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***The Economic Development Benefits of Universal Preschool Education
Compared to Traditional Economic Development Programs***

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This paper presents in a shorter version the analysis and findings previously presented in a much longer report, "Taking Preschool Education Seriously as an Economic Development Program: Effects on Jobs and Earnings of State Residents Compared to Traditional Economic Development Programs" (original version September 30, 2005, revised March 13, 2006 and March 30, 2006). The longer version will be expanded into a book.

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EXECUTIVE SUMMARY

Introduction. In this project, I estimate that high-quality, universal preschool education would have large economic development benefits. The long-run effects would be to boost national employment and gross domestic product by almost 2 percent, which represents over 3 million more jobs and almost \$1 trillion in increased annual GDP.

These economic development benefits occur because high-quality preschool increases both the soft and hard skills of preschool participants, and also their ability to benefit from later education, which increases participants' future employability and productivity in the labor market. This increase in the quantity and quality of U.S. labor supply stimulates business to create new jobs and expand output.

This project considers the economic development benefits of preschool from both a state perspective, and a national perspective. I also compare the effects of preschool with "traditional" economic development programs that offer business subsidies.

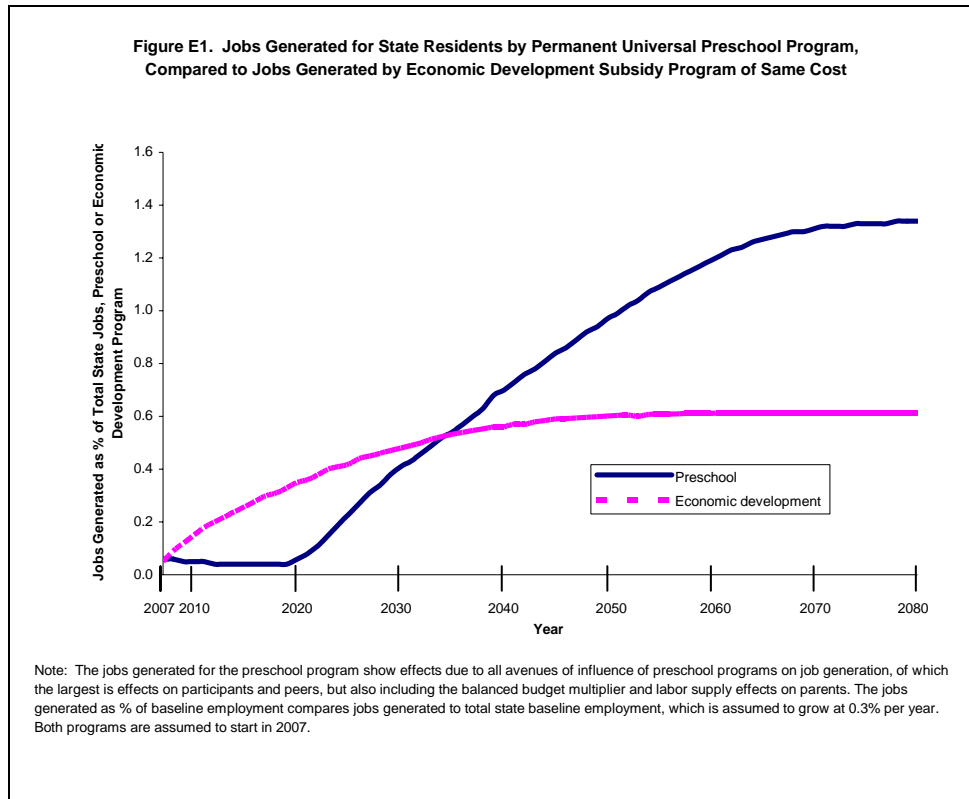
State perspective. U.S. states are actively competing to attract new business, and increase the jobs and earnings of state residents. Most of the resources devoted to state economic development programs take the form of subsidies to business, for example property tax abatements.

More recently, states have begun to view educational investments as important economic development tools. Some researchers and policy groups have suggested that state investments in universal preschool programs could be an important economic development policy.

In this project, I simulate what impact universal preschool education would have in the typical state economy. For comparison, I also simulate the economic effects of devoting the same resources to economic development subsidies to business.

A small portion of the economic development effects of universal preschool occurs through creating jobs for preschool workers, and increasing the labor supply of parents of preschoolers. However, this project's simulations suggest that the major portion of the economic development effects on a state economy of universal preschool occurs through its long-run effects on the quantity and quality of a state's labor supply. Although some preschool participants move out of state, enough preschool participants remain in the state they grew up in—over three-fifths remain in the typical state—to significantly improve the quantity and quality of labor in a state's economy.

Figure E1 shows the simulated effects on a state's jobs of a state's adoption of universal preschool, compared to devoting the same resources to business subsidies. These simulated effects are based on a large body of prior research on how regional economies respond to increases in labor supply and to business subsidies. The figure assumes that this universal preschool program, or a business subsidy program of similar cost, is adopted by the state in 2007.



As the figure shows, initially economic development subsidies create more jobs for a state economy. It is more cost-effective in the short-run to try to tip the location decisions of companies through subsidies than to more directly create jobs through spending more on preschool. But over time, the large increases in the quantity and quality of the labor supply of former preschool participants have a larger effect on a state's economy. By 2033, the state jobs impact of universal preschool exceeds the state jobs impact of business subsidies. In the long-run, after former preschoolers have pervaded the entire age distribution of workers, the annual jobs impact of universal preschool on a state economy is over twice that of business subsidies.

I also simulated the effect of universal preschool on the earnings of state residents, again comparing this with traditional economic development programs that subsidize businesses. Table E1 includes a column showing the effect, from a state perspective, on the present value of the earnings of state residents, per \$1.00 invested in either high-quality preschool or business subsidies. The bottom-line is that either high-quality preschool, or business subsidies, increase the present value of the earnings of state residents by about \$3 for every \$1 of resources devoted to these alternative policies. Preschool has more effects in the long-run, but the short-run advantage of economic development subsidies causes the present value of the state earnings effects of the two policies to be similar in magnitude.

Table E1. Effects on Present Value of Real Earnings, per \$1.00 Invested in that Policy

	State Perspective	National Perspective
Universal preschool	\$2.78	\$3.79
Business subsidies	\$3.14	\$0.65

National perspective. The national economic benefits of preschool and business subsidies differ greatly from the benefits from a state perspective, for two reasons. First, many former preschool participants do move out of state. For the typical state, over one-third of preschool participants are estimated to eventually move out of the state in which they were enrolled in preschool. The earnings increase for these out-migrants should be counted from a national perspective, even if they might not be considered from a state’s perspective.

Second, from a national perspective, many of the jobs a state gains by offering economic development subsidies to business are reshuffled from other states. Estimates suggest that for every five jobs gained by the state offering the subsidies, four jobs are reshuffled from other states. Jobs reshuffled from other states should not be counted as “national benefits” of a business subsidy program, unless the state gaining the jobs is significantly more economically distressed than the average state.

For this project, I also simulated the national economic benefits of investing in preschool, or business subsidies, after allowing for effects on out-migrants and jobs being reshuffled among the states. As shown in Table E1, from a national perspective, preschool education increases the present value of real earnings by almost \$4, per \$1 of preschool spending. For business subsidies, the national perspective suggests that for the typical state, each \$1 of resources devoted to business subsidies increases the present value of national earnings by considerably less than a dollar.

The greater benefits of preschool from a national perspective than from a state perspective – a 4 to 1 national payoff versus a 3 to 1 state payoff – provide a rationale for federal financial support for state government investments in preschool education. The lesser benefits of business subsidies from a national perspective than from a state perspective suggests that many states may overinvest in subsidies to attract business. Federal policymakers might consider exploring ways to curb this competition.

The national economic benefits of universal preschool can be stated in other metrics. Table E2 shows the annual national economic benefits of universal preschool, in the long-run after former preschool participants have pervaded the labor force. In the long-run, universal preschool would add over 3 million jobs to the U.S. economy, almost \$300 billion in annual earnings, almost \$1 trillion in increased annual value of Gross Domestic Product, and over \$200 billion in annual government tax revenues. Although the economic development benefits of preschool take some time to be fully realized, these benefits begin to rapidly increase about 15 years after a universal program is begun, and reach half their long-run level after about 35 years.

Table E2. National Economic Development Effects of Universal Preschool in 2080

	% Effect	Absolute Effect
Jobs	1.8%	3.2 million jobs
Earnings	1.9%	\$294 billion
GDP	1.9%	\$943 billion
Government taxes	1.9%	\$235 billion
(about 4 times annual cost)		

Conclusion. High quality preschool has been shown by rigorous research studies to significantly raise the earnings of participants. From this research, we know enough to say that high-quality preschool has economic development benefits that are large relative to its costs. For universal preschool programs, even the most cautious and conservative estimates, which considerably scale back the effects per participant from the most rigorous studies, still yield large benefits for state economies and the national economy.

1. Introduction

This paper compares the effects of investments by state governments in preschool education and traditional economic development programs. The effects considered are on employment rates and annual earnings. I conclude that from the perspective of state residents, the earnings benefits from investing in preschool education or traditional economic development programs are similar. Each one dollar of investment by a state government in high-quality preschool, or in traditional economic development programs, will increase the present value of earnings of state residents by about three dollars.

Most of the beneficial effects of preschool education on the earnings of state residents occur because high-quality preschool increases preschoolers' future employability and productivity. The beneficial effects on state residents' earnings of traditional economic development programs occur because attracting business to a state provides state residents with job opportunities.

The national benefits of a state's investment in preschool education are about 40 percent higher than the benefits from that state's perspective. National benefits are higher because the national perspective includes increased future earnings for preschoolers who later move out of state. For traditional economic development programs, the national benefits of a typical state's investment in economic development subsidies are about 80 percent lower than the benefits from that state's perspective. National benefits are lower because some of the jobs attracted to this state lead to lost jobs in other states.

