Economic Analysis of Pre-Kindergarten:
An Overview of the Evidence

April 2005

Clive R. Belfield
belfield@qc.edu
Queens College, City University of New York,
65-30 Kissena Boulevard,
Flushing NY 11367

SUMMARY

Recent years have seen a substantial growth in research on the economics of pre-K. This paper reviews this research. The review contains: a summary of what is known about the costs and benefits of pre-K; a report on newly emerging research and evidence; and a catalog of important unanswered questions. The main conclusions are as follows.

The Supply of and Demand for Pre-K:

- As pre-K is an investment, potentially any amount could be invested, and the appropriate investment depends on the size of the benefits. More likely, a financing constraint will determine the amount of investment in pre-K.
- For budgeting purposes, it may be sufficient to assume that one year of full-day pre-K involves an expenditure of $6,000 per child.
- A key question is whether state-level expenditures for pre-K are close to optimal for providing a high-quality program in different states and settings.
- There is limited information on what will happen – as program enrollment rises – to unit costs for a given quality of pre-K
- Further research on the direct expenses incurred by families will help identify the demand for pre-K, and how that demand can be influenced.

Economic Analysis of Pre-K

- Only 3-4 outcomes are economically important: future earnings gains; crime; and compensation for parents; and, to a lesser extent, school savings.
- Given the high victim costs, an appraisal of the impact of pre-K in lowering abuse/neglect (or child well-being in general) may be valuable.
- Although the savings from lower grade retention are trivial, further investigation into the effect of student behavior on school resource use is needed.
- The impacts of pre-K on juvenile crime, school safety, and drug usage are under-explored.

Research on Pre-K:

- State level evaluations are often of little value: they "almost never attempt to address fundamental questions regarding what types of pre-kindergarten services work best and under what conditions of implementation" (Gilliam and Zigler, 2004)
- It is not just at-risk children who might benefit from pre-K, even as the extent of the benefits to children from all socio-economic strata is not precisely known.
- Thus far, research has not directly compared pre-K with educational policies that may actually be implemented, such as increased pay for teachers or reduced class size.
- Economic and demographic changes are likely to reinforce the need for investments in pre-K and other early childhood programs; the full extent of this remains to be determined.

1. Introduction

Recent years have seen a substantial growth in research on the economics of pre-K. (Here pre-K, pre-school, and early childhood education are not distinguished; throughout, pre-K refers to an educational program in the 1-2 years immediately prior to kindergarten). Two types of economic analysis can be undertaken. The first type conceives of pre-K as an investment and applies investment appraisal techniques to test whether the benefits of pre-K outweigh the costs. The second type includes investigation of the economics of the pre-K industry, such as the industry size, numbers of employees, wages paid, and market structure.

This paper reviews the research, focussing mainly on the first type of research. Using a balance sheet framework, the paper summarizes what is known about the costs and benefits of pre-K. A brief review of research on the pre-K industry is also included. Current evidence that is emerging on the economics of pre-K is also reviewed. In concert, a number of important unanswered questions are posed, areas where the evidence is still inconclusive are reported, and research areas for possible development are considered. The aim is to use current research to 'prospect' for future research.[1]

2. Balance Sheet Approach to Investments in Pre-K

Almost all studies of whether pre-K is a good investment take a balance sheet approach, as set out in Table 1. On one side is the cost of the program, with details on the ingredients (e.g., teacher quality, class size, curricula). On the other side are the benefits; these may be classed according to the agency (state/local or federal government, society, or private individual) and according to the time-frame (short, medium, or long-term).

[1] The evidence in this review is based on a literature search following standard research protocols, as well as a search of unpublished literature, working papers, and policy documents (Hart, 1998). Evidence is evaluated using standard methodologies, i.e. experimental evidence is most compelling and survey evidence must address issues of bias (Clarke and Oxman, 2003). The search protocol involves: systematic search of bibliographic databases (ECONLIT, ERIC, EDUCAT, Web of Science, and NCES); citation/footnote searches; website searches (e.g., www.nieer.org); and internet searches using key search terms and authors' names. For methodology, experimental evidence with repeated testing is most persuasive; and for survey evidence, an appropriate sampling frame is needed, with bias accounted for.

Economic studies compare the costs with the discounted benefits to estimate whether pre-K is a good investment.

The tasks for economists appraising investments in pre-K are therefore: (i) to accurately count the costs of the investment; (ii) to identify the behavioral impacts caused by the program; and (iii) to calculate the monetary benefits (or losses) that arise from those behavioral changes. Future research will in some respects simply require that the performance of these tasks be refined.

3. Cost Estimates for Providing Pre-K

Clearly, economic models of pre-K must include an estimate of the costs of provision. However, the question – 'What does pre-K cost?' – must be asked carefully. ***Pre-K is an investment; potentially, any amount could be invested, and the appropriate investment depends on the size of the benefits. More likely, a financing constraint will determine the amount of investment in pre-K***.

High quality programs will clearly cost more than low quality programs. Tailored programs with a specific set of ingredients will have average costs that may be set down. But, these costs will vary across states and settings (urban/rural): and approximately two-thirds of educational costs are wages, which will vary significantly. Where pre-K program ingredients are not exactly prescribed, costs will vary according to how the program is delivered. Moreover, costs will vary according to class size and economies of scale, neither of which can be perfectly estimated; enrollment levels and provider types will also influence costs. (Cost accounting is not helped by the quality of reported information. Budget documents describe costs in very general terms – e.g. in the proposal for universal pre-K, instruction is described only as 'direct services to children', GTF, 2004). Therefore, the notion that there is a correct or definitive 'cost' for pre-K is misleading.

