled in the October CPS. Thus, many of the 4-year-olds in the CPS will be tabulated as 5-year-olds in the Census. In fact, their cohort of 5-year-olds not in kindergarten contains only about 40 percent of that age group. The others, presumably the older 5-year-olds, are already in kindergarten. The enrollment rate for 5-year-olds based on the Census data is comparable to that calculated for 4-year-olds using the CPS as seen in Table 1.3. Moreover, the enrollment patterns by characteristics tabulated by Lopez and de Cos (2004) for the Census are similar to those based on the CPS shown in Table 1.3.

[10] Tabulations from the 2000 Census by Lopez and de Cos (2004) show participation rates are nearly identical, at about 40 percent, for 3- to 5-year-old children with family income up to $50,000 in 2000. They do not show a relatively higher participation rate for children in families with income below $15,000. The differences by income observed in Table 1.3 may reflect sampling errors due to the small sample sizes, especially compared with those of the Census.

Table 1.3
Preschool Enrollment Rates for Children Ages 3 to 4 by Child and Family Characteristics, in California and the United States, October 2001

	Enrollment Rate	
Characteristic	**California**	**United States**
Total	49.0	52.4
Public	27.2	25.9
Private	21.8	26.5
Age		
3	32.9	38.6
4	64.5	66.4
Sex		
Male	48.2	51.7
Female	50.0	53.1
Race/ethnicity		
White non-Hispanic	60.3	55.2
Black non-Hispanic	64.2	60.5
Hispanic	42.5	39.9
Family income		
Less than $14,999	51.2	44.5
$15,000 to $29,999	36.1	42.5
$30,000 to $49,999	37.2	46.4
$50,000 and above	61.7	64.5
Mother's education		
Less than high school	35.6	35.9
High school diploma or equivalent	34.2	44.6
Some college	58.3	56.2
Bachelor's degree or higher	65.2	68.1
Mother's employment status		
Worked 35 or more hours per week	62.4	57.7
Worked less than 35 hours per week	66.3	59.6
Looking for work	46.8	46.7
Not in labor force	33.3	44.7
Sample size	312	3,861

SOURCE: Authors' tabulations of the October 2001 CPS.
NOTES: Estimates are based on children for whom it was reported that they had not yet entered kindergarten. Children from racial/ethnic groups other than white, black, or Hispanic are included in the totals but not shown separately. Children without a mother in the home are excluded from tabulations of mother's education and employment status.

households where all household members over age 14 do not speak English very well).

A Universal Preschool Education Program in California

To evaluate the costs and benefits of a universal preschool program in California, we must make assumptions about the key features of such a program. Ideally, these features would be associated with a high-quality preschool program that is universally available to all age-eligible children. Relevant features would include eligibility criteria and the age(s) of children served, the program intensity in terms of the hours of services delivered, and characteristics associated with high-quality programs (e.g., the class size, child-staff ratio, and teacher qualifications).

Our assumptions follow the program parameters adopted in a companion analysis funded by The David and Lucile Packard Foundation conducted by the Institute for Women's Policy Research (IWPR) and the American Institutes for Research (AIR) (Golin et al., forthcoming). The IWPR/AIR study provides estimates of the cost of a universal preschool program in California based on key assumptions of the program features. Table 1.4 summarizes these features as they pertain to the IWPR/AIR study and they are the ones we adopt for our analysis as well.

We assume that a universal preschool program in California would be voluntary for all 4-year-old children.[11] The publicly funded program would operate part day, with the option of extended day or wraparound care paid for by families or other sources of funds.[12] The part-day schedule would provide for approximately 525 hours of preschool services per year. This is consistent with a 3-hour weekday program that operates during the school year (35 weeks or 175 days) or a 2.14-hour weekday program that operates year round (49 weeks or 245

[11] The IWPR/AIR study considers a program that would serve 3-year-olds as well.

[12] Existing child care subsidies funded by federal, state, or local sources could be used to cover the costs of the wraparound care for families who qualify for such support.

Table 1.4
Features of a Universal Preschool Program in California

Feature	Specifics
Eligibility	Voluntary program for all age-eligible children
Children served	Program enrolls 4-year-olds
Program intensity	Approximately 525 hours per year (3-hour program 5 days a week for school year or 2.14-hour program 5-days a week for 2 year-round program)
"Wraparound" care	Extended day care available financed by other sources
Class size and staff-child ratios	Maximum class size of 20; staff-child ratio of 1:10
Teacher qualifications	Head teacher in each classroom has a bachelor's-level education with an early childhood education credential; assistant teacher in each classroom has an associate's-level degree
Facilities	Programs use existing or new facilities run by private or public providers
Financing	Full funding with public funds

SOURCE: Based on Golin et al. (forthcoming).

days). Programs may operate two-sessions each day, one in the morning and one in the afternoon.

A key element of a high-quality program is the qualifications of the teaching staff and the staffing ratio (Espinosa, 2002). We assume that the head teacher in each classroom has a bachelor's degree while the assistant teacher would have at least an associate's degree. The head teacher would also be credentialed in early childhood education and development. The education qualification for the head teacher, as noted above, is the same requirement in every state for kindergarten-level teachers and consistent with the recommendations of the National Research Council (Bowman, Donovan, and Burns, 2001; Barnett et al., 2004). With two teachers in each classroom, we assume a maximum class size of 20 children, and thus a staff-child ratio of 1:10. This is the level recommended for program accreditation by the National Association for the Education of Young Children (NAEYC).[13]

[13] See "Accreditation Criteria," NAEYC website, available at http://www.naeyc.org/accreditation/criteria98.asp (as of February 22, 2005).

Following the IWPR/AIR study, we assume that a universal program in California would build on the existing preschool infrastructure, with services delivered by both public and private providers. Consistent with a universal program, our primary assumption is that all costs of the core (part-day) program are paid for with public funds. However, in our benefit-cost analysis, we will consider an alternative financing approach that recovers some program costs through fees charged to families on a sliding scale (i.e., based on ability to pay).

CHAPTER TWO

The Benefits of Preschool Education

A key element in assessing the economics of a universal preschool program in California is understanding the potential effects of such a program on participating children, both in terms of the immediate effects, for example on school readiness, but also on longer-term effects on school performance and other outcomes as the children age. In this chapter, we review what is known about the impacts of high-quality preschool programs based on scientifically sound research. We concentrate on studies that examine center-based programs serving children at ages 3 or 4, prior to kindergarten entry.

Most of the best research evidence comes from preschool programs that served children at greater risk of school failure, with the expectation that a high-quality preschool experience in the year or two before kindergarten entry can improve the child's cognitive, social, and emotional development, with corresponding favorable effects on later school performance and other outcomes. However, a universal preschool program would potentially serve more-advantaged children as well. Thus, we also review what is known about the impacts of high-quality preschool programs on lower-risk children.

We begin with a brief overview of the methodological challenges facing researchers who aim to identify the effects of preschool programs. We then focus on the evidence of the effectiveness of preschool education for more-disadvantaged children. The next section examines studies that identify the potential effects for more-advantaged children. We conclude by summarizing our assumptions, based on this literature, that underlie the benefit side of the benefit-cost analysis presented in Chapter Three.

Methods for Program Evaluation

An extensive literature provides evidence of the potential effects of center-based early childhood programs that serve children in the one or two years prior to kindergarten entry.[1] This literature cannot be taken at face value; studies using appropriate methodologies must be culled, as must those measuring a range of outcomes over a period of time.

Using Appropriate Methodologies

Simply observing differences in outcomes among children who attend preschools versus those that do not does not necessarily identify the causal effect of preschool participation. Children in Head Start, for example, are selected from more-disadvantaged backgrounds. Their school performance and other outcomes after attending Head Start may be worse than some children who never attended preschool simply because they are a more disadvantaged group, not because Head Start led to unfavorable outcomes. Likewise, those who attend private preschool programs tend to be children with fewer risk factors. If their outcomes after preschool are better than those with no preschool, it may be because they have other advantages that promote their success, rather than being attributable to preschool attendance itself.

What we need to know is, What is the effect of preschool attendance on children's outcomes compared with what would be observed for the same children had they not attended preschool, holding everything else constant? Of course, we do not have the opportunity to observe outcomes for the same children attending and not attending preschool. Compensating for this inability to observe the counterfactual is the primary challenge facing evaluation research that seeks to identify the causal effects of participating in preschool.[2] In the remainder of this section, we review two main approaches for addressing this challenge: experimental studies and quasi-experimental studies.

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[1] For an overview of the broad array of early childhood programs, including those serving children from birth to age 3, see Karoly et al. (1998).

[2] The concept of causal inference is also referred to as internal validity. In research with high internal validity, we have a more compelling argument that the program has a causal effect on the outcomes.

Experimental Studies. Random assignment studies provide one way to address the problem of drawing causal inferences and are considered the gold standard in evaluation research.[3] In this design, a study population is randomly assigned either to participate in a particular preschool program—the treatment group—or to not participate in the preschool program—the control group. Provided the randomization is implemented properly and the sample is large enough, the two groups will be similar within known statistical bounds in terms of both observable characteristics and unobservable characteristics. The only difference between the two groups will be the chance result that one group participates in the program while the other does not. Thus, the average effect of the program can be estimated by the difference in mean outcomes between the treatment and control groups.[4] This unbiased estimate of the treatment effect can be compromised if there is nonrandom attrition from the study population. This problem can be more severe when sample sizes are small or when experiments attempt to follow participants long after the preschool program has ended.

While properly implemented randomized experiments are considered the gold standard, they do have several drawbacks. The most important include the possibility that results cannot be generalized (to other populations, settings, and times) and the fact that in some situations they are impractical, time consuming, unethical, or prohibitively expensive. For example, when preschool programs are made available universally, in a particular state for instance, it can be impractical or even unethical to withhold a group of randomly selected children from participating in the program in order to have a control group. If the program is phased-in across different geographic locations, or has not yet reached capacity so that some children would be unable to participate anyway, then randomization may be more feasible. Even when randomization may be feasible, experiments are not always supported by program staff since they lose the ability to control who participates in a program.

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[3] Random assignment studies in the context of social science research are discussed in Burtless (1995) and Heckman and Smith (1995).

[4] In some studies, regression analysis is used to increase the efficiency of the estimated treatment effects by controlling for any remaining (random) differences in observed characteristics between the treatment and control groups.

Quasi-Experimental Studies. A second-best alternative to randomized experiments is the use of quasi-experimental designs based on observational data. Most quasi-experimental approaches still rely on comparing two groups: one that participates in preschool and one that does not. However, because these two groups are not randomly assigned, they may differ in respects that influence differences in outcomes. The goal of quasi-experimental approaches is to control for as many of these confounding factors as possible so that the effect of the treatment is isolated.

Statistical or econometric techniques are used to control for factors that are observed by the analyst as well as those that are not observed. One approach is to use a comparison group and control for as many observable differences as possible between the treatment and comparison groups. A potential drawback of this strategy is that unobservable differences may also affect outcomes for the two groups. For example, it may be possible to control for family income and parental education, two factors that are likely to be associated with the choice to attend preschool and subsequent child outcomes. While these two factors may be observed and controlled for in a statistical analysis, other factors, such as parental motivation to invest in their children's education, may not be observed. If such factors affect the choice to enroll in preschool and later child outcomes, estimated differences in outcomes that fail to control for these unobserved factors will be biased. In other words, the contribution of preschool alone cannot be separated from the contribution of these other unobserved, confounding factors.

This problem of unobserved confounding factors may be more severe when the comparison group is drawn from the same population as the treatment group but the only difference is the choice to attend preschool. This would be the case, for example, if the analysis is conducted for a survey sample and the analysis aims to estimate the effect of attending any type of preschool program. On the other hand, reducing the opportunity to self-select into the treatment or control group can help reduce the influence of unobserved factors. For example, the comparison group might be drawn from a population that has background characteristics similar to those of the preschool group but resides in communities that do not have access to the preschool

program. In this case, parental choice (beyond possibly choice over neighborhood location) is not determining who attends preschool. Instead, it is a function of where the preschool program is located, which may be considered a chance factor from the perspective of the child or the child's family.

Another strategy for controlling for unobserved family background factors is to use siblings—where one attended preschool and another did not—as the treatment and comparison groups. Siblings may share common family background factors that are both observed (e.g., maternal education) and unobserved (e.g., parental motivation). So siblings may be used in a quasi-experimental design to control for unobserved family background factors. This strategy will not successfully control for all unobserved family background factors if those factors are not fixed or the same across siblings. For example, parents may have reasons (e.g., differences in the perceived abilities of their children) to choose a preschool program for one child and not another. Such differences mean that the use of siblings as treatment and comparison groups will not control for all potential biases.

In other cases, experimental conditions may be nearly attained if other accidental factors determine who participates in the preschool program or not. For example, a particular date may determine which children are old enough to participate in a preschool program and which children are too young to do so. In this design, it is the chance event of the timing of a child's birthday that determines who is in preschool or not. A comparison of outcomes between those who attended preschool and those who did not (because they were ineligible) can provide a quasi-experimental estimate of the treatment effect. The primary drawback of this approach is that it can identify only the short-term impact (e.g., effect after one year) of preschool participation. Once the children in the comparison group are eligible to enroll, there is no longer a comparison group to use for longer-term follow-up.

Even strong quasi-experimental designs can be compromised by the same factors that can affect experimental studies. These include small sample sizes, nonrandom attrition, and an inability to generalize findings to other populations or settings. Strong designs can also be expensive or impractical to implement. Moreover, other quasi-

experimental designs not covered here are considerably weaker in terms of the ability to support causal inferences.

Scope of Outcomes Measured

Beyond using appropriate methodologies for making inferences about causal effects, several other challenges confront the preschool evaluation literature. First, preschool participation may have a broad range of impacts, beyond those directly related to school performance. Studies in the 1960s tended to focus on the effects of preschool participation, including Head Start, on children's cognition or IQ. Later analyses considered broader impacts related to socio-emotional functioning, health-related outcomes, academic achievement, school performance, and even outcomes in young adulthood when follow-up periods were long enough (see Karoly et al., 1998, for examples).

The fact that preschool programs may have continued benefits as children age presents a second challenge: Children's outcomes must be measured not just soon after program participation ends, but also in the years that follow as children move through primary and secondary education, and even into young adulthood and beyond. Notably, for many of the outcomes relevant for a benefit-cost analysis—those that can be valued in monetary terms, such as the use of special education, crime and delinquency, and educational attainment—long-term follow-up is required. Even with longer-term follow-up, as we discuss further in the next chapter, it is often possible to project some benefits beyond the period of observation based on well-documented relationships, such as the lifetime earnings gains associated with higher educational attainment or the reductions in adult criminal activity associated with a reduction in juvenile crime.

Effectiveness of Preschool Education for Disadvantaged Children

In considering the preschool evaluation literature, we place the greatest weight on experimental designs and those studies that use appropriate statistical methodologies to control for potential confounding factors

that might bias quasi-experimental estimates of preschool impacts. We also narrow our attention to studies that measure a broad range of outcomes, ideally for periods with long follow-up. In this section, we further focus our review on studies evaluating high-quality, targeted education-based programs beginning one or two years before school entry.[5] Table 2.1 lists the four specific program evaluations we consider in this section. For each program, we indicate the program features (specifically the target population served; the ages children participated in the program; whether the focus of the program is the child or the parent(s) or both; and the program content, as well as features of the program evaluation).

All four programs listed in Table 2.1 provide preschool services to children for one or two years prior to kindergarten entry in a center-based setting. Most programs are part-day and operate during the school year. The Early Training Project and Perry Preschool Project were demonstration programs, operating in one site and with experimental evaluations based on relatively small samples. The Chicago Child-Parent Centers (CPC) and Head Start programs are larger-scale programs, in the former case operating in multiple sites in Chicago and in the latter case operating nationwide. The evaluations for these two programs use quasi-experimental designs based on longitudinal survey data. All four programs include long-term follow-up so that outcomes are measured in late adolescence or early adulthood.

We begin our discussion with the Chicago CPC program because we think the nature of the program and the quality of its evaluation make it a good model for use in our analysis of a California program. A discussion of the other three program evaluations follows. In addition to these four programs, we also discuss the results from one meta-analysis of a broader set of evaluations of targeted preschool programs.

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[5] The Abecedarian program is also often cited as providing evidence of the effectiveness of a high-quality preschool program (see Campbell and Ramey, 1994 and 1995, for a description of the program and its findings). However, the Abecedarian program provided year-round full-day center-based care for children starting a few months after birth and continuing until kindergarten entry (a school-age component was included as well). Since this program is more intensive than what is expected of a preschool program that begins one or two years before school entry, we exclude this program from our analysis. Likewise, we exclude several other similar programs reviewed in Karoly et al. (1998) that also started prior to age 4.

Table 2.1
Features of Selected Targeted Preschool Programs with Long-Term Evaluations

Program (Years of Operation) [Site]	Intervention				Evaluation		
	Target	Ages of Participants	Focus (Mode)	Content	Design (Sample Size)	Age at Last Follow-up	Citation
Early Training Project (1962–1965) [Murfreesboro, TN]	Low SES	Entry: 4 to 5 years Exit: 6 years	Child (Center/home)	Summer part-day preschool program Home visits	Experimental (E=44, C=21)	16–20	Gray and Klaus (1970) Gray, Ramsey, and Klaus (1982, 1983) Lazar and Darlington (1982)
High/Scope Perry Preschool Project (1962–1967) [Ypsilanti, MI]	Low SES and low IQ scores	Entry: 3 to 4 years Exit: 5 years	Child (Center/home)	School-year part-day preschool program Home visits	Experimental (E=58, C=65)	40	Weikart, Bond, and McNeil (1978) Schweinhart and Weikart (1980) Berrueta-Clement et al. (1984) Schweinhart et al. (1993) Schweinhart (2004)

Head Start (1965 to present) [national]	Low income	Entry: 3 to 4 years Exit: 5 years	Child (Center/home)	Part-day or full-day preschool program operating during the school year or year round (variation across sites)	Quasi-experimental (E=489, C=2,766)	18–30	Currie and Thomas (1995, 1999) Garces, Thomas, and Currie (2002)
Chicago Child-Parent Centers (CPC) (1967–present) [Chicago, IL]	Low SES	Entry: 3 to 4 years Exit: 6 to 9 years	Child/parent (Center)	Preschool: Half-day school-year program School-age: Kindergarten and primary (to third grade) programs	Quasi-experimental (E=1,150, C=389)	20–21	Reynolds (1994, 2000) Reynolds and Temple (1998) Reynolds et al. (2001)

SOURCE: Derived from Karoly et al. (1998), Table 2.1, and indicated citations.
NOTES: SES = socioeconomic status; E = experimental group; C = control group.

The Chicago Child-Parent Centers

The Chicago CPC program is a large-scale publicly funded preschool program operating in Chicago public schools serving low-income children.[6] The program began in 1967 in four sites serving children ages 3 to 5 prior to kindergarten entry, using Title I funding. The program later expanded in 1978 to continue services in affiliated elementary schools for children through the third grade, including a full-day kindergarten component. In 1998, 25 centers served over 4,000 preschool-aged children in high poverty neighborhoods at an average annual cost per child of $4,400.

The Chicago CPC preschool program has several features that make it a good model for a universal program in California.[7] In terms of program characteristics, the CPC program provides a structured half-day program (three hours per day) during the school year with diverse learning experiences designed to prepare children for school through the promotion of language arts and math. The lead classroom teachers all have bachelor's degrees and certification in early childhood education, and they participate in regular professional development opportunities. The staff-child ratio is 2:17 (with a lead teacher and an aide), and the teachers are relatively well paid as public school employees. In addition to these features, the Chicago program is also one of the few preschool programs with a high-quality evaluation that is also publicly funded, institutionalized, and implemented on a large scale.[8]

Evidence of the effects of the Chicago CPC program comes from the Chicago Longitudinal Study (CLS), a prospective study of a cohort

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[6] This section draws on Reynolds (2000) and Reynolds et al. (2001, 2002).

[7] Other features of the CPC program may differ from a universal program in California. For example, the CPC preschool program provides health screening, speech therapy services, and meals, as well as outreach activities including home visiting. A high priority is also placed on parent involvement, from volunteering in the classroom to participating in school events and field trips. These comprehensive services mirror those emphasized in the Head Start program.

[8] Gilliam and Zigler (2004) review evaluations of 20 state-funded preschool programs (in 18 states), mostly targeted programs. Most states with state-funded programs have not evaluated them, and those that have have generally relied on less-rigorous methodologies. None of the programs were evaluated using an experimental design. Some had no comparison group, while others relied on comparison groups that are likely to produce biased results. We discuss the results for the Georgia and Oklahoma evaluations below.

of 1,539 low-income minority children born in 1980 who attended kindergarten in one of 25 sites in Chicago in the 1985–1986 school year. Of this cohort, 989 children attended one or two years of preschool and kindergarten in one of 20 CPC programs, and a subset also continued to participate in affiliated elementary schools through age 9. The remaining 550 children did not attend a CPC preschool (and most did not attend an alternative preschool program, although about one-fifth were enrolled in Head Start), but they did attend full-day kindergarten either at a CPC-affiliated school or one of five other randomly selected schools in the Chicago area not served by a CPC program.

Using a quasi-experimental design, the first group serves as the treatment group, and the remaining children serve as the comparison group. One concern with this type of study design is that selectivity into the preschool program will bias the estimates of program impacts. For example, more-motivated parents may choose to participate in the CPC program, while less-motivated parents are in the comparison group. We address this concern in the next section by cross-validating the CPC program findings with several high-quality experimental evaluations of targeted preschool programs.

Even without the evidence from other studies, several aspects of the CPC program and the study design mitigate this and other concerns. First, the CLS study sample consists of children in a common kindergarten cohort. In most cases, families in the comparison group did not enroll in the CPC preschool program because they did not live in an area served by one of the centers. Thus, home residency rather than motivation was the primary determinant of participation. Second, in the neighborhoods served by the CPC program, a full-time school-community representative actively engaged in outreach efforts to recruit families most in need of the CPC services. Participation rates were about 80 percent among eligible children because there were few other preschool options in the areas served by the CPC program. Complications in scheduling a half-day preschool program due to work or other commitments was one barrier to CPC participation (Reynolds and Temple, 1995). This high rate of program saturation provides for a sample that is more likely to be representative of the eligible population rather than a selected sample. Third, a comparison

of observable characteristics shows that the treatment and comparison groups are well matched on most characteristics. This comparison includes a measure of the parents' educational aspirations for their child (Reynolds, 1994). Nevertheless, since some differences remain, analysis of differences in outcomes for the treatment and comparison groups have used statistical techniques to account for the quasi-experimental design, with specific controls for background variables. Fourth, beyond controlling for observable differences, explicit modeling of the selection of participants into the CPC program suggests that there is no bias due to selection, thereby increasing the confidence that the measured impacts are true program effects (Reynolds, 1994; Reynolds and Temple, 1995).

Table 2.2 demonstrates that the CLS cohort children served by the Chicago CPC program faced a number of risks to healthy development. Over three-fourths lived in a single parent family, and about four in ten had a parent with less than a high school education. Most had low income as indicated by their eligibility for a free or reduced-price lunch (available to those with family income below 130 percent of the poverty line), and lived in neighborhoods with a high concentration of other low-income families. Just over one-half had an unemployed parent. Over 90 percent of the children were black, and the remainder were Hispanic.

The CLS cohort has been followed through age 20 to 21, providing a long-term assessment of the potential impacts for disadvantaged

Table 2.2
Selected Risk Indicators for Chicago Child-Parent Center Participants

Characteristic	Percentage
Living in single parent family	76
Parent/guardian has less than high school diploma	41
Eligible for free lunch subsidy	84
In school area where more than 60% of students are low income	77
Parent/guardian not employed full time or part time	56
Minority status	100

SOURCE: Reynolds (2000), Table 14.
NOTE: Sample size is 889 in the CPC program group.

children of a high-quality preschool program. At the time of the latest follow-up, data was available for at least two outcomes for 934 children in the treatment group and 504 children in the comparison group, or 84 percent of the original sample in total. There is no evidence of selective attrition, with comparable distribution of background characteristics for children in the follow-up sample versus those who were lost through attrition. Outcomes measured for the CPC program participants and comparison group are based on school records; interviews with participants, teachers, and parents; and court records.

Table 2.3 summarizes key findings of the impact of the preschool component of the CPC program, with outcomes measured as late as age 20.[9] Program impacts are grouped into five categories: school achievement, school remedial services, child maltreatment, juvenile crime and delinquency, and educational attainment. For each outcome, the table shows the mean for the CPC preschool group (labeled "treatment"), the mean for the no CPC preschool comparison group (labeled "control"), and the difference in the two means.[10] The statistical significance of the difference between the two groups is denoted by the p-value, and the effect size provides a standardized estimate of the program impact.[11] These impacts measure the effect of participation in the CPC preschool program for an average of 1.5 years.

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[9] Published results differentiate between impacts for the preschool component from the extended services offered through age 9. Given our focus, we limit our discussion to the findings for the preschool program only. A wider array of outcomes at school entry, in elementary school, and in early adolescence can be found in Reynolds (1994, 2000) and Reynolds and Temple (1998).

[10] The means and mean differences reported in Table 2.3 adjust for differences between the treatment and control group in the child's gender, race/ethnicity, family risk index, and program sites. See Reynolds et al. (2002) for additional details.

[11] The effect size is a standardized measure of impact and is defined as the program impact (treatment minus control group difference) divided by the standard deviation of the outcome for treatment and control groups combined. In other words, the mean difference in the outcome is standardized by the underlying variability in the outcome in the population. This allows for a standardized comparison across outcomes measured in different units. Since the standard deviations are not reported for the CPC results, we have estimated the effect size using the arcsine transformation of the difference between two proportions for dichotomous outcomes and as the standard mean difference effect size for continuous variables (see Lipsey and Wilson, 2001, Appendix B).

Table 2.3
Estimated Effects for Chicago Child-Parent Centers Program

Outcome	N	Treatment	Control	Difference	p-value	Effect Size
School achievement						
Cognitive development at age 5 (ITBS)	1102	49.6	43.3	6.3	<0.001	0.21
Reading achievement at age 9 (ITBS)	1286	98.2	93.5	4.7	<0.001	0.19
Reading achievement at age 14 (ITBS)	1158	147.1	141.6	5.5	<0.01	0.16
School remedial services						
Grade retention by age 15 (%)	1281	23.0	38.4	–15.4	<0.001	–0.34
Special education use by age 18 (%)	1281	14.4	24.6	–10.2	<0.001	–0.26
Years in special education from ages 6 to 18	1281	0.73	1.43	–0.70	0.06	–0.11
Child maltreatment from ages 4 to 17						
Indicated report of abuse/neglect (%)	1408	5.0	10.3	–5.3	<0.001	–0.20
Juvenile crime and delinquency by age 18						
Petition to juvenile court (%)	1404	16.9	25.1	–8.2	0.003	–0.20
Petition to juvenile court for violent offense (%)	1404	9.0	15.3	–6.3	0.002	–0.19
Number of petitions to juvenile court	1404	0.45	0.78	–0.33	0.02	0.13
Educational attainment by age 20						
High school completion (%)	1233	49.7	38.5	11.2	0.01	0.23
Highest grade completed	1226	10.55	10.23	0.33	0.01	0.15

SOURCE: Reynolds et al. (2002), Table 4 and author's calculations (for effect sizes).
NOTES: N is sample size for combined treatment and control groups. Results are for preschool treatment group versus the no preschool comparison group. The final column shows the mean difference effect size estimated using the arcsine transformation of the difference between two proportions for dichotomous outcomes and as the standard mean difference effect size for continuous variables (see Lipsey and Wilson, 2001, Appendix B). ITBS = Iowa Tests of Basic Skills.

These results indicate that the Chicago CPC program had meaningful and statistically significant impacts across a range of longer-term outcomes. The first category indicates that early gains in cognitive development as of age 5 persisted in measures of reading achievement scores as late as age 14. The 5.5-point advantage in reading scores at age 14 corresponds to about a four- to five-month change. The estimated effect sizes for school achievement measures, which range from 0.16 to 0.21, would be considered modest impacts in the context of educational interventions, but the fact that they are observed almost ten years after the intervention is unusual. The gain in mathematics achievement as of age 14 was also significant but slightly smaller, corresponding to a three- to four-month advantage. Since the Chicago CPC program study sample (treatment and control groups combined) had reading and math test scores that placed them 1.5 to 2 years behind the national average for students at the same age, the reading and math score gains closed one-fourth to one-third of the gap between the Chicago CPC program sample and the national average (Reynolds, 2000).

In terms of the use of remedial educational services, children who participated in the CPC program were 15 percentage points less likely to have been retained in grade by age 15 (through eighth grade), and their probability of using special education was 10 percentage points lower as of age 18. Years of special education use were lower by seven-tenths of a year. The absolute values of the effect sizes of 0.34 and 0.26 standard deviations for the two incidence measures are among the largest impacts for the measures in Table 2.3 and are considered meaningful in the context of educational interventions. In addition, the incidence of child maltreatment, as measured by indicated reports of abuse or neglect, was reduced by 5 percentage points, again with a moderate effect size.[12]

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[12] A subsequent study published by Reynolds and Robertson (2003) reports an impact estimate of 5.5 percentage points versus the 5.3 percent we show in Table 2.3 based on Reynolds et al. (2002) (the difference is in the control group mean). We have elected to use the estimate from the 2002 study for our benefit-cost analysis reported in Chapter Three in order to replicate as closely as possible the estimates used for the CPC benefit-cost study. We also note that this impact estimate is for court reported indicated cases of abuse and neglect. Reynolds and Robertson (2003) also report the impact estimate associated with a measure of indicated reports of abuse and neglect based on reports from the state Department of Child and Fam-

The CPC program is also notable for reducing crime and delinquency, according to several alternative measures, and for increasing educational attainment. As of age 18, the fraction of children in the CPC program with a juvenile court petition—the equivalent of filing charges in an adult court, a step taken only for a fraction of youth cited or arrested—was lower by 8 percentage points, and there was a 6 percentage point difference in the incidence of such petitions for violent crime. The mean number of juvenile court petitions (i.e., court filings) among CPC participants was lower by 0.3 petitions, or 42 percent relative to the control group.

Two measures of educational attainment are also included in Table 2.3. By age 20, 50 percent of CPC program participants had completed high school versus 39 percent for the control group, a difference of 11 percentage points. The number of years of schooling increased by 0.3 grades. Similar results are found for high school completion rates and years of school completed as of age 21 (Reynolds et al., 2002). Both the reductions in juvenile crime and the gains in educational attainment have estimated effect sizes that are educationally meaningful.

To summarize somewhat less technically, consider a cohort of 100 at-risk children served by the Chicago CPC program versus 100 with similar characteristics but not served. In the CPC group, 15 fewer children would ever repeat a grade, 10 fewer children would ever use special education, and there would be 11 more high school graduates. There would be 70 fewer child years of special education used over the course of K to 12 schooling. There would be 5 fewer children who experience abuse or neglect, and 8 fewer children with juvenile court petitions (6 of those for violent offenses).

Since children in the CPC program participated for one or two years, the researchers examined whether there were differences in outcomes by the length of time in the preschool program. With the exception of school achievement scores and child maltreatment, these

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ily Services. By this measure, from ages 4 to 17, those in the preschool treatment group had a lower incidence of abuse or neglect—7.3 percentage points (6.9 percent for the treatment group versus 14.2 percent for the comparison group), with a p-value of 0.001, a somewhat larger effect than the value report in Table 2.3.

results show no differences in outcomes between children with one year of preschool versus those with two (Reynolds et al., 2001). In other words, there appears to be no evidence of a statistically significant advantage of a second year of preschool in terms of the use of school remedial services, juvenile crime and delinquency, and educational attainment.

A similar result was found based on data when the CPC study participants were observed at the end of sixth grade (or fifth grade for children who repeated a grade) (Reynolds, 1995). While children who had participated in preschool for two years had higher academic readiness scores at the start and end of kindergarten compared with children who had been in preschool one year, that initial advantage did not persist in statistically significant or educationally meaningful larger impacts on measures of math and reading achievement, grade repetition, use of special education, or social adjustment at the end of primary school.[13] The magnitudes of the effects were consistently larger for the two-year preschool group compared with the one-year group, but the marginal advantage of the additional year was considerably smaller than the first. This suggests a threshold of benefits at one year from preschool education with the features of the Chicago CPC program, and diminishing marginal benefits thereafter.