The rest of this paper will outline how I obtain these estimated effects.

My research career as an economist has focused, among other topics, on state and local government subsidies to businesses to promote economic development. This paper and its

associated project came about because of a request by the Committee for Economic Development that I analyze preschool education as an “economic development program.” The meaning of this request depends upon how “economic development program” is defined. “Economic development” could be defined as any increase in economic productivity. An “economic development program” could be defined as any government activity that affects productivity. But productivity is potentially affected by all government activities. To restrict this project to a manageable scope, I define “economic development” more narrowly: the “economic development” of an area is an improvement in the jobs and earnings of the area’s residents. An “economic development program” is any program that has improvement in the jobs and earnings of the area’s residents as an important goal. In my view, this narrower definition of economic development is the definition implicitly used by state and local economic developers.

Therefore, my focus in this paper is on how preschool education compares with traditional economic development subsidies as a means of increasing employment rates and annual earnings per person. This focus on employment rates and earnings per capita means that I omit many important benefits of preschool. For example, previous studies of preschool have shown that preschool has large effects in reducing future crime rates, and large effects in reducing future special education costs (e.g., Karoly and Bigelow, 2005; Schweinhart et al., 2005; Belfield, 2005). These other benefits of preschool are important, but they are not comparable with economic development benefits.

I also ignore the effects of traditional economic development programs in increasing local land prices and local business profits. Previous studies of economic development subsidies suggest that the benefits from increased employment rates and earnings rates are considerably

larger in magnitude than the benefits to local business owners and property owners (e.g., Bartik, 1991, 2005). Furthermore, the benefits from increased employment rates and earnings rates are more progressively distributed—that is, a greater proportion accrues to lower income groups—than the benefits from higher profit rates and property values. Therefore, focusing on employment rates and earnings rates focuses on the most important and most progressive benefits from economic development subsidies, and allows preschool programs to be compared with traditional economic development subsidies on the same metric.

The traditional economic development programs of state and local governments seek to increase jobs and earnings for local residents by cash or in-kind subsidies to businesses that are more or less customized to the individual business and more or less discretionary in nature, and that are designed to affect the business's decision about how many jobs to locate in that local economy. Examples of such programs include:

- Property tax abatements;
- Refundable corporate income tax credits to business, often tied to the increased income tax revenues from new workers hired;
- Customized job training, under which a local community college provides free job training, customized to the needs of the business, for either existing or new workers;
- Access roads to the new business site;
- Training/advice to the business owners or managers in starting up, improving, or expanding a business.

Most of the resources that state and local governments provide in economic development subsidies to business is financial assistance, rather than in-kind services. The biggest single type of incentive is property tax abatements, in which a new or expanding business is allowed for

some period to pay property taxes below what would normally be owed. The total resources devoted to state and local economic development subsidies are estimated to be \$20 to \$30 billion per year (Bartik, 2001).

The preschool program considered in this paper is a high quality universal preschool program. The baseline program is a 9-month, half-day program offered for free to all 4-year-olds. The baseline program is assumed to have a maximum student to staff ratio of 20 to 2, with one of the staff being a professional teacher with an early childhood specialization. The program is similar to the preschool program offered by the Chicago Child Parent Center program (CPC), for which we have good estimates of the long-run effects on preschool participants (Reynolds et al., 2002). I also consider alternative assumptions about the design of a universal preschool program. The gross costs of a universal preschool program in the United States are also probably around \$25–35 billion (Committee for Economic Development, 2002), although the net additional costs might be only \$15 billion after accounting for savings on current government spending on preschool (see discussion later in this paper, and full report).

In the rest of this paper, I first consider the benefits of traditional economic development programs in increased employment rates and earnings rates. I then consider the effects on employment rates and earnings rates of universal preschool. I also consider alternative assumptions and how they change the estimated effects of preschool. These initial analyses will take a state perspective. I will then consider the national perspective. A conclusion provides a summary oriented to implications for policymakers.

2. Traditional Economic Development Programs

What are the mechanisms by which traditional economic development programs affect the employment and earnings of local residents? How do I estimate the magnitude of these effects?

First, the effectiveness of business subsidies in creating jobs is estimated based on the extensive literature on how state and local business taxes affect employment growth and business location decisions (Bartik, 1991, 2005, 2006). This research literature implies that the typical net cost of creating a job through economic development subsidies is equivalent in present value to a perpetual subsidy of \$19,445 per year per job. This cost of creating a job through business subsidies is an average, reflecting both cases in which the subsidy had no effect on the business location decision, and cases in which the subsidy did tip the location decision.

These estimates of job-creation costs assume that the subsidies are targeted, as most economic development subsidies are, on “export-base businesses”: businesses whose product is purchased by purchasers outside the state, or whose product is purchased by in-state purchasers who otherwise would have purchased a product that was produced outside the state. Subsidies to “non-export-base businesses” will be less effective, as any increased production by the subsidized businesses will come at the expense of lost sales by other in-state businesses.

Second, the subsidized jobs will have some “multiplier effects.” The new businesses or expanded businesses will demand additional supplies in the state, which will cause an increase in job in local suppliers. In addition, the new workers at the subsidized businesses, and their suppliers, will demand various goods and services from the local retail sector, and local retailers will therefore expand their hiring. I assume for this project a typical multiplier of 1.80, that is, for every 1 job in a business that is induced to locate in the state, there will be 0.80 jobs created

in supplier businesses and retail business in the state. This multiplier is based on the best estimates available for multiplier effects of economic development subsidies, which are available for one of Michigan's economic development programs (Bartik, 2006).

Third, the new jobs, both direct and multiplier jobs, create some additional employment opportunities for local residents. Newly created jobs in a local economy are filled by three groups: local residents who otherwise would not be employed, persons who otherwise would have lived elsewhere, and local residents who otherwise would be employed. Jobs filled by the last group lead to additional local job vacancies, which are filled by the same three types of groups. If we continue following this chain of job vacancies, newly created local jobs ultimately either create jobs for the local non-employed, or for persons who otherwise would have lived elsewhere.

Based on previous studies of the effects of local job growth (Bartik, 1991), I estimate that in the short-run, 6 out of every 10 new jobs lead to employment for local residents who otherwise would be unemployed or out of the labor force. This implies that 4 of 10 new jobs go to persons who otherwise would have lived in another state. The proportion of new jobs going to local residents declines over the first five years after the new jobs are created, because increased job opportunities attracts in-migrants with some lag. Based on previous studies, after five years, only 3 out of 10 new jobs increase employment rates for local residents.

Fourth, some proportion of the new jobs go to local residents who already are employed, but are able because of the new jobs to upgrade to a better-paying occupation. Based on previous research, I assume that for every 1 percent shock to a state's employment, occupational upgrading will increase average earnings by 0.2 percent (Bartik, 1991).

Finally, at the end of five years, after the initial in-migration surge, I assume that the local residents who still have new jobs or better jobs are able, due to the job experience they have acquired, to permanently retain their higher employment rates and wage rates. This assumption is backed by studies that show that labor force participation effects and occupational attainment effects of higher state and local job growth are persistent (Bartik, 1991, 1993, 2001). This persistence makes sense because individuals who get new or better jobs will acquire better job skills, greater self-confidence, and a better reputation with employers, all of which will increase long-run employment rates and wage rates.

However, these long-run effects will decline as the individuals who benefitted from the job growth retire and die off. I estimate these effects from Current Population Survey data on employment rates by age, and National Institute of Health data on mortality rates by age.

In addition, from a state perspective, some individuals who gain a higher earnings capacity will over time move to other states. I assume that a state government perspective would disregard earnings after a person has left the state. I estimate these out-migration rates by age using data from the Panel Survey of Income Dynamics and the 2000 U.S. Census, which will be discussed later in this paper.

Using these research-based assumptions, I estimate the effects over time, in a typical state, for an ongoing permanent program of economic development subsidies equal in costs to a universal preschool program. I assume this program starts in 2007. Based on assumptions outlined in the full report, the national costs of such a universal preschool program would be \$14.7 billion in 2004 dollars, which is 0.299 percent of total U.S. wage and salary earnings. The economic development program in the typical state is scaled to have a present value each year of 0.299 percent of the state's wage and salary earnings.

At this point in the paper, I take a state perspective. This means I only look at the effects of the economic development subsidies in attracting jobs to this state. I ignore any effects of these subsidies in reducing the number of jobs in other states. I also ignore any increases in earnings for this state's residents that occur if and when they move out of this state. Later in this paper, I consider a national perspective on a state's economic development subsidies.

I simulate the effects over time of this program as jobs are created each year across all age groups in the state, and these effects depreciate over time due to competition from in-migration, out-migration of affected individuals, and death. Because this is an ongoing economic development subsidy program, with new subsidies offered each year, the effects gradually build up over time. New jobs are attracted to the state each year, increasing the employment rate and earnings rate of state residents. Eventually, the state economy converges to a new labor market equilibrium with a higher employment rate and earnings rate, as the new jobs created each year are just offset by the depreciation of the effects of the jobs previously created.

Table 1 and Figure 1 show these effects over time. In the new state labor market equilibrium, employment rates are increased in the state by enough to increase jobs in the state by 0.6 percent of the state's otherwise prevailing equilibrium employment level, and earnings per capita in the state are increased by about 1.2 percent of the otherwise prevailing earnings level. Per dollar invested in economic development subsidies, the present value of the increased earnings of state residents is estimated to be \$3.14.