Notwithstanding, studies have investigated the costs of pre-K; others report expenditures from state pre-K programs; and the unit costs of tailored programs are available. The typical investment can therefore be estimated. A final alternative is to assume that pre-K programs can be provided for the same level of resource as either

Head Start or public school kindergarten. (The advantage of using these resource measures is that they are available for each state).

For California, Muenchow et al. (2005) estimate the costs of universal, full-day pre-K (using a template derived in part from an earlier model for Massachusetts, see Marshall et al., 2002; see also Golin et al., 2003; LINCC, 2002). They report a range of annual per-child cost estimates: up to $12,205 for their Child Care and Preschool Program; or $4,671-$5,375 for Preschool. In a separate study for California, Karoly and Bigelow (2005) apply unit costs of $5,700 per child. However, because of variations in input availability, input costs, and inflation, these templates may have limited applicability to other states or other programs. Of more use may be a wider range of costing templates which prescribe the specific ingredients for different pre-K programs; states and cities can then apply those templates with individual budgeting. A very detailed budget template is provided by Barnett and Kelley (2002), but this has not been used in many cases.

Table 2 summarizes all the relevant cost and expenditure estimates for pre-K. Expenditures across state programs are readily available year-on-year (see NIEER, 2004; Magnuson et al., 2005; NCCIC, 2004). These show that the average expenditure on a state program is $3,470 (NIEER, 2004); taking the ten states with highest funding levels, pre-K expenditures average $5,476. In comparison, Head Start expenditures are approximately $7,100 per year, and per pupil expenditures in first grade are more, at $8,600 (NCES, 2004). The field trials vary significantly, both in total costs and average costs. Total costs are: $16,000 for the Perry High/Scope Program; $7,400 for the Chicago Program; and $36,000 for the Abecedarian program. Per year program costs range from $4,900 to $13,900, respectively (2002 dollars), although the cost estimate for the Perry Pre-School Program is based on educational provision from the 1960s. Economic models of pre-K typically assume that a year of pre-K costs between $4,500 and $6,500. ***For budgeting purposes, it may be appropriate to assume that one year of full-day pre-K can be provided for $6,000 per child.*** Clearly, in comparison with specific programs, Head Start, and public schooling, investment as part of state pre-K programs is relatively low. Such investment may be lower either because the duration of the program is shorter, or because the programs are lower quality. ***A key question for***

economic analysis is the extent to which state-level expenditures for pre-K are close to optimal for providing a high-quality program in different states and settings.

When considering costs, it is important to take account of the size of the program. Average costs are typically thought to be U-shaped with enrollments: up to a certain scale, average costs fall; then, as the program grows very large, average costs start to rise. Building new capacity for pre-K may require high fixed costs (Gill et al. (2002) report very high fixed costs for provision in Pennsylvania). However, ***there is limited information on what will happen – as program enrollment rises – to unit costs for a given quality of pre-K***. (The relationship between expenditures and enrollment numbers is not helpful, because quality is not constant). A review of research on school cost functions may be helpful in predicting how costs will change as programs expand (e.g., Andrews et al., 2002).

New research on the supply of provision is emerging (Levin and Schwartz, 2005). This indicates that the optimal pre-K provider is probably quite small, and that franchise operations may be hard to sustain. For example, even after ten years of operation, most of the pre-K providers in Georgia are very small and individually owned. No large enterprise has taken over the market (see also Helpburn and Bergmann, 2002; for a review on the available supply of providers within a state (Louisiana), see Etheridge et al., 2002). A lack of supply responsiveness is found more generally in California (PACE, 2002). This new evidence suggests that raising supply will require significantly extra resources.

Moreover, this costing analysis is complicated by the fact that there are already many pre-K programs in different settings. Expanding pre-K therefore requires resources to be added to existing programs so that these programs can either serve more children or be upgraded. There is very little information on how unit costs change as programs are upgraded. Marshall et al. (2002) report that upgraded provision costs approximately 27% more than current provision for Massachusetts; using data from Muenchow et al. (2005), the equivalent figure for California is 51% (but for upgrading from Head Start, it is 11%). The setting of a given program is also a factor: for example, the Abecedarian Program is one-sixth more expensive in a public school center than a child care development center (Masse and Barnett, 2002).

Finally, the family's perspective must be considered. Even where programs are offered with zero fees, not all families take up the option to enroll in pre-K. For some families, the costs and inconvenience of enrollment must outweigh the benefits. It is possible that there is an informational problem: families do not appreciate the benefits of pre-K. However, the more likely explanation is that pre-K is not convenient for many families or that even relatively small direct expenses (such as transportation) are too much. In 1996, Scrivner and Wolfe (2003, 10) estimated average parental payments at $3,726; this suggests that families are making sizeable contributions to the pre-K education of their children. ***Further research on the direct expenses incurred by families will help identify the demand for pre-K, and how that demand can be influenced***.

4. Fiscal Benefits of Pre-K

As itemized in Table 1, studies of small-scale, high-quality programs have identified a considerable array of benefits for the individual child and for society/economy. (For a theoretical treatment on why pre-K conveys such benefits, see Reynolds et al., 2002; Ramey and Ramey, 2004). The results of these evaluations are summarized in Table 3. They show the societal benefits to be more than sufficient to pay for the costs of providing early education; this provides motivation for public support for pre-K. A full review of the evidence derived from state-level evaluations of pre-K programs are given by Gilliam and Zigler (2000, 2004) and Loeb et al. (2004). However, Gilliam and Zigler (2004) report critically on the majority of state-level evaluations; the research designs for many of them are too weak to be considered as reliable indicators of the consequences of pre-K.

