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The Fiscal Effects of Investing in High-Quality Preschool Programs

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Summary

Randomized treatment-control experiments suggest large returns to investments in pre-kindergarten education. Several studies consider the social benefits of such investments, but none have considered the full potential gains to government budgets. We embed estimates of the effects of two model programs in a growth model of the U.S. economy to judge the impact they would have on federal, state and local government budgets. Assuming a 3 percent discount rate we find that both programs would pay back in reduced costs and increased revenues in excess of three-fourths of their costs within a seventy-five year budget window. Both programs would eventually reap a positive return for government budgets if policymakers were sufficiently patient.

Investing in Children

Children living in families with low incomes and those with poorly educated parents are much more likely than other children to grow up to be adults with less education, lower incomes, poorer health, and shorter lives. There have been many attempts to break this cycle of poverty by enriching the environment in which disadvantaged children grow up and to better prepare them to enter school. In order to decide if these programs actually deliver the results they are aiming for, random assignment experimental evaluations with long time horizons must be conducted. Unfortunately, relatively few of these “gold standard” evaluations have been carried out. However, some programs — notably Perry Preschool and the Abecedarian Project — have been shown to have positive effects on later life outcomes in such studies.

Other studies have shown that the social benefits of these programs can substantially outweigh the social costs suggesting that they could be excellent social investments. Most of the benefits of these programs accrue to the participants, mainly in the form of higher income, which is due in large part to their obtaining more education. On the other hand, most of the costs fall on taxpayers when pre-kindergarten programs are implemented as public programs. Taxpayers, however, also reap some of the benefits. If program participants earn higher incomes, they will pay more taxes and be less likely to rely on government transfers. If they are less likely to require special education or to repeat grades, they will cost less to educate. This study attempts to calculate the fraction of the total costs to taxpayers that would likely be recovered if large scale versions of two early childhood programs were to be instituted. We use a simulation model of the U.S. economy to estimate the net effects of investing in pre-kindergarten programs on government budgets.

Ideally, governments would undertake all projects for which net social benefits are positive. However, if a program which has been shown to have positive net social benefits also pays for a large fraction of its own costs with revenue increases and savings, it then becomes more attractive than other programs that produce the same level of benefits but without the fiscal dividend. More such programs could be undertaken within a limited budget. Thus, we believe that the estimates we provide here are a useful supplement to the more traditional benefit-cost analysis of these programs.

How the Model Works

To evaluate the fiscal effects of pre-kindergarten programs we implemented a standard growth model of the U.S. economy. The model was extended by adding a very elaborate model of the effects of education on a number of outcomes by age cohort. A complete description of the model can be found in Dickens and Baschnagel (2008). Here we briefly review how investing in pre-kindergarten programs would affect the economy and government budgets. Figure 1 is a flow diagram of the effects.

their children to get more years of schooling (effect 18), which feeds back into output, as described above. The third form of economic feedback comes through the tax system. We assume that as the program begins to increase GDP, income tax revenues increase (effect 19). This allows the government to cut income taxes (effect 20), which increases labor supply (effect 21), which increases GDP (effect 22). This effect can more than offset the initial negative impact of program costs on GDP.

There are numerous other routes by which we allow our two pre-kindergarten programs to impact government budgets (such as reductions in welfare expenditures and criminal justice system costs). The net fiscal impacts of the pre-kindergarten program are calculated as the total of the potential increases in revenue (if tax rates were held constant at initial levels), minus the costs of the program plus cost savings. As GDP increases, federal, state and local tax revenues are assumed to increase in proportion to their ratio to GDP if tax rates were held constant. This is the primary source of net revenue gains, but there are also several costs that are avoided due to having had more children in pre-kindergarten programs. With more graduates, fewer children will need special education or be retained in grade. If fewer students are held back, fewer resources are used to produce the same number of students with any ultimate level of achievement. Our estimates distinguish between effects on the federal government budget and the total effect on all levels of government.

We examine two programs for which long-term, randomized treatment-control experimental evaluations have shown notable, statistically significant effects on ultimate educational attainment. These programs are the Abecedarian Project and the Perry Preschool Program.

The Abecedarian Program

The Abecedarian program was a randomized treatment-control study of the benefits of early childhood education for poor children. Four cohorts of children, born between 1972 and 1977, took part in the project. Participants received full-time, high-quality educational childcare from infancy through age 5 with considerable individual attention. Educational activities consisted of "games" incorporated into the child's day. Activities focused on social, emotional, and cognitive areas of development but gave particular emphasis to language. Children's progress was monitored over time with follow-up studies conducted at ages 12, 15, and 21. Years of education completed was one of the outcomes assessed at age 21 and the primary input to our simulations. Impacts on special education placement and grade completion were also monitored and are taken into account in our simulations.