3. Universal Preschool Program

The universal preschool program being analyzed has the characteristics assumed in the study by Karoly and Bigelow (2005). These include:

- Although the program is universally available for free for all 4-year-olds, only 70 percent of all 4-year-olds end up participating in the program.
- The program operates for 3 hours per day for 175 days per year for one year for all participants. This design is similar to the Chicago Child Parent Center (CPC) program.
- Following Karoly and Bigelow, the gross cost of the program per 4-year-old participant is \$5,856, in year 2004 dollars. After considering cost savings on current public spending for preschool, the net cost of the new program is \$4,234 per participant.¹
- In the baseline estimates, the effects of the program on participants are largely based on evaluations of the CPC program. However, I use the assumption of Karoly and Bigelow that effects per participant in a universal preschool program are only 23 percent of the effects per participant of the CPC program. The CPC program's effects are for low-income families who otherwise would not have been in any preschool. These effects should be scaled down if preschool's effects are lower for more affluent families, because free universal preschool will include many middle and upper income participants. In addition, universal preschool's net effects will be lower for participants who otherwise would have participated in preschool.²

¹These numbers differ slightly from Karoly and Bigelow for technical reasons outlined in the full report (Bartik, 2006).

²The 23% comes from estimates of the proportion of participants from various income groups, the proportion who otherwise would be in private or public preschool, and assumptions about how benefits of universal preschool vary with income and default preschool enrollment. See Karoly and Bigelow (2005) or Bartik (2006).

- Karoly and Bigelow based their estimates on California data. However, these estimates will give a good approximation to the national ratio of benefits to costs of preschool, because different assumptions will drive benefits and costs in the same direction. For example, if fewer 4-year-olds in a state would have enrolled in any preschool, then net costs of a universal preschool program will increase, but so will program benefits. I consider alternative assumptions later in this paper.

There are four ways in which universal preschool might increase the employment and earnings of state residents. Only one of those four ways leads to large effects. However, before exploring this way in more detail, I will explain each of the four ways, and why three of them do not have large effects on economic development.

1. Balanced budget multiplier effects. First, there are net stimulative effects on demand for goods and services produced in the state, and thereby on labor demand in the state, due to spending more state government dollars on preschool education, even when that spending is financed by increased taxes. These stimulative effects would be similar for any type of increased state spending financed by higher state taxes.

The stimulative effect on the economy of an equal-sized increase in government spending and taxes is commonly presented in introductory macroeconomics courses as the “balanced budget multiplier.” The intuition for the demand effects of spending to exceed those of taxes is as follows: State government spending directly increases final demand for goods and services sold in the state by the same dollar amount as the spending. In contrast, only a portion of the increased state taxes reduces final demand for goods and services sold in the state, because state residents also accommodate the increased taxes by reduced savings, and reduced spending on goods and services that they purchase out-of-state or on-line. Similar arguments are made in

introductory macroeconomics courses for why balanced budget increases in federal spending and taxes will stimulate the national economy.

In the simplest regional economic models, a balanced budget increase in state spending and taxes increases state production by the same amount. The indirect multiplier effects of the increased state spending, as this spending leads to increased production, increased incomes of state residents, and increased respending, will in a simple model exactly offset the negative effects of the increased state taxes. All that remains is the initial increase in state spending, which will be matched by an increase in state production. More complex models allow for the propensity to respend on state goods and services to differ between those whose incomes are affected by state spending vs. state taxes.

This balanced budget multiplier has the same qualitative effect on increasing labor demand as occurs when economic development subsidies attract new business. However, the effects on labor demand per dollar of spending will be much smaller for balanced budget multiplier effects of preschool spending than for traditional economic development subsidies. With balanced budget multiplier effects, essentially each dollar of spending is needed to create a shock to state production of one dollar. With traditional economic development subsidies, the empirical literature suggests that it takes considerably less than one dollar of subsidies to create an increase in business production of one dollar. With traditional economic development subsidies, we are inducing businesses, which already have an out-of-state market for their product, to choose the state. With balanced budget multiplier effects, we are directly creating demand for the goods and services. Inducing businesses to make a different location decision to serve some preexisting demand is cheaper than having to create the underlying demand for goods and services.

Using the REMI regional econometric model, a well-known and well-respected model (Treyz, 1993), I estimate that the balanced budget multiplier effects of greater state government spending on preschool will increase earnings of state residents by a present value of \$0.04, per dollar spent on preschool education.³

The balanced budget multiplier effects of a larger early childhood program would be larger. For example, if we not only increased state government spending for one year of universal preschool, but also increased state government spending for more extensive childcare and preschool from birth to age 5, the total increase in state earnings would be larger. However, the balanced budget multiplier effects per dollar invested would probably be similar.

2. Parental labor supply effects. Second, there are the economic development effects of the increased labor supply of parents due to the free child care provided by universal preschool, for part of the day and part of the year. These effects depend upon how parental labor supply responds to (partially) free child care, and how in turn job creation in a state responds to the increase in labor supply.

As will be discussed later in this paper, I assume, based on previous research, that the job creation response is about two-thirds of the shock to labor supply (Bartik, 2006, 2001). However, the labor supply effects of this partially free child care will be limited, for two reasons. First, many of the parents whose children participate in preschool already work. Second, the child care provided by universal preschool is limited in the number of hours and days offered.

Based on the research literature on labor supply effects of child care prices, I estimate that for every dollar invested in universal preschool, real earnings of state residents will increase,

³As detailed in Bartik (2006), these estimates are based on the Upjohn Institute's REMI model for the state of Michigan. The magnitude of the balanced budget multiplier effects should be similar in different states, as the

due to parental labor supply effects, by a present value of \$0.05. For details on this calculation, see Bartik (2006), which in turn is based on Blau and Hagy (1998) and Anderson and Levine (2000).

A larger child care program would have larger effects, although not necessarily larger effects per dollar of spending. Larger child care effects on labor supply per dollar of spending could be obtained by programs that subsidized child care that is difficult to find, such as child care at third shift hours or for sick children.

3. Participant and peer effects (summary). Third, there are economic development effects of universal preschool education due to preschool's effects on increasing the future employability and productivity of participants, which will increase participants' future employment rates and earnings rates. In addition, because preschool participants fare better in K-12 education, the school atmosphere in K-12 schools will improve, which improves achievement for all students, including peers of the preschool participants. These peer effects also improve future employment rates and earnings rates.

I will go into more detail on these participant and peer effects later on in this paper. For now, I simply note that I estimate that for every dollar invested in universal preschool, these participant and peer effects increase the present value of future earnings by \$2.65.

4. Social productivity effects of education. Fourth, there are effects that occur because preschool's effects in increasing education will increase the overall productivity of the state economy, and thereby attract new business activity. There is evidence that local economies with a more-educated population have higher employment growth (Glaeser and Saiz, 2003). In addition, there is evidence that an individual's wages are not only affected by the individual's

extent of leakages to out-of-state spending has offsetting effects on spending effects and tax effects.

own education, but also by the average education level in the local economy (Moretti 2003, 2004). A plausible interpretation of these effects is that higher average education levels allow businesses to use more advanced technologies and production methods.

However, the empirical evidence suggests that these productivity effects on the overall economy of average education levels are mainly related to the percentage of college graduates in the local economy, not the percentage with lesser credentials such as a high school diploma (Moretti, 2003, 2004). Furthermore, the evidence is that preschool education, although it has large effects on high school graduation rates, does not substantially affect college graduation rates (Schweinhart et al., 2005).

Therefore, the effects of preschool education on economic development by affecting overall social productivity are modest. Using estimates of preschool effects on college graduation, and estimates of how college graduation rates affects affect employment growth, I estimate that for every dollar invested in universal preschool education, the present value of real earnings increases, due to social productivity effects, by \$0.04 (Bartik, 2006).

Perhaps preschool programs, if coupled with later K-12 programs, would have larger effects on college graduation rates. If so, this might increase the social productivity effects of universal preschool per dollar invested.

Summary of preschool effects. Therefore, the total effect of preschool education on economic development, per dollar invested, is to increase the present value of real earnings by \$2.78. Of the \$2.78 total, \$2.65 is due to effects on the future earnings of preschool participants and their peers. Therefore, these participant and peer effects are worth going into in some detail, which I will do next.

Participant and peer effects (more detail). What are the mechanisms by which a universal preschool program causes higher future earnings for preschool participants and their peers?

How do I estimate the magnitude of these effects?

First, the cost-effectiveness of preschool spending depends upon the costs per participant. I assume, as mentioned before, that the net costs of universal preschool per participant, after allowing for current preschool spending, will be \$4,234.

Second, as mentioned before, we need to scale down the effects of preschool participation from the effects we would expect for an exclusively low-income group of 4-year-olds who otherwise would not have participated in preschool. The best studies of preschool's effects are for the Perry Preschool program and the CPC program, which served low-income participants, and evaluated effects compared to a control group that did not participate in preschool. We need to use these high quality studies, but scale down estimated effects per participant for a universal preschool program that will include many middle and upper income participants, and many participants who would have been in preschool without the universal program.

For the baseline estimates, I follow Karoly and Bigelow (2005) and assume that the effects per participant are only 23 percent of the effects that would be obtained for a preschool program that exclusively served low-income participants who otherwise would not have participated in preschool.

Third, preschool will in part increase future employment rates and earnings rates by increasing educational attainment of participants. I use data from the CPC program to estimate the effects on educational attainment through age 19 (Reynolds et al., 2002). I use estimates from the Perry Preschool program for later ages, scaled down to allow for the somewhat lower

effects at younger ages of the CPC program versus Perry Preschool, to estimate the effects at later ages on educational attainment (Bartik, 2006; Schweinhart et al., 2005). I then use data from the Current Population Survey, Outgoing Rotation Group, to estimate how changes in educational attainment affect employment rates and wage rates at different ages.