The conclusion that targeted pre-K programs reap benefits that exceed the costs is well-established and have been reviewed in many publications. However, the distribution of benefits is less well-known. As can be seen in Table 4, there are ***only 3-4 outcomes which appear to be economically important: future earnings gains, crime; and compensation for parents; and, to a lesser extent, school savings.*** Other benefits – such as health/smoking and neglect – may be important, but much less attention has been

paid to these. Moreover, these impacts have often only been considered in light of the public programs that are required to alleviate them. Yet, the costs to victims of abuse, for example, will be significant. ***Given these high victim costs, a societal appraisal of the impact of pre-K in lowering abuse/neglect (or child well-being in general) may be valuable.*** In contrast, although there may be benefits to future generations as a result of pre-K, these intergenerational benefits are very difficult to identify causally (Belfield, 2004).

As well as using experimental evidence, the distribution of benefits from pre-K can be derived from economic models of universal pre-K (Belfield, 2005c). Figure 1 shows that –across four different state systems – the main benefits from pre-K are reductions in crime and savings in school costs (for these models, parental time savings appear less important). The reductions in crime associated with pre-K must be emphasized if universal pre-K programs are to pay off under most scenarios, but the benefits of pre-K appear to be widespread.

4.1 School System Benefits

As with most educational research, the main focus of both state-level evaluations and independent empirical studies of pre-K has been on test scores and or standardized behavioral measures.

Gilliam and Zigler (2004) catalog the full list of developmental competence measures that have been used in state-level evaluations. Achievement gains are also found from recent studies using the ECLS dataset. On initial reading and math tests in kindergarten, children in center-based care report the highest scores in comparisons with pre-schooling care either by parents, by relatives, by non-relatives, or in mixed settings.[2] In their very broad specification, Fryer and Levitt (2004, Table A2) find the effects of center-based pre-schooling to be extremely large, even exceeding a one-standard deviation increase in socio-economic status (see also Portas, 2004). Magnuson et al. (2004) find pre-K attendance raises math and reading scores by 0.1 standard deviations at school entry; for children from low-income families, these academic gains persist through

[2] Children in Head Start do less well, but this is attributable to selection into Head Start provision by families with high levels of socio-economic disadvantage. Head Start offsets part of this disadvantage (see Currie, 2001).

into first grade; and pre-K attendees were also less likely to be held back. (Puzzlingly, they also find that self-control and externalizing behavior effects of pre-K in kindergarten are adverse). Studies of state-wide programs report academic achievement benefits. Participants in Oklahoma's universal program report strong academic gains (of 16%) in overall language and cognitive skills tests, with especially strong impacts for African American and Hispanic students (Gormley and Phillips, 2003; see also Gormley and Phillips, 2004). Similarly positive – but not as powerful – academic effects are found in evaluations of the universal pre-K provision in Georgia (Henry et al., 2003).[3]

For universal pre-K programs, there should also be peer effects on achievement. The evidence on peer effects is mixed. Henry and Rickman (2005) find strong peer effects on value-added achievement for the universal pre-K program in Georgia. In contrast, analysis by Reback and Nores (2005) using the ECLS finds weak peer effects. Although families do seek better quality schools even at a very early age, the impact on peer achievement from school sorting is modest and the achievement gap between children according to school quality is not large. (This result contrasts with the very strong peer effects found for higher grades, see Hanushek et al., 2003; Hoxby, 2002).

For economic analysis, attainment is often more important than achievement – it is better to have one extra year of school than have high test scores. Review of the literature indicates that pre-K participation will reduce the rate of high school drop-out by at least 24%; Temple et al. (2000) report that the Chicago Child–Parent Centers program reduces high school drop-out by 24%; for the High/Scope Perry Pre-School program, the reduction is almost exactly the same, at 25% (Belfield et al., 2004); for the Abecedarian EC Intervention, the reduction is even larger, at 32% (Masse and Barnett, 2002). A one-quarter fall in the dropout rate is therefore a proximate educational effect of a pre-K program.

At issue for economic analysis is the monetary consequence of any academic achievement/attainment gains or behavioral improvements. Clearly, the individuals

[3] Some evidence shows fade-out of achievement gains (Currie and Thomas, 1995; Lee and Loeb, 1995). In rebuttal, pre-K may set children on a different trajectory as 'skills beget skills' (Carneiro and Heckman, 2003). More emphatically, research does not show behavioral fade-out, particularly for attainment, earnings, and crime. This discrepancy could reflect measurement error in tests or more rapid progression of high-achieving students. The most plausible resolution is that pre-K benefits are not restricted to test scores gains.

themselves will benefit considerably. But, potentially, the impacts of pre-K may have a very strong impact on school climate and on the working conditions for those in schools. Plausibly, student behaviors influence how the school allocates resources. The causality is set out in Table 5.

These effects cannot be measured easily using evidence from field trials, but survey evidence shows that where the numbers of children who have attended pre-K rises, so does teacher job satisfaction. Concomitantly, teacher turnover and absenteeism are lower. The effects could be substantial but limited economic inquiry has been made into the resource consequences for schools from investing in pre-K and other school readiness programs.