At age 21, members of the Abecedarian treatment group were found to have levels of educational attainment 0.6 years greater than members of the control group. Although we model many different impacts from Abecedarian, it is this increase in education, and its subsequent effects on the earnings and behavior of participants, that causes most of the fiscal effects. Abecedarian was specifically targeted at children at risk for developmental disadvantage so the program we simulate targets disadvantaged children. 20 percent of children under the age of 6 currently live in families with incomes below the poverty line. These are the children we assume a national program would target.

In addition to the fiscal benefits, we must also calculate the costs to the government of the program. Using data on the costs of the program at the time of the experimental treatment, and updating them based on increases in teachers' salaries and other costs, we calculate that the annual per-pupil cost for a participant in an Abecedarian-style preschool program would be \$17,478 in 2007 dollars. For both of our simulated programs, we assume that the federal government pays the entire cost of the program.

The Perry Preschool Program

The Perry Preschool program operated in Ypsilanti, Michigan in the 1960s. It provided low-income, at-risk, 3 and 4 year-old children with center-based care, two-and-a-half hours per day, five days per week, for thirty weeks each year. The center-based care was supplemented on a weekly basis with one-and-a-half hour home visits by the child's instructor. The Perry program was characterized by a high degree of instructor quality, as well as remarkably low student-teacher ratios. The children in both the "program" and "no-program" groups have been monitored on a periodic basis until the present day, with study participants most recently surveyed at the age of 40. At age 27, members of the program group were found to have levels of educational attainment 0.8 years greater than members of the no-program group. We use this finding as the primary input for our budget simulation. Although Perry was targeted at low socio-economic status (SES) children, we use it here as the model for a universal high-quality pre-kindergarten program. The Perry High/Scope program is suggested by the High/Scope project as a basis for universal programs and its methods may be more appropriate in that setting than those used in Abecedarian.

Projecting the effects of implementing a small-scale program like Perry on a national level raises a host of complicated issues. First, a universal pre-kindergarten program, if it is not compulsory, will not serve 100 percent of eligible children. Second, many of the children served by this new policy are already enrolled in existing pre-kindergarten programs, while most of the children in the no-program group evaluated in the Perry study did not receive any early childhood education. Third, most children served by a universal pre-kindergarten program will not be disadvantaged in the way the children enrolled in the Perry experiment were. It is not clear that students with higher SES will experience comparable gains. Fourth, children today – particularly disadvantaged children – may face different problems from the problems faced by children growing up in the 1960s when the experiment began. Finally, pre-kindergarten administrators may experience considerable difficulty in maintaining an equally high level of program quality in a program enrolling millions, rather than dozens, of children. Recruiting large numbers of highly qualified and highly motivated workers could prove daunting.

In order to address the first two concerns, we use data on the number of children already in various forms of day care and reduce the assumed impact of the program for those currently in public or private day care to account for take-up rates of less than 100 percent and the fact that for many students the new program will just replace existing programs. The reduction also partially addresses our third concern – the possibility of differential program effects on children from households with different levels of SES. Further while we generally assume that the magnitudes of effects before reduction are the same as those found for Perry participants, we assume that the effects are proportional – if Perry students experience a 30 percent reduction in special education, then anyone going from no pre-kindergarten to our high-quality universal program would experience a 30 percent decline in the likelihood of being assigned to special education. Since moderate and high SES students have a lower rate of assignment to special education, the percentage point reduction in the number of students assigned to special education will be lower for higher SES students.