Fourth, there is strong evidence from the Perry Preschool study that preschool participants' employment rates will go up more than would be predicted based on the effects of preschool on educational attainment. Presumably, this reflects more intangible effects of preschool on various soft skills and character traits of participants. I use estimates from the Perry Preschool program to estimate this extra employment rate effect of preschool participation. I will present more evidence on this topic in a little bit.

Fifth, there is an adjustment to reduce effects by the percentage of preschool participants who move out of state, as we only want to count effects on employment rates and earnings rates of state residents in these baseline estimates. A later section of this report will consider effects from a national perspective. This downward adjustment for out-migration is not as much as many might suppose, as I will discuss in more detail later in this section.

Sixth, there is a downwards adjustment to account for preschool participants who die. I estimate this based on National Center for Health Statistics mortality tables.

Seventh, there is an upwards adjustment to account for effects of universal preschool in improving the effectiveness of K-12 education for the peers of the universal preschoolers. Based on evidence from Hanushek et al. (2003) and Hoxby (2000) for how greater achievement of one student affects his or her peers in the same class, these peer effects are assumed to be a little over half of the direct effects on participants (Bartik, 2006).

Eighth, there is a downwards adjustment to account for the displacement effects of shocks that increase labor supply. It should be understood that preschool education is an increase in the quantity and quality of employable, higher skill labor available in the labor market. This increase in the quantity and quality of labor supply does nothing directly to increase employment rates and earning rates. Rather, this increase in the quantity and quality of labor supply will induce an increase in labor demand, in part by the availability of more unemployed labor of high quality, which makes it easier to fill vacancies, and possibly also by some downward adjustment of wages. From the research evidence, as reviewed in Bartik (2001), there are some displacement effects, but very modest or negligible effects in reducing wages. I assume, based on the relevant empirical estimates reviewed in Bartik (2001), that the increase in labor demand will be about two-thirds of the increase in labor supply of preschool participants and their peers.

These various factors can be multiplied together to yield estimated effects of universal preschool education on the employment and earnings of each cohort of preschool participants and their peers for each year of their lives. The long-run effects of universal preschool education are then derived by adding up these effects for all cohorts as the ongoing universal preschool program proceeds.

Bonus employment effects. As discussed above, one assumption I make is that universal preschool will have effects on participants' future employment rates that are greater than would be expected based on effects of universal preschool on educational attainment. Although I have not seen this extensively discussed previously, the research on high-quality preschool suggests that it has employment rate effects that go beyond what we would expect based on educational attainment.

For example, as shown in Table 2, it is clear from the Perry Preschool studies that the Perry control group was much less likely to be employed than one would expect based on educational attainment, whereas the treatment group was about as likely to be employed as one would expect based on their mix of educational attainments. Apparently, the disadvantaged group in Perry Preschool is more disadvantaged than would be ascertained by simply looking at educational attainment. The Perry Preschool program eliminates the isolation of this disadvantaged group from the labor market mainstream, and brings their employment rates into alignment with normal expectations.

For the baseline estimates, I assume that the extra employment effect of the baseline universal preschool program, which is similar in quality to the CPC program, are about half of what we observe in the Perry Preschool program. This adjustment is based on the observation that the CPC program has about half the effects on educational attainment of the Perry Preschool program for participants at the same age, that is, I am scaling down all the effects of the CPC program from the Perry Preschool program by one-half.

More on mobility rates. Another important point is that the downward adjustments for out-migration of preschool participants are not as extensive as one would think. During the working life of preschool participants, mobility data suggest that it is reasonable to assume that at least 60 percent of them will still be living and working in the same state in which they attended preschool. For younger and middle-aged years, the percentage in the same state will be even greater.

Table 3 presents data from the Panel Survey of Income Dynamics (PSID) and the 2000 Census that sheds light on the extent of cross-state mobility. The PSID data follows the same persons over time and reports the percentage of persons living in the same state as they did at age

4. The Census data looks at the 2000 cross-section and reports the percentage of persons, at different ages, living in the same state as their state of birth. It is clear from these data that even for college graduates, many stay in the same state as their state of birth or state of residence at age 4. Furthermore, the educational attainment of preschool participants is modest enough that their average mobility most resembles that of high school graduates but not college graduates, which is a lower mobility group.

I suspect most policymakers and policy analysts assume higher mobility because of their own experiences. Individuals who go to Ivy League or other elite colleges, or who get advanced degrees such as Ph.D.s, or who end up working in Washington, tend to have considerably higher mobility than the average college graduate. Many college graduates stay in the same state to go to college, and try to find jobs in the same state in order to stay close to friends and family and familiar places.

Although mobility rates vary across states, for almost all states the percentage of persons who live in their state of birth is quite high. As Table 4 shows, the percentage does tend to be a bit lower for some rural states with less diverse economies, in which many individuals will move out to explore broader economic opportunities.

Out-migration is also quite high for the District of Columbia, in which only 17 percent of those born in DC still live there as adults. This suggests that cities, in contrast with states, should rationally worry quite a bit about whether preschool program participants will move out, and thereby promote economic development in other communities.

Simulated effects on state jobs and earnings through effects on participants and peers. As mentioned, per dollar invested, preschool education increases the present value of future earnings of state residents, due to effects on participants and peers, by \$2.65. Tables 5 and 6,

and Figures 2 and 3, show the time pattern of effects of an ongoing universal preschool program on the jobs and earnings of participants and peers, compared to effects of traditional economic development subsidies. This program is assumed to begin in 2007.

As one would expect, an ongoing universal preschool program has no effect on jobs for state residents for the first 11 years, before the preschool participants begin entering the labor force. During this time period, traditional economic development programs obviously have the edge in affecting jobs and earnings. After that, the effects of preschool rapidly increase. Universal preschool's effects on jobs exceed those of traditional economic development programs by 2035. In the long-run, preschool increases jobs by increasing employment rates of state residents by about 1.3 percent of state employment, over twice the 0.6 percent effect on employment rates of traditional economic development programs. The lengthy time period of adjustment to the long-run equilibrium, about 70 years, reflects the time needed before the universal preschool experience has pervaded the entire working-age population.

For earnings effects, preschool takes longer to catch up to traditional economic development programs, until 2059. In addition, preschool's long-term effect on earnings, which is about 1.3 percent of state earnings, only modestly exceeds the 1.2 percent effect of traditional economic development programs.

The smaller and delayed advantage of preschool in earnings effects reflects that preschool targets a disadvantaged group that tends to be lower wage than the average worker. In addition, initially the preschool group is younger than average, which also lowers their wages. The preschool group gets a higher wage than they would obtain if they had not attended preschool, but this targeting on a disadvantaged group, particularly during the years when the preschool group is younger, does tend to lower preschool's earnings effects compared to its job

effects. However, this targeting on the disadvantaged also implies that preschool has more progressive effects on the income distribution than traditional economic development programs.

A key implication of this analysis of preschool education vs. traditional economic development subsidies is that these two types of policies can be viewed as complements. These two policies address economic development goals over different time frames. Traditional economic development subsidies clearly have an advantage in generating jobs and earnings for state residents over a 15-year time frame. Preschool programs have an advantage in generating jobs and earnings for state residents in the long-term. Both policies can be seen as needed if we want to achieve better economic development for a state both in the short-run and long-run.

4. Alternative Estimates of Preschool Effects

The baseline estimate of preschool's effect on state economic development is that for each dollar invested, the present value of real earnings of state residents increases by \$2.78. Table 7 summarizes how this baseline estimate changes with different assumptions about program effects and program design.

First, I consider alternative estimates of how effects of a universal preschool program per participant compare with the CPC program. The baseline estimate suggests that effects of universal preschool on the average participant are 23 percent of the effects estimated for the CPC participants, as suggested in Karoly and Bigelow. These baseline estimate makes specific assumptions about how effects on a participant of high-quality preschool education vary with the participant's family income, and with whether the participant would have enrolled in preschool without the universal program, and if so, in what type of preschool. Although these baseline

assumptions are reasonable, it is possible to make alternative assumptions. For example, some researchers have argued that the benefits of high-quality preschool may not decline much with family income (e.g., Barnett, Brown, and Shore 2004; Barnett, Lamy and Jung, 2005).

Karoly and Bigelow (2005, p. 107) also supply a set of alternative assumptions, which include both more conservative and more generous assumptions about high-quality preschool's benefits for upper income groups and for participants who would otherwise have been in some other preschool. These alternative assumptions yield estimates of universal preschool's effects per participant that range from 16 to 41 percent of the CPC program. The resulting present value of earnings effects, per dollar invested, range from \$1.97 to \$4.85.

Second, the baseline estimates suggest that effects similar to the CPC program can be achieved by a program of one school year in duration with a preschooler to staff ratio of 20 to 2. The original CPC program offered a program of up to two school years for 3- and 4-year-olds, and had a preschooler-to-staff ratio of 17 to 2. The baseline estimates, in accord with assumptions of Karoly and Bigelow (2005), are based on research that suggests that the second year offered to CPC participants had little effect (Reynolds et al., 2002)), and that going from a staff ratio of 17 to 2 to 20 to 2 does not significantly reduce preschool effects (Schweinhart et al., 2005). However, suppose that we doubt that this cheaper design will assuredly achieve the same results. We could provide greater assurance of getting the CPC results with a program that more closely mimics the original CPC program, including a two-year duration and a 17 to 2 student to staff ratio.⁴ This revised program is more expensive than the baseline program, and, by assumption, has the same effects on participants and peers. Under this revised program design,

⁴These estimates are in fact quite conservative, as the original CPC program obtained its results with a program that, although available for 2 years, actually averaged 1.5 years in length over all participants.

the present value of earnings effects per dollar invested drop from \$2.78 to \$1.07. The program is estimated to have less earnings effects per dollar invested, but perhaps offers greater assurance that the promised effects will be realized.