Belfield (2005c) reports the distribution of fiscal cost-savings to the school system from applications in four economic models. These are shown in Figure 2. Savings in special education and grade retention are usually listed as important; however, although special educational savings are economically important, the ***savings from lower grade retention are trivial*** (even as the latter is consistently cited as a benefit from pre-K).[4] Clearly, ***further investigation into the effect of student behavior on school resource use is needed***. Such investigation is particularly important in light of: (a) the growing rate of placement of children in special education (Chambers et al., 2003; CSEF, 2004); (b) the rising unit costs of public school education; (c) the failure of other school reforms; and (d) the simple fact that an investment at the start of a child's schooling life has a longer period in which to pay off. Further use of NCES datasets may be worthwhile, although the ECLS has very weak information on school resource use (West et al., 2000).

[4] An in-depth study of the effect of pre-schooling on special education has been undertaken by Conyers et al. (2002), using data from the Chicago Child-Parent Centers program. The study shows that special education placement is lower for pre-school children as far as grade 8 (with no data collected beyond 8th grade). Importantly, Conyers et al. (2002) find the effect is broadly consistent across disability types (not all disability types could be identified in the research because of small samples). Except for emotional/behavioral disorders (where there is no difference), pre-school attendance is associated with special education placement rates which are lower by: 60% for mental retardation; 32% for speech/language impairment; 38% for specific learning disabilities.

4.2 Crime-Education Link

The economic case for investments in pre-K is much stronger if there are demonstrated impacts on criminal activity. Economic models which restrict the crime impacts only to those who do not graduate from high school still show strong benefits. There is a reasonably strong positive correlation between educational attainment and lower violent and property crime. However, attainment only explains a small proportion of the variance in crime and there is limited information on test scores and crime (Farrington, 2003). More important is the fact that crime imposes such a large social burden that a program which genuinely reduces crime by any margin could potentially pay for itself. The many separate costs of crime include: (i) victim costs (medical care, lost earnings, support programs, lost property, and quality of life losses); (ii) criminal justice system costs (probation, detention, treatment, trial/sentencing, incarceration); (iii) costs of lost productivity of criminals (not working); and (iv) external costs (victim avoidance, insurance). Ideally, each of these crime costs for each type of crime should be calculated, in relation to investments in pre-K.[5]

However, data on crime costs are extremely weak; the sources are few, old (early 1990s), and in some cases use methods that may be biased; there is also no consistency in the economic consequences of, for example, assault (see Miller et al., 1996, 2003). The crime type which has the strongest impact in relation to investing in children is juvenile crime. Because it occurs soonest after the investment, its present value is highest; because it conveys such a strongly negative signal in the labor market, juvenile crime has persistent effects on adult economic well-being. A related phenomenon is school safety – damage to school property, bullying, and physical assaults on teachers. ***An important contribution to the economics of pre-K would be a thorough investigation – using new datasets and methods – into the economic consequences of reduced juvenile crime and***

[5] Barnett et al. (2004) find that the lifetime cost-savings to the criminal justice system per participant in the High/Scope Perry Pre-School program are $47,000. Lochner and Moretti's (2004) analysis using the Census and NLSY finds very strong impacts: each additional male graduate yields annual social benefits of $1,170-$2,100 in reduced criminal activity. Using data from the Chicago Child–Parent Center program, Reynolds et al. (2002) report average present value criminal justice system savings of $6,000 per participant. Belfield (2005ab) uses the average gains from crime impacts in Barnett et al. (2004), Lochner and Moretti (2004), and Reynolds et al. (2002). Karoly and Bigelow (2005) use only the gains reported by Reynolds et al. (2002).

improved safety in schools. Within crimes, perhaps the most important type of crime is drug usage. As shown below, drug usage rates are considerably lower for those who have participated in pre-K. Both the Perry Program and the Abecedarian ECI show drug use rates that are at least 10 percentage points lower for participants over the control group. In addition, high proportions of convicts are charged with drug crimes (Levitt, 2004). Therefore, impacts on drug-related crimes could reap considerable economic savings.

4.3 Tax Revenues

Tax revenues to the state will be affected in two ways from expanded participation in pre-K programs: they free up parents to enter the labor market; and they increase earnings and labor market activity in adulthood. Both effects should raise tax revenues.

Earnings gains for parents can be calculated based on the duration of the program and the increased labor market attachment of family members. Research evidence on labor supply elasticities is well-established such that the impact on labor force participation can be calculated. However, it is less clear how many families do benefit from the extra time that pre-K conveys: many families may already use day care or child care services; and if pre-K programs are not full-year or full-day, their usefulness will be limited (this is what Chang et al. (2005) find for some Head Start eligible families).

The gains to participants in terms of earnings are well-established: pre-K enrollment is positively associated with attainment, which is strongly associated with earnings. As noted above, pre-K participation reduces the rate of high school drop-out by at least 24%; wage gains and income taxes can be calculated accordingly using Census data. These calibrations are relatively straightforward using the CPS (as calculated by Toikka and Neveu, 2004).[6] In fact, the link between education and earnings has been tested extensively. Using Census (2000, PINC-04) data on lifetime earnings, ***a high school completer will earn approximately $92,000–$127,000 more in present value dollars over the lifetime compared to a high school drop-out. This might be considered as a benchmark figure for the extent of the private gains from high school graduation***.

[6] This average wage premium is discounted at 5%, with zero earnings growth, including an offset for college costs; it varies little according to the numbers of high school graduates who then progress to college.

(General equilibrium effects are assumed to be small because only a small proportion of the flow is being affected). Importantly, recent evidence shows that the ***returns to additional education in the former of higher wages may actually be increasing***.