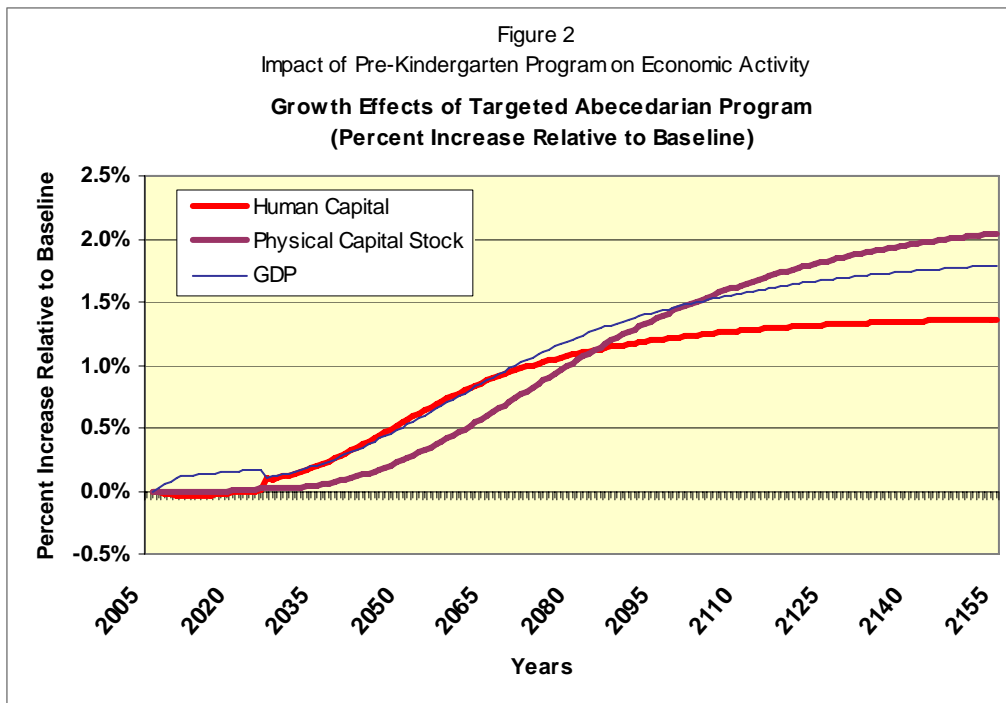
In order to estimate the cost of a Perry-style universal pre-kindergarten program, we take the per-pupil annual cost breakdown from the original Perry Preschool Program conducted in the early 1960's and update it with information on increases in teacher's salaries and other costs. We arrive at a figure of \$12,787 in 2007 dollars.

Impacts on Government Budgets

To estimate the potential impact of an early childhood development program on economic growth, we first simulate a baseline projection of economic growth in the absence of our intervention. For this purpose, we adopt the Congressional Budgets Office's (CBO) 2006 assumptions about future productivity growth. Our model is calibrated to produce growth at the rate forecast by the CBO in the absence of any program. The results with the hypothetical program in place can then be

compared to that baseline. We focus much of our analysis on the seventy-five year budget window used by the Social Security Administration for long-term planning. Below we discuss the impact of each program on two types of outcomes – impacts on economic growth and those on government budgets.

Figure 2 shows the impact of a targeted program modeled on Abecedarian on economic growth. Initially, there is a tendency for GDP to increase relative to the baseline due to the entry of some parents into the labor force who would otherwise care for their children themselves at home. This effect more than offsets the negative impact of the program on labor supply that results from the increased taxes necessary to pay for the program’s costs. The result is an initial small positive impact on GDP.



Years later, when the first participants would have entered the labor force, there is a decline in GDP of 0.08 percent relative to the baseline as the program alumni extend their educational careers and are thus not available to work and produce. This effect is largest in the first year it is present. Despite this decline, output remains slightly above baseline since the direct and indirect effects of increased parental labor supply outweigh the lost labor supply from the participants remaining in school longer. After this initial decline, GDP grows continually reaching a level 1.2 percent above baseline seventy-five years after the start of the program. The inputs to the production process follow a similar profile. All are notably above their baseline levels seventy-five years after the program’s inception. The stock of physical capital is 1 percent larger, the stock of human capital per worker is 1.1 percent larger, and the labor supply 0.5 percent larger.

Effects for a universal program are much larger as one would expect, though they follow a similar pattern. Since the program is only part-day, the effects on parents’ labor supply are proportionately smaller than for the full day targeted program. Thus the effect of the program on GDP remains negative for ten years after the initial decline and then becomes positive and grows continually reaching 4.4 percent after seventy-five years. At that point the physical capital stock is 3.5 percent larger and the stock of human capital 4.2 percent larger.

Increased growth means increased government revenues. The effects of both programs on government budgets are summarized in Table 1. Going from our baseline simulation to our simulation with a targeted Abecedarian-type program, federal revenues would increase by \$150 billion in 2007 dollars seventy-five years after the program’s inception were it not for the tax rate decreases the program allows (all the calculations presented here describe budget effects before the tax rate is adjusted to achieve a balanced budget program effect). Costs to the federal

government net of savings at that point are \$199 billion. Total government revenue is potentially \$295 billion larger seventy-five years after the program's inception at which time total costs minus savings are \$136 billion. The increase in total government revenue overtakes net costs forty-four years after the start of the program.