Third, the Perry Preschool program was evaluated using a random assignment experiment, which is a more rigorous evaluation design than the comparison groups used to evaluate the CPC program. Suppose we wanted to base our program design on the Perry Preschool program because it is the most rigorously evaluated preschool program. Perry Preschool had greater effects per participant than the CPC program, for about twice as great an effect on educational attainment. But Perry also cost more because it had a student to staff ratio of 12.5 to 2, rather than CPC's 17 to 2, and the two staff in each class were both certified teachers, whereas in the CPC program, one staff person was a certified teacher and the other was a teacher's aide. Using the Perry Preschool program's design, the present value of earnings effects per dollar spent changes from the baseline \$2.78 to \$1.21.

Fourth, we could decide that rather than a true universal preschool program, we are going to target the preschool program on low and moderate income families by excluding preschoolers from upper income families from the program. This exclusion drops a group that is argued by some researchers (e.g., James Heckman, as interviewed in Clement, 2005) to have low benefits from preschool. As mentioned, other researchers argue that benefits of preschool may be similar for participants from both lower income and upper income families (Barnett et al., 2004; Barnett et al., 2005). However, the baseline assumption made in this project is that preschool's benefits are significantly lower for participants from upper-income families. Using these baseline assumptions, suppose the universal preschool program excludes children from families with greater than \$50,000 in annual income. Simulations suggest that this "targeted preschool

program” results in a present value of earnings effects, per dollar invested, of \$9.76. However, such a targeted program may be politically unsustainable. This program asks for political support from the general public even though many families are excluded from the program. Some of these excluded families would lose benefits they are currently entitled to, as some children from families with income greater than \$50,000 currently participate in public preschool programs.

Fifth, we could consider a less draconian approach to targeting, by charging fees for the “universal” preschool program based on family income. I consider the case where families with income above \$50,000 pay fees equal to half the preschool costs, families with income between \$30,000 and \$50,000 pay fees equal to one-quarter of preschool costs, and families with income below \$30,000 pay nothing. These fees would induce some moderate and upper income families not to choose the “universal” preschool program. Under the baseline assumptions, this would raise benefits per participant and spread the cost-savings from eliminating current public preschool programs over fewer participants in the new program, thereby reducing net costs per participant. However, charging fees based on income also has some administrative costs of collecting and verifying this information.

In evaluating a fee-based universal preschool program, one issue is whether the fees should be treated as just another sort of financing, or ignored in cost calculations. If we calculate the present value of earnings effects of this partial fee-based universal program, per dollar invested either through government taxes or fees, these amount to \$2.77, little changed from the original figure of \$2.78. The figure is little changed because the modest impact of fees on improving cost-effectiveness of the program are offset by the administrative costs of running a fee based system. Fees have a modest impact on cost effectiveness based on research that

suggests rather modest effects of fees on whether families choose to use the public preschool program (Blau and Hagy, 1998; see Bartik, 2006, for more details on the calculation). On the other hand, the present value of earnings effects of this fee-based system, per dollar of government taxes that go to the program (ignoring the user fees), is \$4.55. The former approach seems more reasonable, as both taxes and fees should be considered costs.

Sixth, we could assume that the labor supply increase brought about by a universal preschool program does not have any displacement effect. This means that the labor supply increase is fully matched by an increase in labor demand. This might occur, for example, if state economic development programs helped induce a matching increase in state labor demand. This might also occur under alternative assumptions about how state labor markets respond to supply and demand shocks. Under these alternative assumptions, the present value of earnings effects, per dollar invested in universal preschool, is \$4.14.

The upshot is that preschool education, under a wide variety of assumptions and program designs, has significant effects in increasing the real earnings of state residents. Furthermore, there are some policies that might be considered that can raise the economic benefits of universal preschool education.

5. National Effects

The numbers given so far are for effects in a typical state of implementing either a universal preschool program, or an economic development subsidy program of similar cost. However, the effects of universal preschool or economic development subsidies may differ considerably from a national perspective, for at least two reasons.

First, these estimates only look at effects on employment rates and earnings of persons who remain in a state. Yet many people do migrate out. This is more significant for universal preschool programs than for economic development subsidies. The targeted group for preschool education (4-year-olds) obviously has much more time to move out of the state after the policy intervention, compared to the workers of all ages whose opportunities are affected by economic development subsidies.

Second, for traditional economic development subsidies, these estimates ignore the likelihood that some of the created jobs in this state come at the expense of jobs that would be created in other states. Estimates of the effects of business subsidies at the national level suggest that about one in five of the new jobs created in a state by economic development subsidies are net national jobs, and the remainder take away jobs from other states (Bartik, 2006).⁵

This analysis applies to economic development subsidies in a typical state with average unemployment. However, if the state is significantly below or above average in unemployment, effects may differ. There is substantial evidence that the inflationary effects of adding jobs and reducing unemployment vary greatly with the initial local unemployment rate. As a result, redistributing jobs to a high unemployment area can allow greater national employment without added inflationary pressures. The inflationary pressures from adding jobs in the high unemployment area can be offset by a much lesser reduction in jobs in a low unemployment area. In contrast, redistributing jobs to a low unemployment area adds inflationary pressures, which lowers the feasible level of national employment without undue inflationary pressures.

⁵Why aren't new jobs created by preschool taken away from other states? In the case of preschool, we have an expansion in the capacity of the economy to produce brought about through expanded labor supply. Labor demand may not fully respond one-for-one to this labor supply shock, but we allow for this by assuming that only two-thirds of the labor supply shock is accommodated by an increase in labor demand.

To estimate universal preschool's effects from a national perspective, I re-estimate preschool's effects under the assumption of zero out-migration. This corresponds to including all the earnings effects on out-migrants. The present value of the earnings effects of preschool, per dollar invested, increase from \$2.78 to \$3.79. The \$1.01 of preschool benefits accruing to non-state residents could justify some federal subsidy for state investments in preschool.

These national economic development effects of preschool are translated into other metrics in Table 8. In the long-run, a universal preschool program will increase the level of jobs, earnings, GDP, and government revenue by 1.8 or 1.9 percent. The numbers generated for possible long-run effects, in 2080, are quite large, and they would be large even if calculated for the present-day economy. On the other hand, these numbers are moderate as a percentage of the size of the economy. This reflects the reality of how hard it is to have large percentage effects on a large economy: based on this project's estimates, participants in a CPC-style program from low-income families on average gain about 16 percent greater earnings from participating in preschool; not everyone participates in universal preschool; and, benefits for the average participant are assumed to be less than one-quarter of the benefits for preschoolers from low-income families.

For economic development subsidies, I estimate benefits from a national perspective by adding in the benefits to out-migrants from the state, and subtracting the benefits from four-fifths of the new jobs created in the state that come from other states. Under these assumptions, the present value of earnings effects for the nation, per dollar invested in economic development subsidies in an average unemployment state, is reduced from \$3.14 to \$0.65.

Simulated effects in states with different unemployment rates get different results from effects in an average unemployment state (Bartik, 2006). In some high unemployment states, the

earnings effects from a national perspective of state economic development subsidies are close to the effects from the state perspective. On the other hand, in some low unemployment states, state economic development subsidies cause such a large increase in inflationary pressures that the net effect on national earnings is negative.

Therefore, from a national perspective, economic development subsidies are on the whole less efficient than preschool program in achieving long-run economic development goals. However, economic development subsidies can have larger benefits if implemented in high unemployment areas. In addition, the full report discusses design changes that can increase the effectiveness of traditional economic development subsidies.

6. Conclusion

Universal, high-quality preschool education would have large effects on U.S. economic development, by raising U.S. employment rates, earnings, GDP, and tax revenue. The long-run effects are a boost in U.S. employment, earnings, GDP, or tax revenue of around 2 percent.

Another recent study analyzes universal preschool and comes up with similar economic effects. Dickens, Sawhill, and Tebbs (2006), using a quite different model than this study, conclude that the effects in 2080 of universal preschool would be to boost U.S. GDP by between 1.3 and 4.0 percent.

This order of magnitude of effects is not surprising. Quality preschool such as the Chicago Child Parent Center program have been shown to raise long-run earnings of participants from low-income families by 16 percent (this study), and some programs such as the Perry Preschool program may have effects twice as great. Realistic estimates of the effects of a universal program should scale back the effects of these small pilot programs, to allow for

factors such as smaller effects of a less-targeted program and less than 100 percent participation in a universal program. However, even with quite conservative assumptions that scale back these effects quite a bit, it is difficult to get estimates of the effects of preschool on the economy that are less than a one or two percent boost.

Most of the economic development benefits of high-quality preschool are due to effects on preschool participants. High-quality preschool raises these preschoolers' future educational attainment, employability, and productivity. Preschool also stimulates the economy by injecting government spending into the economy, and by increasing the labor supply of preschooler parents, but these economic benefits are much smaller than the economic benefits from the future increase in preschoolers' economic productivity.

From the perspective of state policymakers interested in promoting a state's economic development, both universal preschool education and economic development subsidies to firms have a similar cost-effectiveness in increasing the present value of state residents' earnings. A dollar invested by a state government in either universal preschool education, or traditional economic development subsidies, will increase the present value of state residents' earnings by about three dollars.

From a state policymaker perspective, the nature of the effects of universal preschool education, versus economic development subsidies, implies that these two policies are complementary. Traditional economic development subsidies provide a greater boost to state residents' employment and earnings for at least the first 15 years after implementing the policy. Universal preschool education provides a greater boost to a state economy in the long run. In addition, there are some possible synergies: simultaneously boosting a state's labor demand,

through economic development subsidies, and labor supply, though universal preschool, may have a greater effect than pursuing each policy separately.