4.4 Health and Welfare Cost-Savings

The final cost items are related to expenditures on child (and adult) health and general well-being. Pre-K affects general behavior and the prevalence of risk factors associated with problem conditions (McCarton et al., 1997; Johnson and Walker, 1991); there are also health gains associated with screening, immunization, and nutrition. A review by the Center for Disease Control and Prevention (CDCP, 2002) reported effect size impacts for social risks after pre-schooling was -0.41; the gain in health screening rates was 44% (see Smokowski et al., 2004). These impacts in turn influence the child's reliance on health support services and welfare programs. Table 6 reports on the salient effects on child who participated in pre-K. In all areas of health, pre-K participants report improved health over the control group. Equally importantly, pre-K appears to effect family formation (in terms of abortions and rates of teen-parenting)

However, ***the economic consequences of these impacts on health and well-being have not been incorporated into the evaluations***. Review yields one estimate of the cost-savings from reduced abuse/neglect of children; per child, the cost-savings in this domain have been estimated at $338 (Reynolds et al., 2000). No economic evidence on health support services is available. The effect of pre-K on drug usage and so on drugs-related public policies has not been addressed (CASA (2001) estimates that drugs-related expenditures are 10% of school budgets). Similarly, the consequences for child welfare have not been included (CCB, 2003). Other important outcomes of pre-K might include teenage parenting, smoking, and foster care.

The economic importance of investments in child health and welfare is beginning to be appreciated. Across the states, welfare programs are extensive, including services in relation to: prevention, for children at risk of abuse and neglect; family preservation and reunification; child protection; in-home and out-of-home support; out-of-home placements; and adoption. From a national survey, Geen et al. (1999) report that

spending on these child welfare programs at federal, state, and local levels is $17.4 billion per year. The potential for savings is therefore substantial.

However, states vary in how they report health and welfare programs. States are now collecting information as part of a 'Children's Budget' (e.g. Ohio, Louisiana). These list the public investments that are being made by the state on children within that state. For example, in ensuring children are ready for school, Ohio invests $2.48 million; for at-risk children to succeed in school, it invests $51.3 million (on, e.g., mental health programs). More important are the commitments of: $154.7 million for Services for Severely Emotionally Disturbed and At-Risk Children; $33.5 million for Child Protection Services; and the $640 million for Child Foster Care and Adoptions. Similarly, for its 'Youth Choose Healthy Behaviors' program, the state invests $41.7 million. A reduction in this commitment by only small proportion would save a substantial amount. These expenditures are likely to become even more important if family circumstances are deteriorating, as is suggested in analyses by Heckman and Masterov (2004).

The economic consequence of pre-K on the Children's Budget for each state merits further investigation. The growth of these budgets indicates: (i) these services are needed for children; (ii) redistribution of resource rather than new funding could be obtained if pre-K ameliorates the need for these investments; and (iii) interagency coordination of services could be established via the single budget accounting framework. As with other benefits, it is necessary to itemize the full set of health and well-being consequences from pre-K and to cost these out from the perspective of the state and the individual. The new data makes this task easier (although few evaluations include information on the requisite array of health and well-being measures).

Adult welfare expenditures are also listed as a benefit from pre-K. However, ***adult welfare reliance is unlikely to be important: welfare differences are not found to be substantial across pre-K children and control groups; and welfare payments are not large sums when discounted***. Welfare differences are not found in most programs, with the exception of the Perry Pre-School Program (and its positive welfare effects in the age-27 follow-up are not reproduced with the age-40 follow-up).

4.5 Macroeconomic Models of Pre-K

Macroeconomic models of pre-K are also possible. Lynch's (2004) is the most recent example, along with other studies that have attempted to measure the total stock of human capital in the economy. However, these macroeconomic models rely on microfoundations: that is, the effect on the total labor market is the sum of the effects on each individual who participates in pre-K. Therefore, any aggregate estimate of the macroeconomic consequences of pre-K is simply a generalization of the individual benefits. ***It is therefore simpler and more direct to report the individual effects of pre-K programs***. (At least if one is assuming that there are no general equilibrium effects; this assumption is plausible if pre-K is only affecting the flow of human capital rather than its stock). Also, macroeconomic analyses may be useful for federal decisions about support for pre-K, but most of the funding for education comes from the state/local level.

4.6 Economic Impact Studies

Economic impact studies report on the size of the pre-K industry. Calman and Tarr-Whelan (2005, Appendix I) catalog these studies across the US; the most complete examples of economic impact studies are by Traill and Wohl (2004) for Massachusetts, Stoney et al. (2004) for Kansas, and Nagle and Terrell (2005) for Louisiana. In each study, the pre-K or child care industry is seen to be a significant employer, contributing to state income and employment. In most cases, the industry ranks highly relative to other industries or services within a given economy. However, many of these studies are unpublished and have not therefore been peer-reviewed. Importantly, ***economic impact studies cannot easily be applied to make the case for public investments in pre-K***. Thus, although they may have appeal for the political constituency representing the workers in that industry, they might have limited appeal to the general public.

5. General Issues in Economic Analysis

At a most basic level, further research on pre-K should focus either on improving costing models or on more precisely identifying benefits. (Some of these benefits are relatively

novel, such as school system benefits, others have already been identified but only imperfectly measured). Concomitantly, the ***research should more accurately consider who pays for and who gains from pre-K***. This will establish a more direct link between the research evidence and the politics of pre-K. Thus, costing models should explicitly relate to the educational systems that operate within each state. Benefits should relate to the affected groups: cost-savings to the school system should be considered from the perspective of education professionals; parents should be made aware of the potential familial advantages to them of pre-K; welfare agencies should be mindful of the impacts on child well-being from pre-K enrollment.