Other Long-Term Evaluations of Targeted Programs

As noted earlier, we focus on the Chicago CPC program because it has features, combined with a high-quality long-term evaluation, that make it well suited for our efforts to model the costs and benefits of a universal preschool program in California. However, there are a number of other targeted preschool programs that have also been evaluated in terms of their longer-term impacts on participating children. In this subsection, we focus on three programs in particular where high-quality evaluations provide evidence of preschool impacts as of young adulthood. We also review the findings of a recent meta-analysis of the effects of targeted preschool programs. In reviewing these results, our primary interest is

[13] Those who participated in any preschool (either one or two years) had more favorable (and statistically significant) outcomes through sixth grade on all these measures compared with children who had not attended preschool.

to gauge the extent to which the results from the Chicago CPC program have been replicated in other studies, both in terms of the domains of impact, as well as in the direction and magnitude of the impacts.

Early Training Project. The Early Training Project was one of the first preschool intervention programs with an experimental evaluation (see Table 2.1). The program was implemented in Murfreesboro, Tennessee, between 1962 and 1965, with a cohort of 65 black children from families with low-socioeconomic status (SES). Born in 1958, the children were randomly assigned to participate or to be in the control group (Gray and Klaus, 1970; Gray, Ramsey, and Klaus, 1982, 1983; Lazar and Darlington, 1982). The program consisted of a ten-week part-day preschool program for one or two summers, as well as weekly home visits during the school year. At the time of the final follow-up in 1978, most participants were 19 years old, and 80 percent of the original study population was included.

Preschool participants showed an IQ advantage after the program, but it faded within a few years. There were, however, longer-term differences on other outcomes. Table 2.4 shows that although the difference in grade retention rates between the treatment and control groups was not significant (and the effect was the opposite of what was expected), preschool participants were considerably less likely to participate in special education as of age 18. The estimated effect size for special education use is about three times as large as that for the CPC program. In addition, a higher fraction of Early Training Project participants completed high school compared with the control group (61 versus 48 percent) although the difference was not statistically significant. The effect size, however, was about the same as that for the CPC program, which had larger sample sizes and therefore more power to detect statistically significant differences of this magnitude.

Finally, there is some evidence that, in the Early Training Project, outcomes were similar for the children who participated in the program for just one summer compared with those who participated for two (Gray, Ramsey, and Klaus, 1983). This echoes the Chicago CPC finding (as well as a similar finding for the Perry Preschool program discussed next) that a second year of preschool, at least as these programs were implemented, had a lower marginal benefit than the first year.

Perry Preschool Project. The High/Scope Perry Preschool Project, another early experimental study of a targeted preschool program, is perhaps the best known early intervention study (see Table 2.1). The program enrolled 123 black children in Ypsilanti, Michigan, over five waves between 1962 and 1967. Children were eligible if they had low-SES and an IQ less than 85 at entry. Children were randomly assigned to a control group or to participate in the part-day school-year program, for either one year or two. The child-staff ratio in the program was 6:1, and all teachers were certified public school teachers trained in early child development. The last follow-up took place when the children were age 40, with missing data rates of about 6 percent.

The Perry Preschool program had significant favorable long-term effects on the education and economic outcomes of program participants (see Table 2.4) (Schweinhart et al., 1993).[14] Use of special education was lower for Perry Preschool participants, with an effect size comparable to what was found for the CPC program. Although grade retention was lower for program participants, the difference was not statistically significant, and the effect size was about half as large as the CPC program. Like the CPC program, contact with the criminal justice system was lower for Perry Preschool participants, with an effect size as of age 27 that exceeded that measured for CPC participants by a factor of four. The high school completion rate was also significantly higher for Perry Preschool participants, again with an effect size larger than what was found for the CPC program. Finally, the Perry Preschool evaluation measured several economic outcomes as of age 27. (These are not included in the CPC program follow-up because the participants had yet to reach adulthood.) Notably, Perry Preschool program participants were more likely to be employed, less likely to use social welfare services, and had higher earnings. These differences in contact with the criminal justice system, employment, and earnings were also significant at the age-40 follow-up (Schweinhart, 2004).

Like the Chicago CPC study, there is also some evidence from the Perry Preschool study that those children who received just one year

[14] This discussion focuses on detailed results from the age-27 follow-up. Detailed results for the age-40 follow-up have not yet been released.

Table 2.4
Comparison of Estimated Long-Term Effects for Targeted Preschool Programs

Outcome	N	Treatment	Control	Difference	p-value	Effect Size
Grade retention						
CPC (by age 15) (%)	1281	23.0	38.4	–15.4	<0.001	–0.34
Early Training Project (by age 18) (%)	62	58.5	52.4	6.2	not signif.	0.12
Perry Preschool (by age 27) (years)	112	0.5	0.7	–0.2	0.437[a]	–0.15
Meta-analysis by Aos et al. (2004) (24 effect sizes)	—	—	—	—	—	–0.23 / –0.18
Special education						
CPC (by age 18) (%)	1281	14.4	24.6	–10.2	<0.001	–0.26
Early Training Project (by age 18) (%)	62	4.9	33.3	–28.5	0.004	–0.79
Perry Preschool (by age 19) (% of years)	112	16	28	–12	0.039	–0.29
Meta-analysis by Aos et al. (2004) (23 effect sizes)	—	—	—	—	—	–0.16 / –0.13
Child abuse and neglect						
CPC (ages 4 to 17) (%)	1408	5.0	10.3	–5.3	<0.001	–0.20
Meta-analysis by Aos et al. (2004) (1 effect size)	—	—	—	—	—	– 0.24 /–0.21
Juvenile/adult crime and delinquency						
CPC (by age 18) (no. of petitions to juvenile court)	1404	0.45	0.78	–0.33	0.02	–0.13
Perry Preschool (by age 27) (no. of arrests)	123	2.3	4.6	–2.3	0.004[a]	–0.54
Meta-analysis by Aos et al. (2004) (8 effect sizes)	—	—	—	—	—	–0.21 / –0.16
High school completion						
CPC (by age 20) (%)	1233	49.7	38.5	11.2	0.01	0.23
Early Training Project (by age 18) (%)	62	61.0	47.6	13.4	not signif.	0.27
Perry Preschool (by age 27) (%)	123	66	45	21	0.02	0.43
Meta analysis by Aos et al. (2004) (10 effect sizes)	—	—	—	—	—	0.15 / 0.13

Employment and earnings						
Perry Preschool (at age 27) (% employed)	116	71	59	12	0.181	0.25
Perry Preschool (at age 27) (monthly earnings $1,993)	115	1219	766	453	0.007[a]	0.51
Social services (welfare, food stamps, etc.) use						
Perry Preschool (by age 27) (% received in last 10 yrs.)	123	59	80	–21	0.010	0.44
Meta-analysis by Aos et al. (2004) (3 effect sizes)	—	—	—	—	—	0.00 / 0.00

SOURCE: CPC: Reynolds et al. (2002), Table 4, and author's calculations (for effect sizes); Perry Preschool: Berrueta-Clement et al. (1984), Table 6 and authors' calculations (for effect sizes) and Schweinhart et al. (1993), Tables 9, 10, 18, 22, and 24; Early Training Project: Gray, Ramsey, and Klaus (1983), Table 2.4 and authors' calculations (for effect sizes); Aos et al. (2004), table C.1a, adjusted effect sizes.
NOTES: N is sample size for combined treatment and control groups. Results are for preschool treatment group versus the no preschool comparison group. The final column shows the mean difference effect size estimated using the arcsine transformation of the difference between two proportions for dichotomous outcomes and as the standard mean difference effect size for continuous variables (see Lipsey and Wilson, 2001, Appendix B).
[a] For count variables, p-values are based on chi-square statistics for the truncated distribution of the variable. See Schweinhart et al. (1993), p. 46.

of preschool had similar outcomes to those that participated for two years (Barnett and Escobar, 1987; Schweinhart and Weikart, 1988; Schweinhart, 2004). However, very few children were in the first group (just 13 one-year participants) so the study had low statistical power to detect differences between children by years spent in preschool. While these results are only suggestive that a single-year of preschool could have similar effects, they confirm the finding from the Chicago CPC analysis, which is based on analyzing larger samples.

Head Start. Although the Head Start program has been in operation since the mid-1960s, a nationally representative experimental study has only recently been launched to provide high-quality evidence about the effects of Head Start on participating children.[15] Since its inception, the Head Start program has been the subject of intensive study; yet the evidence of the program's effects has been mixed. A comprehensive meta-analysis of the literature conducted by McKey et al. (1985) concluded that Head Start generated immediate cognitive benefits for participants, but those gains eventually faded as the children aged. A small number of studies completed by that time did indicate, however, that Head Start could generate improved schooling outcomes in terms of lower rates of grade retention and use of special education and some evidence of favorable effects on physical health (Karoly et al., 1998). More recent analyses by Currie and Thomas (1995 and 1999) used nationally representative nonexperimental survey data and statistical controls to account for selection into Head Start. These analyses indicate that Head Start can have longer-lasting effects on school performance, although there are important differences for children by race/ethnicity, with stronger gains for whites and Hispanics.[16]

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[15] Information on the national Head Start Impact Study can be found at the U.S. Department of Health and Human Services web site (http://www2.acf.dhhs.gov/programs/core/ongoing_research/hs/impact_intro.html).

[16] In contrast, Aughinbaugh's (2001) analysis of Head Start participation for a slightly older sample (the National Longitudinal Survey of Youth 1997 with a sample age 12 to 17 as of the first interview) finds no gains in terms of school suspensions, grade repetition, and mathematics achievement. In addition to having a somewhat older sample, her method of controlling for possible selection bias differed from Currie and Thomas (1995 and 1999). She also does not explore differential impacts by racial and ethnic groups as was done in the Currie and Thomas studies.

Evidence of even longer-term effects of Head Start comes from Garces, Thomas, and Currie (2002), who use nationally representative nonexperimental data for the cohort born between 1964 and 1977, which included 18- to 30-year-olds as of 1995. This cohort has been followed annually, from as early as birth, as part of the Panel Study of Income Dynamics. Retrospective questions about Head Start participation as a child are combined with adult information on high school completion, college attendance, earnings between ages 23 to 25, and incidence of ever being booked or charged with a crime. Their analysis uses a careful set of statistical techniques, including models based on sibling controls, to add successive controls for both observed and unobserved family background characteristics that are associated with the selective participation in Head Start.

When no family background controls are included in the model, they find that participation in Head Start is associated with lower rates of high school completion and college attendance, and higher rates of contact with the criminal justice system than for no preschool attendance. However, if controls that account for Head Start's relatively more disadvantaged population of enrollees are included, Head Start generates some longer-term favorable effects, although again, differences by race are salient. Among whites, Head Start leads to higher rates of high school completion and college attendance, by 20 percentage points and 30 percentage points, respectively, compared with no preschool attendance. For whites, there is no significant effect of Head Start on earnings in young adulthood or with contact with the criminal justice system. Among black Head Start participants, while there are no effects of Head Start on high school completion, college attendance, or earnings, there is a significantly lower incidence of being booked or charged with a crime compared with those who did not attend preschool.

The results reported in the Garces, Thomas, and Currie (2002) study cannot be readily translated into mean differences for treatment and control groups, or effect sizes, as is done for other programs in Table 2.4. It is notable that the results in their study for blacks are potentially most comparable to those for the Chicago CPC program, which largely served a black population. While the estimated impact

on contact with the criminal justice system for black Head Start participants is of a similar magnitude as that reported for CPC (an 11 percentage point reduction, compared with the rate for no preschool attendance), the Head Start program does not appear to produce other gains for blacks comparable to those evident for the CPC program. This difference may be explained by the differential quality of the program: CPC requires higher teacher qualifications and therefore spends more resources per child than Head Start.

Meta-Analysis of Targeted Preschool Programs. A recent meta-analysis conducted by researchers at the Washington State Institute for Public Policy provides another source of estimated long-term impacts for preschool programs serving disadvantage 3- and 4-year-old children (Aos et al., 2004). For this study, researchers compiled estimated impacts for 48 program evaluations published between 1967 and 2003 that met a minimum set of research standards. The four targeted programs we have reviewed here were included, as well as other preschool program evaluations. Estimated impacts for each program were converted to effect sizes so results could be compared across studies. Regression techniques were used to generate a weighted average effect size, as well as an adjusted effect size that accounts for differences across studies in the quality of the study design and outcome measures.

Table 2.4 includes the estimated weighted average effect size and the adjusted effect size for all outcomes with the exception of employment and earnings (which was not included among the meta-analysis outcomes). As seen in Table 2.4, the adjusted effect sizes are lower by about 20 percent compared with the weighted average effect size. Focusing on the unadjusted effect sizes, the meta-analysis effect sizes for educational outcomes are lower than those estimated based on the Chicago CPC program. On the other hand, the effect size for child abuse and neglect is almost identical, while the estimated effect size for crime and delinquency is larger for the meta-analysis.[17] In the

[17] The difference in the effect sizes for child maltreatment for Chicago CPC and the Aos et al. (2004) meta-analysis as reported in Table 2.4 is due to differences in the measure used. We rely on a measure of indicated child abuse and neglect cases based on court reports (as do Reynolds et al., 2002), while the Aos et al. (2004) study relies on the measure based on Department of Child and Family Services reported cases.

former case, there is only one study contributing to the meta-analysis estimate, and it is presumably the CPC study, hence the equivalence. Table 2.4 also shows that the estimated effect for Perry Preschool on the use of social services is not replicated more broadly in the literature—the estimated effect size from the meta-analysis for this outcome is zero.

The results in Table 2.4 generally indicate that the domains of impact and the direction of the effects estimated in the Chicago CPC program are replicated in other evaluations of high-quality preschool demonstration programs or in the literature more generally.[18] In terms of special education use and high school completion, the CPC effect sizes are bounded by the Perry Preschool program (on the high side) and the meta-analysis results (on the low side). The Perry Preschool and CPC effects are very close in the case of special education use, while the CPC effect size is the lowest for juvenile crime. In the case of grade repetition, the CPC effect size is the largest estimate among single studies or the meta-analysis.[19] Given the confirmation of the direction and magnitude of the CPC program effects against these other studies and given that the CPC evaluation provides estimated impacts of a targeted preschool program delivered by the public sector on a larger scale, we rely on these impact estimates for our analysis of a California program.

The Perry Preschool findings also indicate that it is reasonable to project higher future earnings on the basis of the increase in educational attainment, a projection we make in the benefit-cost analysis in the next chapter. We do not make such a projection for the use of social services, which has a sizeable effect size in the Perry Preschool study but an estimated zero effect size according to the meta-analysis. To the

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[18] The exception is the child abuse and neglect result found in the CPC program, which cannot be confirmed in the literature. The CPC study appears to be the only one with this finding. This is not necessarily because other studies did not find an effect on child maltreatment but rather because most studies do not measure this outcome.

[19] To the extent that the CPC effect size for grade repetition is larger than what might be expected for a large-scale public program, the benefit-cost analysis in Chapter Three will overstate the savings from reduced grade repetition. However, the analysis in the next chapter shows that this is not a large source of savings; so reducing the estimated effect size will not have a large effect on the benefit-cost results.

extent that the use of social services in adulthood is reduced as a result of participation in a high-quality preschool program, our analysis will be conservative by not including this domain of benefits.

Effectiveness of Preschool Education for More-Advantaged Chldren

Studies of the impact of targeted preschool programs suggest that they can have significant impacts on long-term outcomes for disadvantaged children, including school performance, child abuse and neglect, crime and delinquency, and high school completion. Is there evidence of such long-term effects of preschool participation for more-advantaged children?

It is notable that many of the problems that preschool programs can successfully address for at-risk children are also prevalent among children with lower risks. Consider, for example, special education use, grade repetition, and school dropout. Table 2.5 shows rates of special education use among a sample of children ages 6 to 13 in 1999, stratified by household income categories. Rates of special education use fall

Table 2.5
Rates of Special Education Use by Income, 1999

Household income in 1999	Use of special education (percent)	Share of special education students (percent)	Share of population[a] (percent)
Less than $15,000	17.5	19.9	13.0
$15,000 to $24,999	16.0	16.0	11.4
$25,000 to $50,000	12.7	31.9	28.7
$50,001 to $75,000	9.5	19.0	22.7
More than $75,000	6.3	13.3	24.2
Total	11.4	100.0	100.0

SOURCE: Authors' calculations based on Wagner, Marder, and Blackorby (2002), Exhibit 3-10.

NOTES: Estimates are based on a sample of children ages 6 to 13 receiving special education during the 1999–2000 school year.

[a] Based on data from 1997 for households with children ages 6 to 17.

monotonically with income, ranging from 17.5 percent for children in families with less than $15,000 to 6.3 percent for children in families with more than $75,000. As a result, special education students are disproportionately represented among lower-income families. For example, Table 2.5 shows that children in the lowest income category make up 13 percent of the population but 20 percent of the special education population. Nevertheless, even though the incidence of special education use falls with income, just over half of the special education population is in families in the middle income range of $25,000 to $75,000. Thus, a large fraction of the incidence of special education use is attributable to more-affluent families.

Similar patterns are seen in Table 2.6 with respect to rates of grade repetition and school dropout based on data from 1995. Rates of ever being retained in grade and school dropping out fall sharply as income rises, here defined by quintiles. However, once again, children with family income in the middle 60 percent of the distribution represent over half of all children ever retained in grade or who drop out of school. The table also shows striking differences by race/ethnicity, with high rates of grade repetition among blacks compared with Hispanics or whites, and higher rates of school dropout for Hispanics—especially low-income Hispanics—compared with blacks or whites.[20]

These data support two relevant points. First, the incidence of many of the problem outcomes that preschool programs may help to avoid in the long run is lower for more-advantaged children (at least when measured by income). This suggests that there may be less room for high-quality preschool programs to have an impact for more-advantaged children compared with their less-advantaged peers. This is consistent with the findings for another early childhood intervention program, the Elmira nurse home-visiting program. As discussed in Karoly et al. (1998), the home-visiting program had a larger impact

[20] The school dropout rate for Hispanics, shown at 30.0 percent in Table 2.6, is particularly high because of those Hispanics who are foreign born and not educated in the United States. The dropout rate is just under 18 percent among Hispanics born in the United States and just under 24 percent for foreign-born Hispanics who ever enrolled in school in the United States.

Table 2.6
Rates of Grade Repetition and School Dropout for 16- to 24-Year-Olds by Particular Characteristics, 1995

Characteristic	Ever Retained in Grade (%)	Share Ever Retained in Grade (%)	School Dropouts (%)	Share of School Dropouts (%)
Total	13.3	100.0	12.0	100.0
Family income				
Low (bottom 20 percent)	18.2	28.4	23.2	40.2
Middle	13.1	55.9	11.5	54.4
High (top 20 percent)	9.1	15.4	2.9	5.4
Race-ethnicity				
White, non-Hispanic	12.1	61.8	8.6	48.7
Black, non-Hispanic	18.7	20.5	12.1	14.7
Hispanic	14.7	15.3	30.0	34.7
Born in United States	n.a.	n.a.	17.9	11.8
Foreign born and ever enrolled in United States	n.a.	n.a.	23.7	6.7
Race-ethnicity and income				
White, non-Hispanic				
Low (bottom 20 percent)	n.a.	n.a.	18.6	n.a.
Middle	n.a.	n.a.	8.8	n.a.
High (top 20 percent)	n.a.	n.a.	2.6	n.a.
Black, non-Hispanic				
Low (bottom 20 percent)	n.a.	n.a.	20.1	n.a.
Middle	n.a.	n.a.	8.7	n.a.
High (top 20 percent)	n.a.	n.a.	3.2	n.a.
Hispanic				
Low (bottom 20 percent)	n.a.	n.a.	38.9	n.a.
Middle	n.a.	n.a.	28.2	n.a.
High (top 20 percent)	n.a.	n.a.	8.7	n.a.

SOURCE: Authors' calculations based on NCES (1997), Tables 5, 7, 15, 16, and 24.
NOTES: The dropout rate is the cumulative rate of high school dropout for all young adults age 16 to 24 as of 1995. n.a. = not available.

on the higher-risk families compared with lower-risk families because there were different baselines.[21]

Second, although the incidence is lower, a large fraction of the population falls into the more-advantaged group; so even if the impact of a preschool program is smaller for more-advantaged groups, it can have a meaningful impact on the incidence of the particular outcome.

With these two points in mind, we now turn to a review of the evidence of the impact of preschool programs on more-advantaged children. In general, there are far fewer higher-quality studies to draw on compared with the studies focusing on disadvantaged children. For example, we have identified just one experimental study, and it does not allow comparison between different children based on developmental risk or other risk measures. Other studies rely on quasi-experimental designs and, with a few exceptions, approaches that are more likely to suffer from residual selection bias. Finally, most studies that are available look at short-term outcomes, not long-term outcomes. In a few cases, the evaluations focus only on the impact of preschool participation on measures of school readiness because the data do not support assessments of outcomes at older ages.

Evidence from Experimental Evaluations

We have identified just one experimental evaluation of the impact of preschool participation on lower-risk children. Larsen and Robinson (1989) present results of an evaluation of a university-affiliated preschool based on data for three waves of participants. In the original study, 191 children were randomly assigned to the preschool group, and 100 were assigned to the control group. At the time of follow-up by second and third grade, about one-third of the study participants were no longer available for follow-up, but an analysis of attrition suggests little bias from this relatively high attrition rate. The preschool

[21] For example, without the nurse home-visiting program, welfare use among higher-risk mothers in the study was an average of 90 months over the child's first 15 years, and the program impact was an estimated reduction in welfare use of 30 months. Among lower-risk families, without the program, welfare use was just 30 months over the same time period, one-third as much as the higher-risk group. The two-month reduction in welfare use among the lower-risk families was a smaller impact, but the starting point was already so much lower. See Karoly et al. (1998) for further discussion.

program met four days a week for 2.5 hours per day during the school year. The staff-student ratio and teacher qualifications are similar to those for the CPC program. Participation in a parent education program was required.

Analysis was conducted separately for boys and girls, and the girls showed no differences across 11 achievement test score components. On the other hand, boys who participated in the preschool program scored significantly higher on reading vocabulary, composite reading, spelling, composite language, and the total composite test battery compared with those who did not attend preschool. There were no significant differences for boys on any of the math test components, nor on reading comprehension. Other research suggests that early test score performance may be associated with higher earnings gains in adulthood (Currie and Thomas, 2001); yet that conclusion is not directly supported by this study.

Evidence from Universal Preschool Program Evaluations

As noted in Chapter One, Georgia and Oklahoma have implemented voluntary preschool programs that provide near-universal access for all 4-year-olds in the state. Recent evaluations provide some evidence of the short-term effects of these programs, although the research designs have their drawbacks in terms of the conclusions that can be drawn.

In 2001, Georgia State University began the Early Childhood Study to examine differences in children's outcomes from preschool entry at age 4 (fall 2001) through kindergarten entry (fall 2002) for children in three types of early childhood programs: Georgia's Pre-K Program, Head Start, and other private preschools (Henry et al., 2003b).[22] Of the 630 children randomly sampled in the three groups at baseline, 466 children were available for follow-up one year later. No comparison is available for children who did not participate in preschool; so all results are based on relative differences between the three

[22] An earlier evaluation conducted by Georgia State University researchers followed a group of children who participated in Georgia's Pre-K program through the fourth year of primary school (Henry et al., 2003a). The study was not designed to measure the impact of Georgia's Pre-K program versus other preschool programs or versus no preschool.

preschool groups.[23] Since children were not randomly assigned to the three program types, differences in outcomes may be due to selection bias absent efforts to control for underlying differences in the three groups of children.

Assessments of language development and cognitive skills for participating children were made at preschool entry (baseline at age 4), the end of preschool, and the beginning of kindergarten. Teacher and parent ratings of child socio-emotional development and health, as well as classroom observations, complement the information available from the child assessments. Comparisons are also made with national norms to assess progress relative to other children nationwide. Given the limited period of follow-up, the outcomes essentially provide information on school readiness rather than measures of school success.

The findings from the analysis indicate that children in all three preschool program types experienced gains in the various measures of cognitive skills and language development during the course of the preschool year. Since the Head Start children were from the most disadvantaged backgrounds on average, Head Start children tended to be behind children in the other two groups, and their gains did not close the gap. When individual child and family background characteristics are accounted for, the children in the Georgia pre-K program did not exhibit any consistently larger gains relative to children in the other two groups. Gains for children were higher for all three groups the higher the school quality. These results indicate that all three programs succeed in making children more ready for school after a year of preschool experience, but there is little evidence of differential effects across the three program types. While we refer to gains and success, this study does not shed light on whether such gains might have been realized without any preschool. Nor does it indicate whether the improvements in readiness are subsequently translated into gains in school performance or other outcomes as the children age.

The evaluation of Oklahoma's program has a potentially stronger research design that provides evidence of the short-term benefits from

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[23] The Georgia State University research group plans to include a comparison group that did not participate in preschool in the evaluation in the future (Henry et al., 2003b).

preschool participation for those who choose to participate. Gormley and Gayer (forthcoming) and Gormley et al. (forthcoming) use a quasi-experimental method called regression-discontinuity design, which exploits the strict age eligibility for the Oklahoma program. In effect, the analysis compares outcomes for the oldest children just entering the pre-K program (who just missed attending preschool a year earlier because their birthday fell after September 1) with their counterparts who are just old enough to attend kindergarten (birthdays before September 1) and attended the preschool program in the prior year. This estimation strategy measures the immediate impact of one year of preschool attendance. The approach does not support analysis of effects after one year since the control group children will have then experienced the preschool program.

The evaluation, based on data from Tulsa, the state's largest school district, shows that children who attended pre-K in Oklahoma had higher cognitive and language test scores based on both a local test administered in September 2001 and the Woodcock-Johnson achievement test, a well validated test instrument, administered to another cohort two years later (Gormley and Gayer, forthcoming; Gormley et al., forthcoming).[24] While the results from the home-grown instrument suggested that gains were larger for more-disadvantaged students (e.g., minorities and those who qualified for a free lunch), the results from the Woodcock-Johnson test indicate that gains occurred for students in each racial/ethnicity group and regardless of free lunch status. The methodology, however, does not allow comparison of the magnitude of the effects across groups because the treatment is for those who select into the program and selection biases may differ across groups (Gormley et al., forthcoming). Moreover, these results do not indicate whether the gains in school readiness for the various groups are manifested in improvements in other outcomes as children age.

[24] Tests conducted in 2001 for motor development showed smaller gains compared with those for cognitive development, while there were no gains in socio-emotional development. The latter scores may have been affected by a "ceiling effect"—i.e., a test score range that was too limited (Gormley and Gayer, forthcoming).

Evidence from Other Nonexperimental Evaluations

Several studies use the Early Childhood Longitudinal Study (ECLS) to examine the effect of preschool attendance on outcomes prior to or during kindergarten and the relationship to measures of family income or other risk factors. In the absence of random assignment, differences in outcomes between the preschool and no-preschool group may reflect other observed or unobserved characteristics of the children and their families unless they are controlled for adequately. For our purposes, a limitation these studies share is that they are able to consider only measures of school readiness or very early school performance. It remains to be seen whether these relationships will continue to hold when the full range of outcomes at older ages covered by studies that focus on disadvantaged children is examined.

Bridges et al. (2004) use the California subsample of the ECLS data to look at developmental differences at kindergarten entry between children who attended preschool and those who did not. They report that children who attend center-based preschool programs in the year prior to kindergarten entry are about two months ahead in pre-reading skills and one month ahead in early math skills at the time they enter kindergarten. They also report that there are no differences in these gains for middle-class children versus more-disadvantaged children. Bridges et al. (2004) indicate that these estimates account for factors that explain selection into preschool programs; yet it is not clear what factors they have controlled for and whether they are likely to capture all relevant background characteristics.

Magnuson et al. (2004) conduct a similar analysis with a very extensive set of controls included in models of reading and math skills at kindergarten entry and later in kindergarten, as well as models of grade repetition in kindergarten. They, too, find that measures of school readiness, as well as performance in kindergarten, are significantly higher for children who attended a center-based preschool program in the year prior to kindergarten entry. Their models include extensive controls for demographic characteristics, home environment and family background, and neighborhood and school characteristics. The persistence of these effects even after the inclusion of an extensive set of controls increases the confidence that they are controlling for

potential selection bias. Notably, in contrast to the reported findings of Bridges et al. (2004), Magnuson et al. (2004) report stronger effects for more-disadvantaged children, whether defined by poverty status, low maternal education, single parent headship, or mothers who do not speak English.[25]

Evidence from Longer-Term Evaluations

As noted at the outset, most studies that examine the benefits of preschool education for more-advantaged children are able to focus on only shorter-term impacts, such as measures of school readiness or early test scores. Garces, Thomas, and Currie (2002) represent one study with a longer-term follow-up that, although not the main focus, provides some additional evidence of the longer-term effects of preschool for non-disadvantaged populations. This study, mentioned earlier given its focus on the longer-term effects of Head Start, also provides estimates of the effect of attendance at preschools other than Head Start for the same cohort born between 1964 and 1977. Non–Head Start preschool attendance rises sharply with family income during early childhood, indicating the study is measuring preschool participation among more-affluent families.

In this study, when there are no statistical controls for family background characteristics that might be related to preschool attendance, the authors' estimates indicate that children who attended a preschool other than Head Start are significantly more likely to complete high school, attend some college, and have higher earnings, and they are less likely to be booked or charged with a crime compared with children who attended no preschool. However, once family observed and unobserved characteristics are controlled for in their statistical models (including models that use sibling controls), these favorable impacts disappear, and there are no statistically significant differences in these outcomes between those who attended a non–Head Start preschool and those attended no preschool.

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[25] Magnuson et al. (2004) report results for the entire sample and various high-risk subsamples (e.g., children in poverty, or with mothers with low education, or in single parent households). They do not report equivalent results for the counterpart lower-risk children; so a comparison in the magnitudes cannot be made across groups.

Caution is warranted in considering these findings given that the sample in this study participated in Head Start and preschool programs in the 1960s and 1970s, which may have been different than those offered today. Moreover, we do not have information on the quality of the non–Head Start programs children attended. Nevertheless, their estimates suggest that, in nonexperimental data, those who attend preschool programs that are not targeted at more-disadvantaged children are likely to be selected from those who would have done well anyway without a preschool program. Thus, it is very important that studies with nonexperimental data that aim to estimate the causal impacts of preschool program participation control for possible biases due to the selectivity into such programs. Also, recall the association between preschool attendance and school readiness measures or early test scores, as shown, for example, for the universal Oklahoma program. The findings of Garces, Thomas, and Currie (2002) indicate that such an association does not necessarily translate into gains in eventual educational attainment or other economic outcomes in adulthood as it appears to do for more-disadvantaged children.

Potential Impacts of a Universal Preschool Program in California

The evidence presented in this chapter indicates that a high-quality preschool program for one or two years before kindergarten entry can be expected to have significant long-run impacts on disadvantaged children in several domains, including educational processes, educational attainment, crime, and delinquency. Evidence of the potential impacts of such a preschool program on more-advantaged children is less conclusive. The most convincing evidence suggests that the effects of preschool on school readiness are likely to be smaller for more-advantaged children compared with their less-advantaged peers. This is evident in the ECLS data analyzed by Magnuson et al. (2004). While one small experimental evaluation of a preschool program suggests that at least boys from advantaged backgrounds may show gains in some reading and language skill assessments as late as third grade, we have no direct

experimental evidence on the effect on such outcomes as grade repetition, use of special education, or subsequent educational attainment for more-advantaged children. One study with such long-term measures, based on quasi-experimental evidence, suggests that there is no long-term gain from non–Head Start preschool participation, in other words, preschool for more-advantaged populations. However, it is not clear if this same finding would prevail if the assessment were limited to high-quality programs delivered to more-advantaged populations.

In the next chapter, we aim to measure the dollar benefits from a universal preschool program in California in order to compare total benefits with program costs. This requires that we have estimates of the impacts of preschool participation for all children who may potentially enroll. The most optimistic assumption would be that all children in California would experience the same benefits measured for the higher-risk CPC program population, our preferred source of impact estimates for a targeted preschool program. This assumption is certain to overstate the benefits from a universal preschool program for two reasons.