The national economic development benefits of universal preschool education significantly exceed the already large benefits from a state perspective. Because of migration across states, a significant portion of the boost in the future employment, productivity, and earnings of preschoolers may occur outside the state in which the preschool education is delivered. The benefits to out-migrants boost the earnings benefits of universal preschool by over 30 percent, so that every dollar invested in high-quality universal preschool boosts the present value of national earnings by almost \$4. These national benefits are sufficient to justify sizable federal subsidies for universal preschool.

From a national perspective, four out of the five jobs attracted to a state by traditional economic development subsidies are taken away from other states. After adjusting for these adverse effects on other states, a typical state's investment of one dollar in economic development subsidies probably increases the present value of earnings by less than a dollar nationally. In low-unemployment states, economic development subsidies may even reduce national earnings by increasing inflationary pressures, which will force macroeconomic policymakers to restrict national economic growth. In high-unemployment states, economic development subsidies may have greater than average benefits, by redistributing economic growth in a way that reduces inflationary pressures and allows more expansionary macro policy. Therefore, federal policy should explore discouraging economic development subsidies in low-unemployment areas, while encouraging economic development subsidies in high-unemployment areas.

A key design issue is how preschool's economic development benefits vary with preschool spending per student. This deserves further research. However, even if we make extreme assumptions about how much must be spent per preschooler to assure that the preschool is high quality, preschool still produce more than a dollar of earnings benefits per dollar invested.

Another key design issue is whether we should target preschool on lower income families. The estimates presented in this report assume a truly universal preschool program, in which free preschool is provided to all. The estimates presented here also assume that preschool's benefits are much higher for lower-income children than upper-income children. Even under this assumption, a universal preschool program has large economic benefits. A more targeted program would be estimated to have larger benefits per dollar spent. However, such a targeted program may have less political support. In addition, the research evidence for these greater benefits from targeting is not definitive.

These program design issues should not obscure the bottom line: universal preschool education would have sizable economic development benefits. The economic development benefits of universal preschool are comparable in magnitude to business subsidies from a state perspective, and larger in magnitude from a national perspective.

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Table 1. Jobs and Earnings for State Residents From Traditional Economic Development Subsidies of Equivalent Size to Universal Preschool Program

Year	As percentage of baseline state employment	As percentage of baseline state wage and salary earnings	Year	As percentage of baseline state employment	As percentage of baseline state wage and salary earnings
2006	0.00	0.00	2037	0.55	1.02
2007	0.05	0.06	2038	0.55	1.03
2008	0.09	0.12	2039	0.56	1.04
2009	0.12	0.18	2040	0.56	1.05
2010	0.15	0.23	2041	0.57	1.07
2011	0.18	0.28	2042	0.57	1.08
2012	0.20	0.32	2043	0.58	1.08
2013	0.22	0.36	2044	0.58	1.09
2014	0.24	0.39	2045	0.59	1.10
2015	0.26	0.43	2046	0.59	1.11
2016	0.28	0.47	2047	0.59	1.11
2017	0.30	0.51	2048	0.60	1.12
2018	0.31	0.54	2049	0.60	1.12
2019	0.33	0.58	2050	0.60	1.13
2020	0.35	0.61	2051	0.60	1.13
2021	0.36	0.65	2052	0.60	1.13
2022	0.38	0.68	2053	0.60	1.13
2023	0.40	0.71	2054	0.61	1.14
2024	0.41	0.74	2055	0.61	1.14
2025	0.42	0.77	2056	0.61	1.14
2026	0.44	0.79	2057	0.61	1.14
2027	0.45	0.82	2058	0.61	1.14
2028	0.46	0.84	2059	0.61	1.14
2029	0.47	0.87	2060	0.61	1.14
2030	0.48	0.89	2061	0.61	1.14
2031	0.49	0.91	2062	0.61	1.14
2032	0.50	0.93	2063	0.61	1.14
2033	0.51	0.95	2064	0.61	1.14
2034	0.52	0.97	2065	0.61	1.14
2035	0.53	0.99	2066 & subsequent years		
2036	0.54	1.00		0.61	1.15

NOTES: Table shows effects on jobs and real earnings of state residents of an economic development subsidy program that each year from initial year (assumed to be 2007) onwards devotes resources to economic development subsidy program equal to what would be costs of universal preschool program.

Table 2. Employment Rate Effects of the Perry Preschool Program: Predicted Effects Based on the Program's Effects on Educational Attainment, Versus Actual Employment Rate Effects

Age		Predicted employment rate based on educational attainment	Actual observed employment rate	Actual difference minus predicted difference	Unpredicted difference as percent of predicted control group employment rate	Extrapolation of unpredicated employment difference as percent of control group for CPC program
19	Program group	51.7	50			
	Control group	49.0	32			
	Difference	2.7	18	15.3	31.2	15.6
27	Program group	72.5	69			
	Control group	70.1	56			
	Difference	2.4	13	10.6	15.2	7.7 (half of average of 15.2 and 15.8)
40	Program group	77.8	76			
	Control group	75.8	62			
	Difference	2.0	14	12.0	15.8	

NOTE: See Table 11 of Bartik (2006) for a more detailed note giving full sources for derivations. The predicted employment rates are based on educational attainment of each group and data from Current Population Survey on employment rates of different educational groups. Perry preschool data come from Schweinhart et al. (2005) and Barnett (1993). The last column extends these results to the CPC-like program considered in this project. Because the CPC program has about half the educational attainment effects of the Perry Preschool program, I assume that the CPC program's "bonus" effects on employment rates, above and beyond the effects due to educational attainment, are half the effects observed in the Perry Preschool program.

Table 3. Percentage Living in Same State, Different Educational Attainment Groups, Based on Data from the Panel Survey on Income Dynamics and Census PUMS data

Age	PSID: % living in same state as at age 4			PUMS: % living in same state as state of birth				Ratio of PSID weighted average to PUMS weighted average	PUMS figure adjusted to PSID concept of percentage in state as lived in at age 4, with adjustment using average observed ratio	
	Education < 12 years	Education 12–15 years	Education > 16 years	Weighted average based on distribution of education in preschool program group at each age	High school dropouts	High school degree but no higher degree	Associates degree or higher			Weighted average based on distribution of education in preschool program group at each age
16	85.8	87.3	84.0	85.8	78.7	74.5	69.6	78.7	109.0	85.1
17	87.7	87.7	82.8	87.7	79.1	78.1	70.7	79.1	110.9	85.5
18	85.2	85.2	82.9	85.2	78.4	71.2	73.0	78.4	108.6	84.8
19	84.8	85.9	87.1	85.3	78.4	70.6	70.7	74.5	114.6	80.5
20	81.9	83.9	88.4	82.9	77.8	70.9	71.2	74.4	111.5	80.4
21	79.2	82.9	89.6	81.5	76.9	70.0	70.0	72.6	112.3	78.5
22	79.0	80.4	81.4	79.9	77.0	70.0	65.3	72.6	110.0	78.5
23	85.5	79.2	71.3	81.5	76.0	70.7	63.0	72.6	112.2	78.5
24	86.3	77.3	65.2	80.5	76.2	70.8	61.2	72.6	110.8	78.5
25	88.7	77.0	61.0	81.1	74.8	69.6	59.2	71.3	113.6	77.1
26	84.2	75.5	58.6	78.3	75.4	69.3	58.4	71.3	109.8	77.0
27	82.1	75.0	57.5	77.1	74.3	69.2	57.7	70.8	109.0	76.5
28	82.6	73.5	58.0	76.3	73.3	68.7	57.1	70.0	109.0	75.7
29	84.6	74.6	60.6	77.7	73.9	68.3	56.1	69.9	111.1	75.6
30	74.3	71.8	59.2	72.2	72.4	67.7	55.6	68.9	104.8	74.4
31	80.4	72.0	61.4	74.5	72.0	67.6	55.4	68.6	108.6	74.1
32	82.8	70.9	59.1	74.4	72.2	67.8	55.0	68.7	108.3	74.3
33	87.3	76.0	60.5	79.0	72.7	67.5	55.1	68.6	115.1	74.2
34	62.1	70.8	57.2	67.1	72.0	67.6	54.9	68.3	98.2	73.8
35	86.7	73.0	57.7	76.6	71.6	66.6	54.6	67.6	113.5	73.0
36	46.1	69.9	54.2	61.1	71.9	66.2	53.6	67.2	90.8	72.7
37	83.9	70.2	52.4	73.4	70.7	66.1	53.3	66.7	110.0	72.1
38	42.6	62.6	54.9	55.6	71.4	66.4	53.6	67.1	82.9	72.5
39	75.3	73.8	57.5	73.0	70.7	66.3	53.3	66.7	109.6	72.1
40					70.7	66.2	53.1	66.5		71.9
41					70.3	66.2	52.6	66.4		71.7
42					70.5	65.9	52.9	66.3		71.6
43					70.6	66.0	52.4	66.3		71.7

Table 3. (Continued)