This Section, however, includes discussion of issues in relation to pre-K that do not easily fit within the cost-benefit framework.

5.1 Financing and Funding Mechanisms for Pre-K

A range of financing options could be considered for pre-K. Wolfe and Scrivner (2003) itemize the funding types that may be considered for pre-K, as well as the funding sources for federal, state, and local. The main distinction here is between foundation programs, where states allocate a base amount of per-student funding to districts based on state and local contributions, and categorical programs, where funding is for a specific service. The relative merit of tax credits versus provider subsidies versus vouchers has been considered. However, given the popularity of vouchers as an idea for funding education, a specific study which looks at a voucher system should be considered. Education tax credits for corporations have also proved to be popular in some states (e.g Florida). Under those policies, companies can claim a tax credit for any amount of investment in education. As well as the funding mechanisms, more attention should be paid to the burden of financing in relation to tax systems (see Gale and Kotlikoff, 2004, for one approach).

Economic studies which look at the incentives within the funding mechanisms may be useful. Incentives built into each funding formula will influence the types of pre-school provision available (ECS, 2004). For kindergarten, a number of states have a disincentive to provide full-day programs because: no extra funding is available for full-

day over part-day; and kindergarten funding is lower than first grade funding. A similar incentive structure may be identified for pre-K programs.

5.2 Identifying Programs that Pay-Off

Unambiguously, "pre-K" generates a positive return to society. However, it is not clear which particular types of pre-K offer the best investment. An important next step is therefore to investigate and compare the types of pre-K. Gilliam and Zigler (2004, 38) rightly conclude that ***"evaluations almost never attempt to address fundamental questions regarding what types of pre-kindergarten services work best and under what conditions of implementation"***. At least, it should be possible to adjudicate: (a) between full-day and half-day programs; (b) between Head Start and center-based programs; (c) between well-resourced and poorly-resourced programs; and (d) between one-year and multi-year programs. From this list it might then be possible to adjudicate between specific, named programs and between the quality of new providers – should pre-K programs expand – versus existing providers.[7]

New research is making some advance here. DeCicca (2005) finds that full-day kindergarten generates academic advantages over half-day programs in the first few years, but these advantages fade out after a few year. Thus, although longer programs are better, they may be less efficient from the public perspective. Currie and Neidell (2005) compare Head Start programs with different amounts of funding; they too find that more resources translate into better academic outcomes, but they do not establish whether these extra resources are worth it. Other distinctions ((b) and (d)) also need to be investigated, along with the more detailed set of adjudications. Even this research would leave unknown the extent to which successful programs could be implemented to the same effect in different settings; and whether it is feasible to operate a licensing or accreditation system that maintains quality control over time.

[7] International comparisons of pre-K investments may be useful for making the case that the U.S. under-invests in pre-K, but they are likely to be less relevant for identifying the programs that will pay off (Witte and Trowbridge, 2004).

5.3 Targeted versus Universal Programs

The debate over targeted versus universal programs is just an extension of the previous discussion – pre-K pays off, but for exactly what proportion of children? Is it better to invest resources in pre-K for all children, or heavily invest in programs for at-risk children?

Leaving aside the equity of different investments across children, there are efficiency issues. These relate to whether the high yields from targeted programs would be obtained from universal programs.

In fact, there is some evidence that evidence from targeted programs is reasonably pertinent for universal programs. First, participants in state-wide programs in Oklahoma and Georgia report academic gains. Second, targeted programs are aimed at those at-risk of high school dropout or in low-income families. Presently, 10.7% of all persons aged 16-24 are high school dropouts (for African Americans, the rate is 10.9%; for Hispanics, it is 27.0%). On-time completion rates are even lower: using the federal Cumulative Proportion Index, public schools graduate less than three-quarters of all students on-time (Swanson, 2004). Third, some benefits of pre-K arise only with large-scale programs (peer effects). Fourth, when considering what options currently exist, it may also be assumed that pre-K will be beneficial.[8] Finally, targeted programs will require additional resources for screening children, determining who is eligible, and monitoring eligibility. Universal systems may therefore operate at lower unit cost.

Overall, the most salient conclusion emerging from the debate over targeted versus universal programs is that: ***it is not just at-risk children who might benefit from pre-K, even as the extent of the benefits to children from all socio-economic strata is not precisely known.*** For economic analysis, however, the benefits of pre-K are such that even if there is no public gain from pre-K for children in families above median income, a universal program would still pay for itself (Belfield, 2004a, 2005ab).

[8] Current child care options may be improved considerably. As noted by Ramey and Ramey (2004), many programs: do not include pre-service training for teachers; are not very intensive; are remedial rather than preventive; and are aimed at supporting families as much as children.

5.4 Caveats and Counters to Investing in Pre-K

It is also worth considering the caveats or counters to the overall positive conclusion about pre-K.

The most obvious counter is that ***there may be better investment alternatives***. If most of the benefits of pre-K are mediated through lower rates of high school drop-out, then why not address drop-out directly with programs for youth that will take effect within 2-3 years? If most of the state benefits are mediated through crime, then why not improve policing systems such that acts of crime are less likely? Based on current evidence, a plausible answer to both of these questions is that there is no proven alternative program that has such beneficial effects (on dropouts, see Rumberger, 2004).