First, as discussed above, the evidence suggests that more-advantaged children will experience smaller benefits. This would be expected to the extent that there is less room for improvement in such outcomes as grade retention, special education use, and high school graduation—patterns that were indeed evident in Tables 2.5 and 2.6. Second, the impacts estimated for the Chicago CPC program essentially compare a high-quality preschool program with no preschool program. Only about 20 percent of the comparison group in the Chicago CPC study attended a Head Start program, and the rest were in home care. However, in California, as indicated in Chapter One, about 33 percent of California's 3-year-olds already attend a preschool program and the rate is 65 percent for 4-year-olds (see Table 1.3). Thus, the marginal impact of moving from current preschool enrollment patterns to what would be obtained under a universal program, even if it raises the quality of the program for some children already in preschool, may be less than what is measured when the baseline is no preschool at all.

For these reasons, we adjust the CPC benefits downward to reflect the distribution of at-risk children in California as well as whether chil-

dren attending preschool under a universal regime would have done so without such a regime. These two adjustments are taken up in the next two subsections. We conclude the chapter by combining the adjustments and applying the benefits measured by the Chicago CPC program to a cohort of California children.

Adjusting for Lower Risk

The CPC evaluation provides evidence of the potential benefits for an at-risk population, but the population served by that program—low-income primarily black children in poor urban neighborhoods (see Table 2.2)—is a relatively small fraction of the California population. For our benefit-cost analysis, we need to make an assumption about the fraction of the California population that can be expected to share similar risk characteristics as the Chicago CPC population and therefore can be expected to experience benefits of the same magnitude.

Table 2.7 shows the distribution of children under age 5 in California according to various potential measures of risk, such as race, ethnicity, household type, family income, and immigrant status. A few indicators of risk are also shown for all new births and for children under 18. These data reveal that 18 percent of children under 5 live with a single parent, while 12 percent are nonwhite and living below poverty, and 13 percent are Hispanic and living below poverty. Eleven percent of births are to teenage mothers, and even higher fractions of children are born to women with less than a high school education, live in high-poverty neighborhoods, or live with foreign-born parents. Remarkably, nearly half of all young California children have a foreign-born parent, reflecting both immigration trends and higher fertility among immigrant groups (Reed, 2003).

These data suggest that it is reasonable to assume that about 25 percent of California children face the type of risks that would make them likely to have the highest benefits from a high-quality preschool experience. This fraction is approximately equivalent to the share of children living in poverty (see Table 2.7). At the other extreme, we assume that 55 percent of California children face the lowest risks and therefore will receive a lower level of benefit. This fraction is approximately the share of children in families above 75 percent of the

Table 2.7
Characteristics of California Children, 2000

Characteristic	Percentage
Children Under Age 5	
Race	
White	50.0
Black	6.9
Asian	8.9
Other	34.2
Ethnicity	
White non-Hispanic	31.7
Other non-Hispanic	20.5
Hispanic	47.8
Household type	
Married couple	65.7
Single mother	12.5
Single father	5.4
Other (other relative, nonrelatives, group quarters)	16.3
Family income	
Below poverty	19.7
Nonwhite and below poverty	12.2
Hispanic and below poverty	12.9
Single mother and below poverty	7.7
Low income (below 75% of California median)	44.
Immigrant status	
Either parent foreign born	49.2
Family head foreign born	44.7
New Births	
Births to teenage mothers (1999)	11.
Births to women with less than 12 years of education	30.
Children Under Age 18	
Children 5 to 17 with difficulty speaking English	16.4
Children 5 to 17 who are linguistically isolated[a]	13.4
Children living in high-poverty neighborhoods (20% or more of the population is below poverty)	29.6

SOURCES: Annie E. Casey Foundation (undated) and Reed and Tafoya (2001).
NOTE: The precision of the percentages varies across sources, with some reporting to the nearest tenth of a percent while others report to the nearest whole percent. The latter figures do not have a digit to the right of the decimal.
[a] Linguistically isolated households are those where no one over age 14 speaks English "very well."

California median income (see Table 2.7). We assume the residual 20 percent of children are medium risk, between the two extremes, and will receive a middle level of benefit. This assumed distribution of the population of children is shown in the top row of Table 2.8 (row a).

For these three groups, we assume that the high-risk group, the group that will benefit the most, would receive 100 percent of the benefits experienced by children in the Chicago CPC program relative to a baseline of no preschool. In terms of the benefits that would accrue to children in the medium- and low-risk groups, there is little in the way of quantitative evidence to suggest how much benefits would be attenuated for more-advantaged children.[26] Therefore, we make a baseline assumption that the medium-risk and low-risk groups receive 50 percent and 25 percent of the CPC program benefits, respectively—again both relative to a baseline of no preschool experience. These should be considered to be average effects within each of these groups. For example, within the low-risk group, some children with the least risks may experience no benefit from preschool participation, while other children who have risks closer to the medium-risk group may gain more from preschool participation. In the analysis in the next chapter, we test the sensitivity of our benefit-cost results to variation in this assumed distribution of benefits, with both more-conservative and less-conservative assumptions.

Adjusting for Current Preschool Enrollment

As noted above, the Chicago CPC program essentially measured the impacts of a high-quality preschool program compared with no preschool. If California adopts a universal preschool program, we can examine the benefits and costs relative to a baseline of no preschool (a

[26] The Magnuson et al. (2004) study provides estimates of the effects of participation in a prekindergarten program relative to no program for the full ECLS sample and subsamples of children living in poverty, with mothers with low education, with a single parent, and with a non-English speaking mother. A comparison of the estimated coefficients on kindergarten math and reading scores for the higher-risk groups versus the average effect, or an imputed effect for the non-high-risk group, indicates that the effects for the average or non-high-risk group are about 40 to 60 percent of the effects for the higher-risk group. Our assumption of a 50 percent benefit attenuation in moving from the high- to middle-risk group is consistent with these estimates.

Table 2.8
Estimated Distribution of Children at Baseline and Under Universal Preschool, by Risk Status

Characteristic	High Risk	Medium Risk	Low Risk	Total
Baseline Assumptions				
a. Distribution of children (%)	25	20	55	100
b. Preschool participation rate (%)	55	65	70	65
c. Preschool distribution by type (%)				
Public	85	65	35	55
Private	15	35	65	45
Total	100	100	100	100
d. Distr. of preschool part. by type (%)				
Public	12	8	13	33
Private	2	5	25	32
Total	14	13	38	65
Assumptions Under Universal Preschool				
a. Distribution of children (%)	25	20	55	100
e. Public preschool part. rate (%)	70	70	70	70
f. Preschool distribution by type (%)				
Public	95	90	85	88
Private	5	10	15	12
Total	100	100	100	100
g. Preschool participation rate (%)				
Public	70	70	70	70
Private	4	8	12	10
Total	74	78	82	80
h. Distr. of preschool part. by type (%)				
Public	18	14	38	70
Private	1	2	7	10
Total	19	16	45	80
i. Change in part. by preschool type (no.)				
Public	+6	+6	+25	+37
Private	–1	–3	–18	–22
Net				+15
j. Type of preschool universal program parts. would have attended at baseline (no.)				
None	5	3	7	15
Public	12	8	13	33
Private	1	3	18	22
Total	18	14	38	70

NOTES: A comparison of the distribution of children under the universal preschool assumptions (row h) versus the baseline (row d) shows the net change in the distribution of children by preschool type and risk level for every 100 children. This is labeled as the change in participants by preschool type (row i).

hypothetical case that does not currently exist) or relative to the current baseline where an average of 65 percent of 4-year-olds attend either public or private preschool programs. In this section, we account for this latter baseline.

Table 2.8 shows the assumptions under the baseline based on current enrollment patterns in preschool for 4-year-olds in California, and those that are estimated to apply under a universal preschool program. Under the baseline assumptions (top panel of Table 2.8), the preschool participation rates by risk level are based on the current enrollment patterns for 4-year-olds by income, using the same data in the distribution in Table 1.3 for 3- and 4-year-olds (where high risk includes those with family income up to $30,000 and low risk is defined as those with family income of $50,000 or more). Thus, the preschool participation rate ranges from 55 percent for high-risk children (those with the lowest incomes) to 70 percent for low-risk children (those with the highest incomes), for an average rate of 65 percent (see row b of Table 2.8). The breakdown by public and private providers is consistent with the distribution observed in the CPS, again where income is used to define the three risk groups (see row c). This pattern shows that enrollment in private preschool programs increases with family income or as the risk level declines.

Under the baseline assumptions, out of every 100 children, 65 are assumed to be enrolled in preschool. Given the assumptions regarding the distribution of children by risk group and participation rates by risk group, 38 of those 65 children will be in the low-risk group (70 percent of the 55 children in this group), 14 will be in the high-risk group (55 percent of 25), and 13 will be in the medium-risk group (65 percent of 20) (see the total line in row d of Table 2.8). We then apply the percentage distribution between public and private preschools (row c) to derive the numbers in public and private programs (the disaggregated numbers in row d). For example, of the 14 children from the high-risk group in preschool, 12 are assumed to be in a public program (85 percent of 14) and 2 are assumed to be in a private program (15 percent of 14).

The second panel of Table 2.8 shows the assumptions under universal preschool. The distribution of children by risk level remains the

same under the universal preschool assumptions (row a is repeated in the second panel of Table 2.8). However, two key distributions change relative to the baseline. First, we assume that 70 percent of children at each risk level will participate in the public universal preschool program (see row e). This is within the range of the public preschool participation rate for 4-year-olds in Oklahoma and Georgia (see Table 1.1).

Second, we assume a new breakdown between public and private preschool for each risk group (see row f of Table 2.8). In particular, the overall fraction in private programs, 12 percent, is consistent with the public-private ratio for kindergarten and first-grade children.[27] In other words, on average about 12 percent of children in the elementary grades are in private schools, with rates that increase with family income (and therefore in our assumptions as the risk level declines). So for example, for the high-risk group, we assume 5 percent of all preschool participants will be in private programs. That share rises to 15 percent for the low-risk group.

Applying the public-private distribution (row f of Table 2.8) to the public preschool participation rate (row e) gives the combined enrollment rate in public and private programs (see row g). The overall combined public and private enrollment rate under the universal preschool assumptions is 80 percent (70 divided by 0.88—i.e., if the 70 percent public participation rate is 88 percent of total participation, then total participation must be 80 percent), with 70 percent in the public program and 10 percent in private programs. The overall preschool enrollment rate rises from 74 percent for the high-risk group to 82 percent for the low-risk group, all because of a rising enrollment rate in private programs in moving from high- to low-risk children.

Applying the distribution by preschool type (row g) to the distribution of children (row a), Table 2.8 next shows, for every 100 children, how the 80 children who participate in preschool are distributed

[27] The fraction of preschool enrollments in private programs in California today is higher than what is observed in elementary and secondary grades because there are relatively few public preschool spaces. Thus, we assume that with a universal program, the fraction of preschool enrollments in private programs will converge to the rate that is observed in kindergarten and first grade, where spaces supported with public funds are available for all children who choose to enroll, but some families still choose to pay for a private preschool program.

by risk level and preschool type (see row h). Overall, 19 participants are from the high-risk group (74 percent of 25 children), 16 from the medium-risk group (78 percent of 20 children), and 45 from the low-risk group (82 percent of 55 children). Eighteen out of nineteen high-risk children are assumed to be in public programs (70 percent of 25), compared with 38 out of 45 for low-risk children (70 percent of 55).

A comparison of the distribution of children under the universal preschool assumptions (row h of Table 2.8) versus the baseline (row d) shows the net change in the distribution of children by preschool type and risk level for every 100 children. This is labeled as the change in the number of participants by preschool type (see row i). The net addition in going from the baseline to universal preschool is 15 new children in preschool education (going from 65 out of 100 participating to 80 out of 100). However, there are 37 new children in the public program (from 33 total in row d for the public system to 70 total in row h). The 37 new children in public preschool include the 15 net additions plus 22 children who move from the private system to the public system (a decrease from 32 children in private preschools in row d to 10 children in row h).[28] Most of the movement from the private to the public sector (18 children of the 22 who move) occurs for low-risk children since they were the most likely to be in private programs under the baseline.

The last section of Table 2.8 shows the estimated distribution of children in the universal preschool program by the type of preschool they would have attended in the absence of a universal program (see row j in Table 2.8). The first group is those children who would not have received a preschool education at the baseline (the difference in the total rows under the distributions in rows d and h). They are net new additions in the public-sector universal preschool program compared with the baseline. The second group is those children who would have been in a public-sector preschool program at the baseline and remain in the public sector under universal preschool (the public-sector line under row d). We assume that children who remain in the public system experience a higher-quality preschool experience than in the past

[28] We note, as discussed in Chapter One, that we have assumed a universal preschool program that may include private providers supported with public funds. Thus, the public-sector universal preschool program may include both public and private providers.

because of the higher standards for teacher education, and so on. The third group of children would have attended a private preschool program under the baseline, but they switch to the public-sector program under universal preschool (the absolute value of the change in children in the private-sector line in row i). As a starting point, we assume that the quality of preschool education for those children moving from the private sector to the public sector does not change.[29]

As seen in Table 2.8 (row j), for the 70 out of 100 children assumed to participate in the universal preschool program, 15 are estimated to be new participants relative to the baseline (the net new additions to preschool participation), 33 are in upgraded public-sector programs relative to the baseline (the same 33 children who would have been in the public preschool program at baseline), and 22 children are in public-sector programs that are assumed to be of the same average quality as the private-sector program they would have experienced at baseline. Among high-risk children, 5 are new preschool participants, 12 are in upgraded public programs, and 1 is a transfer from a private program. At the other end of the spectrum, among low-risk children, 7 are new preschool participants, 13 are in upgraded public programs, and 18 transfer from the private sector to the public sector.

Combining the Adjustments

Table 2.9 shows the assumed distribution of benefits for universal preschool participants at each risk level by the type of preschool experience they would have had under the baseline. Benefits are measured as a share of the Chicago CPC benefit level. For example, for those who are new preschool participants, since the baseline was no preschool, we assume that those in the high-risk group get 100 percent of the CPC program benefit, while the medium- and low-risk groups get 50 percent and 25 percent, respectively (per the discussion above). For those in upgraded public-sector programs, we assume that those in

[29] There is some evidence that private preschool programs on average may be of lower quality than public preschools (Barnett et al., 2004). If that is the case, there may be some benefit for children in upgrading from private-sector preschool programs to a high-quality public program. We relax this assumption of no change in quality later in our sensitivity analysis in Chapter Three.

Table 2.9
Percentages of CPC Program (Maximum) Benefits Realized by Children of Differing Risk and Alternative Preschool Types at Baseline

Type of Preschool Universal Program Participants Would have Attended at Baseline	High Risk	Medium Risk	Low Risk
None	100%	50%	25%
Public	50%	25%	0%
Private	0%	0%	0%

the high-risk group get 50 percent of the CPC benefit, those in the medium-risk group get 25 percent, while those in the low-risk group get no additional benefit over the baseline. These assumptions follow if there is some benefit from high- and medium-risk children of being in a lower-quality preschool program, so that the marginal gain in increasing the program quality is not as large as what was observed for the Chicago CPC participants. Finally, for those who would have been in the private sector under the baseline (the last row of the table), we assume that there is no change in quality in moving from the private sector to public sector; so there is no net benefit over the baseline. Thus, relative to the CPC impacts, the benefit is zero. This set of assumptions can arguably be viewed as quite conservative. As part of the sensitivity analysis in Chapter Three, we consider even more-stringent assumptions, as well as more-liberal assumptions to see how sensitive our results are to these distributional assumptions.

The distribution of children by the change in preschool experience relative to the baseline shown at the bottom of Table 2.8 and the assumed distribution of benefit levels shown in Table 2.9 can be used to estimate the average benefit for the population served by a universal public preschool program in California. Compared with the optimistic assumptions where the average benefit level is 100 percent of the CPC program benefits, these distributional assumptions produce an average benefit level equal to 23 percent of that experienced by the CPC program participants. This attenuation of the benefits of preschool education over the optimistic assumption reflects an assumed reduction in benefit levels as risk declines, and it reflects reduced benefits because

some children would have been enrolled in another public or private preschool program in the absence of universal preschool.

Implied Consequences for a California Cohort of 4-Year-Olds

Over the next ten years, population projections from the California Department of Finance indicate the average size of each annual cohort of 4-year-olds will be about 550,000 children.[30] Assuming 70 percent of the cohort of 4-year-olds participates in a universal preschool program, 385,000 children in each single-year age cohort will participate. For this single-year age cohort and preschool participation rate, Table 2.10 shows the estimated changes in outcomes. These impacts are based on the measured Chicago CPC results summarized in Table 2.4, but they are attenuated because of the adjustments we have made for lower-risk participants in a universal program and current preschool participation in California.

As seen in Table 2.10, a universal preschool program in California is estimated to reduce the number in each cohort ever retained in grade by approximately 13,800 children, while about 9,100 fewer children will ever use special education, for a cumulative total reduction of nearly 63,000 child years of special education use. Assuming California cohorts have the same cumulative rates of grade repetition and special education use as those observed for the United States as a whole (see Tables 2.5 and 2.6), these changes represent reductions of 19 and 15 percent from the baseline, respectively.[31] A universal preschool program is also estimated to generate 10,000 additional high

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[30] The size of the California cohort of 4-year-olds is projected to be about 514,000 in 2006, increasing to 539,000 by 2015. These projections date from May 2004 (see State of California, 2004).

[31] To illustrate how these figures are derived, consider the result for grade repetition. The Chicago CPC program reduced grade repetition by 15.4 percentage points (Table 2.3). Attenuating that result by 23 percent gives a 3.5 percentage point reduction in grade repetition. Applied to a cohort where 385,000 children participate in preschool, that attenuation yields about 13,700 fewer children ever repeating a grade (Table 2.10). If the population baseline rate for grade repetition is 13.3 percent (Table 2.6), then 73,000 children at baseline out of the full cohort of 550,000 children can be expected to ever repeat a grade. Thus, the reduction of 13,700 children represents about 19 percent of 73,000. Alternatively we could have attenuated the 3.5 percentage point reduction above by the 70 percent participation rate in public preschool to get an overall reduction of 2.45 percentage points, which is about 19 percent of the baseline grade repetition rate of 13.3 percent.

Table 2.10
Estimated Impacts for California Single-Year Cohort of 4-Year-Olds Participating in Universal Preschool

Outcome	Change Assuming Distribution of Benefits Among Participants
Education processes and attainment	
Reduction in the number of children ever retained in grade	13,764
Reduction in the number of children ever using special education	9,116
Reduction in the number of child years of special education use	62,563
Increase in the number of high school graduates	10,010
Increase in the number of child years of education	29,494
Child maltreatment	
Reduction in the number of children with report of child abuse or neglect	4,737
Juvenile crime	
Reduction in the number of children with a juvenile petition (court filing)	7,329
Reduction in the number of children with a juvenile petition (court filing) for a violent offense	5,631
Reduction in the number of juvenile petitions (court filings)	29,494

NOTES: The California annual cohort of 4-year-olds is assumed to be 550,000 children, and 70 percent of children are assumed to participate in the universal preschool program.

school graduates and a total of 29,500 child years of additional schooling. Again, assuming the graduation rate in California is comparable to the national rate (see Table 2.6), this represents a 15 percent reduction in the high school dropout rate.

A universal preschool program is also estimated to reduce by 4,700 the number of children with a substantiated case of abuse or neglect between the ages of 4 and 17. In terms of crime outcomes, nearly 7,300 fewer children will ever have a juvenile petition filed (court filing), while the number ever with a juvenile petition for a violent offense is estimated to decline by 5,600 children. The total number of juvenile petitions is estimated to fall by nearly 29,500. Since these are

all cumulative measures of incidence, we need to compare them against baseline rates that are also cumulative. Such measures are not readily available. However, data for California indicate that 1.5 percent to 0.8 percent of children ages 4 to 17 each year have a substantiated case of child abuse and neglect, with rates that decline by age group (U.S. Department of Health and Human Services [DHHS], 2004). Assuming half the cases in each year are children with prior reports, the reduction in child maltreatment shown in Table 2.10 represents a 9 percent reduction over the baseline. Similarly, the rate of juvenile petitions for youth age 12 to 17 is approximately 2.5 percent per year (California Department of Justice, 2004). Again, assuming half the petitions each year are youth with prior petitions, the reduction in Table 2.10 is a 16 percent reduction over the baseline. In each case, these should be viewed as rough estimates, given that we do not have more-precise data on lifetime incidence of child maltreatment or juvenile petitions in California. These reductions would be underestimated to the extent that there is more than a 50 percent repeat rate from year to year in child maltreatment cases and cases of juvenile crime.

CHAPTER THREE

A Benefit-Cost Analysis of Universal Preschool Education in California

Judging from the scientifically sound research literature, a high-quality universal preschool program can generate sizeable long-term benefits, particularly for disadvantaged children, and to a lesser extent, for more-advantaged children as well. In this chapter, we use benefit-cost methodology to translate those long-term benefits from the universal preschool program discussed in Chapter Two into dollar savings for government, as well as benefits to program participants and the rest of society. These benefits are then compared with the estimated costs of such a program. The analysis in this chapter parallels a previous study of the benefits and costs of the Chicago CPC program (Reynolds et al., 2002). In our case, we estimate benefits and costs using data specific to the California context wherever possible.

We begin with a brief overview of benefit-cost methodology and its application to assessments of preschool education. We then summarize our methodology for estimating the costs of a high-quality preschool program in California. That is followed by a discussion of how we place dollar values on the benefits of such a program. Results from our benefit-cost analysis are then presented under several alternative assumptions.

Overview of A Benefit-Cost Analysis for Preschool Education

A number of studies have applied benefit-cost analysis to consider the returns from investing in high-quality preschool programs (Bar-

nett, 1993; Karoly et al. 1998; Reynolds et al., 2002; Rolnick and Grunewald, 2003; Belfield, Nores, and Barnett, 2004).[1] Benefit-cost analysis is a useful tool for this purpose because preschool education potentially generates a wide range of benefits that are distributed across different stakeholders and distributed over time. In the remainder of this section, we detail the essential elements of the benefit-cost methodology (including its limitations), review the nature of the spillover benefits associated with preschool education, and summarize the findings of other benefit-cost studies of preschool programs.

Key Elements of Benefit-Cost Analysis

Benefit-cost analysis is a policy analysis tool that seeks to quantify, for a given stakeholder, the total value of the benefits of a policy option relative to some baseline, and then to compare those benefits with the cost of that policy option relative to the baseline.[2] Such a comparison requires benefits and costs be measured in common units, and dollars are typically the measure chosen. To account for inflation, all dollar values are denominated in a common base year. A further adjustment must be made because the time paths of costs and benefits may differ—the cost of the program are usually realized upfront, but the benefits may accrue gradually afterwards, for many years into the future. To most people, a future dollar is not as attractive as one received today, and the further in the future the dollar accrues, the less valuable it is. (The analogous argument applies to costs: Future costs seem less burdensome than current ones in the same amount.) Thus, future benefits and costs are discounted at an annual rate that is, for simplicity's sake, constant. The discount rate chosen for a benefit-cost analysis of a social policy program typically ranges from 3 to 6 percent per year in real terms. We use 3 percent here.

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[1] Beyond these two preschool programs, benefit-cost analysis has been applied to other targeted early childhood intervention programs, including the Abecedarian program (see Masse and Barnett, 2002) and the Elmira Prenatal/Early Infancy Project (see Karoly et al., 1998).

[2] For a discussion of benefit-cost analysis in particular, and cost and outcome analysis more generally, see Karoly et al. (2001).

Benefit-cost analysis is typically conducted from the perspective of society at large, but benefits and costs can be considered for segments of society as well. For example, if the policy option is a program made available to an eligible group of participants, benefits and costs may be assessed from the perspective of participants or from that of nonparticipants. The government is another entity that is often the stakeholder of interest. Since many policy options involve expenditures by the public sector, it is relevant to compare government costs with subsequent benefits that flow to the public sector.[3] The public sector may be further disaggregated by jurisdiction (local, state, or federal) or agency.

In comparing benefits and costs, it is important that they both be compared to the same relevant baseline. In the case of assessing a preschool program conducted a number of years ago or in a jurisdiction where preschool enrollment rates are very low, an appropriate baseline may be no preschool. Then, both costs and benefits of the preschool program would be valued relative to those of no preschool. In a state such as (present-day) California, the relevant baseline is the status quo, in which a certain fraction of children already participate in preschool education, either in the public or private sector, and in which the public sector already invests some resources in preschool education. The policy of universal preschool would then be incremental to that baseline, and the costs and benefits would be measured incrementally as well.

By expressing costs and benefits in a common metric—present value dollars—all benefits that can be measured can be summed and compared with program costs. Net benefits (or the net present value) are the difference between total benefits and total costs, and they may be calculated for various stakeholders as well as for society as a whole. Likewise, benefit-cost ratios are also often calculated for society as a whole or different stakeholders as the ratio of total benefits to total costs. A ratio greater than one is equivalent to net benefits being greater than zero.

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[3] A benefit-cost analysis that focuses exclusively on the public sector is sometimes called a cost-savings analysis (see Karoly et al., 2001).

The results of a benefit-cost analysis can also sometimes be summarized in terms of the internal rate of return (IRR).[4] The IRR is calculated from the same time sequence of cash flows as the net present value. In fact, it is the discount rate at which the net present value would be zero or, putting it another way, at which the present value of the stream of costs equals the present value of the stream of benefits. When net benefits are positive, the IRR will exceed the discount rate used to discount benefits and costs, while the reverse is true when net benefit are negative.[5]

The IRR is particularly sensitive to the timing of benefits and costs. If two preschool programs have the same net present value but one generates a benefit stream that is shifted toward younger ages of the children, that program will have a higher IRR. Finally, not every stream of cash flows will have an IRR—e.g., a stream with nothing but costs (no benefits in any year) or nothing but benefits (no costs in any year). In our analysis below, we find we can always calculate an IRR for society as a whole, but not for every stakeholder.

While benefit-cost analysis has the advantage of being able to compare the flow of costs and benefits associated with a given program or policy relative to a baseline, all in a common metric, there are limitations, and some are particularly relevant in the context of early childhood programs. First, while program costs are relatively easy to estimate, future benefit streams can be more challenging to value. Some potential benefits may go unmeasured, so they are not included. This would occur, for example, if the impact of preschool education was not assessed for certain outcomes (e.g., benefits to parents), or if

[4] When the time sequence of cash flows looks like an investment—a few years of up-front costs followed by returns in the later years—the IRR is called the return on investment. When the cash flows look like a loan—an up-front benefit followed by years of costs—the IRR is the same as the interest rate on the loan.

[5] For example, if an investment (cost) of $97 this year yields a return (benefit) of $100 next year, the IRR is 3 percent, because that is the discount rate that must be applied to the $100 to equal $97 in present value. If the benefit is $103 next year, the IRR is 6 percent. If the benefit is $99, the IRR is 2 percent. If the actual discount rate is 3 percent, the present value of the $103 is $100, so the benefit net of the $97 cost is positive. The present value of $99 is $96, so the net benefit is negative. In the event the benefits are lower in undiscounted terms than the costs—e.g., a $94 return next year on a $97 investment this year—the IRR is negative, –3 percent in this case.

the follow-up period was not long enough to measure other outcomes (e.g., benefits to the children of participants).

Other benefits may be measured but are not easily translated into dollar values. For example, a reduction in crime may produce both tangible benefits (e.g., reduction in injury, lost work time, and so on) and intangible benefits (e.g., reduced pain and suffering). The latter are harder to value in dollar terms, and different methods can lead to large differences in estimated savings (Karoly et al., 1998). Such intangible benefits may therefore be excluded. For both reasons, benefits are likely to be underestimated; yet this is less likely to be the case for program costs. This will lead to an underestimate of the benefit-cost ratio and may also reduce the IRR as well.

A second limitation of benefit-cost analysis is that, if it considers benefits and costs only in the aggregate, it does not reveal the distribution of benefits and costs for the different stakeholders. To the extent that considerations of equity are relevant, benefit-cost analysis is then silent. The assumption is that the decisionmaker weighs the costs and benefits equally regardless of to whom they accrue. Alternative weighting schemes are possible. For example, some decisionmakers may place more weight on benefits to more-disadvantaged children, whereas the benefit-cost analysis weights benefits equally for children regardless of their level of advantage.

A third concern is that benefit-cost analysis typically does not account for altruistic values that members of society may place on benefits that accrue to others. For example, members of society may value the improved outcomes for children who attend preschool, above and beyond any direct private benefit they may experience (e.g., a reduction in crime). Such altruistic valuations are difficult to measure and, again, estimates may vary widely. However, at least in some contexts (e.g., the valuation attached to reducing health-related risks), estimates suggest that the altruistic values may exceed the private valuations typically included in benefit-cost analyses (Viscusi, Magat, and Forrest, 1988).

Spillover Benefits from Preschool Education

Chapter Three summarized the evidence of the longer-term impacts of high-quality preschool programs, primarily based on studies of more-

disadvantaged children. In the case of the Chicago CPC program, the range of benefits observed through the last follow-up at age 20 includes improved educational outcomes, lower rates of child maltreatment, and reductions in juvenile crime. While these outcomes are beneficial in their own right, they also generate spillover benefits that can often be quantified in dollar terms in the context of a benefit-cost analysis.

These benefits may accrue to the government in the form of reduced costs of public programs and services or in the form of higher taxes paid; they may accrue to program participants in the form of improvements in related outcomes in childhood or adulthood (e.g., preschool participation, by providing child care, frees up parental time for work or other activities); or they may accrue to other members of society in the form of improved outcomes such as reduced crime rates. In some cases, we may also be able to project benefits that would extend beyond those observed by researchers. For instance, to the extent we can estimate how higher educational attainment measured in a preschool program evaluation translates into improvements in lifetime earnings, we can account for such longer-term projected benefits as well. In some cases, the favorable effects of preschool programs may generate added costs. When preschool participants complete more schooling, for instance, that is more costly in terms of educational expenses than if they had dropped out of school earlier.

Table 3.1 illustrates the linkages between improved outcomes for preschool participants (the source of benefits or costs) and the spillover benefits (or costs) to government, participants, and the rest of society. In the case of government, we further differentiate between costs or savings accruing to state and local government and those accruing to the federal government. Benefits are divided between those that have been observed based on the Chicago CPC program and those that must be projected based on the observed impacts. The latter include additional postsecondary education that can be expected on the basis of higher educational attainment through age 20 and the related gains in lifetime compensation. Reductions in adult criminal careers can also be projected from observed reductions in juvenile crime. In this way, our analysis combines the results from a high-quality preschool program evaluation with well documented relationships between outcomes in

Table 3.1
Spillover Benefits and Costs from Improved Outcomes for Preschool Participants

		Benefits (Costs) Accrue to:			
		Government			
Source of Benefits (Costs)	Spillover Benefits (Costs)	State and Local	Federal	Participants	Rest of Society
Observed Benefits					
Reduced grade repetition	Fewer years spent in K–12 education	X			
Reduced use of special education	Lower costs for special education	X	X		
Increased educational attainment	(More years spent in K–12 education when dropping out is avoided)	(X)			
Reduced child maltreatment	Lower costs to child welfare system and lower abuse victim costs	X	X	X	
Reduced contact with juvenile justice system	Lower costs to juvenile justice system and lower crime victim costs	X			X
Increased child care provided	Value of subsidized child care for parents of participating children			X	
Projected Benefits					
Increased educational attainment	(More years spent in postsecondary education)	(X)		(X)	
Increased educational attainment	Increased lifetime earnings for participants and increased tax revenue to government	X	X	X	
Reduced contact with juvenile justice system	Lower costs to adult justice system and lower crime victim costs	X			X

NOTE: Parentheses denote spillover costs as opposed to benefits.

adolescence and young adulthood and outcomes across the adult life course.[6]

The first row of the table indicates that when high-quality preschool programs generate reduced rates of grade repetition, that results in fewer years spent in K–12 education and hence savings of those educational costs that would have otherwise been borne by state and local government. The third row has the opposite effect: The increased educational attainment that results from preschool participation leads to more time spent in school and therefore higher costs to state and local government. Likewise, higher postsecondary educational attainment (the first row under projected benefits) results in more costs to the public higher education system; it also increases costs to the participant since public universities and community colleges are not fully subsidized.