Age	PSID: % living in same state as at age 4			PUMS: % living in same state as state of birth				Ratio of PSID weighted average to PUMS weighted average	PUMS figure adjusted to PSID concept of percentage in state as lived in at age 4, with adjustment using average observed ratio
	Education < 12 years	Education 12–15 years	Education > 16 years	Weighted average based on distribution of education in preschool program group at each age	High school dropouts	High school degree but no higher degree	Associates degree or higher		
44					71.1	65.8	52.0	66.4	71.7
45					69.6	65.2	51.9	65.5	70.8
46					70.2	64.7	52.2	65.4	70.7
47					69.9	64.8	51.8	65.4	70.6
48					69.9	64.4	51.7	65.1	70.4
49					69.1	64.0	51.6	64.6	69.8
50					69.1	63.4	51.7	64.2	69.4
51					68.9	63.5	50.9	64.2	69.4
52					69.0	62.6	49.7	63.5	68.7
53					67.8	62.5	48.6	63.0	68.1
54					67.6	60.9	46.6	61.9	66.9
55					67.5	59.5	44.9	60.8	65.7
56					66.0	60.3	45.0	60.9	65.8
57					66.8	60.5	45.4	61.2	66.2
58					67.0	60.7	45.7	61.5	66.4
59					64.8	60.0	44.9	60.3	65.2
60					66.2	59.9	45.7	60.7	65.6
61					65.4	59.6	45.3	60.3	65.2
62					65.5	60.0	45.7	60.6	65.5
63					65.0	59.7	44.6	60.1	65.0
64					65.3	59.6	44.8	60.2	65.0
65					64.6	59.0	45.4	59.6	64.4
66					64.8	59.2	45.3	59.8	64.6
67					64.9	58.8	45.6	59.6	64.4
68					64.7	59.5	44.7	59.9	64.8
69					64.9	58.8	45.8	59.7	64.5
70					64.8	58.7	45.6	59.6	64.4
71					64.9	58.4	45.3	59.3	64.1

Table 3. (Continued)

Age	PSID: % living in same state as at age 4			PUMS: % living in same state as state of birth				Ratio of PSID weighted average to PUMS weighted average	PUMS figure adjusted to PSID concept of percentage in state as lived in at age 4, with adjustment using average observed ratio
	Education < 12 years	Education 12–15 years	Education > 16 years	Weighted average based on distribution of education in preschool program group at each age	High school dropouts	High school degree but no higher degree	Associates degree or higher		
72					64.8	58.6	44.7	59.4	64.2
73					64.2	58.0	45.1	58.9	63.6
74					64.5	58.0	44.6	58.9	63.7
75					65.1	57.1	45.4	58.6	63.4
76					64.8	57.1	43.6	58.4	63.1
77					64.6	56.8	45.1	58.3	63.0
78					64.7	56.4	43.8	58.0	62.7
79					64.5	56.6	44.2	58.1	62.8

NOTES: See Table 12 of Bartik (2006) for more details. The PSID data follows all 4-year-olds in the years 1968-77 until they are last observed in the PSID; there are reasonable sample sizes for this calculation up to age 30. The Census PUMS (Public Use Microdata Sample) data are cross-sectional data for the year 2000. The weighted averages use educational attainment data for preschool participants for different ages. To calculate the percentage of persons of all different ages who live in the same state they lived in at age 4, I take the PUMS data, which has the largest sample size and all ages included, and adjust it using the PSID data. Specifically, I multiply the PUMS figures by 1.081, which is the average ratio of the PSID figures to the PUMS figures for overlapping years.

Table 4. Percentage of Persons Living in Birth State

State of birth	% living in state of birth	State of birth	% living in state of birth	State of birth	% living in state of birth
Alabama	68.2	Kentucky	65.8	North Dakota	44.8
Alaska	53.5	Louisiana	71.6	Ohio	70.9
Arizona	69.9	Maine	66.3	Oklahoma	60.3
Arkansas	58.8	Maryland	68.5	Oregon	66.0
California	76.9	Massachusetts	66.2	Pennsylvania	69.1
Colorado	62.0	Michigan	73.7	Rhode Island	60.4
Connecticut	65.0	Minnesota	71.1	South Carolina	69.8
Delaware	62.3	Mississippi	60.3	South Dakota	49.6
District of Columbia	16.8	Missouri	66.0	Tennessee	70.2
Florida	73.6	Montana	53.3	Texas	79.8
Georgia	73.4	Nebraska	56.0	Utah	70.7
Hawaii	63.0	Nevada	62.9	Vermont	59.1
Idaho	55.4	New Hampshire	61.1	Virginia	67.3
Illinois	65.7	New Jersey	64.5	Washington	70.4
Indiana	69.1	New Mexico	59.9	West Virginia	52.2
Iowa	59.0	New York	63.2	Wisconsin	73.3
Kansas	55.9	North Carolina	74.8	Wyoming	42.8
		U.S. Average	68.4		

NOTE: This is derived from a special tabulation by the U.S. Census Bureau from the 2000 U.S. Census, released on the internet on January 31, 2005, and available at <http://www.census.gov/population/www/cen2000/phc-t38.html>. This includes all U.S. residents in 2000 born in the U.S. The percentage is simply what percentage of this total is living in the same state they were born in, broken down by state of birth.

Table 5. Jobs Generated for State Residents by Permanent Universal Preschool Program, Compared to Jobs Generated by Economic Development Subsidy Program of Same Cost

Jobs generated as % of baseline employment			Jobs generated as % of baseline employment		
Year	Preschool program	Economic development program	Year	Preschool program	Economic development program
2006	0.00	0.00	2042	0.72	0.57
2007	0.00	0.05	2043	0.75	0.58
2008	0.00	0.09	2044	0.77	0.58
2009	0.00	0.12	2045	0.80	0.59
2010	0.00	0.15	2046	0.82	0.59
2011	0.00	0.18	2047	0.85	0.59
2012	0.00	0.20	2048	0.88	0.60
2013	0.00	0.22	2049	0.90	0.60
2014	0.00	0.24	2050	0.93	0.60
2015	0.00	0.26	2051	0.95	0.60
2016	0.00	0.28	2052	0.98	0.60
2017	0.00	0.30	2053	1.00	0.60
2018	0.00	0.31	2054	1.02	0.61
2019	0.01	0.33	2055	1.05	0.61
2020	0.04	0.35	2056	1.07	0.61
2021	0.07	0.36	2057	1.09	0.61
2022	0.11	0.38	2058	1.11	0.61
2023	0.15	0.40	2059	1.13	0.61
2024	0.19	0.41	2060	1.15	0.61
2025	0.23	0.42	2061	1.16	0.61
2026	0.27	0.44	2062	1.18	0.61
2027	0.31	0.45	2063	1.20	0.61
2028	0.34	0.46	2064	1.21	0.61
2029	0.37	0.47	2065	1.22	0.61
2030	0.40	0.48	2066	1.23	0.61
2031	0.43	0.49	2067	1.24	0.61
2032	0.45	0.50	2068	1.25	0.61
2033	0.48	0.51	2069	1.26	0.61
2034	0.51	0.52	2070	1.26	0.61
2035	0.54	0.53	2071	1.27	0.61
2036	0.56	0.54	2072	1.27	0.61
2037	0.59	0.55	2073	1.28	0.61
2038	0.62	0.55	2074	1.28	0.61
2039	0.64	0.56	2075	1.28	0.61
2040	0.67	0.56	2076& subsequent years		
2041	0.69	0.57		1.29	0.61

NOTES: The jobs generated for the preschool program are solely due to effects on participants and peers, and omit all other avenues of influence of preschool programs on job generation (e.g., balanced budget multiplier, labor supply of parents, etc.). These other avenues do not have large effects. Both programs considered are assumed to start in 2007.

Table 6. Real Earnings Generated for State Residents by Permanent Universal Preschool Program, Compared to Real Earnings Generated by Economic Development Subsidy Program of Same Cost

Earnings generated as % of baseline state earnings			Earnings generated as % of baseline state earnings		
Year	Preschool program	Economic development program	Year	Preschool program	Economic development program
2006	0.00	0.00	2042	0.61	1.08
2007	0.00	0.06	2043	0.64	1.08
2008	0.00	0.12	2044	0.68	1.09
2009	0.00	0.18	2045	0.71	1.10
2010	0.00	0.23	2046	0.75	1.11
2011	0.00	0.28	2047	0.78	1.11
2012	0.00	0.32	2048	0.82	1.12
2013	0.00	0.36	2049	0.85	1.12
2014	0.00	0.39	2050	0.88	1.13
2015	0.00	0.43	2051	0.91	1.13
2016	0.00	0.47	2052	0.94	1.13
2017	0.00	0.51	2053	0.98	1.13
2018	0.00	0.54	2054	1.01	1.14
2019	0.01	0.58	2055	1.04	1.14
2020	0.02	0.61	2056	1.07	1.14
2021	0.03	0.65	2057	1.10	1.14
2022	0.05	0.68	2058	1.12	1.14
2023	0.07	0.71	2059	1.15	1.14
2024	0.09	0.74	2060	1.17	1.14
2025	0.12	0.77	2061	1.19	1.14
2026	0.14	0.79	2062	1.21	1.14
2027	0.17	0.82	2063	1.23	1.14
2028	0.20	0.84	2064	1.25	1.14
2029	0.22	0.87	2065	1.27	1.14
2030	0.25	0.89	2066	1.28	1.15
2031	0.28	0.91	2067	1.29	1.15
2032	0.30	0.93	2068	1.30	1.15
2033	0.33	0.95	2069	1.31	1.15
2034	0.36	0.97	2070	1.31	1.15
2035	0.39	0.99	2071	1.32	1.15
2036	0.42	1.00	2072	1.32	1.15
2037	0.45	1.02	2073	1.33	1.15
2038	0.48	1.03	2074	1.33	1.15
2039	0.51	1.04	2075	1.33	1.15
2040	0.54	1.05	2076 & subsequent years		
2041	0.58	1.07		1.34	1.15

NOTES: The real earnings generated for the preschool program are solely due to effects on participants and peers, and omit all other avenues of influence of preschool programs on real earnings generation (e.g., balanced budget multiplier, labor supply of parents, etc.). These other avenues do not have large effects. Both programs considered are assumed to start in 2007.