Table 1
Impact of Preschool Program on Federal Budget and Total for All Levels of Government (Millions of 2007 dollars)

Years into the program	Change in Revenues		Program Savings Net of Costs		Change in Budget Surplus		Change in Present Value of Cumulative Surplus (3 percent discount rate)	
	(Federal)	(All levels)	(Federal)	(All levels)	(Federal)	(All levels)	(Federal)	(All Levels)
Targeted Abecedarian								
25	\$5,262	\$10,369	(\$52,396)	(\$33,047)	(\$47,134)	(\$22,815)	(\$600,005)	(\$314,130)
50	\$41,955	\$82,685	(\$99,603)	(\$62,992)	(\$57,648)	\$18,028	(\$1,053,624)	(\$395,337)
75	\$149,873	\$295,368	(\$198,828)	(\$136,494)	(\$48,955)	\$155,094	(\$1,277,002)	(\$99,011)
150	\$1,550,469	\$3,055,642	(\$1,494,485)	(\$1,123,594)	\$55,985	\$1,925,852	(\$1,371,018)	\$1,597,519
Universal Perry								
25	(\$1,965)	(\$3,873)	(\$119,664)	(\$106,113)	(\$121,629)	(\$110,834)	(\$1,618,561)	(\$1,487,417)
50	\$129,390	\$254,999	(\$241,372)	(\$231,184)	(\$111,983)	\$17,801	(\$2,723,079)	(\$2,167,438)
75	\$539,114	\$1,062,478	(\$475,910)	(\$484,962)	\$63,204	\$563,309	(\$2,910,142)	(\$1,229,427)
150	\$6,009,857	\$11,844,135	(\$3,463,181)	(\$3,691,883)	\$2,546,676	\$8,127,406	(\$1,056,296)	\$5,663,126

The universal program produces much larger revenue impacts, but also has much larger costs. Federal revenues would increase by \$539 billion in 2007 dollars seventy-five years after the program's inception were it not for the tax rate decreases the program allows. Costs to the federal government net of savings at that point are \$476 billion. The program begins to pay 100 percent of its costs at the federal level sixty-eight years after inception. Total government revenue is potentially \$1.06 trillion larger seventy-five years after the programs inception at which time total costs minus savings are \$476 billion. The increase in total government revenue overtakes net costs forty-nine years after the start of the program.

Paying for the Program

Since program costs are high in the early years and revenue gains and savings become large only in the later years, it is reasonable to ask what the long-run impact would be on the budget if the program were deficit financed. Would the increased revenue and the savings in the later years be enough to pay off a substantial fraction of the interest and principle of the bonds sold to pay for the costs in the early years? In conducting this exercise we want to emphasize that it is not normally expected that government programs will pay for themselves. Whether early childhood development programs are a good investment depends on whether net benefits to society as a whole are positive, not whether they produce a positive return on net revenues for government. Both of the programs considered here could pay a large fraction of the costs of bond finance over the seventy-five year budget window. The calculations that follow all assume a 3 percent real discount rate, which would mean a 5 percent interest rate on the bonds if inflation was constant at 2 percent. At the federal level, the targeted Abecedarian-type program pays 67 percent of its costs in increased revenue and savings. For all government, the share is 97 percent. The corresponding values for the universal Perry program are 49 percent and 78 percent. The cost recovery for the universal program is lower over the first seventy-five years because a much larger fraction of the costs for the targeted program are paid out of budgets for existing childcare programs. However, the universal program is increasing revenues faster at seventy-five years and the fraction of total costs covered for the universal Perry program over the next twenty-five years grows higher than the targeted Abecedarian program.

Both programs might be expected to more than pay for themselves if policy makers were sufficiently patient. If the present value of the streams of increased revenues and net costs to all levels of government are calculated using a 3 percent real discount rate, the sum of revenues exceed costs for the Abecedarian program after eighty-one years. It would take ninety-two years

for a universal Perry-type program to recover all its costs. This may sound like a long time, but the vast majority of government expenditures are undertaken with no hope of ever recovering their costs. That preschool education holds out hope of doing so, while promising large social returns in the short and medium run, makes it an outstanding investment.

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A Qualification

Our results are only as good as the assumptions behind them. Extensive analysis of the sensitivity of results to assumptions was conducted. A few parameters, when changed, produce results that vary a good deal from those produced by our preferred values. These include the impact of education on productivity and the aggregate importance of education to the economy. However, the main message of the analysis is a surprising lack of sensitivity to individual assumptions which seems to be due in large part to the many different paths by which the programs affect outcomes. Even very large changes in the assumptions about any one path have limited influence on the overall effect

Our main hesitation in presenting these findings is our concern that it may not be possible to achieve the gains that these demonstration programs did when the programs were operated on a national scale. A safe way to answer these concerns would be to establish a large scale demonstration program. As it would be impractical to wait twenty years to judge the impact of the program on adult outcomes, it would be very important to develop methods to predict adult outcomes on the basis of early program impacts.

Additional Reading

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