Special education costs and the costs of the child welfare system are borne by state and local government, as well as the federal government. Thus, those two impact areas generate benefits to both levels of government based on their relative shares of the costs of providing those services. The reduced incidence of child maltreatment generates benefits to children in the form of reduced medical costs and other tangible costs of abuse. The reduction in juvenile crime and projected adult crime leads to reductions in the tangible costs of crime for those who would have been victimized, along with savings to government—i.e., the criminal justice system. The reductions in child maltreatment and crime may also generate benefits in the form of reduced pain and suffering for victims of abuse or crime—an intangible benefit that is harder to quantify in dollar terms.

The higher projected earnings, as a result of higher educational attainment, lead to benefits for state, local, and federal governments in the form of higher tax revenues (income taxes and social security taxes), as well as higher incomes for participants (net of taxes). Families of participants also benefit at the time the preschool education is provided in that they receive child care that frees the time of the parent who would otherwise provide care for that child.

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[6] This is an approach adopted in most of the benefit-cost studies of preschool programs that we reference in the next section.

Other Benefit-Cost Analyses of Preschool Programs

The benefit-cost methodology has been applied to the Chicago CPC program, as well as the Perry Preschool program, both targeted preschool programs serving children one or two years before kindergarten entry. Reynolds et al. (2002) estimate that the preschool component of the Chicago CPC program generated $47,759 in benefits to society as a whole versus program costs of $6,692, all in 1998 dollars per child discounted to the present at a 3 percent annual rate. This translates into a societal return of $7.14 for every dollar invested. The largest component of benefits was the added lifetime earnings received by program participants as a result of higher educational attainment ($20,517 per child or 43 percent of total benefits). The largest sources of government benefits were taxes on the higher earnings and savings to the criminal justice system ($7,243 and $7,130 per child, respectively, or about 15 percent each). The analysis did not include a value for the intangible benefits from crime reduction and therefore can be considered a conservative estimate of the benefits to society.

These results are for the CPC evaluation sample, which participated in the CPC program for an average of 1.5 years. However, the impacts for children participating one year were very similar to those for participants who attended two years. Reynolds et al. (2002) calculate that the program serving children for just one year generated $12.02 per dollar invested, while a two-year program generated $5.02 per dollar invested.[7] This reflects the diminished long-term benefit associated with the second year of preschool as discussed in Chapter Two.

Several benefit-cost estimates are available for the Perry Preschool program.[8] The benefit-cost analysis conducted by the Perry Preschool

[7] As reported in Reynolds et al. (2002), two years of preschool provided no statistically significant advantage over one year, with the exception of child maltreatment. Indeed, they report that the estimate of total benefits for one year exceeds that for two years ($51,350 versus $43,820 in present value benefits). Consequently, the one-year program, which costs half as much, actually has a benefit-cost ratio that is more than twice that for the two-year program. If confidence intervals were calculated for the two estimates of benefits or the benefit-cost ratios, we would expect them not to be statistically different for the one-year versus two-year programs, given that the impact estimates used to derive the benefit-cost analysis measures are not statistically different either.

[8] In addition to the studies discussed here, see Lynch (2004) for a projection of government finances and societal benefits through the year 2050 of a targeted early childhood program based on impact estimates from the Perry Preschool program.

researchers, based on the age-27 follow-up, estimated the program generated $108,002 in total benefits to society per child versus $12,356 in program costs (all 1992 present value dollars using a 3 percent discount rate), or a return of $8.74 to society for every dollar invested (Barnett, 1993; Schweinhart et al., 1993). The bulk of the total benefits, $70,381 per child or 65 percent, was due to the observed and estimated reduction in crime, where both tangible and intangible crime losses were valued. The observed and projected gains in participant's earnings and fringe benefits accounted for another $30,311 per child or 28 percent. More recently, the benefit-cost analysis based on the age-40 follow-up has indicated an even higher return to society of $17.07 for every dollar invested (Belfield, Nores, and Barnett, 2004; Schweinhart, 2004).

Karoly et al. (1998) estimate a lower benefit-cost ratio (about 4 to 1) for the Perry Preschool program as a result of excluding the intangible losses to victims of crime. Rolnick and Grunewald (2003), in a reanalysis of the age-27 Perry Preschool program results that retained the valuation of the intangible crime costs, estimate that the IRR for society as a whole is 16 percent, where for the public sector (both government and nonparticipants) the IRR is 12 percent. They argue that this IRR compares favorably with, if not exceeds, that achieved by other uses of public-sector funds for economic development. These results for the Perry Preschool program are all based on participants who attended, on average, about 1.5 years of preschool. Given the diminished returns for the second year of preschool evident in the Perry results (see the discussion in Chapter Two), these rates of return would be even higher for a program that served children for one year.[9]

Aos et al. (2004) use the results of their meta-analysis of the impacts of 48 targeted preschool programs serving children ages 3 and 4 (see the discussion in Chapter Two) to conduct a benefit-cost analysis. Because the impact estimates based on their meta-analysis tend to be lower than those measured in either the CPC or Perry Preschool programs (two studies included in their meta-analysis), their estimates of net benefits and the benefit-cost ratio are lower than those estimated

[9] Indeed, this was the finding from earlier benefit-cost analysis of the Perry Preschool program, where the benefit-cost ratio was found to decline from 6:1 to 3:1 in going from a one-year program to a two-year program (Barnett and Escobar, 1987; Schweinhart and Weikart, 1988).

for the individual programs. In particular, they find that net benefits per child in 2003 present value dollars, using a 3 percent discount rate, total approximately $9,900 ($17,200 in present value benefits less $7,300 in present value costs). The benefit-cost ratio is 2.36. The benefits valued in this analysis, in most cases using dollar figures based on Washington state cost data, include those related to educational outcomes, child abuse and neglect, domestic violence, teen pregnancy and suicide attempts, crime, and substance abuse.

Finally, Belfield (2004a, 2004b) uses impacts from evaluations of Perry Preschool, Chicago CPC, Abecedarian, and Head Start to estimate the savings of implementing universal preschool programs in New York and Ohio. In the New York analysis (Belfield, 2004a), savings are limited to those in the medium term, resulting from lower grade repetition, reduced use of special education, and increased education efficiency through peer effects (i.e., the improved performance of children who participate in preschool provides benefits for their peers through an enhanced classroom environment, and so on, making learning more efficient for all children). More- and less-conservative assumptions regarding the attenuation of benefits over those measured in more-targeted programs are used to generate a range of estimates of the education system savings. The study concludes that 41 to 62 percent of the costs of a universal preschool program serving 80 percent of New York 4-year-olds would be offset by savings to the education system alone. For the Ohio analysis (Belfield, 2004b), a similar methodology is followed for a broader range of benefits. A universal preschool program serving 3- and 4-year-olds in Ohio is estimated to generate returns of $1.38 to $1.91 for every dollar invested.

Valuing the Benefits of a Universal Preschool Program in California

The benefit-cost analysis requires that we estimate the spillover benefits (and in some cases, the costs) associated with improved outcomes for participating children and their families, both when the children are young and also as they grow older. In this section, we review our ap-

proach for valuing the benefits of the various observed outcomes in the Chicago CPC evaluation and also how we project future benefits for some outcomes. Unless otherwise noted, all dollar figures discussed in this section are for 2003 and have not been discounted.[10] In the benefit-cost analysis results presented later in this chapter, the dollar figures we report are discounted and also attenuated to account for the distribution of benefits and the baseline distribution of preschool enrollment (see the discussion that follows).

Our analysis differentiates benefits for (1) state and local government, (2) the federal government, (3) program participants, and (4) the rest of society (nonparticipants). The distinction between levels of government has not typically been made in prior benefit-cost analyses of preschool programs. However, given that the focus is a preschool program in California, it is natural to measure savings (or costs) to the public sector in the state as separate from those that accrue to the federal government. With this approach, we can also differentiate between the benefits that accrue to California society as a whole, versus those that accrue to the rest of the United States.

Our approach to valuing benefits follows the benefit-cost analyses conducted by Karoly et al. (1998), Reynolds et al. (2002), and Aos et al. (2004) using, wherever possible, data specific to California. The discussion here focuses on the total (undiscounted) benefits (or costs) associated with an outcome, such as avoiding a year of special education. For the benefit-cost analysis, we multiply that value by the estimated impact from universal preschool, either per child or for the whole cohort, as set out in Chapter Two, to arrive at the dollar-valued program benefit. Given the timing of when the benefit (or cost) is assumed to accrue, we then calculate the present value of that stream of dollars. Additional details regarding the assumptions and data sources described in this section are contained in Appendix A.

Remedial Education Services and Educational Attainment

The Chicago CPC program estimated a 15-percentage point reduction in the number of children who ever repeated a grade through

[10] All dollar figures from earlier years are inflated using the Consumer Price Index—All Urban Consumers (CPI-U). See Appendix A for details.

age 15. We assume that the state and local government cost associated with each grade repeated is the average statewide annual K–12 public education cost in California equal to $6,961 per child in school year 2002–2003. This savings is applied as of age 19 of the child on the assumption that any grades repeated will extend the time in school by an added year at the end of K–12 education. The CPC program evaluation does not tell us the average number of years repeated, so this will be an underestimate of the savings to state and local government in California to the extent that the reduction in grade repetition is more than one grade on average.

The use of special education in the CPC program fell by 0.7 years between ages 6 and 18. Data on annual special education costs in California are not readily available. However, data from the 1998–1999 school year indicated that the ratio of special education costs to general education costs in California was 1.38.[11] Applying this ratio to the California general K–12 education costs in 2002–2003 noted above gives an annual cost of special education for the same year equal to $9,637. Data for the 1998–1999 school year also indicate that 10 percent of special education costs nationwide are funded by the federal government, while the remaining 90 percent are covered by state and local government. This distribution of savings over the government sectors is applied at age 12 of the child, the midpoint of the age interval when special education use is measured.

In the CPC program evaluation, the high school graduation rate increased by 11 percentage points as of age 20, and years of schooling increased by 0.33 years as of the same age. The additional years of schooling generate a cost in terms of California K–12 education. In other words, children who otherwise would have dropped out stay in school longer, which costs the K–12 education system more. We use the same annual cost of K–12 education discussed above and apply it as an added cost to state and local government as of age 19 of the child.[12]

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[11] Data from the 1992–1993 school year on California special education costs versus general education costs indicate a ratio of 1.35, suggesting this ratio has remained fairly constant over time. Estimates of this ratio at the national level are as high as 1.9, so this may be a conservative estimate. See Appendix A for additional discussion.

[12] This added cost was not accounted for in Reynolds et al. (2002).

The increased high school graduation rate can be projected to lead to an increased rate of college attendance for preschool children, compared with their nonpreschool counterparts. Indeed, 62 percent of the CPC treatment group had graduated from high school as of age 21, and 47 percent were attending college at the same age (Reynolds et al., 2002). We infer from data on subsequent education of high school graduates that graduation from high school is associated with an additional 1.5 years of postsecondary education, on average. For the 2002–2003 academic year, the average state and local cost of higher education in California was $6,678 per full-time-equivalent student. Student fees were an average of $780 for the same year, or about 10 percent of the combined public and private costs. These added state and local government costs, as well as participant costs, are applied for 1.5 additional years of schooling to the 11-percentage point high school graduation rate differential as of ages 19 and 20.

Child Welfare

In the CPC program evaluation, the incidence of child maltreatment measured by substantiated cases of abuse or neglect between ages 4 and 17 was 5.3 percentage points lower for CPC participants. The dollar savings associated with this favorable outcome is difficult to ascertain for California. Data for California do indicate that a substantiated case of child abuse results in foster care in 31 percent of cases, while the remaining 69 percent of cases require in-home care. Foster care in California is estimated to cost nearly $19,000 per year in 2003 dollars, while data for several other states on the cost of in-home care indicate those costs equal about $3,400 per year. Applying the proportions of cases that result in these two outcomes to these figures, and adding an estimate for administrative costs per substantiated case (about $1,000), gives a weighted cost per substantiated case of $9,349 for the California child welfare system in 2003. These savings accrue to the state and local government as well as to the federal government, with estimated shares of 57 percent and 43 percent, respectively. The cost savings from the reduction in child maltreatment for both levels of government is applied as of age 10. This estimate of savings will be conservative to the

extent that time spent in foster care or in-home care exceeds an average of one year.

The reduction in child maltreatment also results in less harm to the victim (i.e., preschool program participants), which can be valued in terms of a reduction in tangible losses—e.g., those associated with medical care and mental health treatment. Estimates of these costs indicate that nearly $7,800 of losses in 2003 dollars are associated with a case of child abuse, while a case of child neglect costs about $1,200. Weighting by the proportion of California cases in these two categories (61 and 39 percent, respectively) gives an estimate of $5,231 in tangible victim costs for each case of abuse and neglect. These savings are applied to participants as of age 10 as well. Note that to be conservative, we do not include any intangible costs of child maltreatment in this savings estimate (see the discussion below). However, as part of our sensitivity analysis, we conduct a benefit-cost analysis that includes an estimate of intangible benefits as well.

Criminal Justice

As of age 18, CPC preschool participants had 0.33 fewer petitions to juvenile court. This results in savings to the justice system at the state and local level in terms of costs for the police and court system, as well as for incarceration. We estimate the costs based on the distribution of juvenile court petitions in California as of 2003 and the costs associated with each of those outcomes. For example, about 22 percent of juvenile petitions lead to incarceration in a county facility, which cost an estimated $25,200 annually in California as of 2003. A sentence in the California Youth Authority is much more rare (about 1 percent of cases) but much more expensive ($49,200 per year in 2003). Probation, other dispositions, and dismissal are the other major outcomes. Weighting the cost for each outcome by the share of petitions with this disposition, plus adding an estimate of costs for arrests and adjudication, results in an estimate of $9,480 in justice system costs for each juvenile petition in 2003. This savings to state and local government is applied as of age 14. Note that this assumes that cases that result in detention are for an average of one year. If detentions are longer on

average, this will be an underestimate of the savings to the state and local government.

The reduction in juvenile crime also lowers the costs to victims of crime, which falls into the "rest of society" category. Here we focus on the tangible costs to crime victims, which include property loss, lost productivity, medical care, and mental health costs. Following the approach used by Aos et al. (2004), we estimate victim tangible costs based on the distribution in California of juvenile petitions and tangible costs by type of crime, with a scaling factor to account for crimes that are not reported to police or that do not generate a court action. The approach recognizes that only a fraction of all crimes (or victimizations) are even reported to the police and only a subset of those crimes leads to an arrest or court case. Thus, we assume that the reduction in juvenile petitions observed in the Chicago CPC program is associated with a larger reduction in the absolute number of crime victimizations. Using this method, we estimate the tangible victim costs per juvenile court petition at $13,259 as of 2003. This savings is applied to the rest of society, also as of age 14. As with the child maltreatment component, this is a conservative estimate because it does not include a value for any intangible victim costs (i.e., pain and suffering). As part of a sensitivity analysis, we generate an estimate of crime victim savings that includes both tangible and intangible costs of crime.

The reduction in juvenile crime can be used to project a reduction in crime by the preschool program participants beyond the observed age of 18. This projection covers the most crime-prone years (i.e., up to age 44), often called the adult criminal career. Following the methodology applied by Karoly et al. (1998) and also applied by Reynolds et al. (2002), we estimate that the net present value of the savings to the criminal justice system at age 19 due to the reduction in the adult criminal career is $3,536. (This figure, applied to the state and local government, is further discounted to the same age as all other cost and benefit terms.) Applying an estimate that indicates that the tangible victim costs for an adult criminal career are about 1.05 times the justice system costs gives an estimate of the former equal to $3,708 in 2003, again a present discounted value as of age 19 (also further discounted). This benefit accrues to the rest of society. Since this estimate does not

include intangible victim costs, this is another conservatively estimated benefit, although we provide an estimate that includes this savings component in a sensitivity analysis.

Compensation and Taxes

The increased educational attainment of preschool participants can be used to project the lifetime earnings gains associated with additional schooling. As of the last CPC program follow-up, the earnings gains were not measured. However, the Perry Preschool findings as of ages 27 and 40 indicate significant earnings gains of preschool participants over their counterparts who did not attend preschool (see the discussion in Chapter Two). There are a number of alternative approaches to projecting future earnings streams based on education levels. Our approach is to use 2003 data on mean annual earnings for different levels of educational attainment, disaggregated by age group and race/ethnicity (white non-Hispanic, black, Hispanic, Asian, and other). These data are used to calculate the expected lifetime earnings differential (to age 65) between the average high school dropout and the average high school graduate (accounting for the distribution of additional schooling among high school graduates). This earnings differential is weighted by the racial/ethnic composition of the California cohort from birth to age 4 in 2000, thereby reflecting the demographics of the future California workforce. We allow real wage growth of 0.5 percent per year in the 2003 cross-sectional earnings profile due to productivity gains, and fringe benefits are assumed to equal 20 percent of cash earnings.

With these data and assumptions, we then project the differential in total compensation between high school dropouts and high school graduates each year between ages 18 and 65.[13] This approach assumes that the education differential observed today can be expected to persist once the cohort that enters preschool reaches adulthood. This is potentially a conservative assumption because the returns to additional years of school have been increasing in the last two decades, a trend

[13] Some studies have attenuated the estimated earnings differentials by education level observed in cross-sectional age-earnings profiles to account for possible selectivity bias. We examine the sensitivity of our results to our assumption of no bias by reporting an estimate below that includes the same adjustment applied by Aos et al. (2004).

that is likely to continue given the demand for a highly skilled workforce (see the discussion in the next chapter).

The additional earnings by preschool participants generate tax revenues at the state, local, and federal levels. Our estimate of tax revenues from the additional earnings at the state and local level is based on applying the marginal tax rates for the California income tax (ranging from 1 to 9.3 percent) to the appropriate cash earnings level. For the federal level, we apply the combined employer and employee share for Social Security (FICA) and Medicare (equal to 15.3 percent), with the marginal tax rates for the federal income tax (ranging from 10 to 35 percent). In calculating after-tax earnings for participants, we deduct only the employee share of the FICA and Medicare taxes.

Value of Child Care

The families of preschool participants receive the value of the child care provided under a preschool program. We follow Reynolds et al. (2002) in valuing the care received at the minimum wage. For California, the current minimum wage is $6.75 per hour. If we apply this amount to a program providing care for 525 hours annually, we obtain a benefit to participants in 2003 dollars of $3,544 for each year of preschool.

Potential Benefits Not Incorporated

The assumptions reviewed in this section allow us to generate estimated benefits (and in some cases costs) associated with each of the rows in Table 3.1. In general, when alternative cost estimates were available, we have selected the more-conservative measure so that our estimates of measured benefits will tend to be conservative. Our estimates can also be viewed as conservative because there are benefits we do not value in the benefit-cost analysis, either because the benefit is difficult to monetize or because the potential benefits were not measured in the Chicago CPC study and reliable methods for making predictions for those unmeasured benefits do not exist. In this subsection, we briefly delineate these various sources of potential missing benefits and indicate their potential magnitude and the affected stakeholders.

Welfare Benefits. As noted in Chapter Two, the Perry Preschool program led to a significant reduction in welfare use as of age 27 of

the participants. This outcome was not measured in the Chicago CPC study, so this potential benefit is not included in our analysis. From the perspective of taxpayers, the Perry impact was estimated to result in a savings to government through adulthood of nearly $3,000 per child in 1992 present value dollars using a 3 percent discount rate. However, from the perspective of participants, the reduction in welfare use lowered their present value income by about $2,700. Thus, from the perspective of society as a whole, the net benefit is just under $300 per child in 1992 dollars.[14] These findings indicate that our estimate of the savings to government may be underestimated and the benefits to participants overestimated as a result of omitting potential savings from reduced use of welfare programs. However, the effect on our estimate of the benefits to society as a whole is likely to be quite small.

Other Benefits to Parents of Preschool Participants. While our estimates value the hours of child care received, we do not incorporate other potential benefits to the parents of participating children, largely because they were not measured in the Chicago CPC program. However, other evaluations suggest that parents may benefit in other ways when their child participates in a high-quality center-based program. For example, the Abecedarian program provided full-day year-round center-based care for children a few months after birth until kindergarten entry. The program evaluation found that the education level, occupational status, and earnings of mothers of participating children improved compared with those of mothers in the control group, a benefit that persisted once the program ended (Masse and Barnett, 2002). A benefit-cost analysis of this program estimated a total earnings gain to mothers of participating children over their lifetime of nearly $74,000 per child in 2002 present value dollars using a 3 percent discount rate. Taxpayers benefit as well from the associated increase in tax revenue. In other early childhood programs, participating mothers might also have used less welfare as a result of higher earnings, which generates additional savings to government (Karoly et al., 1998).

[14] Reductions in the use of means-tested cash transfer programs will generally produce a wash from the perspective of society as a whole since the income loss of participants equals the revenue gain to taxpayers. The small positive gain overall is attributable to the administrative costs of the transfer program, which are saved by the reduction in program use.

Benefits in this category associated with a part-day universal preschool program in California are likely to be more modest, however. Such a program is less intensive than the Abecedarian program (part day versus full day, and part year versus full year). Nonetheless, we may underestimate the benefits to participants (from higher earnings net of taxes and lower welfare benefits), and perhaps to the government as well (from lower welfare payments and higher tax revenues). The reduction in welfare use by mothers, however, will have little effect on benefits for society as a whole for the same reasons noted above in the case of reduced welfare use by participants when they reach adulthood.

Other Benefits Associated With Higher Educational Attainment. The increased educational attainment of preschool participants may also generate other benefits that are not always measured in evaluations of preschool programs. In a recent survey of the literature, Wolfe and Haveman (2002) note that the benefits from investing in human capital extend to a range of social and nonmarket benefits—benefits that may be as large as the market-based effects typically measured (e.g., effects on earnings and social welfare program use). The broader benefits include higher educational attainment for the next generation (i.e., the children of preschool participants); improved health status for preschool participants when they are adults and for their family members (e.g., children); better consumer choices by preschool participants in adulthood, which raise well-being through more-efficient consumption; improved fertility choices by preschool participants (e.g., timing and spacing of births); and improved outcomes for peers of preschool participants through effects on classrooms or neighborhoods. The potential for intergenerational effects generates a virtuous cycle where education and improved well-being for one generation leads to similar gains for their children, and so on down the line.[15] While many of these favorable effects generate benefits for participants only, some

[15] Belfield (2004c), after reviewing the literature on intergenerational transmission of earnings and other outcomes, suggests that earnings gains from early childhood programs could be augmented by up to 17 percent to account for discounted intergenerational benefits. However, evidence from the age-40 Perry Preschool follow-up study—limited by small samples of children of participants—shows little indication of second-generation benefits in terms of grade repetition, employment, welfare use, or crime.

also produce spillover benefits to the government or society as a whole in the form of lower public health system costs, reduced use of public services by subsequent generations, lower crime rates in later generations, and so on.

Some of these benefits have been observed or projected in other benefit-cost analyses of early childhood programs. For example, Masse and Barnett (2002) include a calculation of the benefits from the Abecedarian program for generations two through four (the preschool participants are generation one), which equals about $5,700 in 2002 present value dollars per child based on a 3 percent discount rate. This equals about 15 percent of the value of the discounted lifetime earnings gains to preschool participants. Among possible health effects, a reduction in smoking rates for participants was found in the Abecedarian study. Valuing the reduction in mortality associated with reduced smoking, Masse and Barnett (2002) estimate the Abecedarian program will save society nearly $18,000 per child in 2002 present value dollars. Finally, in their benefit-cost analysis of early childhood education programs, Aos et al. (2004) consider nonearnings benefits linked to education by assuming that other benefits are equal to 25 percent of the earnings-related benefits they estimate.

For our analysis, there is little basis for making projections regarding the potential benefits to participants, the government, or other members of society from these nonmarket benefits of improved educational outcomes. Doing so would require very strong assumptions about these benefits based on other studies in the literature rather than those directly evaluating high-quality preschool programs. For this reason, we view these as unmeasured benefits that would add to the value of the dollar figures we report, with magnitudes that may range from very modest to quite sizeable.

Intangible Victim Costs. As noted above, our estimates will be conservative in not including the value of avoided intangible losses by victims of child abuse and neglect and victims of crime. These intangible losses include pain and suffering, fear of crime, and other aspects of quality of life. Miller, Cohen, and Wiersema (1996) and Miller, Fisher, and Cohen (2001) provide estimates of both tangible and intangible costs associated with various categories of crime. In the case of

child abuse and neglect, the estimates by Miller, Cohen, and Wiersema (1996) indicate that the ratio of intangible to tangible losses for child abuse victims is about 8 to 1. Based on the distribution of juvenile petitions in California and these two studies, we derive estimates of tangible and intangible crime losses associated with broad crime categories. We estimate that the intangible costs of juvenile crime in California are about 1.4 times the tangible costs, or $18,891 per juvenile petition (see Appendix A). This estimate suggests that the total benefits to society from the reduction in crime, both tangible and intangible crime savings, would be larger than the estimates we rely on for the tangible crime costs. We report specific estimates that account for these intangible benefits in a sensitivity analysis below.

Costs of a Universal Preschool Program in California

Our benefit-cost analysis requires that we have an estimate of the cost per child of providing a part-day school-year preschool program in California with the features outlined in Chapter One. Our estimates of the costs of such a program closely follow the cost analysis of a universal preschool program in California prepared by Golin et al. (forthcoming). In particular, we make the following key assumptions for a fully operational, steady state program:[16]

- A three-hour per day preschool program operating for 175 days during the academic year for a total of 525 hours per year.
- For every 120 students, there are three classrooms that provide two sessions per day with 20 children in each classroom (a total of six classes given per three classrooms).

[16] Golin et al. (forthcoming) estimate costs for a universal preschool program as it is phased in. In the initial years, only those teachers who have obtained a bachelor's degree and early childhood credential would qualify for parity with the average kindergarten teacher salary. They assume it would take ten years before all lead teachers have acquired the required credentials and therefore reach parity with the average kindergarten teacher salary. By applying the average kindergarten teacher salary for our cost estimate, we are costing a mature, steady-state program.

- An instructional staff for each 120 students that consists of three lead teachers (one for each classroom, including one who also serves as a site supervisor) and four assistant teachers (one for each classroom plus one floater). Time is also included for substitute teachers (720 hours per 120 children). The classroom child-staff ratio is 10:1.
- Administrative staff for each 120 students that consists of 0.15 full-time equivalent each for a director, accountant/bookkeeper, education specialist, and enrollment specialist.
- Salaries for lead teachers are assumed to be on par with average kindergarten teacher salaries in the California public school system (i.e., appropriate for a lead teacher with a bachelor's degree required of kindergarten teachers). Salaries for other staff positions are based on data collected from state and federal agencies for various child care settings (e.g., California state preschool program, Head Start, and General Child Care) as determined by the IWPR/AIR analysis (Golin et al., forthcoming). Mandatory employee benefits (i.e., Social Security [FICA] earnings tax, the Medicare tax, and unemployment, workers compensation, and disability insurance) plus employee fringe benefits (i.e., health, dental, and life insurance and retirement benefits) are assumed to add another 33.6 percent on top of cash earnings.
- Nonpersonnel costs are assumed to equal 31 percent of total costs.[17] This is calculated based on deriving occupancy costs from the capital investment associated with each classroom amortized over 30 years at 6 percent per year, plus an additional 2 percent per year of the total investment cost available for other classroom costs for equipment and supplies.

Valued in 2003 dollars, the annual cost of this part-day preschool program equals $5,704 per child.

By comparison, Reynolds et al. (2002) estimate that the Chicago CPC program cost $4,400 per child per year in 1998 dollars, including $446 per child as the estimated value of mandatory parental time par-

[17] Golin et al. (forthcoming) assume that nonpersonnel costs are 37 percent of total costs based on the ratio observed for Head Start programs.

ticipating in the program (ten hours per month). Inflating this estimate using the Consumer Price Index (CPI) for urban consumers indicates the CPC program would cost $4,967 per child per year in 2003 dollars. This estimate is about 13 percent lower than our estimate for California, which may reflect lower teacher salaries in Illinois. It may also reflect the fact that the Chicago CPC program operates on a large scale in the public school system, whereas our cost assumptions would also apply to smaller-scale programs (including Head Start centers) operating in the private sector.

The cost estimate of $5,704 per child for a part-day school-year preschool program does not account for current spending for public preschool education in California. As noted in Chapter One, like other states, California currently funds preschool education for a fraction of 4-year-old children, while Head Start supports preschool for additional children with federal funds. In our benefit-cost analysis, we are interested in the cost on the margin for a universal preschool program compared with the marginal benefit. Based on the distributional assumptions reviewed in Chapter two (see Table 2.8), we assume that 33 percent of California 4-year-olds are currently in a public preschool program.[18] Based on enrollment data for Head Start and the California preschool program in the 2003–2004 school year, combined with estimates of per-child spending in these two programs for a half-day session estimated in Golin et al. (forthcoming), we estimate that California currently spends about $374 million on preschool education for 4-year-olds.[19] Given the size of the California cohort and the assumed

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[18] This public preschool enrollment rate is based on CPS data. However, enrollment figures for Head Start and the California state preschool program can account for about 70 percent of this enrollment. In reporting public preschool enrollment rates, CPS respondents may also be including programs supported through the California General Child Care program (which offers full-day care under similar standards as the state preschool program) or other sources of public funds. Our offset for current public-sector spending accounts only for Head Start and California state preschool program funds.

[19] Barnett et al. (2004) report that the California state preschool program enrolled 75,231 children in the 2003–2004 school year. Golin et al. (forthcoming) report that 70 percent of those children are age 4 and estimate that the program costs per child are $3,206 in 2003 dollars ($3,143 in 2002 dollars inflated by 2 percent). Total spending for 4-year-olds is therefore estimated to be $169 million (75,231 × 0.70 × $3,206). The California Head Start Association (http://caheadstart.org/) reports total enrollment in fiscal year 2004 to be 91,115, with

enrollment rate in public programs, this results in spending per child enrolled of $2,334.[20] This figure is used to offset the costs of the high-quality universal preschool program discussed above for those children estimated to already be enrolled in a public program. The offset can also be measured per child in a universal preschool program. With a 70 percent participation rate, the offset of program costs from current spending is $1,100 per participating child.[21]

Benefit-Cost Analysis Results Under Alternative Assumptions

In this section, we present the results of our benefit-cost analysis of a universal preschool program in California.[22] Unless otherwise stated, we used a 3 percent real discount rate and discount all costs and benefits, extending as far as age 65, back to age 3 of the child.[23] The estimates also account for mortality loss starting at age 5 and continuing through age 65, assuming mortality patterns continue in the future at current age-specific rates. All results are estimated per participating

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62.2 percent of the spaces for 4-year-olds. Golin et al. (forthcoming) estimate Head Start costs per child as $3,613 in 2003 dollars ($3,542 in 2002 dollars inflated by 2 percent). Thus, total Head Start spending for 4-year-olds is estimated to be $205 million (91,115 × 0.622 × $3,613).

[20] The cohort of 4-year-olds in 2003 is estimated to be 485,302 by the California Department of Finance. If 33 percent participate in public preschool programs and spending for Head Start and California state preschool totals $374 million, the spending per child participating is $2,334.

[21] If 70 percent of the cohort participates in a universal preschool program, current spending will offset the costs by $1,100 per child ($374 million ÷ (485,302 × 0.70)).

[22] Appendix B presents the results of estimating the costs and benefits of a targeted preschool program assuming the same impacts as the Chicago CPC program relative to a baseline of no preschool. That analysis shows that we closely replicate the benefit-cost analysis of the CPC program by Reynolds et al. (2002).

[23] Although we focus on a program serving 4-year-old children, which would suggest discounting all dollar figures to age 4, we use age 3 so that our figures are comparable with Reynolds et al. (2002) and other benefit-cost studies that focus on preschool programs whose participants are as young as age 3.

child and can be viewed as the benefits associated with a program with a 70 percent participation rate, up and running in a steady state.[24]

In the absence of solid data on the long-term impact of a universal preschool program, we must rely on assumptions about the distribution of benefits. Moreover, we must consider impacts relative to a baseline that we assume is the current distribution of preschool education. Following the discussion of Chapter Two, we adopt an initial set of baseline model assumptions regarding the distribution of benefits and current preschool enrollments as outlined there. However, we also consider how robust our results are to alternative assumptions about the distribution of benefits. In addition, we report another variant of our model with the inclusion of the estimated value of the intangible benefits associated with reductions in child maltreatment and crime. Given the interest on assessing the benefits of a preschool program for California, we also consider separately the effect of incorporating out-of-state migration.[25] Finally, we incorporate an assumption about recovering some of the costs of preschool education through a sliding-scale fee.