Aos et al. (2004) have undertaken a series of cost-benefit analyses for many government programs from the perspective of the state of Washington. They find that although pre-K ranks highly, it has a lower return than some other programs. However, ***the quality of the evidence for pre-K is a lot higher than the quality of the evidence for many of the other programs evaluated*** by Aos et al. (2004). First, the pre-K programs have high-quality costs data – for many of the comparators, Aos et al. (2004) use program prices (not costs). Second, pre-K programs generate an array of benefits that other programs do not appear to generate. Of course, the justification for investing in pre-K is that it yields a high return relative to other educational options that are actually being considered. Thus, it is not essential to establish that pre-K is the best investment, only that it is better than other options proposed for the school system. One area of inquiry would be a ***direct comparison between educational policies that may actually be implemented – such as increased pay for teachers, reduced class size***, and school choice programs.[9]

Next, there is a concern that – even though they are discounted – the benefits occur too far in the distance to be realistically incorporated into a public policy decision.

[9] The new research in pre-K has also contributed to the methodology of economic evaluations. As the literature develops, so do the methodological standards. An ideal economic model should therefore: (i) be transparent in calculations as to the full costs and benefits; (ii) relate directly to program design and resource usage; (iii) distinguish between gains to government levels and agencies; and (iv) use microeconomic rather than aggregate data on the public benefits of pre-K. These are standards that are not applied to other investments, such as reductions in class size, which typically focus exclusively on test score gains.

Fundamentally, ***pre-K is too risky because it is too long term***. Using economic indices such as the payback period, i.e. the length of time it takes for the program to pay for itself, may help here.

An important concern is that of resource redistribution between government agencies or programs. ***The returns to pre-K depend in large part on cost savings*** from reduced pressure on programs, e.g. special education. However, it is necessary for budget allocations for special education to fall, if the need for services falls. This may not happen: government funds are allocated in part using historical formulas; and government agencies may be very reluctant to accept reduce budgets regardless of need. Of course, such inertia applies to many investments, but it is particularly salient for an investment which is reliant on cost-savings.

A final concern is that pre-K yields benefits to many separate government levels (federal versus state/local) and agencies (Department of Education versus Criminal Justice System versus Child Welfare). As each level and each agency benefits, then they should contribute to the financing of pre-K in accordance with the size of the benefits. However, this coordination may be inoperable. The danger then is that, even as pre-K is a strong investment, it is not sufficiently worthwhile for the education system to allocate enough funds. Given the distribution of benefits, this is a real danger. It suggests that ***economic research should consider the returns to each government level and agency independently***. (Some states have circumvented this problem by coordinating child care and education into a single agency, e.g. Massachusetts, or by policies encouraging inter-agency collaboration, e.g. Louisiana ECCS).

6. Conclusion

In no small measure, the economic analysis of pre-K is considerably ahead of economic analysis of many other educational reform options. Thus, ***many of the recommendations highlighted above would set a standard for evaluation of pre-K that few other reforms could readily meet***. However, having set this evaluative standard – is pre-K a good investment? – then it is imperative to address these issues.

Although research on pre-K has grown, there still remain many unanswered questions. Some of these can be answered, because descriptive data is increasingly becoming available (e.g. the NIEER yearbooks, NCCIC, preknow.org), to complement the high-quality data from the ECLS. That said, there is an ***absence of high-quality research evaluating state programs***; this is an important area where more could be done, as more states address whether to expand these pre-K programs, rather than create new programs.

Finally, a theme running through the above discussion is that ***economic and demographic changes are likely to reinforce the need for investments in pre-K and other early childhood programs***: the costs of schooling and criminal justice systems have been rising faster than the rate of inflation over the last two decades; and an ageing population both puts additional pressure on government resources and reduces the labor force participation rate.

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Table 1 Template Balance Sheet for Pre-K Programs

Investment Costs (C)	**Benefits/Cost-savings (B)**
Well-resourced, good quality pre-K for a reasonable period of time Cost ingredients: ▪ Well-qualified teachers ▪ Administrators ▪ Educational materials ▪ Facilities for learning Examples include: ▪ Head Start ▪ High/Scope Perry Pre-School Program ▪ Infant Health/Development Project ▪ Abecedarian Early Childhood Intervention ▪ Chicago Child-Parent Center and Expansion Program	**<u>For child/individual:</u>** *Short-term:* ‣ Enhanced academic achievement ‣ Improved health/nutrition ‣ Increased well-being / less abuse *Long-term:* ‣ Higher likelihood of graduation/ college enrollment ‣ Higher wages/employment probability ‣ Lower teen-pregnancy/delinquency **<u>For society/economy:</u>** *Short-term:* ‣ Income tax revenues from parents' released time *Medium-term:* ‣ Greater school system efficiency: – Reduction in special education – Reduction of grade repetition – Higher student learning productivity – Reduced pressure on school resources ‣ Reduction in abuse/neglect ‣ Lower reliance on public healthcare *Long-term:* ‣ Increased income tax revenues ‣ Lower welfare dependence ‣ Reductions in delinquency/crime ‣ (Higher educational subsidies)

Sources: Currie and Thomas (1995); Johnson and Walker (1991); Karoly et al. (1998); McCarton et al. (1997); Montes et al (2003); Ramey and Ramey (2004); Reynolds et al. (2001, 2002, 2003, 2004); Schweinhart (1993); Campbell and Ramey (1994; 1995).