Benefit-Cost Results Assuming a Baseline Distribution of Benefits and Preschool Utilization

Table 3.2 shows the results of the benefit-cost analysis of a universal preschool program in California serving 4-year-olds under the baseline distributional assumptions. Costs and benefits are measured relative to a baseline that accounts for current public spending on preschool education in California, as well as the distribution of preschool participation and assumptions about the distribution of benefits. Thus, the analysis accounts for the distribution of benefits based on the expected participation rates for the most-disadvantaged to least-disadvantaged children relative to the baseline of current participation. The resulting costs will be lower than those compared with a baseline of no pre-

[24] In other words, we are not accounting for the transition time to bring participation rates up to the steady-state level, or the associated one-time transition costs.

[25] Migration is a potential issue to the extent that California is the only state to make an investment in high-quality universal preschool education. If all states make a comparable investment, interstate migration will not affect the benefit-cost results.

school, and the resulting benefits can be expected to be below those observed for a targeted preschool program compared with a baseline of no preschool.[26]

Each row in Table 3.2 captures a given source of costs (negative numbers) or benefits (positive numbers), where the detailed benefit rows differentiate between those benefits that are measured versus those that are projected, all based on the Chicago CPC program evaluation combined with other information used to project outcomes beyond those observed at the last CPC follow-up. The columns differentiate the stakeholders that incur the costs or receive the benefits, where we differentiate among state and local government, the federal government, and total government, as well as preschool participants and the rest of society. The final two columns tally the total benefits, first for California society as a whole (the benefits to the federal government are excluded) and for the total U.S. society. The last three rows of the table record net benefits (benefits minus costs), the benefit-cost ratio (benefits divided by costs), and the IRR (the discount rate at which discounted costs equal discounted benefits, as discussed earlier in this chapter).[27]

In interpreting results from the perspectives of California governments (state and local) or of all governments combined, we note that investments made by state and local governments are not always

[26] As discussed in Chapter Two, the baseline distributional assumptions result in program benefits that are 23 percent of the level observed in the CPC program. Benefits are attenuated because both higher-risk and lower-risk children are served in a universal program and because some children already attend preschool under the baseline (in contrast to the CPC program, which measured effects relative to a baseline of no preschool). Note that there is no attenuation of program costs because of the assumption that not all preschool program participants will experience the impacts measured for the disadvantaged children in the Chicago CPC program. However, program costs account for current public spending on preschool education for 4-year-olds in California; so they are lower, on average, than the costs of adding a program from a baseline of no public preschool spending. Finally, the value of child care to the families of participating children is attenuated by a different factor than other benefit categories. Under our baseline assumptions, the value of child care applies, on the margin, only to new children who participate in a preschool program under universal preschool, compared with the baseline. This is 15 out of 70 children or 21 percent (see Table 2.8). The value of child care is augmented by the cost of private care for families that switch from private care to the public program—a total of 22 out of 70 children under the baseline (again, see Table 2.8).

[27] For those stakeholders where the costs are zero, the benefit-cost ratio is not defined, nor is the IRR.

Table 3.2
Present Value Costs and Benefits for Universal Preschool in California in the Baseline Model (in dollars per child)

	Government					Total Society	
Source of Costs or Benefits	State and Local	Federal	Total	Participants	Rest of Society	California	Total U.S.
Program costs	–4,339	—	–4,339	—	—	–4,339	–4,339
Program benefits							
Education outcomes (measured)							
Grade retention	150	—	150	—	—	150	150
Special education	1,047	116	1,164	—	—	1,047	1,164
Educational attainment	–321	—	–321	—	—	–321	–321
Child welfare outcomes (measured)							
Child welfare system costs	52	39	91	—	—	52	91
Costs to victims of abuse and neglect	—	—	—	51	—	51	51
Juvenile crime outcomes (measured)							
Justice system costs	508	—	508	—	—	508	508
Costs to victims of juvenile crime	—	—	—	—	711	711	711
Value of child care (measured)	—	—	—	2,406	—	2,406	2,406
Total measured benefits	1,436	155	1,592	2,456	711	4,604	4,759

College attendance (projected)	–155	—	–155	–18	—	–173	–173
Labor market earnings (projected)							
Net earnings/compensation	—	—	—	5,371	—	5,371	5,371
Taxes on earnings	430	2,138	2,568	—	—	430	2,568
Adult crime outcomes (projected)							
Justice system costs	558	—	558	—	—	558	558
Costs to victims of adult crimes	—	—	—	—	585	585	585
Total projected benefits	833	2,138	2,971	5,353	585	6,772	8,910
Total benefits	2,269	2,293	4,563	7,809	1,296	11,375	13,669
Net benefits	–2,070	2,293	224	7,809	1,296	7,036	9,329
Benefit-cost ratio ($/$1)	0.52	—	1.05	—	—	2.62	3.15
Internal rate of return (%)	–0.1%	—	3.2%	—	—	10.3%	11.2%

SOURCE: Authors' calculations. See Appendix A for details.

NOTES: Unless otherwise indicated, all amounts are per child in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. The California column excludes benefits/costs to the federal government. Numbers may not add because of rounding.

justified in terms of the in-state government savings or in-state societal benefits that accrue. Indeed, if that were the case, states and localities would under invest in many programs that have larger societal benefits beyond the state's own borders (just as individuals would under invest if there are societal benefits of an investment beyond the private returns to the individual). Thus, while it is of interest to consider net benefits from the California state perspective—either in the form of California government savings or benefits for California society—it is also important to consider the benefits to all levels of government and U.S. society as a whole.

Table 3.2 reveals that a universal preschool program is estimated to cost an additional $4,339 per child in 2003 present value dollars over current California state spending on preschool education.[28] Total gains to U.S. society as a whole for the added benefits of a high-quality preschool program in California tally $13,669 per child in 2003 present value dollars so that net benefits are $9,329 per child. The benefit-cost ratio indicates a return of $3.15 for every dollar invested. After excluding the benefits that accrue to the federal government, the benefit-cost ratio for California is $2.62 for every dollar invested.[29] The IRR, given the time paths of preschool program costs and the resulting benefits, equals 11.2 percent for U.S. society as a whole, and 10.3 percent for California society. With these IRRs, we could use a discount rate up to 10 percent and still have positive net benefits for California society and the U.S. society as a whole.

Viewed across the stakeholders (the columns) delineated in Table 3.2, net benefits are highest for preschool program participants, largely because of the value of the child care received and the net earnings gains they experience over their lifetime. Net benefits are also positive for the federal government, for the combined government sector, and for "the rest of society"—i.e., everyone other than the participants and the various levels of government. Net benefits are negative for Califor-

[28] This is the undiscounted cost per child of $5,704 less the current public preschool spending offset of $1,100 per child, all discounted to age 3 at a 3 percent discount rate.

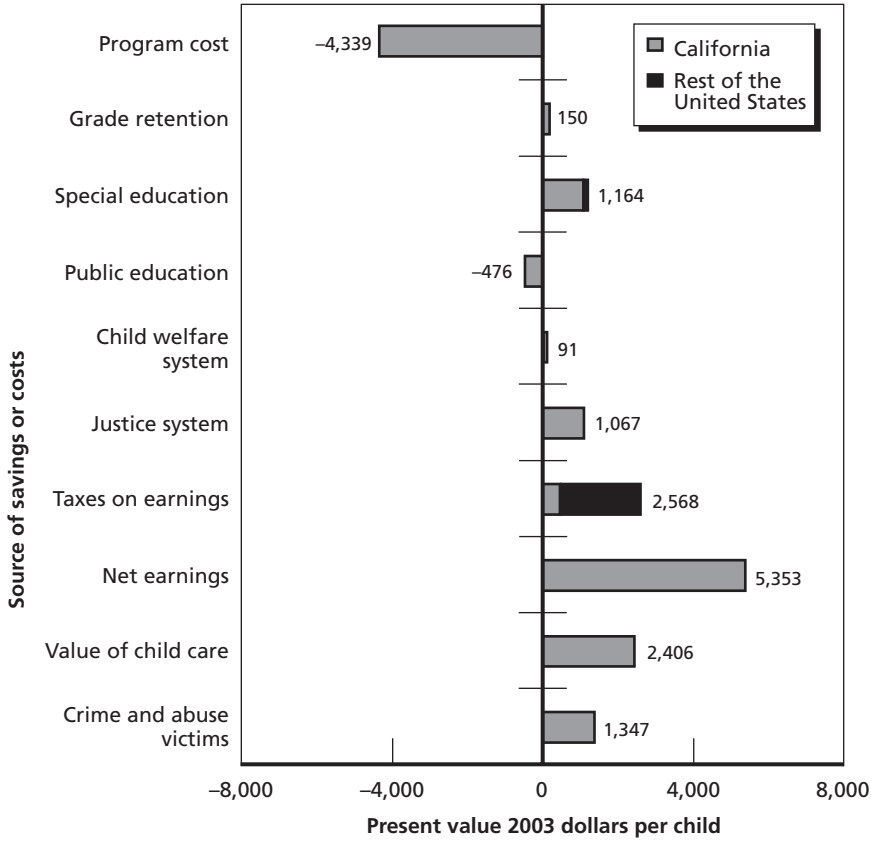
[29] The reduction is due to the exclusion of wage and income taxes that accrue to the federal government, along with small benefits that accrue to the federal government given the federal contribution to special education funding and funding for the child welfare system.

nia state and local government using the baseline 3 percent discount rate. The IRR of –0.1 percent indicates that if costs and benefits were not discounted, the state and local government would essentially break even. The combined government sectors, however, break even with net benefits of $224 per child and an IRR of 3.2 percent, just above the 3 percent discount rate. It is important to keep in mind that these benefits are likely to understate the benefits to the government sector, given those potential benefits to the public sector that are not captured in the analysis (see the discussion above). Moreover, as we discuss in the concluding section, investments in public education more generally are not necessarily justified because they generate net savings to any given level of government but because they generate positive net benefits for society as a whole.

The positive net benefits to the federal government are based on assuming no federal contribution to the cost of the universal preschool program. In fact, like many states, California may use some federal funding streams to pay for the program—funds such as Head Start, Title I, Temporary Assistance for Needy Families (TANF), or the Child Care and Development Fund (CCDF) (Christina and Goodman, forthcoming). As the share of federal funding increases, it would raise the net benefits, benefit-cost ratio, and IRR for California government. The federal government would then be making a contribution toward a program that generates benefits at the federal level. Depending on the share of federal funds, net benefits for the federal government may be positive or negative.

To better view the magnitude of the sources of costs and benefits (the rows of Table 3.2), Figure 3.1 plots the present value costs and benefits per child, for both California society as a whole (light shaded segment of the bar) and for the rest of the United States (dark shaded segment of the bar). (The size of each bar represents the costs or benefits per child to society as a whole.) The benefit categories are aggregated into slightly different groupings than those used in Table 3.2. In particular, public education benefits (actually a cost) account for the additional time spent in both public secondary schooling and public postsecondary schooling. Child welfare system and justice system costs (combined juvenile and adult system costs) exclude the tangible victim

Figure 3.1
Present Value Costs and Benefits for California and the Rest of the United States in the Baseline Model



SOURCE: Table 3.2. See Appendix A for details.

NOTES: All amounts are per child in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. California values exclude benefits/costs to the federal government. Numbers may not add because of rounding.

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costs. Tangible crime victim costs are added to the tangible costs to victims of abuse and neglect and represent the total benefits to potential victims from reduced crime and child abuse. The earnings gains are measured net of taxes paid, as in Table 3.2 as well, but also net of participants' contribution to postsecondary education tuition. The

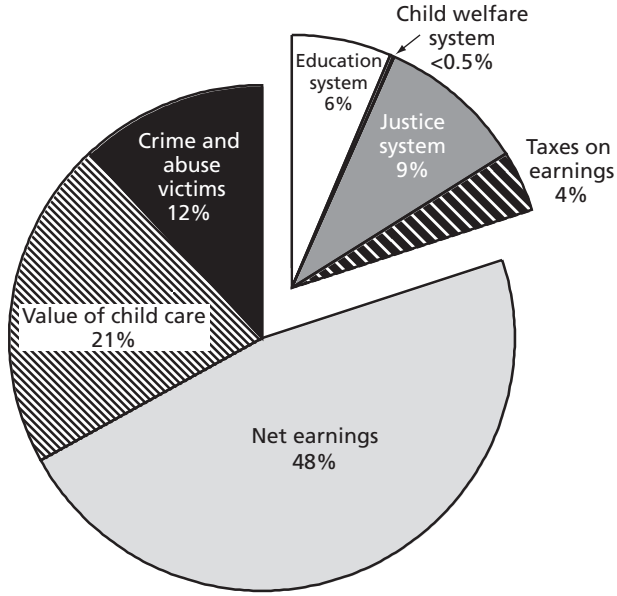
first six categories of benefits (grade retention though taxes on earnings) represent savings to the public sector. The last three categories of benefits are private gains that accrue to either program participants or the rest of society.

As seen in the figure, the largest sources of present value benefits are the private categories of net earnings for participants and the value of child care, equal to nearly $5,400 and $2,400 per child, respectively. Taxes on earnings total just under $2,600 per child, but most of that benefit accrues to the rest of the United States (i.e., the federal government). The combined savings in tangible crime and abuse victim costs nearly equal $1,400 per child, while savings to the justice system is slightly lower at nearly $1,100 per child. The savings from reduced special education use is about $1,200 per child. The savings per child due to changes in grade retention and child abuse and neglect are considerably smaller (less than $250 per child in total), while the public education changes represent a net cost of about $500 per child.

Figure 3.2 shows the percentage distribution of measured benefits for California society as a whole. The education system category incorporates the net savings from changes in grade retention, special education use, and public investment in education (secondary and postsecondary)—the first three bars after program cost in Figure 3.1. Categories separated from the pie represent those that generate a savings to government, while the others capture the private benefits to preschool program participants or other members of society. The largest category of benefits, representing 48 percent of the total, is the net earnings gains to program participants. Participants also gain another 21 percent of the benefits in the form of the value of child care, while the savings to potential victims of crime and abuse captures 12 percent of the total. The savings to government (taxpayers) represent the remaining 19 percent of the total, with about half of that amount attributable to savings to the criminal justice system.

Our estimates of the lifetime earnings gains associated with preschool participation are projected benefits based on the observed earnings differences at each age between high school dropouts and high school graduates. In their benefit-cost analysis, Aos et al. (2004), consistent with other studies, attenuate their estimate of the earnings dif-

Figure 3.2
Distribution of Present Value Benefits for California Society in the Baseline Model



SOURCE: Table 3.2. See Appendix A for details.

NOTES: The percentage distribution is per child based on 2003 dollars. The dollars are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. California values exclude benefits/costs to the federal government. Numbers may not add because of rounding.

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ferential associated with higher educational attainment to account for possible selection bias. In other words, some of the earnings differential between education groups may be due to the selectivity of who obtains additional education, so that the earnings gains from higher educational attainment would not apply to a randomly drawn individual with lower educational attainment. They assume that 25 percent of the observed earnings differential is not causal, leaving 75 percent of the differential as causal. If we adopt this assumption, our estimates of net benefits for U.S. society falls by about $2,200 per child (because of lower earnings and tax benefits). The benefit-cost ratio declines from

$3.15 in our baseline model to $2.64, and the IRR drops from 11.2 to 10.4 percent.

In our baseline model and the subsequent sensitivity analyses, we do not adopt this assumption because the preschool program can be viewed as an intervention that changes underlying abilities and hence educational attainment and earnings. Moreover, recent estimates of the return to education indicate that econometric methods that correct for selectivity bias produce similar estimates (if not higher estimates) of the returns to schooling as models without such a correction (Ashenfelter, Harmon, and Oosterbeek, 1999). Without attenuation, the earnings differential we estimate is consistent with the observed earnings differential in the Perry Preschool sample as of age 40 (taking into account the differential effect sizes on educational attainment between the Chicago CPC program and the Perry Preschool program). Moreover, Aos et al. (2004) also augment the earnings differential by a 25 percent inflation factor to account for other benefits of higher educational attainment beyond earnings (see the discussion above regarding other benefits, such as improved health and other behaviors). The combination of the two adjustments would be equivalent to our baseline assumptions, which simply provide a value for the earnings benefit based on the observed lifetime earnings differential by education level.

Returning to the baseline results, the figures in Table 3.2 express present value benefits and costs on a per-child basis. We can aggregate those figures over a given single-year California cohort to understand the total resource flows. Approximating each California cohort of 4-year-olds as 550,000 children (the average size over the next ten years—the figure used in Chapter Two), a total of 385,000 4-year-old children would participate in a universal preschool program in California each year, assuming a 70 percent participation rate. Table 3.3 shows the resulting aggregate present value costs and savings associated with that cohort, first for California society as a whole and second for the United States as a whole. The aggregate cohort figures are shown side by side with the per-child figures reported in Table 3.2. For reference, the table also repeats the benefit-cost ratio and IRR shown in Table 3.2 for California and the United States.

Table 3.3
Present Value Costs and Benefits for Universal Preschool in California in the Baseline Model (in dollars per child and dollars per cohort of 4-year-olds)

	Benefits (Costs) to Society—California Only		Benefits (Costs) to Society—U.S. Total	
Source of Costs or Benefits	Dollars per Child	Dollars per Cohort (millions)	Dollars per Child	Dollars per Cohort (millions)
Program costs	–4,339	–1,671	–4,339	–1,671
Program benefits				
Education outcomes (measured)	876	337	992	382
Child welfare outcomes (measured)	102	39	141	54
Juvenile crime outcomes (measured)	1,220	470	1,220	470
Value of child care (measured)	2,406	926	2,406	926
Total measured benefits	4,604	1,772	4,759	1,832
College attendance (projected)	–173	–67	–173	–67
Labor market earnings (projected)	5,801	2,234	7,940	3,057
Adult crime outcomes (projected)	1,143	440	1,143	440
Total projected benefits	6,772	2,607	8,910	3,430
Total benefits	11,375	4,379	13,669	5,262
Net benefits	7,036	2,709	9,329	3,592
Benefit-cost ratio ($/$1)	2.62		3.15	
Internal rate of return (%)	10.3%		11.2%	

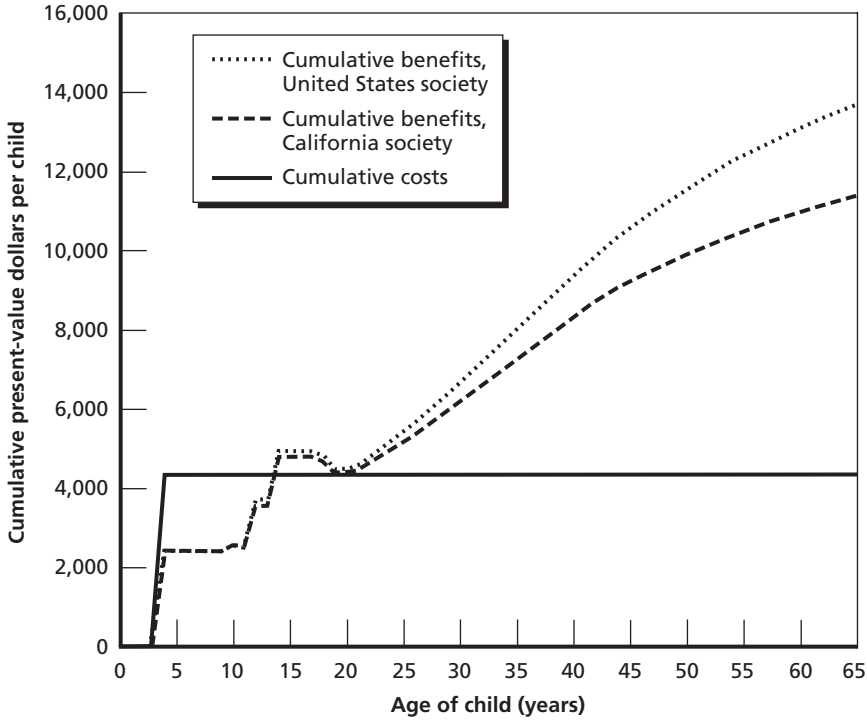
SOURCE: Authors' calculations based on Table 3.2.
NOTES: Unless otherwise indicated, all amounts are in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. Dollars-per-child figures are from the final two columns in Table 3.2. Dollars-per-cohort figures assume a cohort of 550,000 4-year-olds and a 70 percent preschool participation rate. Numbers may not add because of rounding.

As seen in the table, a universal preschool program in California that serves 70 percent of 4-year-olds is estimated to cost, in present value terms, almost $1.7 billion in additional funds beyond those currently spent for each annual cohort. This investment in turn is estimated to generate $4.4 billion in present value benefits for California for each cohort served, for a net present value benefit of $2.7 billion per cohort. Viewed from the perspective of the United States as a whole (with the gains to the federal government included as well), the program generates

$5.3 billion in total present value benefits for the same investment, or a net present value benefit of $3.6 billion per single-year cohort served.

The results for the baseline model are summarized in Table 3.2 in terms of present value costs and benefits for participating children as of age 3. While the costs of a one-year preschool program are incurred upfront, the benefits accumulate over time, up through age 65 in our model. Figure 3.3 shows how the benefits to society accumulate over time by plotting the present value of cumulative benefits for society as a whole at each age (separately for California and the United States)

Figure 3.3
Cumulative Costs and Benefits for California and U.S. Society in the Baseline Model



SOURCE: Authors' calculations based on results presented in Table 3.2.

NOTES: All amounts are per child in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. California values exclude benefits/costs to the federal government.

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versus the present value of cumulative costs. For example, the costs of a universal preschool program occur at age 4, so the cumulative cost curve is flat after that age at the total present value of program costs equal to $4,339 (see Table 3.2). Each point on the cumulative benefits curve for California or the United States represents the present value of total benefits to society up to that age. By age 65, the cumulative present value benefits reach the total we report in Table 3.2.

Figure 3.3 reveals that cumulative present value benefits for both California and United States exceed cumulative costs at age 14. The benefit curve declines slightly until age 20 because of higher secondary and postsecondary educational costs, as well as lower earnings while participants are still in school, but then it rises continuously after that age as adult benefits accrue. The divergence between the cumulative benefit curve for the United States and California is primarily due to the federal tax revenues that begin accumulating once the preschool participants enter the workforce.

Benefit-Cost Results Incorporating Intangible Benefits from Lower Child Maltreatment and Crime

The baseline model in Table 3.2 values only the tangible benefits associated with reductions in child maltreatment or juvenile and adult crime. Intangible benefits associated with reduced pain and suffering, fear of crime, and so on are not included in the baseline model. However, as noted above, other benefit-cost analyses of preschool programs include estimates of these benefits, namely the analyses of the Perry Preschool program by Barnett (1993), Schweinhart et al. (1993), and Belfield, Nores, and Barnett (2004) and the meta-analysis by Aos et al. (2004). Following methods adopted in these studies (see Appendix A for details), we incorporate the best available estimates of intangible victim costs into our model.

Table 3.4 reports the results of incorporating intangible victim costs into our estimates of the benefits of a universal preschool program (panel b), along with the tangible benefits included in the baseline model (panel a). Since these benefits accrue only to participants (as potential victims of child maltreatment) and the rest of society (as potential victims of crime), Table 3.4 reports the columns only for these stakeholders, as well as total California society and total U.S. society.

Table 3.4
Present Value Costs and Benefits for Universal Preschool in California With and Without Intangible Victim Costs (in dollars per child)

Source of Costs or Benefits	Participants	Rest of Society	Total Society	
			California	Total U.S.
a. Baseline Assumption: Tangible Victim Costs Only				
Selected program benefits				
Costs to victims of abuse and neglect	51	—	51	51
Costs to victims of juvenile crime	—	711	711	711
Costs to victims of adult crimes	—	585	585	585
Total benefits	7,809	1,296	11,375	13,669
Net benefits	7,809	1,296	7,036	9,329
Benefit-cost ratio ($/$1)	—	—	2.62	3.15
Internal rate of return (%)	—	—	10.3%	11.2%
b. Alternative Assumption: Tangible and Intangible Victim Costs				
Selected program benefits				
Costs to victims of abuse and neglect	485	—	485	485
Costs to victims of juvenile crime	—	1,724	1,724	1,724
Costs to victims of adult crimes	—	2,512	2,512	2,512
Total benefits	8,243	4,236	14,749	17,042
Net benefits	8,243	4,236	10,410	12,703
Benefit-cost ratio ($/$1)	—	—	3.40	3.93
Internal rate of return (%)	—	—	14.2%	14.8%

SOURCE: Authors' calculations. See Appendix A for details.
NOTES: Program costs and all other benefit categories beyond victim costs are identical under both assumptions (see Table 3.2). Unless otherwise indicated, all amounts are per child in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. The California column excludes benefits/costs to the federal government. Numbers may not add because of rounding.

Three benefit rows from Table 3.2 are pertinent: victim costs associated with abuse and neglect, juvenile crime, and adult crime. These three rows are included in Table 3.4, along with the summary measures of total benefits, net benefits, the benefit-cost ratio, and the IRR. All other rows and columns remain unchanged from Table 3.2.

In aggregate, a comparison of panels a and b shows that the inclusion of intangible victim costs raises both California and U.S. society total benefits and net present value benefits by about $3,400 per

child. This is nearly a 50 percent increase in net benefits for California society and a 36 percent increase for U.S. society. The benefit-cost ratio increases to 3.40 for California (from 2.62) and 3.93 for the United States (from 3.15). The IRR ranges from 14.2 to 14.8 percent, about 3 percentage points higher than in the baseline model. These results indicate that including estimates of tangible victim costs can enhance the economic case for investing in a universal preschool program. However, there is considerably more uncertainty about the dollar value attached to these intangible victim costs, so we continue to be conservative in excluding them for the additional sensitivity analyses that follow.

Benefit-Cost Results Assuming Alternative Distributions of Benefits

The results in Tables 3.2 and 3.3 are based on a set of assumptions about the distribution of expected benefits from preschool education for a universal program as discussed in Chapter Two. The first panel (panel a) of Table 3.5 repeats those baseline assumptions regarding the percentage of full CPC benefits expected by the type of preschool experience the child would have had without universal preschool (none, public, or private) and the risk level (high, middle, low) (see also Table 2.9). To the extent that we have overestimated the potential benefits associated with any of the cells in this matrix, we will overstate the benefits of investing in a universal preschool program, while the reverse is true if we understate the potential benefits.

We examine how robust our benefit-cost findings are by altering these distributional assumptions. In particular, Table 3.5 shows four other panels (panels b through e) with alternative benefit matrices, two that are more conservative than the baseline assumptions (panels b and c), and two that are less conservative (panels d and e). Alternative distribution 1 (panel b) is the most conservative we consider and assumes that the benefits of high-quality preschool apply only to the 25 percent of the population in the high-risk group, where benefits match those assumed for this group in the baseline model. Alternative distribution 2 (panel c) adds back in the benefit levels assumed under the baseline model for the 20 percent of the population in the medium-risk group. Thus, compared with the baseline model, in this second alternative,

Table 3.5
Alternative Assumptions Regarding the Distribution of Benefits by Alternative Preschool Types at Baseline and Risk Status

Type of Preschool Universal Program Participants Would Have Attended at Baseline	High Risk	Medium Risk	Low Risk
a. Baseline Assumption			
Percentage of full CPC benefits			
None	100	50	25
Public	50	25	0
Private	0	0	0
b. Alternative Distribution 1			
Percentage of full CPC benefits			
None	100	0	0
Public	50	0	0
Private	0	0	0
c. Alternative Distribution 2			
Percentage of full CPC benefits			
None	100	50	0
Public	50	25	0
Private	0	0	0
d. Alternative Distribution 3			
Percentage of full CPC benefits			
None	100	70	35
Public	70	35	0
Private	0	0	0
e. Alternative Distribution 4			
Percentage of full CPC benefits			
None	100	50	25
Public	100	50	25
Private	50	25	0

there is still an assumption of no benefits for the low-risk group, which represents 55 percent of the population.

The third and fourth alternative distributions are less conservative than the baseline model. Alternative distribution 3 (panel d) assumes higher benefit levels for medium- and low-risk children who would

have attended no preschool in the absence of a universal preschool program (the baseline), as well as for high- and medium-risk children who would have attended a public preschool program at baseline. This distribution still assumes that benefits are lower for those who would have been in a public preschool program at baseline compared with those who would have had no preschool at baseline. Finally, alternative distribution 4 (panel e) assumes that the same benefit level under the baseline model for children who would have had no preschool at baseline also applies for children who would have been in a public program. This would be reasonable if there was a threshold effect whereby the benefits from preschool education accrue only when quality is above some threshold (say a teacher with at least a bachelor's degree, or a staff-child ratio no higher than 1:10), and existing programs do not meet that threshold. Alternative distribution 4 also assumes, unlike any of the other scenarios, that there are also benefits for high- and medium-risk children who would have attended a private preschool program at baseline. This could be true, again, if quality is higher under a public universal preschool program than the private-sector programs available to children in these groups today.

As discussed in Chapter Two, under the baseline model assumptions, benefits from a universal preschool program are 23 percent of the level measured for the CPC program. Under alternative distributions 1 and 2, those factors are 16 and 21 percent, respectively, while under alternative distributions 3 and 4, those factors are 30 and 41 percent, respectively. Thus, we would expect benefits to approximately double in going from the most conservative assumption (alternative distribution 1) to the least conservative (alternative distribution 4).[30]

Table 3.6 summarizes the resulting present value benefits, present value net benefits, benefit-cost ratio, and IRR under the baseline model (where panel a repeats what was shown in Table 3.2) and the four alter-

[30] The ratio of 41 to 16 percent is 2.6. However, the value of child care does not change in moving from alternative distribution 1 to alternative distribution 4 since it depends only on the number of new spaces out of total spaces and the number of children who switch from private to public preschool. Thus, the value of benefits would be expected to increase less than a factor of 2.5. The actual increase is a factor of 2.2. These same factors apply to the increase in the benefit-cost ratio in moving from alternative distribution 1 to alternative distribution 4 since the program costs remain fixed under these alternative distributional assumptions.

native distribution scenarios (panels b through e). Present value costs are the same across all five sets of results (see the first row of Table 3.2), so they are not repeated in the table. In general, in moving from panel b to panel e—from most conservative to least conservative—all summary measures of the benefit-cost analysis improve. The results for the baseline model fall in between those for distribution 2 and distribution 3 (panels c and d).

Notably, for California as a whole, the benefit for every dollar invested ranges from $1.95 under the most conservative assumption to $4.21 under the least conservative assumption, and the IRR ranges between 7.9 and 14.8 percent. The figures for the United States as a whole follow the same pattern and are even larger. Even with the most conservative assumption that benefits from a high-quality universal preschool program accrue only to the most disadvantaged 25 percent of the population, California society as a whole still gains $8,477 per child or net benefits of $4,138 per child. Under the two most conservative assumptions (panels b and c), the net benefits to the total government (state and local plus federal) are negative, but they are positive under the other two scenarios that are less conservative (panels d and e). Net benefits to California state and local government are negative in all five scenarios, although they are close to zero with the most-generous assumptions about the distribution of benefits.

Benefit-Cost Results Accounting for Migration

To the extent that the interest is in understanding the benefits and costs of a California universal preschool program for California government and the rest of California society, we need to account for the fact that some children who participate in a preschool program at age 4 will eventually move out of the state, whether at an age when they are still in school or when they reach adulthood. This interstate migration will mean that the benefits from a high-quality preschool program will accrue to the governments and members of society in the other states where these children eventually reside. Published data from the 2000 Census provide information on the fraction of Californians who move to other states in the five years before the Census (see Appendix A). According to these data, the out-migration rate for California is highest

Table 3.6
Present Value Costs and Benefits for Universal Preschool in California with Alternative Distributional Assumptions (in dollars per child)

	Government					Total Society	
Source of Costs or Benefits	State and Local	Federal	Total	Participants	Rest of Society	California	Total U.S.
a. Baseline Assumption							
Program benefits	2,269	2,293	4,563	7,809	1,296	11,375	13,669
Net benefits	–2,070	2,293	224	7,809	1,296	7,036	9,329
Benefit-cost ratio ($/$1)	0.52	—	1.05	—	—	2.62	3.15
Internal rate of return (%)	–0.1%	—	3.2%	—	—	10.3%	11.2%
b. Alternative Distribution 1							
Program benefits	1,536	1,552	3,089	6,063	878	8,477	10,030
Net benefits	–2,803	1,552	–1,250	6,063	878	4,138	5,690
Benefit-cost ratio ($/$1)	0.35	—	0.71	—	—	1.95	2.31
Internal rate of return (%)	—	—	1.8%	—	—	7.9%	8.8%
c. Alternative Distribution 2							
Program benefits	2,025	2,046	4,072	7,227	1,157	10,409	12,456
Net benefits	–2,314	2,046	–268	7,227	1,157	6,070	8,116
Benefit-cost ratio ($/$1)	0.47	—	0.94	—	—	2.40	2.87
Internal rate of return (%)	–0.5%	—	2.8%	—	—	9.6%	10.4%

d. Alternative Distribution 3							
Program benefits	2,898	2,929	5,827	9,306	1,655	13,859	16,788
Net benefits	–1,441	2,929	1,487	9,306	1,655	9,520	12,448
Benefit-cost ratio ($/$1)	0.67	—	1.34	—	—	3.19	3.87
Internal rate of return (%)	0.9%	—	4.2%	—	—	12.1%	13.0%
e. Alternative Distribution 4							
Program benefits	4,015	4,058	8,073	11,966	2,293	18,275	22,332
Net benefits	–324	4,058	3,734	11,966	2,293	13,936	17,993
Benefit-cost ratio ($/$1)	0.93	—	1.86	—	—	4.21	5.15
Internal rate of return (%)	2.6%	—	5.7%	—	—	14.8%	15.8%

SOURCE: Authors' calculations. See Appendix A for details.

NOTES: Program costs are identical under all assumptions (see Table 3.2). Unless otherwise indicated, all amounts are per child in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. The California column excludes benefits/costs to the federal government. Numbers may not add because of rounding. For alternative assumptions, see Table 3.4.

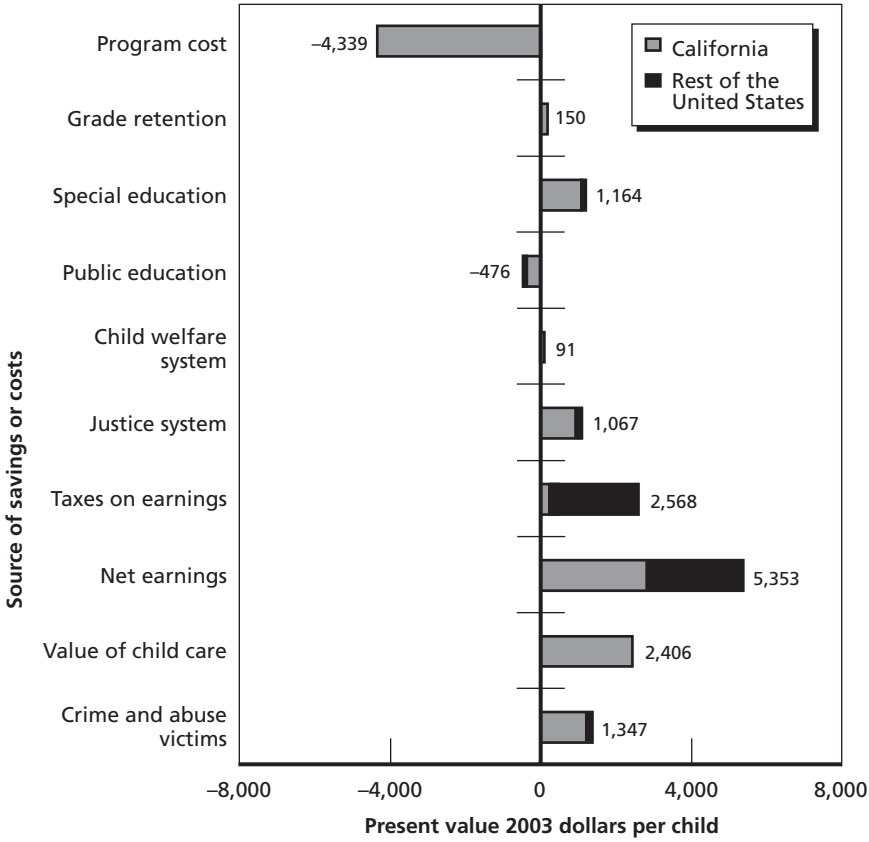
among 25- to 29-year-olds (which means they moved when they were 20 to 24), and the rate declines almost steadily thereafter. On average, over all ages, 1.4 percent of Californians move out of state every year.

Table 3.7 shows the results for the benefit-cost analysis when migration is taken into account, assuming interstate migration patterns continue in the future at current age-specific rates.[31] Compared with Table 3.2, there is of course no difference in the results for the United States as a whole (the last column), for the federal government, or for the government sector as a whole. There is also no change in the distribution of the costs of a universal preschool program. Instead, migration simply redistributes the benefits away from California stakeholders toward the equivalent stakeholders (e.g., the government, participants, and the rest of society) in other states. Table 3.7 separately shows the effect for other state and local governments, while the gains for participants who eventually live in other states and to the nonparticipants in other states are not shown separately. The boxes highlight those columns that differ compared with the baseline results in Table 3.2.

For California as a whole, the return for each dollar invested falls from $2.62 assuming no migration to $1.89 accounting for migration. The associated IRR also falls from 10.3 percent to 8.6 percent. As seen in Figure 3.4, which replicates Figure 3.2 after accounting for migration, the biggest impact of migration is on the earnings gains to participants. After accounting for migration, 45 percent of those earnings gains now accrue to children who attended preschool in California but eventually live in another state. State income taxes gained by California also fall by a similar amount (from a present value of $430 per child to $233 per child), since those tax revenues now benefit other state and local governments. The impact is largest on earnings and the associated state and local income tax revenues because these are two of the benefit streams that continue throughout adulthood, so the cumulative effects of migration are much larger. In contrast, there is no effect of migration

[31] Our model allows for out-migration but does not account for potential return migration. In other words, some fraction of children who participate in the California preschool program and eventually move to another state will subsequently return to California. Quantitatively, the effect of such return migration is small and therefore would have little effect on the estimates. The estimates should be considered as upper bounds for that reason, however.

Figure 3.4
Present Value Costs and Benefits for California and the Rest of the United States in the Model with Migration



SOURCE: Table 3.2. See Appendix A for details.

NOTES: All amounts are per child in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. California values exclude benefits/costs to the federal government. Numbers may not add because of rounding.

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on the value of child care to participants since this benefit accrues while the child is in preschool, prior to when out-migration could occur.

This exercise illustrates the moderate attenuation of benefits for California's investment in preschool education as a result of migration patterns. However, if other states make similar investments in preschool

Table 3.7
Present Value Costs and Benefits for Universal Preschool in California in the Model with Migration (in dollars per child)

	Government						Total Society	
Source of Costs or Benefits	California State and Local	Other State and Local	Federal	Total	California Participants	Rest of California Society	California	Total U.S.
Program costs	–4,339	—	—	–4,339	—	—	–4,339	–4,339
Program benefits								
Education outcomes (measured)								
Grade retention	119	30	—	150	—	—	119	150
Special education	946	101	116	1,164	—	—	946	1,164
Educational attainment	–256	–65	—	–321	—	—	–256	–321
Child welfare outcomes (measured)								
Child welfare system costs	48	4	39	91	—	—	48	91
Costs to victims of abuse and neglect	—	—	—	—	47	—	47	51
Juvenile crime outcomes (measured)								
Justice system costs	448	61	—	508	—	—	448	508
Costs to victims of juvenile crime	—	—	—	—	—	626	626	711
Value of child care (measured)	—	—	—	—	2,406	—	2,406	2,406
Total measured benefits	1,305	131	155	1,592	2,453	626	4,384	4,759

College attendance (projected)	–123	–32	—	–155	–14	—	–137	–173
Labor market earnings (projected)								
Net earnings/compensation	—	—	—	—	2,977	—	2,977	5,371
Taxes on earnings	233	197	2,138	2,568	—	—	233	2,568
Adult crime outcomes (projected)								
Justice system costs	366	192	—	558	—	—	366	558
Costs to victims of adult crimes	—	—	—	—	—	384	384	585
Total projected benefits	476	357	2,138	2,971	2,962	384	3,822	8,910
Total benefits	1,781	488	2,293	4,563	5,415	1,010	8,206	13,669
Net benefits	–2,558	488	2,293	224	5,415	1,010	3,867	9,329
Benefit-cost ratio ($/$1)	0.41	—	—	1.05	—	—	1.89	3.15
Internal rate of return (%)	–1.6%	—	—	3.2%	—	—	8.6%	11.2%

SOURCE: Authors' calculations. See Appendix A for details.

NOTES: Unless otherwise indicated, all amounts are per child in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. The California column excludes benefits/costs to the federal government. Numbers may not add because of rounding.

education, California would also be a beneficiary of those states' programs when the preschoolers they invest in move to California. The extent to which California's lost benefits are replaced by benefits generated by other states' programs depends on the fraction of other states that make a comparable investment. If all states make an equivalent investment in high-quality preschool education for 4-year-olds, there will be no attenuation of California's benefits from its investment due to out-of-state migration.

Benefit-Cost Results Assuming Sliding-Scale Fees

Thus far, our analysis has assumed that a universal preschool program in California would be provided without charge to all families who wish to enroll. However, to the extent that financing such a program is not feasible, it is possible to consider recovering some of the program costs by charging families to participate. Families could be required to pay a flat fee or a sliding-scale fee associated with family income.[32] Recovering some of the program costs would have an effect on the level and distribution of preschool benefits across stakeholders only if the fees led to lower enrollment rates in the universal program. We elaborate on this below. We also discuss the implications of administrative costs associated with implementing fees.

Table 3.8 shows the benefit-cost analysis that results from recovering a part of the preschool program costs through fees, assuming no administrative costs or enrollment effects (boxes again highlight those cells that have changed relative to the baseline model). The table assumes that families of high-risk children (the most disadvantaged 25 percent of children) pay no fees, while families of medium- and low-risk children pay average fees equal to 25 percent and 50 percent, respectively. For medium-risk families (the next 20 percent of families), the fee equals $1,426 for a year of preschool or about $158 per month for nine months. For low-risk families (the remaining 55 percent of

[32] See Wolfe and Scrivner (2003) for a proposal to use sliding-scale fees implemented through the income tax system. Union City, California (in Alameda County), offers a universal preschool program to all 3- and 4-year-old children in the New Haven School District, charging no fees for families meeting state income guidelines (e.g., no more than $37,645 for a family of four), and a maximum of $441 per month for families using the part-day program for five days a week (CED, 2003).

families), the annual and monthly fees are double these amounts (i.e., $2,852 per year or about $317 per month). As seen in the "Participants" column of Table 3.8, this sliding-scale fee structure is equivalent to charging each participating child $1,728 in present value dollars, which lowers the state program costs by an equal amount.

With this level of cost recovery, the California government has net benefits that fall short of zero by about $300 (with a corresponding benefit-cost ratio that is slightly under 1 and an IRR that is just above 2 percent). Even with this level of contribution, participants gain over $4 for every dollar they invest. Again, there is no change in societal costs or benefits, just a redistribution of who bears the program costs.

It is important to note that these calculations do not account for the administrative costs of implementing a program of cost recovery for a universal preschool program. Whether a flat fee is applied or a sliding-scale fee is used, there will be additional costs of collecting these fees from participating families. These costs are likely to be lower for a flat fee relative to a sliding-scale fee since the latter requires determining the fee level based on some criteria like family income.

Administrative costs of means-tested programs are typically assumed to be 10 percent of the value of the means-tested transfer (Barnett, 1993). Assuming this incidence of administrative costs, it would apply to the full present value per-child cost of the universal preschool program equal to $5,376, thereby adding approximately $538 in present value administrative costs to the average program costs shown in Table 3.8. This would lower net benefits for state and local government, total government, California society, and U.S. society by the same amount (net benefits for the federal government, participants, and the rest of society remain unchanged). Compared with Table 3.8, the benefit-cost ratio for California society and U.S. society will decline to $2.33 and $2.80, respectively. With this estimate of administrative costs, the IRR falls to 8.8 percent and 9.6 percent, respectively. The bottom line is that any administrative costs serve as a deadweight loss that lowers the actual fee recovery by the public sector (for each dollar in fees, less than a dollar goes toward the cost of the program) and lowers the net benefits and IRR to society as a whole below the level that would be obtained in the absence of any fee recovery.

Table 3.8
Present Value Costs and Benefits for Universal Preschool in California in the Model with Fees (in dollars per child)

	Government					Total Society	
Source of Costs or Benefits	State and Local	Federal	Total	Participants	Rest of Society	California	Total U.S.
Program costs	–2,611	—	–2,611	–1,728	—	–4,339	–4,339
Program benefits							
Education outcomes (measured)							
Grade retention	150	—	150	—	—	150	150
Special education	1,047	116	1,164	—	—	1,047	1,164
Educational attainment	–321	—	–321	—	—	–321	–321
Child welfare outcomes (measured)							
Child welfare system costs	52	39	91	—	—	52	91
Costs to victims of abuse and neglect	—	—	—	51	—	51	51
Juvenile crime outcomes (measured)							
Justice system costs	508	—	508	—	—	508	508
Costs to victims of juvenile crime	—	—	—	—	711	711	711
Value of child care (measured)	—	—	—	2,406	—	2,406	2,406
Total measured benefits	1,436	155	1,592	2,456	711	4,604	4,759

College attendance (projected)	–155	—	–155	–18	—	–173	–173
Labor market earnings (projected)							
Net earnings/compensation	—	—	—	5,371	—	5,371	5,371
Taxes on earnings	430	2,138	2,568	—	—	430	2,568
Adult crime outcomes (projected)							
Justice system costs	558	—	558	—	—	558	558
Costs to victims of adult crimes	—	—	—	—	585	585	585
Total projected benefits	833	2,138	2,971	5,353	585	6,772	8,910
Total benefits	2,269	2,293	4,563	7,809	1,296	11,375	13,669
Net benefits	–342	2,293	1,952	6,081	1,296	7,036	9,329
Benefit-cost ratio ($/$1)	0.87	—	1.75	—	—	2.62	3.15
Internal rate of return (%)	2.2%	—	5.4%	—	—	10.3%	11.2%

SOURCE: Authors' calculations. See Appendix A for details.

NOTES: Model assumes no fee for high-risk children, a 25 percent fee for medium-risk children, and a 50 percent fee for low-risk children. Unless otherwise indicated, all amounts are per child in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. The California column excludes benefits/costs to the federal government. Numbers may not add because of rounding.

Table 3.8 also does not take into account the possibility of enrollment effects from the fee. We do not have data supporting a confident quantitative prediction of the responsiveness of families of children at different risk levels to fees of varying levels for a program of uncertain perceived quality. However, we can make two qualitative observations.

First, children who would, without a universal program, not have gone to preschool are likely to participate at lower rates if there is a fee. That may be particularly true of low-risk children, for whom the fee would be nearly $2,900 per year, and to a lesser extent for the medium-risk children. However, these children make up only a fraction of the total (7 out of 70 children, see Table 2.8), and they realize only fractional benefits compared with higher-risk children, so enrollment decreases among these children are unlikely to substantially affect the results in Table 3.8.

Second, we hypothesize that, in the presence of a high-quality free public program, most children now attending preschools supported by private fees would shift to high-quality programs supported with public funds (21 middle- and low-risk children out of 70 total, see Table 2.8). If the public program were to charge a fee for medium- and low-risk children, that shift is likely to be less extensive. However, by our assumptions (see Table 2.9), such children gain no benefit from switching, so if fewer shift to the public program, it will raise the per-child benefit across all stakeholders. Costs per child for state and local government, though, would rise because the distribution of participating children in the public program would shift in relative terms toward those paying no fees. On balance, for all stakeholders, however, the higher benefits per child outweigh the higher costs per child. On this account, then, Table 3.8 may modestly understate the net benefits, benefit-cost ratio, and IRR.

CHAPTER FOUR

Indirect Economic and Noneconomic Benefits of Universal Preschool Education

The benefit-cost analysis presented in Chapter Three provides one perspective on the economic case for a universal preschool program in California. Such an analysis, however, does not fully capture all of the potential economic and noneconomic benefits that may accrue to the state of California from such an investment.[1] In this chapter, we consider several others ways in which the California economy, its workforce, and its businesses may gain from a universal preschool program in both the short run and long run. In particular, we focus on one benefit in the near term: the current labor force, and two potential future benefits: (1) the macroeconomy and international competitiveness and (2) economic and social equality.

Labor Force Benefits

A universal preschool program in California has potential benefits for the current labor force in terms of the size of the workforce, participation rates among the working age population, and workforce performance. These are benefits that would accrue as the result of changes in outcomes of the parents of participating children. These benefits are not captured in the benefit-cost analysis included in the prior chapter,

[1] The CED also argues for a more comprehensive assessment of the benefits of early childhood education (CED, 2004b).

primarily because these outcomes are not typically measured in evaluations of preschool programs.[2]

In considering these potential labor force benefits, it is important to recognize that labor force issues will become more salient in the future because of the overall slowdown in the growth rate of the workforce. The national trend in coming decades is toward a slower growth in the labor force due to population aging (Karoly and Panis, 2004). During the 1980s, the U.S. labor force grew at an annual rate of 1.6 percent, a rate that slowed to 1.1 percent in the 1990s. In the current decade, the Bureau of Labor Statistics projects no change from the 1990s, but the rate is forecasted to slow further to 0.4 percent in the 2010s and 0.3 percent in the 2020s (Fullerton and Toossi, 2001). Although California's population is somewhat younger than that of the United States as a whole, the labor force growth rate has slowed for the state as well in the last two decades, and it can be expected to follow the national pattern in the decades ahead.[3] This slowdown in the growth rate of the labor force will place pressure to increase the size of the labor force in order to sustain rates of economic growth experienced in the past. Periods of rapid growth and tight labor markets—such as those experienced in the 1990s—are likely to result.

Labor Force Recruitment

One strategy for increasing the size of the workforce is to increase the attractiveness of the state of California to potential workers. A number of studies examine the factors that attract workers to particular communities, while others consider factors associated with business location decisions (see the recent review by Weiss, 2004). Notably, as a result of the rising demand for more-skilled workers, given technologi-

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[2] The Abecedarian program, which provided full-time center-based care and education from birth to age five, did report an increase in earnings for the mothers of program participants over the mothers of children in the control group (Masse and Barnett, 2002).

[3] Data from the California Employment Development Department show that the California labor force grew by an average annual rate of 2.7 percent in the 1980s, 1.1 percent in the 1990s, and again 1.1 percent between 2000 and 2003 (calculated from annual average labor force data at http://www.calmis.cahwnet.gov/default.htm—as of February 22, 2005). For further information on the future demographics of California's workforce, see McClellan and Holden (2001).

cal advances and the growing importance of international competition, communities are increasingly looking for ways to attract skilled workers. A high-quality universal preschool program has the potential to attract families with young children to the state of California over other communities that do not offer such a program. While we are not aware of any studies that have specifically examined the potential impact of a universal preschool program on location decisions, research increasingly points to quality-of-life considerations—including the quality of the education system—as playing a role in attracting workers and firms to local communities.

For example, Florida (2000, 2002) argues that more-skilled workers, a group he terms "the creative class," take quality of life into consideration when deciding where to live. Likewise, Love and Crompton (1999) find that small, mobile, highly professional businesses concerned about attracting professional personnel also look to quality-of-life considerations when deciding where to locate, expand, or relocate. In Love and Crompton's study of 174 businesses in Colorado, primary and secondary education were rated as extremely important factors in deciding location by 10 percent, very important by 29 percent, and somewhat important by 21 percent. Other surveys identify K–12 education as one of the most important quality-of-life dimensions, especially for high-technology and other firms that employ more-skilled "knowledge workers" (Salverson and Renski, 2003). The focus on quality of life issues by businesses in their location decisions is not because those factors are necessarily relevant for producing goods and services (in contrast to other location factors such as the cost of land, labor, utilities, and other production inputs; the quality of the transportation infrastructure; and so on), but because they are relevant for attracting a high-quality workforce.

The research base to date is too limited to make estimates of the potential impact of a universal preschool program in California on location decisions of either workers or firms. However, the limited evidence that points to the quality of the K–12 education system as an important decision factor in individual and business location decisions suggests that the addition of a publicly funded preschool program could increase the attractiveness of California to workers and employ-

ers. This is likely to be especially true for more-educated, professional workers who value quality-of-life considerations.

Labor Force Participation Rates

Another option for increasing the size of the labor force is to increase labor force participation rates among the working age population. One potential source of increased labor force participation is women with young children. While labor force participation rates for women have increased over time, many women with young children remain out of the labor force because they lack access to or cannot afford high-quality child care. A number of studies demonstrate that women's labor force participation is tied to the cost and availability of child care. While there are a range of estimates, a reasonable approximation, based on studies that have examined the issue, is that a 10 percent reduction in child care costs will lead to a 2 percent increase in the labor force participation rate of mothers with young children, with an even larger effect for low-wage women (see reviews and empirical estimates provided by Blau, 2001, and Anderson and Levine, 2000). Other research indicates that the effect of reducing child care costs on women's labor force participation rates is higher for single mothers than for married mothers (Han and Waldfogel, 2001).

In providing fully subsidized preschool education, the price of child care is reduced to zero. Thus, perhaps a more relevant study is one conducted by Gelbach (2002). Gelbach's analysis shows that enrollment in public kindergarten, essentially free child care during school hours, leads an unmarried mother whose youngest child is age 5 to increase her labor force participation rate by 4 percentage points on average. These mothers' annual weeks worked increase by 3.6 weeks, and hours worked per week rise by 2.2 to 2.7 hours. Somewhat smaller effects are found for married women. Lemke et al. (2000), in analyzing data for welfare participants in Massachusetts, also find that work participation is higher when full-day kindergarten is available compared with part-day programs or no program. Moreover, they find that stability and quality of child care options have a greater effect than child care costs have on the likelihood of work for their sample of low-income women.

These estimates suggest that the California labor force, and the work effort of mothers with young children, would increase by a modest amount as a result of making high-quality universal preschool available. Families will also benefit from the increased income that results.

Workforce Performance

The provision of a high-quality universal preschool program can be expected to generate other benefits for current workers and their employers. A high-quality preschool program that is available half day or for an extended day offers working parents access to stable, convenient, high-quality care for their preschool-age children. By minimizing disruptions due to unreliable child care providers and by providing a safe, secure, and stimulating environment, such high-quality care allows working parents to experience less disruption in their work schedules, lower levels of stress, and diminished concern about the well-being of their children during working hours. Such changes could lead to a corresponding reduction in absenteeism and job turnover and an associated improvement in productivity. While we are not aware of any studies that explicitly consider such benefits in the context of a universal preschool program, we can ascertain the potential for such benefits from studies of child care and employment more generally and, more specifically, from analyses of the experiences of employers that offer child care access to their employees.

Much of the research on child care and the labor market has focused on the effect of child care costs, and in some cases quality, on whether women work. More recently, a few studies have examined how access, cost, and stability of child care arrangements affect work outcomes. In terms of absenteeism, parents report that formal child care arrangements (e.g., center-based care) are more dependable than informal arrangements, such as a sitter in the child's home, resulting in less time lost from work because a provider was not available (Hofferth et al., 1991).

Job turnover is another outcome that may be affected by the availability, cost, and stability of child care arrangements. In an analysis of job exits, Hofferth and Collins (2000) find that, controlling for other

factors, mothers without a formal nonparental child care arrangement or who had less convenient access to a center-based program are more likely to leave their job. Likewise, instability in child care providers, such as having a child care arrangement end, also increases the chances of a job departure. The importance of the stability of child care arrangements appears to be strongest for moderate-wage and high-wage mothers. Moderate-wage mothers are most sensitive to the cost of care, with higher costs increasing the likelihood of a job exit.

With the increase in the share of employees with children from single-parent households and dual-earner households, more and more employers are offering benefits to their employees that help balance the demands of family life and work (Burud and Tumolo, 2004). Among the benefits designed to enhance work-life balance are those that aim to improve access to, or lower the cost of, child care. Such benefits include child care referral services, reserved child care spaces, subsidized child care spaces, backup care for sick children, and onsite employer-sponsored child care centers.

A number of studies aim to measure the effects on employee performance as a result of these child care benefits. Traill and Wohl (2003) and Burud and Tumolo (2004) cite several companies that have experienced reductions in turnover and improvements in retention as a result of implementing child care benefits for their employees. However, these examples are mostly descriptive, relying on company data or benefits reported in surveys of employees. One challenge in this literature is the potential selectivity of which employers offer child care benefits to their employees, as well as the selectivity of employees who take up the various benefits. We are not aware of any randomized experiments that would overcome these potential biases from observational studies; yet several analyses aim to account for potential selection biases using statistical techniques, albeit with relatively small samples in selected geographic locales.

Milkovich and Gomez (1976) analyze differences in absenteeism and turnover for a sample of 30 mothers with preschool-aged children in an employer-subsidized child care center matched with 30 mothers of children the same age who were not enrolled in a center-based program, all holding similar jobs. The mothers whose children were in the center had significantly lower rates of both absenteeism and turn-

over. Kossek and Nichol (1992) do not find an effect of an employer-sponsored onsite child care center on absenteeism, although the comparison group in their study, on the wait list for the employer center, all relied on center care elsewhere. So the contrast between the "treatment" and "comparison" groups was not as sharp as in the Milkovich and Gomez (1976) study.

Baughman, DiNardi, and Holtz-Eakin (2003) use data from a survey of 120 employers in Onondaga County, New York, in 2000 and demonstrate that employers that offer child care referral services to their employees experience a reduction in turnover measured as voluntary quits. Their analysis controls for employer characteristics and other benefits offered and uses an approach to avoid bias in their estimates if employers that have high turnover are more likely to adopt family-friendly policies. This finding is consistent with an earlier study by Goff, Mount, and Jamison (1990), which found that employees who were more satisfied with the quality of child care they received, regardless of whether it was provided at the work site or not, had lower levels of work/family conflict, which were then associated with lower absenteeism. Thus, it is not necessarily the provision of child care by employers that matters but access to reliable, quality care.

While the literature linking access to high-quality preschool programs and employment such outcomes as absenteeism and turnover points to the potential benefits to employers from a universal preschool program in California, the literature does not support a quantitative estimate of the potential dollar benefits to employers. We are not aware of other attempts to make such calculations. Nevertheless, other estimates suggest that the advantages from reducing turnover and absenteeism in particular can be substantial. Estimates indicate, for example, that employer turnover costs 1.5 times the annual salary of exempt employees and 0.75 times the annual salary of nonexempt workers (Phillips, 1990). These are costs associated with the lost productivity of departing employees as they leave, lost productivity while the position remains vacant, and the costs of recruiting and training a replacement.

Absenteeism is also costly from the perspective of employers, and lost days due to family responsibilities are an important component of absenteeism overall. An annual survey of employers conducted by

CCH Incorporated (2004) shows that workplace absenteeism cost employers $610 annually per employee in 2004. After personal illness, which accounts for 38 percent of absenteeism on the job, family issues rank second, with 23 percent of absenteeism associated with the need to care for children or elderly relatives. With 14.9 percent of the female California workforce having children under age 6 as of 2000, the potential gains to employers of a universal preschool program serving children age 4 in terms of the performance of today's workers are likely to be modest but still meaningful.[4]

Macroeconomic Benefits of Education Investments

The investment in universal preschool education in California not only has broader benefits for today's workforce, but it also has potential benefits for future cohorts of workers—the children who participate in preschool—that are not captured in the benefit-cost analysis presented in the prior chapter. Chapter Two highlighted the evidence that preschool programs can increase educational attainment, particularly for more-disadvantaged children. In this section, we consider the implications of raising educational attainment for overall economic growth and for competitiveness in the global economy.

Social Returns to Increases in Education

The benefit-cost analysis presented in Chapter Three captures the private returns from higher educational attainment that result from investing in preschool education. These private returns are manifested in higher lifetime earnings for those who participated in preschool programs. However, the benefit-cost analysis does not necessarily reflect the full range of social returns from higher educational attainment for future cohorts. The social returns, often called "externalities" by economists, capture benefits to society beyond those benefits to private individuals.

The benefit-cost analysis does capture some of the social benefits that result from investing in preschool education. For example, the

[4] Data on California workforce are from U.S. Census Bureau (undated).

benefit-cost analysis presented in Chapter Three measures the spillover benefits from higher earnings in the form of increased tax revenue to state and local government. The reduction in criminal activity, which is valued in terms of savings to government and crime victims in the benefit-cost analysis, may also be viewed as another form of social return from higher educational attainment.

A more educated workforce could have broader benefits to society beyond those already captured in the analysis in Chapter Three. In particular, an extensive economics literature has assessed the link between human capital—typically measured by education levels for a given country as a whole—and overall economic growth (for a recent review, see Krueger and Lindahl, 2001). For instance, Jorgenson, Ho, and Stiroh (2002) estimate that a more highly educated workforce over time contributed 0.3 percentage points per year to economic growth between 1958 and 1999, a period when economic growth averaged 3.4 percent per year. DeLong, Goldin, and Katz (2003) reach a similar estimate for the 85-year time span between 1915 and 2000, although they note that the contribution has been smaller in the past two decades as the growth in educational attainment slowed. However, such an accounting in either study may understate the contribution of education, to the extent that a more highly educated workforce makes capital more productive (Kodrzycki, 2002).

Indeed, economists theorize that education could have two effects on economic growth (Aghion and Howitt, 1998). One hypothesis is that—just as the accumulation of physical capital, a factor of production, can affect the growth rate of an economy—the accumulation of human capital, treated as another factor of production, can lead to higher rates of economic growth. This is the assumption behind the growth accounting estimates cited above. A second hypothesis is that the current stock of human capital leads to higher growth by improving the ability of a country to develop, implement, and adopt new technologies. The resulting technological progress leads to sustained growth. In the first hypothesis, it is the change in human capital over time that affects growth, while under the second hypothesis, it is the stock of human capital that drives economic growth. The reverse cause and effect relationship could also hold if anticipated increases in eco-

nomic growth in the future lead to increases in educational attainment (see, for example, Bils and Klenow, 2000).

To date the empirical literature finds evidence in support of both hypotheses.[5] While no clear consensus has emerged regarding these competing hypotheses, education is viewed as having a large effect on economic growth (DeLong, Goldin, and Katz, 2003). In their recent review and reanalysis of cross-country data, Krueger and Lindahl (2001) conclude that evidence in favor of the second hypothesis rests on assumptions not supported by the data. Their estimates, which support the first hypothesis, suggest that the social returns to education are at least as high as the private returns, although their estimates of the social returns may be biased upwards because of reverse causality.

Other analyses suggest that it is not only the quantity of schooling that matters but the quality as well. Hanushek and Kimko (2000) find that the quality of school as measured by math and science scores have a positive impact on growth rates that exceeds that for the quantity of schooling. In their analysis, one standard deviation in test performance leads to a one-percentage point difference in the annual growth rate of real per-capita gross domestic product. Over a 50-year period, a one-percentage point difference in growth rates, for example 2 percent versus 1 percent, results in incomes that are higher by 64 percent (Hanushek, 2002). Thus, small differences in growth rates have a large cumulative impact over the long run.

Education and International Competitiveness

In this first decade of the 21st century and beyond, the United States increasingly competes in a global marketplace shaped by rapidly changing technologies (Karoly and Panis, 2004). And the California economy—the sixth largest in the world—is no exception.[6] Recent analysis

[5] Much of the empirical literature that examines the link between education and economic growth must contend with the potential bias due to measurement error in cross-country data on the level and change in human capital (typically measured by average years of schooling) (see the discussion in Krueger and Lindahl, 2001, and Bosworth and Collins, 2003).