Table 2 Unit Costs/Expenditures of Pre-K Programs

Source	Annual Unit/Per Child Cost/Expenditures
Pre-K Expenditures:	
All states with pre-K	$3,470
2 states with universal pre-K (GA, OK)	$3,096
10 highest funded states with pre-K	$5,476
Comparable Expenditures:	
Head Start	$7,100
First grade expenditures in public schools	$8,600
Program Costs:	
Abecedarian Early Childhood Intervention	$13,900
High/Scope Perry Pre-School Program	$9,800
Chicago Child-Parent Pre-School Center Program	$4,900
Economic models (range) [a]	$4,500-$6,500

[a] Belfield (2004, 2005ab); Karoly and Bigelow (2005); Muenchow et al. (2004).

Table 3 Cost-Benefit Analyses of Pre-School Programs

Programs	Cost-Benefit Results for State/Society
High/Scope Perry Pre-School Program	Every $1 investment returns as much as $17 (Belfield et al., 2004)
Abecedarian Early Childhood Intervention	Every $1 investment returns $2–$3.66 (Masse and Barnett, 2002)
Chicago Child-Parent Pre-School Center and Expansion Program	Every $1 investment returns $7.14 (Reynolds et al., 2001)
Head Start	Short- and medium-term benefits offset 40-60% of the total costs (Currie, 2001)

Table 4 Distribution of Benefits from Pre-School Programs

Source of Benefit:	High/Scope Perry Pre-School Program	Chicago Child-Parent Center Program	Abecedarian Early Childhood Intervention
Crime	65%	28%	0%
Earnings	28%	58%	23%
Child care	1%	3%	11%
K-12 schooling	6%	10%	5%
Maternal compensation	Na	Na	45%
Parental time savings	Na	Na	6%
Health smoking	Na	Na	11%
Abuse / neglect	Na	1%	0%
College progression	-1%	-1%	-5%
Welfare	0%	1%	0%
Future generation	Na	Na	4%

Table 5 Increased Learning Productivity and Cost-Savings from Universal Pre-K

Positive Impact of Pre-K		Cost-savings for the School
In the classroom		
Individual student impacts:		
Academic proficiency	➔	*More efficient teachers/instructors* (less down-time/remediation, more instruction)
Classroom contributions		
Responsiveness to instructions		*More satisfied teachers*
Peer impacts:	➔	(more control over classroom conditions)
Peer-learning interactions		*More efficient use of curriculum materials*
Peer norms/values toward study		(care of books, equipment, learning instruments)
In the school		
		Slower depreciation of physical capacity
	➔	(less vandalism, wear and tear)
Behavior in school		*Lower maintenance expenditures* (policing/custodial/supervisory tasks)
		More efficient administration system
Attendance rates	➔	(fewer truancy/absenteeism investigations)
		More efficient school management (less time arbitrating disputes)
Well-being / safety in school	➔	*More efficient student counseling systems* (less time on student welfare issues)

Table 6 Behavioral Impacts from Pre-K

Source of Benefit:	Pre-K Program (%)	Control Group (%)
Teenage parent [a]	26	38
Teenage parent [b]	26	45
Teenage parent [c]	20	27
Single parent [b]	25	39
Abortion [a]	16	38
Health stops work [a]	43	55
Health problem [a]	20	29
Smoker [a]	42	55
Soft drug use [a]	45	54
Hard drug use [a]	22	29
Needed treatment (drugs/drinking) [a]	22	34
Drug-user [b]	18	39

Notes: [a] Perry Pre-School Program; Parent; [b] Abecedarian ECI; [c] Chicago CPC.

Figure 1 Distribution of Benefits Across Universal Pre-K in Four States

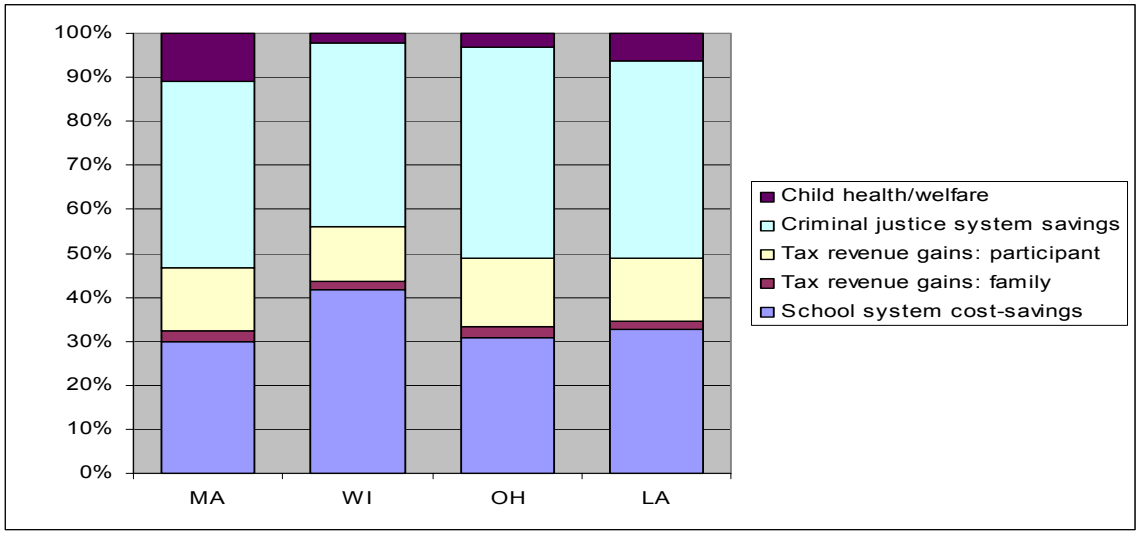

Figure 2 Cost-Savings to the Education System from Universal Pre-K