[6] California's gross state product in 2002 (see Bureau of Economic Analysis, undated) ranks sixth in the world after the gross national product (in U.S. dollars) in the same year of the United States (less California), Japan, Germany, the United Kingdom, and France (see U.S. Census Bureau, 2004c, Table 1337).

of trade and investment patterns indicates that California is on the leading edge of globalization, with higher shares than the national average in newer forms of global economic integration in such areas as rising services exports, the growing relative share of trade transported by air rather than sea, and the increase in vertical trade (Shatz, 2003).[7] The rise of the global economy stems, in part, from technological change that has shaped the goods and services we consume and where and how those goods and services are produced. In the face of rapidly changing technology and global competition from other developed economies and those economies that are rapidly developing, the competitive advantage for the U.S. economy rests with its "human capital"—the skills of the workforce.

In recent decades, an increasingly global economy coupled with technological change has favored more-skilled workers. The demand for a highly skilled workforce is manifested in the wage premium associated with additional education, which has risen in recent years in California and the nation as a whole (Reed, 2003). For example, in 1969, a California male college graduate could expect to earn 47 percent more on average than a high school graduate. By 2001, that premium had nearly doubled to 88 percent more. Large increases are also measured for college graduates versus high school dropouts, and high school graduates versus dropouts.

In the knowledge-based economy of the future, a premium will be placed on such skills as abstract reasoning, problem solving, communication, and collaboration. Yet the skills of U.S. students and workers often fall short when compared with their counterparts in other developed economies. The Organisation for Economic Development (OECD) Programme for International Student Assessment (PISA) provides one perspective on how U.S. students rank in comparison with their counterparts in other high-income countries (OECD, 2004). PISA, implemented for the second time in 2003, assesses performance

[7] Vertical trade is the process of carving up the production process into stages implemented in multiple countries, such as locating more capital-, knowledge-, or technology-intensive stages in higher-wage settings and more labor-intensive stages in lower-wage settings (see Karoly and Panis, 2004). Thus, final products may be made up of inputs produced and assembled in stages in different countries.

of 15-year-olds (approximately the age of entry into secondary education) in 41 countries on internationally comparable standardized tests of reading, mathematical literacy, and scientific literacy. Tables 4.1 and 4.2 show how the United States ranks in comparison with 20 other developed economies on the reading and mathematical literacy scores.[8] In addition to showing mean scores (which are used to rank the countries

Table 4.1
Student Performance on PISA 2003, Reading Scale

Country	Mean Score	Level 1 or Below (percentage)	Ratio, 90th Percentile to 10th Percentile
Finland	543	5.7	1.47
Korea	534	6.8	1.48
Canada	528	9.6	1.55
Australia	525	11.8	1.63
New Zealand	522	14.5	1.71
Ireland	515	11.0	1.55
Sweden	514	13.3	1.62
Netherlands	513	11.5	1.55
Hong Kong	510	12.0	1.53
Belgium (Flanders)	507	17.8	1.79
Norway	500	18.2	1.72
Switzerland	499	16.7	1.65
Japan	498	19.0	1.76
Poland	497	16.8	1.65
France	496	17.5	1.67
United States	**495**	**19.4**	**1.72**
Denmark	492	16.5	1.60
Iceland	492	18.5	1.69
Germany	491	22.3	1.83
Austria	491	20.7	1.74
Czech Republic	489	19.4	1.68

SOURCE: OECD (2004), Tables 6.1 and 6.2.
NOTE: Countries are ranked by mean score.

[8] The response rate for the United Kingdom did not meet PISA standards, so comparable data are not reported in Tables 4.1 and 4.2. All other OECD countries excluded from Table 4.1 had mean reading test scores below that of the United States. Four other countries not shown in Table 4.2 had higher mean scores on mathematical literacy: Hungary (490), Luxembourg (493), the Slovak Republic (498), and Spain (485).

Table 4.2
Student Performance on PISA 2003, Mathematical Scale

Country	Mean Score	Level 1 or Below (percentage)	Ratio 90th Percentile to 10th Percentile
Hong Kong	550	10.4	1.53
Finland	544	6.8	1.49
Korea	542	9.6	1.56
Netherlands	538	11.0	1.58
Japan	534	13.3	1.64
Canada	532	10.1	1.54
Belgium (Flanders)	529	16.5	1.74
Switzerland	527	14.5	1.65
Australia	524	14.3	1.62
New Zealand	523	15.0	1.65
Czech Republic	516	16.6	1.64
Iceland	515	15.0	1.59
Denmark	514	15.4	1.60
France	511	16.6	1.61
Sweden	509	17.3	1.63
Austria	506	18.8	1.63
Germany	503	21.6	1.74
Ireland	503	16.8	1.63
Norway	495	20.8	1.63
Poland	490	22.0	1.61
United States	**483**	**25.7**	**1.71**

SOURCE: OECD (2004), Tables 2.5a and 2.5c.
NOTE: Countries are ranked by mean score.

from highest to lowest score), the fraction scoring in the lower tail of the distribution is recorded, as well as the ratio of the scores at the 90th and 10th percentiles (a measure of score dispersion).

On the reading score, the U.S. ranks 16th out of the 21 countries shown and has one of the highest fractions proficient at reading level 1 or lower (out of a possible five levels). Proficiency at reading level 1 indicates a student is capable of only the least complex reading tasks measured in PISA, which is designed to assess "reading for learning" (e.g., reading literacy as a tool for acquiring knowledge and skills) rather than just reading fluency. Those scoring below level 1 are not able to routinely perform at even this most basic level. In the United States, 6.5 percent score below

level 1, while 12.9 percent score at level 1. Only Austria and Germany exceed this fraction of 15-year-olds with the lowest reading proficiency, while the Czech Republic ties with the United States. The dispersion in reading scores in the United States is also among the highest, surpassed only by Austria, Belgium, Germany, and Japan. These same patterns are even more striking in the mathematical literacy scores shown in Table 4.2, where the U.S. ranks at the bottom of average scores, has the highest fraction scoring at level 1 or below, and has a wider dispersion than all but two other countries (Belgium and Germany).

The same pattern is also evident when the workplace literacy of adults is compared across nations. The OECD International Adult Literacy Survey (IALS) assesses the distribution of adult literacy skills relevant for functioning in the economy and society in 20 countries based on data collected between 1994 and 1998 (OECD, 2000). Table 4.3 shows the ranking among 13 countries for adults 16 to 65 on the IALS measure of prose literacy—having the knowledge and skills needed to use and understand text such as newspapers, brochures, and instructional manuals.[9] Once again, the United States ranks below the middle of the distribution of countries studied.[10] Again, five levels of literacy are defined, and, for the adults in the United States, 20.7 percent are only proficient at level 1, which means they have very poor literacy skills (e.g., they may be unable to determine the correct amount of medicine to give to a child based on information printed on the package). Slightly higher fractions score at this same low level for document literacy (23.7 percent) and quantitative literacy (21.0 percent). Among the countries shown in Table 4.3, the United States also has the highest gap between the 10th and 90th percentiles in the prose literacy score.

While we are not aware of any formal studies that attribute differences in measures of student and adult literacy to differential investments in preschool education, it is notable that many of the countries

[9] The IALS also assessed document literacy (ability to use information in formats such as job applications, payroll forms, maps, tables, and charts) and quantitative literacy (ability to apply arithmetic operations for tasks such as balancing a checkbook, figuring out a tip, and so on).

[10] The seven countries excluded from Table 4.3 (Chile, the Czech Republic, Hungary, Poland, Portugal, Slovenia, and Switzerland) all scored below the United States.

Table 4.3
Performance of Adults 16 to 65 on the IALS 1994–1998, Prose Score

Country	Mean Score	Level 1 (percentage)	Ratio 90th Percentile to 10th Percentile
Sweden	301.3	7.5	1.51
Finland	288.6	10.4	1.54
Norway	288.5	8.5	1.44
Netherlands	282.7	10.5	1.48
Canada	278.8	16.6	1.78
Germany	275.9	14.4	1.51
New Zealand	275.2	18.4	n.a.
Denmark	275.0	9.6	1.39
Australia	274.2	17.0	1.69
United States	**273.7**	**20.7**	**1.90**
Belgium	271.8	18.4	1.68
United Kingdom	266.7	21.8	1.75
Ireland	265.7	22.6	1.71

SOURCE: OECD (2000), Tables 2.1, 2.2, and 4.13.
NOTES: Countries are ranked by mean score. n.a. = not available.

that score above the United States in Tables 4.1 to 4.3 do make substantial investments in high-quality early care and education (Kamerman, 2000; OECD, 2001). Table 4.4 shows enrollment rates of 4-year-olds in preprimary education in 13 European countries, along with the average duration of preschool participation among children ages 3 to 7. The current public investment in preprimary education is summarized in terms of the ages of children served, eligibility criteria, and the degree of public funding.[11] The age of compulsory schooling and age at which primary education begins is also listed for reference.

With the exception of Finland, the 13 countries all have higher preschool participation rates for 4-year-olds than the United States (66 percent as of 2001, see Table 1.2). Six countries—France, the United

[11] The preprimary care and education programs for the 13 countries listed in Table 4.4 vary in other dimensions as well, such as whether they are part day or full day, the government agency that is responsible for the public program, whether services are delivered by public or private providers or both, and the extent and nature of curriculum and staffing requirements, and other standards (Kamerman, 2000; OECD, 2001).

Table 4.4
Preprimary Education in Selected European Countries

Country	Participation Rate of 4-Year-Olds in Preprimary Education (1999–2000)	Average Years of Participation of Children 3–7 in Preprimary Education (1999–2000)	Preprimary Education Policy Dimensions			
			Age Group Served	Eligibility Criteria	Public Funding	Compulsory Schooling Age/Primary Schooling Age
France	100.0	3.0	2–6	Universal	Full	6/n.a.
United Kingdom	100.0	1.5	3–4	Universal	Full	5/5
Netherlands	99.5	2.0	4–6	Universal	Full	5/6
Belgium	99.2	3.0	2.5–6	Universal	Full	6/n.a.
Spain	99.2	2.8	3–6	Universal	Full	6/n.a.
Italy	98.4	2.9	3–6	Universal	Full	6/6
Denmark	90.6	3.6	0.5–6	Working parents	Partial subsidy	7/7
			5/6–7	Universal	Full	
Germany	81.4	2.9	3–6	Universal	Partial subsidy	6/n.a.
Austria	79.6	2.4	3–6	Working parents	Partial subsidy	6/n.a.
Norway	78.1	2.3	4–6	Universal	Partial subsidy	6/6
Portugal	73.6	2.2	3–5	Universal	Partial subsidy	6/6
			5–6	Universal	Full	
Sweden	72.8	3.1	1–6	Working parents	Partial subsidy	7/7
Finland	41.9	2.0	0.5–6	Universal	Partial subsidy	7/7
			6	Universal	Full	

SOURCE: Kamerman (2000), Tables 1 and 3; OECD (2001), Appendix 1; and European Commission (2002), Figures C1 and C5.
NOTES: Countries are ranked by participation rate of 4-year-olds. n.a. = not available. Policies are those in effect around 2000.

Kingdom, the Netherlands, Belgium, Spain, and Italy—serve almost all children at age 4 through voluntary programs that are available to all children (in various age ranges) with full public funding. Denmark, Portugal, and Finland provide publicly funded universal care starting at ages 5 or 6, along with programs that serve younger children in all families or families with working parents, and with only a partial public subsidy. The remaining four countries—Germany, Austria, Norway, and Sweden—all require some private contribution to the costs of care at each age served, while Austria and Sweden also limit access to working parents. In countries where programs are partly financed by fees, they are generally modest.

Increasingly, the programs in these countries stress school readiness as the primary goal through education or even compensatory education, as well as socialization and emotional development. Consequently, a number of the countries with more limited access plan to expand eligibility and public support. For example, as of 2003, Sweden has extended universal access to free part-day preschool education to all 4- and 5-year-olds.[12] France is among the countries seeking to increase participation for children under age 3 (Kamerman, 2000).

From these international comparisons, it is evident that the United States does not measure up well compared with our counterparts in other developed countries in terms of the skills of our students and our workers. While we produce some of the best-educated individuals in the world, we also have a large share who are poorly prepared to function in society and the workplace. The challenges of producing a highly skilled workforce are even more salient in California given the high proportion of immigrants to the state and the corresponding large fraction of minorities and those with limited English language skills. The PISA and IALS data show, for example, that the fraction of the student or adult population with low levels of literacy rise with the share of the population that is first-generation immigrants (i.e., one or both parents are immigrants), that is foreign born, or where the individual's

[12] See information on child care available from the Swedish National Agency for Education at http://www.skolverket.se/english/system/child.shtml (as of February 22, 2005).

native language is different than the language of instruction (OECD, 2000, 2004).

In California, these patterns are also manifested in levels of educational attainment. As has been the case for the country as a whole, the share of the California population with a bachelor's degree has increased from 15 percent in the late 1960s to 29 percent in 2002 (Reed, 2003). Notably, however, there has been little change since the 1970s in the share of working age Californians without a high school diploma or a General Equivalency Diploma (Reed, 2003). Over the last three decades, that share has stood at about 20 percent, while the fraction of the population that had not finished ninth grade remained steady at 10 percent over the same period. For the United States as a whole, there has been a steady decline in the fraction with such low levels of educational attainment. That trend is likely to continue. In the United States as a whole, cohorts that reach retirement age have lower levels of education on average than the new cohorts of potential workforce entrants. In California, that cohort pattern of education improvement will not be as strong since younger cohorts have similar educational attainment as older cohorts (Reed, 2003).

These differences in educational attainment for California largely reflect the demographic makeup of the state, with larger representation of groups such as immigrants (particularly Hispanics from Mexico and Central America) and U.S.-born Hispanics who have lower educational attainment compared with other demographic groups (Reed, 2003). While preschool education investments will not have a direct effect on the educational attainment of the California population that immigrates after the early childhood years, the lower educational attainment of U.S.-born children of immigrants can potentially be improved through a public investment in a high-quality preschool program.

In the context of the global economy, the United States, including the state of California, has one of the lowest levels of commitment to publicly provided preschool education relative to other developed countries. The evidence presented in Chapter Two suggests that high-quality preschool programs can raise overall skill levels in the California state economy and help narrow the gap in preparation for the labor force between more- and less-disadvantaged children. California's investment

in preschool education could help the state to remain competitive in the international economy and with other states making such investments.

Consequences for Economic and Social Equality

In the last several decades, economic disparities have widened in the United States, with family incomes and worker earnings rising faster at the upper tail of the distribution compared with the growth in incomes and earnings at the lower tail (Burtless and Jencks, 2003). Data from the U.S. Census Bureau reveal, for example, that the poorest 20 percent of households in 2003 had 3.4 percent of total income, the lowest share since 1967, while the richest 20 percent had 49.8 percent of income, the second highest level after a peak in 2001 (U.S. Census Bureau, 2004a). The rise in inequality has wider implications in terms of disparities that affect family functioning, neighborhood quality, education, health, crime, and political participation (see, for example, the collection of studies edited by Neckerman, 2004).

This trend has also been manifested in California, as well. Analysis by Reed (2004) indicates that between 1969 and 2002, the ratio of income at the 90th percentile of the family income distribution to the 10th percentile increased from 5.3 to 9.3. This widening income gap has been accompanied by real declines in incomes at the bottom of the distribution in contrast with substantial real increases at the top. Since 1969, real family income at the 10th percentile declined 9 percent, while income at the 90th percentile rose 60 percent. Compared with the United States as a whole as of 2002, California had a higher share of poor families (13.1 percent versus 11.9 percent) and a larger fraction of families defined by Reed (2004) as affluent—those with seven times or more of the poverty level income (15.8 percent versus 13.2 percent).

California's population is extremely diverse in terms of its demographic makeup, with large fractions of minorities and immigrants. Indeed, California recently became the first state where the non-Hispanic whites represented less than 50 percent of the population. This diversity contributes to the level of economic disparities in income among families in the state (Reed, 2004). For example, in 2000–2002, median

family income among U.S. born white family heads was $77,000, compared with $31,000 for foreign-born Hispanics. Foreign-born Hispanics made up 22 percent of families but 41 percent of poor families during the same period. Beyond economic status and labor market outcomes, disparities along racial and ethnic lines are also evident in other outcomes, such as health status and political participation (Reyes, 2001).

Much of the increase in family income inequality is driven by rising inequality in earned income—reflected, in part, in the widening wage gap by education level discussed above (Reed, 2004). Thus, those with more education are able to earn increasingly more than their less educated counterparts, pulling the distribution of earnings and family income further apart. The relationship between education and race/ethnicity also means that as the returns to education increase, so do racial and ethnic wage gaps. The widening gap in earnings, in turn, is driven by technological change and, to a lesser extent, globalization, which are increasing the demand for more-skilled workers faster than the supply has risen, thereby raising the premium paid to more-skilled workers (Karoly and Panis, 2004). Goldin (2002) notes that we are in a race between technology and education, and technology has been winning since the 1970s, and inequality has increased as a result. The current period may be contrasted with the first half of the 20th century, when the high school movement provided secondary education for the masses. The concomitant rise in average education levels was sufficient to meet the technological changes of that era and resulted in the last period of sustained decline in inequality.

Improving educational attainment for future cohorts of California children will help reduce income disparities, lower poverty, and narrow the gaps in economic and social outcomes across racial and ethnic groups. For example, Reed and Cheng (2003) estimate that if full-time Hispanic workers had the same education distribution as white full-time workers, they would earn 93 percent as much as their white counterparts compared with 80 percent today. Equalizing education outcomes would also close the wage gap for blacks as well, though by a smaller amount. A universal preschool program that raises educational attainment overall and improves educational outcomes for more-disadvantaged children will contribute toward such benefits.

CHAPTER FIVE

Conclusions

The benefit-cost analysis undertaken in this study indicates that there can be substantial returns for California society as a whole from investing in a high-quality universal preschool program. Our baseline estimates, arguably conservative figures, show that every additional dollar invested by the public sector, beyond current spending, generates $2.62. The associated stream of investment costs and returns produce an IRR of about 10 percent. Even a very conservative estimate of the benefits from a high-quality universal preschool program generates almost $2 for every dollar invested and an IRR to California society of nearly 8 percent. If benefits exceed our conservative baseline assumptions, the IRR could be even more substantial.

And these estimates do not account for the array of other likely economic and noneconomic benefits not captured in our benefit-cost analysis (or typically in other such analyses) because of data limitations. These potential benefits include the following:

- Lower intangible losses from averted juvenile and adult crimes of preschool participants and reduced intangible losses from averted abuse and neglect of preschool participants.
- Reduced reliance on social welfare programs by the families of preschool children and by the preschool participants when they reach adulthood.
- Improved labor market outcomes for parents of preschool children and their employers.
- Enhanced educational and social experiences for peers of preschool children through effects on classrooms and neighborhoods.

- Improved health outcomes for preschool participants across their life course and subsequent gains in health status for their children.
- Higher educational attainment for the children of preschool participants and related gains in well-being (e.g., health status, earnings, and so on).
- Better consumer choices and life course decisions (e.g., fertility timing and spacing) by preschool participants in adulthood.
- Higher rates of economic growth and improved competitiveness in global markets as the result of a more educated future workforce.
- Reductions in income disparities, poverty rates, and economic and social gaps across racial and ethnic groups because of improved educational attainment for preschool participants.

A more complete accounting of this full range of benefits would further increase the estimated benefit-cost ratio and IRR associated with investing in a universal preschool program in California.

In the remainder of this final chapter, we tie our analysis of the economics of a universal preschool program in California to several relevant issues from the perspective of policymakers and the public considering such an investment. First, we consider an investment in high-quality universal preschool in the context of state and local economic development strategies more generally. Next, we raise a number of choices that will confront policymakers and the public in implementing publicly supported preschool education programs. Finally, we conclude by framing an investment in universal preschool education in terms of the current commitment to public education in the United States.

Preschool as Economic Development

Given the mounting evidence of long-term economic benefits from investing in high-quality preschool education, this policy is increasingly framed in the context of economic development strategies more gener-

ally (Rolnick and Grunewald, 2003; CED, 2004a; Schweke, 2004). To promote economic activity, a larger tax base, better jobs, and an increased standard of living, states and localities make a range of investments in local infrastructure, business assistance, and workforce education and training (Anderson and Wassmer, 2000; Bartik, 2003). Although there are no systematic sources of information on spending (or related tax breaks) by state and local governments for economic development assistance, estimates range from $20 billion to nearly $50 billion in annual spending on such programs (Bartik, 2002; Schweke, 2004).

Yet, there is often very little basis for determining the ultimate economic impact of these investments. It is rare that state and local economic development programs are rigorously evaluated (Bartik, 2002). For some economic development policies, the evidence suggests little benefit. In many cases, jobs would have been created anyway, or jobs simply move from one locale to another so that those gained in one community are at the expense of another. Indeed, the competition among states and localities for attracting and retaining new businesses is increasingly viewed as at best ineffective and at worst counterproductive (Burstein and Rolnick, 1995; Fisher and Peters, 1998). As examples, recent research indicates that state and local investments in business clusters or industrial parks, in enterprise development zones, in professional sports teams and stadiums, and in high-profile companies typically do not generate positive investment returns (Peters and Fisher, 2002; CED, 2004a).

It is likewise unusual for benefit-cost analysis to be applied to economic development programs. One such exploratory effort by Bartik (1991) suggests that the average economic development project in an average local labor market will just break even, with benefits and costs of a similar magnitude. Benefits are more likely to exceed costs when unemployment rates are high, when more of the new jobs go to the unemployed, or when local residents move to higher paying jobs (Bartik, 2004).

Traditional economic development strategies, with their questionable economic benefit, stand in contrast to high-quality preschool education, which is supported by a more rigorous research base. As

discussed in Chapters Two, Three, and Four, sound scientific evidence, often from high-quality experimental studies, demonstrates the short- and long-term benefits from providing children, especially those with disadvantaged backgrounds, with one or two years of preschool experience before entering kindergarten. This investment generates an array of savings to government, as well as broader benefits to society as a whole. In addition to the size of the returns potentially associated with high-quality early childhood investments, it is worth noting that these investments may have additional advantages over typical investments designed to promote economic development. Notably, in the case of early childhood investments, the net gains to government and society as a whole are not zero sum but constitute real benefits in terms of lower government outlays, a more skilled future workforce, and a more responsible future citizenry. Moreover, these conclusions rest on scientific evidence that these outcomes are attributable to the investment in preschool education itself and would not occur under the status quo.

Key Choices for States Funding Preschool Programs

Our analysis has assumed a given set of parameters for a preschool program in California. Key features we have assumed are that the program will be universal, that it will serve children for one year before kindergarten entry, and that it will be of high quality, as indicated by measures such as teacher qualifications and the staff-child ratio. In this section, we consider some alternatives to these parameters and the potential implications for the economics of preschool investments. We also discuss some of the other issues associated with implementing universal preschool programs.

Universal Versus Targeted

As noted in Chapter Two, the strongest evidence for the benefits of high-quality preschool education comes from studies of programs that targeted disadvantaged children. While the features used to target participants have varied, the Chicago CPC and Perry Preschool programs both served children at significant risk of school failure. Likewise, ben-

efit-cost analyses of preschool programs are typically based on such targeted programs. The high returns often cited are based on programs that served disadvantaged children and generated large impacts that translate into substantial economic returns for every dollar invested.

In contrast, for reasons articulated in Chapter Two, we argued that a universal program could be expected to have smaller impacts than those measured in targeted programs. A universal program would be available to more-advantaged children, as well as children already attending private preschool programs. Thus, the marginal benefit of providing a publicly funded preschool program is likely to be smaller than what would be expected from providing the same program to more-disadvantaged children not in preschool. Indeed, our estimate of the benefit-cost ratio of a universal program in California presented in Chapter Three is less than our estimate for a similar program that serves a more targeted population (see the analysis in Appendix B).

The higher expected returns from implementing a targeted program lead some to favor investing public funds in a targeted preschool program rather than a universal program (Heckman and Masterov, 2004). Head Start is one such program. However, there are costs associated with targeting that must be accounted for when making this comparison.[1] First, implementing a targeted program can have sizeable administrative costs. When programs are designed to serve children based on their own or their family's characteristics, program eligibility rules must be determined and then a process to identify who is eligible must be implemented. Since family circumstances often change (e.g., fluctuations in income, employment status, family size, headship status), children may fall in and out of eligibility over time. Second, a targeted program may discourage participation among the targeted population because of a negative stigma attached to such programs or confusion over eligibility rules. Third, any targeting rules are likely to be inefficient in that some children who may benefit from a high-quality preschool experience will be excluded from eligibility. This targeting inefficiency occurs when it cannot be determined with precision, based

[1] For a more complete discussion of the trade-offs between targeted and universal preschool programs, see Wolfe and Scrivner (2003) and Barnett, Brown, and Shore (2004).

on observed characteristics at a given point in time, who is likely to benefit most from a preschool program.

In contrast, a universal program does not require a bureaucratic infrastructure to determine who is and who is not eligible. There is no stigma attached since all children and families are eligible and since children are more likely to be served in economically integrated programs. There is no concern about targeting inefficiency since all children who could potentially benefit the most will be eligible to participate. And while the benefits to more-advantaged children are likely to be lower than those realized for more-disadvantaged children, society will realize the gains for all children. Proponents also argue that a program that serves all children is more likely to receive strong political support from families across the spectrum of socioeconomic status and such a program may be more likely to be funded at the level required for high quality (Barnett, Brown, and Shore, 2004).[2]

Ultimately, while the goal may be to provide universal access to a high-quality publicly funded preschool program, it may be necessary to phase a program in.[3] The phase-in period could be done in a targeted fashion, not necessarily by targeting children with particular characteristics but rather by targeting particular disadvantaged communities much like the New Jersey Abbott District program and the New York state preschool program (Barnett et al., 2004; CED, 2003). Providing universal access to all children in targeted disadvantaged communities will mean the program will begin by serving children who are otherwise less likely to participate in a high-quality preschool program and who would benefit the most from the preschool experience. Such targeting does not require individual families to demonstrate that they meet some eligibility standard so the administrative costs associated with targeting particular children are avoided.

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[2] This conclusion is also supported by theoretical modeling as shown by Gelbach and Pritchett (2002).

[3] For example, full funding may not be immediately available, and the necessary physical infrastructure and trained teaching staff may not be immediately available to serve all children who would want to participate in a universal program.

One Year or Two

If one year of preschool is a good investment, might two years be an even better one? Our analysis of a universal preschool program in California focused on a program serving 4-year-olds for one year before kindergarten entry. While several of the targeted preschool programs with high-quality evaluations have served children for up to two years (e.g., Chicago CPC and Perry Preschool), those states with universal preschool programs (Georgia and Oklahoma) have served only 4-year-olds.

Researchers have not made a systematic effort to study the differential impact in the short or long term from one year of preschool education versus two. However, evidence cited in Chapter Two suggests that there are diminishing returns from the second year of preschool education, at least for preschool programs with the features that have been studied to date. Obviously, a universal program that serves children for up to two years before kindergarten entry will require more funding, although it is unlikely to be double the expenditure since participation rates among 3-year-olds are likely to be lower than those for 4-year-olds.

The benefit-cost analyses that compare the returns from one year versus two years of preschool cited in Chapter Three show a higher return for the one-year program. A similar result would follow for our analysis of a universal preschool program in California. This suggests that, when resources are limited, it is more beneficial to serve a greater number of children in a high-quality one-year program than to serve a smaller number for two years.

Preschool Quality

Our analysis of a universal preschool program in California assumed several features associated with high-quality programs and the program costs associated with these more expensive features (e.g., teachers with a bachelor's degree, an appropriate staff-child ratio, and so on). Would less emphasis on features associated with high-quality result in less benefit reduction than the money it saves? Unfortunately, the research base does not allow us to determine the likely changes in the benefits of preschool education from altering these program features.

For example, to our knowledge, there are no experimental evaluations that compare the long-term outcomes for preschool programs that use varying staff-child ratios or different levels of teacher qualifications. Instead, the features of a high-quality program have been inferred from those features shared by programs that have demonstrated long-term impacts.

Schweinhart and Weikart (1988) offer the following features associated with quality:

- A developmentally appropriate curriculum.
- Classrooms with no more than 20 children, with at least two adults.
- Staff trained in early childhood development, with appropriate supervisory support and in-service training.
- Parent involvement.
- Sensitivity to the noneducational needs of the child and family (e.g., health and nutrition).
- Developmentally appropriate procedures for evaluation.

Espinosa (2002) identifies a similar set of factors as well as others associated with high-quality preschool programs. With respect to teacher training, these experts and others underscore the need for lead teachers to have at least a four-year-college degree along with specialized training in early childhood development. As noted in Chapter One, this is consistent with the recommendations of the NAEYC and the National Research Council (Bowman, Donovan, and Burns, 2001). However, consistent with our assumptions about program cost, more-qualified teachers will command a higher salary, particularly in comparison with the pay of most child care workers, who typically have lower educational credentials.

Implementing a preschool program with these features associated with high quality will be more costly than one that deviates by such changes as lowering teacher qualifications or increasing the group size and the number of children per staff member. While the research base does not provide definitive estimates that would suggest the expected impacts of a lower-quality preschool program, we can expect that a

lower-quality and less costly program would generate benefits that are less than those we estimate.

Program Implementation

Beyond determining key parameters such as whether a program is universal or targeted, the ages of children served, and the choice of program features associated with quality, a variety of other issues confront state- and local-level policymakers who must address the implementation of publicly supported preschool programs. Christina and Goodman (forthcoming), in examining several states moving toward universal preschool education, identify many of these issues including the following:

- The ability to use existing funding streams (e.g., funds for Head Start, Title I, TANF, and CCDF) and the complexities of blending funding sources.
- Preschool program auspices within state or local agencies (e.g., an education department, welfare department, or economic development department).
- The range of providers offering state-sponsored preschool programs (e.g., public schools, Head Start programs, other child care providers) and the adequacy of existing capacity to take a program to scale.
- Methods for ensuring program quality and other aspects of accountability (e.g., the use of performance standards and accountability-based testing).
- The integration of preschool education with other services for children and families (e.g., health and nutrition support).
- The integration of preschool programs with services for younger children and the education of children in grades K to 12.

Our benefit-cost analysis does not support the resolution of many of these issues, although we can expect that some of these aspects of program implementation will have implications for preschool program costs, as well as the downstream benefits. For example, the Chicago CPC program provides continued services to children participating in the preschool program through the third grade. The extended elemen-

tary school intervention for targeted children proved strongly effective, with a return of $6.11 for every dollar invested (Reynolds et al., 2002).

Extending the Investment in Public Education

A free public education has long been viewed as a fundamental commitment to the development of human capital in the United States. That commitment is justified by the recognition that, without such a public-sector investment, educational costs would be prohibitive for many families and the investment in human capital would be less than optimal (DeLong, Goldin, and Katz, 2003). The private returns to additional schooling (e.g., in the form of higher earnings) may be a sufficient motivator to obtain further schooling. However, when the social returns exceed the private returns, individuals may stop short of investing in the socially optimal level of education if they bear the full costs.[4] In the absence of public subsidies, many families would not have sufficient resources to invest in their children's education, and capital markets do not support families in borrowing against higher future earnings to finance education costs today. Some families may not make investments in their own children's education consistent with their long-term interests, and children themselves, especially as they mature, may not comply with their parents' wishes for more schooling. For all these reasons, public-sector investments in K–12 education, and even higher education, are justified as a critical investment in human capital with long-term benefits at the individual and societal levels. Notably, the investment made at the K–12 level is a universal benefit available to all children, regardless of the ability of their families to finance the educational investment privately.

Investing in a universal preschool program in California—or in any other state or for the United States as a whole—can be considered in the context of this public-sector commitment to investing in education. As discussed in Chapter One, while preschool enrollment rates

[4] This is because individuals invest in schooling until the marginal private cost equals the marginal private benefit, rather than the marginal social benefit.

have been rising over time, in our current system of mixed public- and private-sector financing, a substantial fraction of children do not attend one or more years of preschool prior to kindergarten entry. Moreover, enrollment rates are particularly low for disadvantaged children, a group that has been demonstrated to receive long-lasting benefits from a high-quality preschool experience. And many of the children who are currently enrolled in preschool programs do not receive the same high-quality experience associated with programs that have demonstrated significant benefits.

While there is strong evidence, discussed in Chapters Two and Three, that high-quality preschool programs can have substantial benefits, particularly for disadvantaged children, families may not be able to invest in such an educational experience even though they understand the short- and long-term benefits for themselves and their children. In some cases, families do not qualify for subsidized programs targeted for low-income families; yet they cannot afford to send their child to a high-quality private program. Although children can be expected to benefit later in terms of higher earnings, it is not possible to borrow against those future earnings to pay for the schooling today. In other cases, programs are not available near the home or workplace, and distance becomes a barrier to attendance. The result is that benefits from preschool participation for children, their families, and society as a whole go unrealized. Economists refer to this underinvestment in preschool education as a market failure that can justify public-sector resources to reach the socially optimal outcome.

A universal preschool program available to all children regardless of circumstance can allow families who choose to participate to reap the reward from a high-quality program. Public funds are used to make an investment that has a long-term payoff for society as well, whether in the form of lower government outlays or a higher future standard of living. As demonstrated in Chapters Three and Four, the economic returns are such that society gains more than the program costs, at least $2 for every dollar invested. Most likely, the returns are even higher, given the broader range of benefits not typically considered in benefit-cost calculations. In this way, society collectively makes an investment today that pays off down the road.

APPENDIX A

Methodology and Sources for Benefit-Cost Analysis

In this appendix, we discuss the various methods and data sources used in the benefit-cost analysis for a universal preschool program in California presented in Chapter Three and for the benefit-cost analysis of a targeted preschool program presented in Appendix B.

As noted in Chapter Three, all benefit-cost analyses are conducted using a 3 percent real discount rate and all present values are calculated as of age 3 of the participating child. We use the Consumer Price Index—All Urban Consumers (CPI-U) to adjust all figures for inflation to 2003 dollars (see U.S. Department of Labor, undated).

Our baseline estimates adjust for mortality using national mortality rates for 2000 for five-year age groups (from age 5 to 65) available from the Centers for Disease Control (undated).

In the analysis that accounts for migration, we use data for California on out-of-state migration rates based on the 2000 Census, again for five-year age intervals from age 5 to 65 (see U.S. Census Bureau, 2003a, Table 3). We calculate the out-migration rate as the ratio of the number of California out-migrants in the prior five years to the Census population in 2000. Since these numbers are for a five-year age interval, we divide the rate by five to estimate the annual out-migration rate for each age in the interval. All migration activity refers to the prior five-year period for each age group, so we adjust each age interval backwards in time by five years. Thus, the migration rate for individuals age 10 to 14 at the time of the 2000 Census is applied in our analysis as the migration probability from ages 5 to 9.

In the remainder of the appendix, we focus on the methods and data sources for estimating the present values of the various sources

of benefits, focusing first on benefits from outcomes measured in the CPC evaluation followed by those projected based on observed CPC outcomes.

Methods and Sources for Estimating Measured Preschool Benefits

Table A.1 presents the full CPC impact estimate for each outcome area of measured benefits. Estimated unit costs, denoted in 2003 dollars are indicated, as well as the age the benefit (or cost) is applied. The data source and any relevant notes about cost allocation across stakeholders are indicated as well.

Grade Repetition

The CPC reduced the incidence of grade repetition by 15.4 percentage points. Data from California indicate that the statewide annual expenditure per average daily attendance for K–12 education in 2002–2003 across all school districts was $6,961. The savings from reduced grade repetition is applied at age 19 and assumes that, on average, just one grade is repeated. All savings in this category are applied to California state and local government.

Special Education Use

Special education use declined by 0.7 years as a result of CPC participation. Information on special education costs in California are available only periodically. Parrish et al. (2004) indicate that California spending per special education student in 1998–1999 equaled $7,526. In the same year, average statewide spending per pupil (from the same data source above) was $5,436, indicating that special education costs were 1.38 times the cost of regular K–12 education. Special education data from Chambers et al. (1998) suggest a ratio of 1.35 for 1992–1993 indicating some stability in the ratio over time. Thus, we apply the 1.38 ratio to the cost of K–12 education above for 2002–2003 to arrive at an annual cost of special education for the same year of $9,637. Parrish et al. (2004) indicate the national ratio is 1.9 as of 1999–2000, which sug-

Table A.1
Estimates and Sources for Valuing Measured Preschool Benefits (Costs)

Source of Benefits (Costs)	Impact	Unit Cost (in 2003 dollars)	Age Applied	Unit Cost Source/Stakeholder Notes
Reduction in K–12 education costs due to reduction in fraction ever repeating a grade (%)	–15.4	$6,961	19	Education Data Partnership (undated) All savings assumed to accrue to state/local government
Reduction in special education costs due to fewer years of special education use	–0.70	$9,637	12	Parrish et al. (2004), Exhibit II-6 Assume federal share of savings is 10% and state/local share is 90% based on Parrish et al. (2004)
Increased costs of K–12 education due to higher educational attainment (years)	0.33	$6,961	19	Education Data Partnership (undated) All costs assumed to accrue to state/local government
Reduced cost of child welfare system due to lower incidence of child abuse and neglect (%)	–0.053	$9,349	10	Case outcomes: DHHS (2004), Table 6-4; Foster care cost: Legislative Analyst's Office (2000); Other costs: Courtney (1998) Assume federal share of savings is 43% and state/local share is 57% based on Courtney (1998)
Reduced tangible costs to abuse victims due to lower incidence of child abuse and neglect (%)	–0.053	$5,231	10	Case type: DHHS (2004), Table 3; Victim costs: Miller, Cohen, and Wiersema (1996), Table 2 All benefits assumed to accrue to participants

(continued)

Table A.1—continued

Source of Benefits (Costs)	Impact	Unit Cost (in 2003 dollars)	Age Applied	Unit Cost Source/Stakeholder Notes
Reduced cost of juvenile justice system due to fewer juvenile petitions	–0.33	$9,480	14	Petition outcomes: Office of the Attorney General (2003), p. 6—7; County facility cost: Legislative Analyst's Office (1995); CYA cost: California Youth Authority, fiscal year 2002/03; Probation cost: Miller, Fisher and Cohen (2001), Table 3; Other costs: Greenwood et al. (1994), Table 3.1 All savings assumed to accrue to state/local government
Reduced tangible cost to victims of juvenile crime due to fewer juvenile petitions	–0.33	$13,259	14	Petitions by crime category: Office of the Attorney General (2003), Table 5; Crime reporting rates: U.S. Department of Justice (2002), Tables 93 and 93a; Reported crimes: Office of the Attorney General (2003), Table 1; Arrests: Office of the Attorney General (2003), Table 3A; Tangible crime costs: Miller, Cohen, and Wiersema (1996), Table 1 and Miller, Fisher, Cohen (2001), Table 1 All benefits assumed to accrue to rest of society
Value of child care (annual hours)	525	$6.75	4	U.S. Bureau of Labor Statistics (2004) All benefits assumed to accrue to participants

gests our estimate may be conservative relative to the costs experienced in other states. Parrish et al. (2004) also indicate that in 1998–1999, 10 percent of special education funds came from federal funds, while the remaining 90 percent were from state and local funds. We apply these shares to apportion the savings between California government and the federal government. The savings are applied as of age 12.

High School Graduation

The high school graduation rates were higher by 11 percentage points, and years of schooling among CPC participants were higher by 0.33 years at age 20, compared with the control group. This extra schooling results in added cost to the K–12 education system, assumed to be the same annual cost applied above in the case of reduced grade repetition. This added cost is applied as of age 19.

Child Maltreatment

The incidence of substantiated cases of abuse and neglect was 5.3 percentage points lower for the CPC participants. Data for California indicate that 31.4 percent of substantiated cases of abuse and neglect require foster care (removal from the home), while the remaining share (68.6 percent) require in-home care (DHHS, 2004). The California Legislative Analysts Office estimates that the annual cost of foster care per participant in 2000–2001 was $18,249. Inflating to 2003 dollars gives $18,960. A cost estimate for in-home care for California was not readily available. However, Courtney (1998) reports an estimate of $2,702 in 1993 based on Ohio and Texas data. That equals $3,441 in 2003 dollars. Likewise, the same source indicates administrative costs per substantiated case, based on data for the same two states, equaled $813 in 1993 dollars, or $1,035 in 2003 dollars. Applying these fixed administrative costs to all cases and taking the weighted average cost of foster care and in-home care using the shares above give an estimated average costs per substantiated case of child abuse and neglect of $9,349 in 2003 dollars. Courtney (1998) also reports that, on average across all states, 57 percent of child welfare agency costs across all states is provided by state and local government, while 43 percent is provided by the federal government. The savings are applied as of age 10 of the child.

In terms of avoided tangible costs associated with child abuse and neglect, Miller, Cohen, and Wiersema (1996) estimate, in 1993 dollars, child abuse victims lose $6,102 per victimization, while the comparable figure for neglect cases is $958. Converted to 2003 dollars these figures are $7,770 and $1,220, respectively. These costs cover lost productivity, medical care, and mental health costs. They exclude costs associated with social services provided to victims and small costs associated with police and fire services, all of which are assumed to be covered in the cost estimate for the child welfare system above. Data for California in 2002 indicate that approximately 61.2 percent of substantiated cases involve child abuse, while the remaining fraction involve neglect (DHHS, 2004).[1] These shares, when applied to the associated cost figures above, give a weighted average estimate of tangible victim costs in 2003 dollars of $5,231. The reduction in victim costs is also applied as of age 10.

Miller, Cohen, and Wiersema (1996) also provide estimates of the intangible costs associated with child abuse and neglect. In 1993 dollars, these figures equal $52,371 and $7,900, respectively. Again, inflating to 2003 dollars and weighting by the same distribution of substantiated cases, we estimate that the intangible costs of child abuse and neglect equal $44,739 in 2003 dollars. In a sensitivity analysis, this reduction in intangible victim costs is applied as of age 10.

Juvenile Crime

Children who participated in the CPC program had 0.33 fewer juvenile petitions by age 18. Data from California for 2003 indicate there were 87,927 juvenile court petitions filed (see Table A.1 for source). Based on the disposition of petitioned cases, we estimate that 21.7 percent result in incarceration in a county facility, 1.1 percent are in a California Youth Authority (CYA) facility, 47.9 percent are on probation, 11.3 percent are in a residual "other" category, while 17.6 percent are dismissed. We assume the costs associated with all of these outcomes in-

[1] Since cases may involve both abuse and neglect, the reported shares add to more than 100. In particular, California data for 2002 indicate that 70.0 percent of cases involve either physical abuse, sexual abuse, emotional/psychological abuse, or other abuse, while 44.3 percent of cases involve child neglect. We renormalize these percentages to sum to 100, giving the shares noted in the text.

clude arrest and adjudication costs. Greenwood et al. (1994) provide a national average cost for all petitioned cases of $1,924 in 1993 dollars, or $2,450 in 2003 dollars. We assume no additional costs for cases in the "other" category or those dismissed. The annual cost per inmate for a California county facility is $20,900 as of 1994–1995, which inflates to $25,234 in 2003 dollars. In 2002–2003, the annual cost per inmate of a CYA facility was $49,200. Based on data from Pennsylvania in 1993, Miller, Fisher, and Cohen (2001) estimate the cost for juvenile probation at $1,635 or $2,082 in 2003 dollars. The weighted estimate cost for a juvenile petition in 2003 dollars is thus $9,480.

The tangible victim costs are estimated based on costs for various types of crimes as reported in Miller, Cohen, Wiersema (1996) and Miller, Fisher, and Cohen (2001). From these sources, we obtain estimates associated with lost productivity, medical care, and property loss for murder, rape, robbery, assaults, burglary or attempt, arson, and driving under the influence. We then use the California state data on juvenile petitions by type of crime to weight these cost figures (see source cited in Table A.1). However, we must also account for the fact that not all crimes are reported to the police or lead to an arrest and petition. In other words, if a high-quality preschool program reduces juvenile petitions, it is reasonable to expect that crime victimizations will decline by an even larger amount. Our approach, following Aos et al. (2004), is to scale up our estimate of victim costs by the inverse of the probability of arrest (see sources cited in Table A.1).[2] Data for California show reported crimes for various categories of crime. Using data from the 2002 national Crime Victimization Survey, we obtain an estimate of the fraction of crimes in various categories reported by victims. These reporting rates are used to inflate reported crimes into total crimes by category. Data on arrests by crime category for California, divided by total crimes, result in an estimate of the probability of arrest for each crime type.

The result is an estimate of $13,259 in 2003 dollars of the average tangible victim cost per juvenile petition, applied as of age 14. The same sources of cost data also provide estimates of intangible (quality

[2] For example, if the probability of arrest is 50 percent, then for every arrest, a total of two crimes have been committed.

of life) costs associated with each type of crime as well. Again, inflating by the inverse probability of arrest and weighting by the distribution of juvenile petitions in California, we get an estimate of intangible cost per juvenile petition of $18,891 in 2003 dollars, about 1.4 times the tangible costs. This figure is also applied as of age 14 in the sensitivity analysis, which includes intangible benefits.

Value of Child Care

The time spent in preschool, assumed to be 525 hours annually for a universal preschool program in California, is valued at the California minimum wage, which stood at $6.75 per hour as of 2003. This benefit is applied at age 4, the year the preschool services are received.

Methods and Sources for Estimating Projected Preschool Benefits

Several remaining categories of benefits (or costs) are projected based on observed outcomes as of age 20.

College Education

Following Reynolds et al. (2002), we project college expenditures for CPC program participants based on education attainment observed as of age 20. Data from the CPS indicate that high school graduates on average attend 1.5 years of postsecondary education.[3] Data for California are used to estimate the average annual cost of one year in the California public postsecondary system. For the 2002–2003 school year, we use data on state general funds per full-time equivalent student at the University of California and California State University, and state plus local funds for California community colleges.[4] Student fees are

[3] Reynolds et al. (2002) assume two more years of college. Our estimate is based on the distribution of subsequent educational attainment for U.S. high school graduates by race and gender, assuming that those who attend some college spend one additional year, those with an associate's degree spend two additional years, and those with a bachelor's degree spend four additional years. The weighted average is 1.58 additional years of schooling beyond high school.

[4] See California Postsecondary Education Commission, 2003, Displays 13–15 and 40.

also available per full-time equivalent student, along with state general funds for Cal Grants A, B, and C. Weighting by the number of full-time equivalent students at each level, we estimate that the state and local costs for higher education (general funds and grants) are $6,678 per full-time equivalent student, while average student fees are $780. Thus, approximately 10 percent of the total costs are borne by the student. These figures are used to apportion the costs, applied at ages 19 and 20, of higher education between state/local government and preschool participants, based on the 11-percentage point increase in the high school graduation rate and average of 1.5 years of additional schooling.

Compensation and Taxes

We use the observed impact of the CPC on high school graduation rates to project the impact on lifetime compensation (earnings net of taxes plus the value of fringe benefits) of participants, and the taxes that accrue to the state and federal governments. We begin with data from the CPS on mean annual earnings by age group and education level as of 2003, disaggregated by race/ethnicity (white non-Hispanic, black, Hispanic, Asian, and other).[5] These data are used to generate the earnings differential from age 18 to 65 between the average high school dropout and the average high school graduate (accounting for the distribution of additional schooling among high school graduates). These earnings differentials for the various demographic subgroups are then weighted by the racial/ethnic distribution for the California cohort from birth to age 4 in 2000, based on Census data.[6] This means that the weighted earnings premium for higher education reflects the demographic composition of the cohorts that would be entering preschool in California today. This method of using the current cross-sectional age-earnings profile does not allow for growth in real wages over time with improvements in productivity. We adopt a conservative assumption of a 0.5 percent annual real growth in earnings. Fringe benefits are calculated at 20 percent of cash earnings.

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[5] See U.S. Census Bureau (2004d).

[6] See U.S. Census Bureau (undated), SF-3, Tables P7, P8, and P145.

As of 2003, marginal tax rates in California vary from 1 to 9.3 percent.[7] We apply these rates to the cash portion of compensation to determine the increased tax revenue to the state of California. Likewise, we apply the federal income marginal tax rates, which range from 10 to 35 percent, to determine the gain in federal revenues.[8] Federal revenues also increase by the amount of the combined employer and employee tax rates for FICA and Medicare (15.3 percent). After-tax compensation for participants is defined as cash earnings less state and federal income taxes and the employee share of FICA and Medicare taxes, plus the value of fringe benefits.

Adult Crime

We follow a similar methodology as Karoly et al. (1998) to estimate the justice system costs associated with an adult criminal career and the reduction in crime through age 44 associated with the observed reduction in juvenile crime. In particular, Karoly et al. (1998) use an estimate that the net present value at age 19 of a California adult criminal career is $27,350 in 1993 dollars (using a 4 percent discount rate). Like the CPC analysis by Reynolds et al. (2002), we assume that 30 percent of the targeted population served by the CPC program would have a criminal career. So on average, in the CPC population the present value cost of adult crime is $8,205 in 1993 dollars. The CPC produced a 42 percent reduction in juvenile petitions, and we assume that the reduction in adult crime is 80 percent of the effect on juvenile crime. Thus, the CPC is estimated to reduce the per-child present value criminal justice system costs at age 19 of an adult criminal career by $2,777 in 1993 dollars or $3,536 in 2003 dollars. We further discount this figure to age 3 and apply a 3 percent discount rate to be consistent with our other present value calculations. These savings are applied to state and local government.

The associated tangible adult crime victim costs are estimated following the methodology in Karoly et al. (1998) where the ratio of tangible victim costs to justice system costs for an adult criminal career is

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[7] See California Franchise Tax Board (2003).

[8] See Internal Revenue Service (2003).

estimated to be 1.0485. Thus, the present value of tangible adult crime cost savings at age 19 is $3,708, which we further discount to age 3 and to which we apply a 3 percent discount rate.

Although Karoly et al. (1998) do not include a value of avoided intangible crime losses, they report, based on the Perry Preschool benefit-cost study as of age 27, that tangible and intangible crime costs are 4.5 times the criminal justice system costs for a typical adult career (see Schweinhart et al., 1993). We apply this ratio in our sensitivity analysis to estimate the total benefit from reductions in tangible and intangible crime costs.

APPENDIX B

Benefit-Cost Estimates for a Targeted Preschool Program

This appendix presents the results of a benefit-cost analysis of a high-quality targeted preschool program in California serving 4-year-old children. The preschool program features are assumed to match those of the universal program discussed in Chapter One, so the program costs per child are assumed to be the same as those used in the Chapter Three benefit-cost analysis of a universal program. The target population is assumed to share similar risks as the children served by the Chicago CPC program. Following the discussion of Chapter Two, we assume this is the same 25 percent of the California population we labeled as high-risk children.

The analysis below is based on two alternative baselines. The first is a baseline where the high-risk children are assumed not to attend preschool. In this benefit-cost analysis, we compare the total cost of adding a preschool program with the total benefit of going from no preschool to a high-quality preschool program. The program impacts are thus assumed to be 100 percent of the benefits measured in the Chicago CPC program (since most of the children in that control group did not attend preschool). As a result, this analysis will capture the largest potential benefit from preschool participation and is comparable to that measured in the Chicago CPC program. The second baseline assumes the current distribution of preschool participation by high-risk children in California. Thus, in this benefit-cost analysis, we compare the marginal costs of increasing the quality of the current publicly supported preschool program in California as well as increasing the participation rate among high-risk children who do not attend preschool at baseline, with the mar-

ginal benefit for those already participating and for those who are new participants.

All other assumptions about the dollar value of the various benefits from a preschool program are assumed to be the same as those used in the benefit-cost analysis of Chapter Three. Like that analysis, we discount all dollar flows to age 3 of the child, using a 3 percent real discount rate. The estimates also account for mortality (but not migration).

No Preschool Baseline

The initial baseline assumes that out of every 100 children in California, 25 are high-risk children who would be served by a targeted high-quality preschool program. With a 70 percent participation rate, 18 of 25 children would participate in the program, and all would be new preschool participants and receive 100 percent of the benefits observed in the Chicago CPC program evaluation. Using this baseline, we produce results for California that are comparable to the benefit-cost analysis of the CPC program conducted by Reynolds et al. (2002).

Table B.1 shows, for the various stakeholders, the present value dollars for the various sources of costs and benefits, as well as the summary benefit-cost analysis measures (net benefits, benefit-cost ratio, and IRR) for a targeted high-quality preschool program in California. For California as a whole, this present value investment of $5,376 per child generates $41,979 per child in benefits, or a benefit-cost ratio of $7.81 for every dollar invested. The IRR is 24.2 percent. These summary measures are all larger for the United States as a whole since federal income and wage taxes are included as additional benefits. From the perspective of California state and local government, every dollar invested returns $1.82, and the IRR is 7.3 percent. Patterns in the distribution of benefits across sources and stakeholders are similar to those discussed in Chapter Three for a universal preschool program.

As indicated above, the analysis in Table B.1 is closest to replicating the benefit-cost analysis for the CPC program conducted by Reynolds et al. (2002). Table B.2 provides a comparison of the total societal

benefits calculated for a targeted California program (last column of Table B.1)—using California cost parameters wherever possible—and the targeted CPC program—conducted using Illinois cost parameters for many benefit categories—both with a baseline of no preschool. The Reynolds et al. (2002) analysis is for a program that serves children 1.5 years on average, so we have adjusted program costs and the value of child care to match the one-year program assumed in Table B.1. In addition, the Reynolds et al. (2002) results are reported in 1998 dollars, so we have adjusted to 2003 dollars using the CPI-U. Finally, the Reynolds et al. (2002) analysis does not adjust for mortality as we do in Table B.1. Thus, we report the percentage difference between the California and CPC program, first based on the analysis as reported in Table B.1 and second when there is no mortality adjustment (results not shown).

Table B.2 shows that program costs are estimated to be about 13 percent larger in the California program, while program benefits are estimated to be 3 percent lower. Part of the difference in benefit estimates is attributable to the mortality adjustment. While the difference in measured benefits is almost the same with and without the mortality adjustment, projected benefits are higher by 5 percentage points without the mortality adjustment (4 versus 9 percent higher), with the largest effects on earnings and taxes on earnings. This is what we would expect since these two components are valued through age 65, so mortality has the largest impact on this benefit stream, which stretches 45 years into the future.

Of the specific sources of benefits, the gain from lower rates of special education, the value of child care, and taxes on earnings are the only elements that are estimated to be higher in the California program.[1] All other sources result in lower benefit estimates (or higher cost estimates in the case of college attendance costs) for the California program (with mortality adjustment) compared with the CPC analysis. For the California analysis, we also include the costs of added secondary schooling due to higher educational attainment, a component

[1] It is unclear from the Reynolds et al. (2002) methodology whether the earnings benefit of $23,160 per child is net of taxes paid. If it is gross earnings, then the net earnings estimate would also be larger for the California program.

Table B.1
Present Value Costs and Benefits for Targeted Preschool Program Assuming No-Preschool Baseline (in dollars per child)

	Government					Total Society	
Source of Costs or Benefits	State/Local	Federal	Total	Participants	Rest of Society	California	Total U.S.
Program costs	–5,376	—	–5,376	—	—	–5,376	–5,376
Program benefits							
Education outcomes (measured)							
Grade retention	645	—	645	—	—	645	645
Special education	4,511	501	5,012	—	—	4,511	5,012
Educational attainment	–1,382	–	–1,382	—	—	–1,382	–1,382
Child welfare outcomes (measured)							
Child welfare system costs	223	168	391	—	—	223	391
Costs to victims of abuse and neglect	—	—	—	219	—	219	219
Juvenile crime outcomes (measured)							
Justice system costs	2,190	—	2,190	—	—	2,190	2,190
Costs to victims of juvenile crime	—	—	—	—	3,063	3,063	3,063
Value of child care (measured)	—	—	—	3,340	—	3,340	3,340
Total measured benefits	6,187	669	6,856	3,559	3,063	12,809	13,478

College attendance (projected)	–668	—	–668	–78	—	–747	–747
Labor market earnings (projected)							
Net earnings/compensation	—	—	—	23,137	—	23,137	23,137
Taxes on earnings	1,854	9,210	11,064	—	—	1,854	11,064
Adult crime outcomes (projected)							
Justice system costs	2,404	—	2,404	—	—	2,404	2,404
Costs to victims of adult crimes	—	—	—	—	2,521	2,521	2,521
Total projected benefits	3,590	9,210	12,800	23,059	2,521	29,170	38,380
Total benefits	9,776	9,879	19,656	26,618	5,584	41,979	51,858
Net benefits	4,400	9,879	14,279	26,618	5,584	36,602	46,482
Benefit-cost ratio ($/$1)	1.82	—	3.66	—	—	7.81	9.65
Internal rate of return (%)	7.3%	—	10.0%	—	—	24.2%	25.3%

SOURCE: Authors' calculations. See Appendix A for details.

NOTES: Unless otherwise indicated, all amounts are per child in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. The California column excludes benefits/costs to the federal government. Numbers may not add because of rounding.

Table B.2
Benefit-Cost Analysis Comparison of Targeted California Preschool Program (No-Preschool Baseline) with CPC Program (in dollars per child)

Source of Costs or Benefits	California Program (U.S. Society)	Chicago CPC (Total Society)	Percentage Difference	Percentage Difference When No Mortality Adjustment
Program costs	–5,376	–4,682	12.9	12.9
Program benefits				
Education outcomes (measured)				
Grade retention	645	781	–21.1	–20.4
Special education	5,012	4,719	5.9	6.0
Educational attainment	–1,382	n.a.	—	—
Child welfare outcomes (measured)				
Child welfare system costs	391	533	–36.4	–36.2
Costs to victims of abuse and neglect	219	336	–53.9	–53.7
Juvenile crime outcomes (measured)				
Justice system costs	2,190	5,100	–132.9	–132.4
Costs to victims of juvenile crime	3,063	3,824	–24.9	–24.6
Value of child care (measured)	3,340	1,247	62.7	62.7
Total measured benefits	13,478	16,540	–22.7	–22.6

College attendance (projected)	–747	–629	15.8	16.2
Labor market earnings (projected)				
Net earnings/compensation	23,137	23,160	–0.1	5.0
Taxes on earnings	11,064	8,176	26.1	30.3
Adult crime outcomes (projected)				
Justice system costs	2,404	2,949	–22.6	–20.5
Costs to victims of adult crimes	2,521	3,092	–22.6	–20.5
Total projected benefits	38,380	36,748	4.3	9.0
Total benefits	51,858	53,289	–2.8	1.1
Net benefits	46,482	48,607	–4.6	–0.2
Benefit-cost ratio ($/$1)	9.65	11.38	–18.0	–13.6
Internal rate of return (%)	25.3%	n.a.	—	—

SOURCE: For California program, Table B.1, last column; for Chicago CPC: Reynolds et al. (2002), Table 5, adjusted for inflation using CPI-U and program costs and value of child care adjusted for one-year program.
NOTES: Unless otherwise indicated, all amounts are per child in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. Numbers may not add because of rounding. n.a. = not available.

not included in the Chicago CPC study. The largest relative difference occurs for the costs of the justice system for juvenile crime, and victims of crime and abuse. In total, the CPC program is estimated to generate an additional $1,400 in benefits per child for society as a whole. Without the mortality adjustment, the two estimates would be almost the same ($53,867 in total benefits for the California program versus $53,289 for the Chicago CPC).

The bottom line is that the CPC program, implemented for one year, is estimated to generate $11.38 for every dollar invested, a figure that is about 18 percent higher than the California estimate. Reynolds et al. (2002) report that their analysis of a one-year program generates $12.02 for every dollar invested, based on program impacts for one-year participants (not reported). This figure indicates an even larger gap between our estimate for a targeted California program and their estimate for the Chicago CPC program. The percentage differences in the last column of Table B.2 are attributed to a higher total program cost for the California program and differential cost parameters applied to the same program impacts. The difference between a return of $11.38 for every dollar invested (shown in Table B.2) and the reported estimate of $12.02 by Reynolds et al. (2002) is due to differential impact estimates for a one-year program (not reported in the study but used to generate the benefit-cost ratio) versus the impacts for a program for an average of 1.5 years (the reported impacts we rely on for our analysis, which we assume also apply for a one-year program).

Current Preschool Participation Baseline

The second baseline accounts for the distribution of current preschool participation among high-risk children in California based on Table 2.8 (first column). As seen in that table, under the baseline, 55 percent of high-risk children are estimated to be currently attending a preschool program, and the participation rate is assumed to increase to 70 percent under a targeted state-funded program. With these assumptions, 18 of the 25 high-risk children (out of every 100 children statewide) will participate in the high-quality state funded program. Based on the

current distribution of public versus private program participation for the high-risk children (see Table 2.8), of the 18 children in the targeted high-quality program, 12 will be in upgraded public-sector programs relative to the baseline, 5 are new preschool participants, and 1 child is in a public-sector program that is assumed to be of the same average quality as the private-sector program he or she would have experienced at baseline. Assuming the same benefit distribution shown in Table 2.9 for upgraded public programs, new preschool participation, and transfers from a private program for high-risk children, by accounting for the current distribution of preschool participation, benefits will be 61 percent of the level associated with a baseline of no preschool participation (Table B.1).[2] Costs will be reduced by the amount of current spending on public preschool programs for this population, but benefits will be reduced as well.

Table B.3 shows the resulting benefit-cost analysis under this alternative baseline. For California as a whole, for every dollar invested, the return is $6.45 or an IRR of 15.5 percent, while the comparable figures for the United States as a whole are $7.90 and 16.5 percent.[3]

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[2] The value of child care is attenuated by a different factor, the ratio of the number of children newly enrolled in preschool to the total number of children (since, on the margin, only families with no preschool under the baseline receive the value of new child care under the targeted preschool program). In this case, that ratio is 5 out of 18 children or 28 percent. However, the value of child care is augmented by the cost of private care for those children who switch from private care to public care (which in this case is 1 child out of 18).

[3] Compared with the change in the benefit-cost ratio, the IRR falls by proportionately more for California society as a whole and the United States as a whole in going from Table B.1 to Table B.3 because of the relatively large decline in the value of child care between the two tables. The value of child care is an offset to program costs in the first year of the program. Since the offset is relatively smaller under Table B.3, the upfront investment is relatively larger, which lowers the IRR.

Table B.3
Present Value Costs and Benefits for Targeted Preschool Program Assuming Current Preschool Baseline (in dollars per child)

	Government				Rest of	Total Society	
Source of Costs or Benefits	State/Local	Federal	Total	Participants	Society	California	Total U.S.
Program costs	–3,910	—	–3,910	—	—	–3,910	–3,910
Program benefits							
Education outcomes (measured)							
Grade retention	394	—	394	—	—	394	394
Special education	2,757	306	3,063	—	—	2,757	3,063
Educational attainment	–845	—	–845	—	—	–845	–845
Child welfare outcomes (measured)							
Child welfare system costs	136	103	239	—	—	136	239
Costs to victims of abuse and neglect	—	—	—	134	—	134	134
Juvenile crime outcomes (measured)							
Justice system costs	1,338	—	1,338	—	—	1,338	1,338
Costs to victims of juvenile crime	—	—	—	—	1,872	1,872	1,872
Value of child care (measured)	—	—	—	1,227	—	1,227	1,227
Total measured benefits	3,781	409	4,190	1,360	1,872	7,013	7,422

College attendance (projected)	–408	—	–408	–48	—	–456	–456
Labor market earnings (projected)							
Net earnings/compensation	—	—	—	14,140	—	14,140	14,140
Taxes on earnings	1,133	5,628	6,761	—	—	1,133	6,761
Adult crime outcomes (projected)							
Justice system costs	1,469	—	1,469	—	—	1,469	1,469
Costs to victims of adult crimes	—	—	—	—	1,541	1,541	1,541
Total projected benefits	2,194	5,628	7,822	14,092	1,541	17,826	23,455
Total benefits	5,974	6,037	12,012	15,452	3,413	24,839	30,876
Net benefits	2,065	6,037	8,102	15,452	3,413	20,929	26,967
Benefit-cost ratio ($/$1)	1.53	—	3.07	—	—	6.35	7.90
Internal rate of return (%)	5.9%	—	8.7%	—	—	15.5%	16.5%

SOURCE: Authors' calculations. See Appendix A for details.
NOTES: Unless otherwise indicated, all amounts are per child in 2003 dollars and are the present value of amounts over time where future values are discounted to age 3 of the participating child, using a 3 percent annual real discount rate. The California column excludes benefits/costs to the federal government. Numbers may not add because of rounding.

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