Table 7. Alternative Estimates of Present Value of Preschool Earnings Effects per Dollar Spent

Assumptions About Program Designs or Effects	Present Value of Earnings Effects Per Dollar Spent
Baseline assumptions	\$2.78
Different assumptions about participant effects compared to CPC program (Karoly and Bigelow, 2005, p. 107)	\$1.97 to \$4.85
More expensive CPC design (2 years, 17 to 2 ratio)	\$1.07
Perry Preschool design and effects	\$1.21
Eliminate public preschool for families above \$50K income	\$9.76
Sliding scale fees based on family income	\$2.77 ratio to taxes plus fees for program, \$4.55 ratio to taxes for program
No displacement effects of preschool	\$4.14

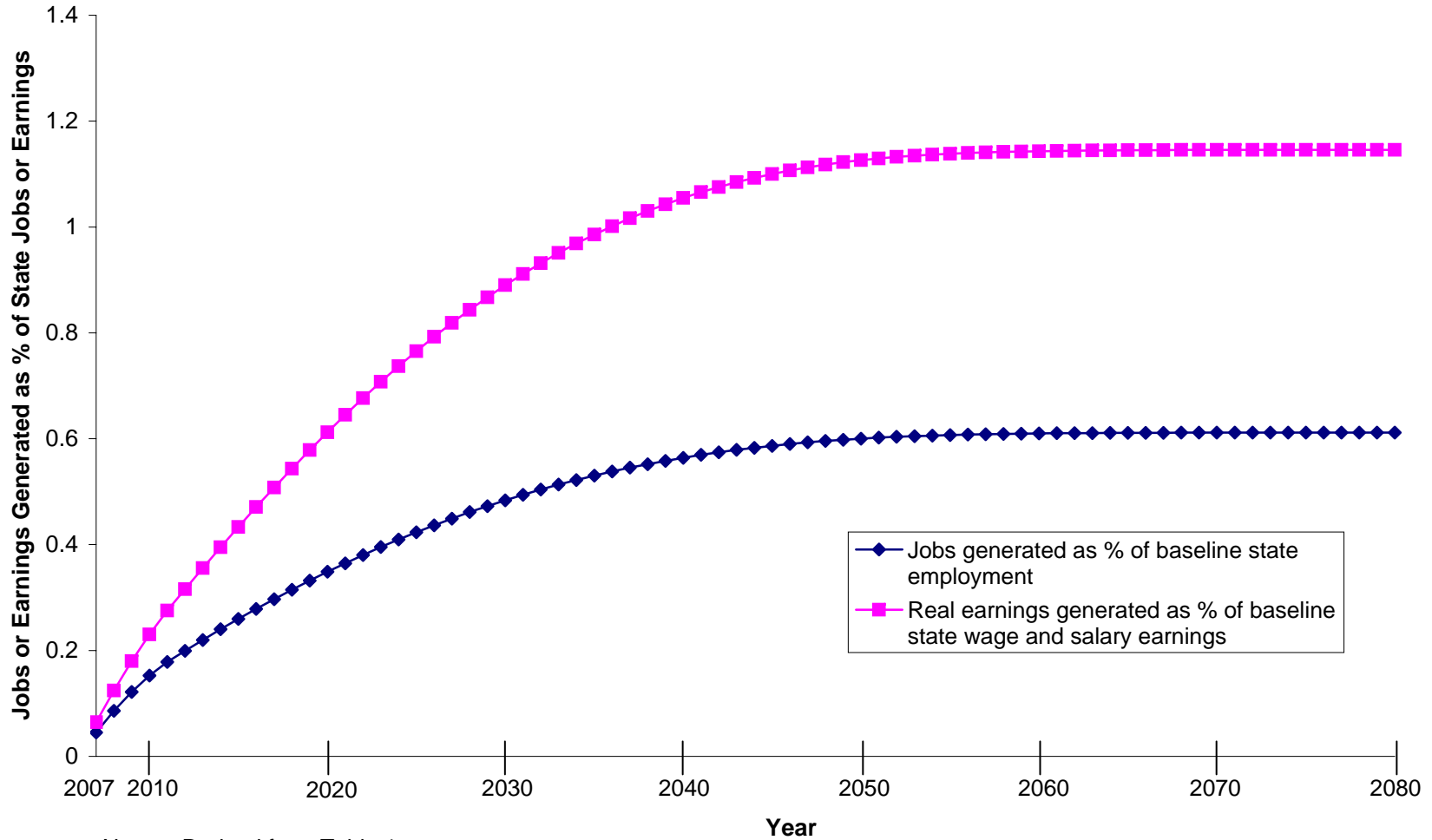
NOTES: See text of this paper, and Bartik (2006), for more detail on the different assumptions made.

Table 8. Long-Run Effects of Universal Preschool at the National Level

	Long-run % effect	Effect in 2080
Jobs	1.8%	3.2 million jobs
Annual real earnings (2004 dollars)	1.9%	\$294 billion
Annual real GDP (2004 dollars)	1.9%	\$943 billion
Annual government tax revenue (2004 dollars)	1.9%	\$235 billion
Annual preschool costs (2004 dollars)		\$60 billion

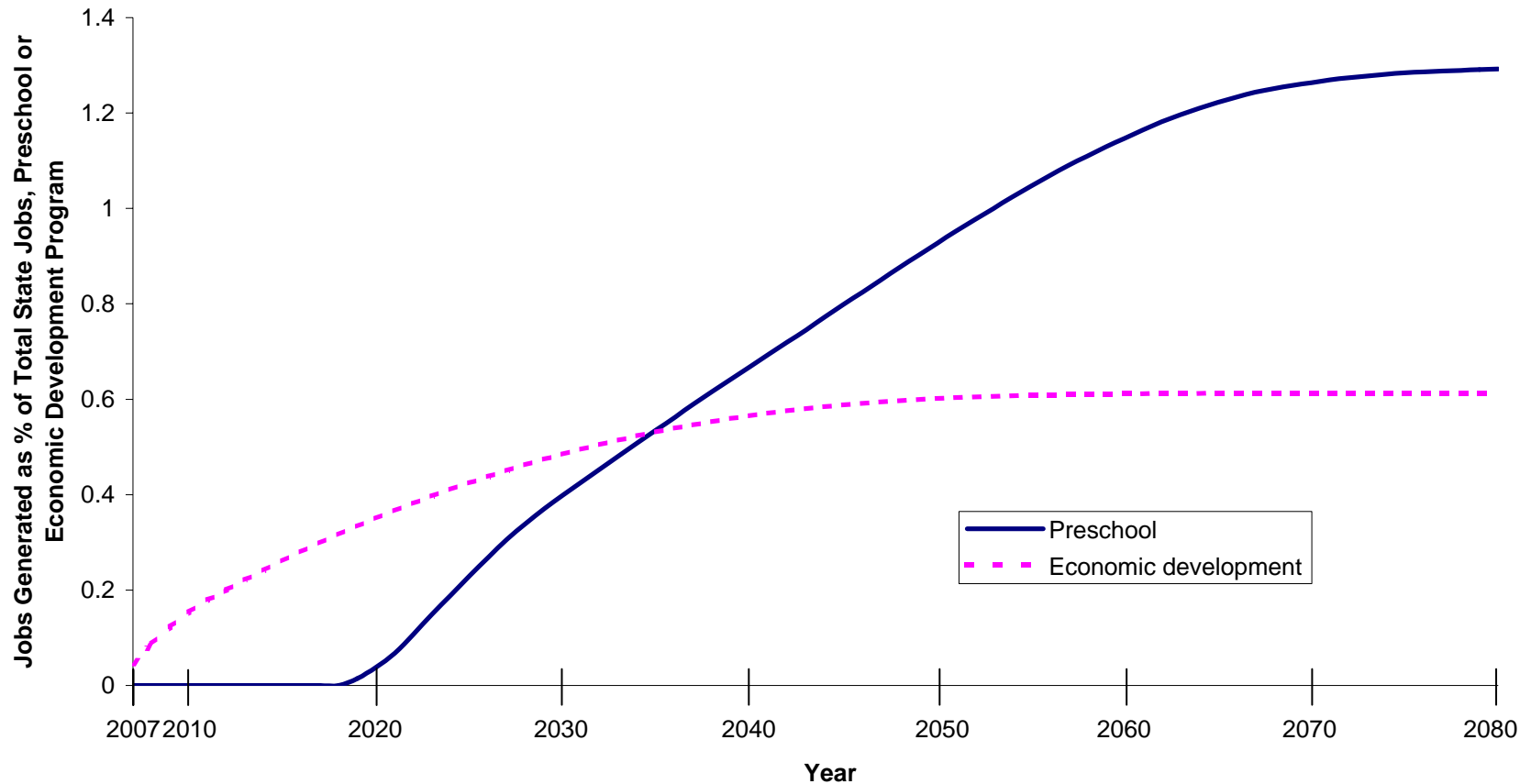
Notes: These numbers show percentage effects based on assuming an ongoing universal preschool program, in an economy with underlying population and employment growth of 0.3%, and underlying growth in real wage rates of 1.2%, and therefore real earnings growth of 1.5%. These figures are based on long-run projections from the U.S. Social Security Administration (OASDI Board of Trustees, 2005), except I use slightly higher real wage growth of 1.2% from the U.S. Congressional Budget Office (Holtz-Eakin, 2005). The assumed annual real GDP growth is assumed to be 1.9%, which is consistent with the OASDI Board of Trustees Report, and is consistent with a constant labor share and non-wage compensation growing faster than wage compensation. The effects in 2080 apply the percentage effects to a forecast U.S. economy in 2080, carrying forward these average growth rates from now to 2080. Annual government tax revenue is calculated based on figures for current federal, state, and local government tax revenue as a percentage of GDP. Annual preschool costs take the initial costs of preschool, and assume they are inflated by GDP growth between now and 2080.

Figure 1. Jobs and Real Earnings Generated from Permanent Economic Development Subsidy Program Equal in Costs to Universal Preschool Program, as Percentage of Baseline State Employment and Wage and Salary Earnings



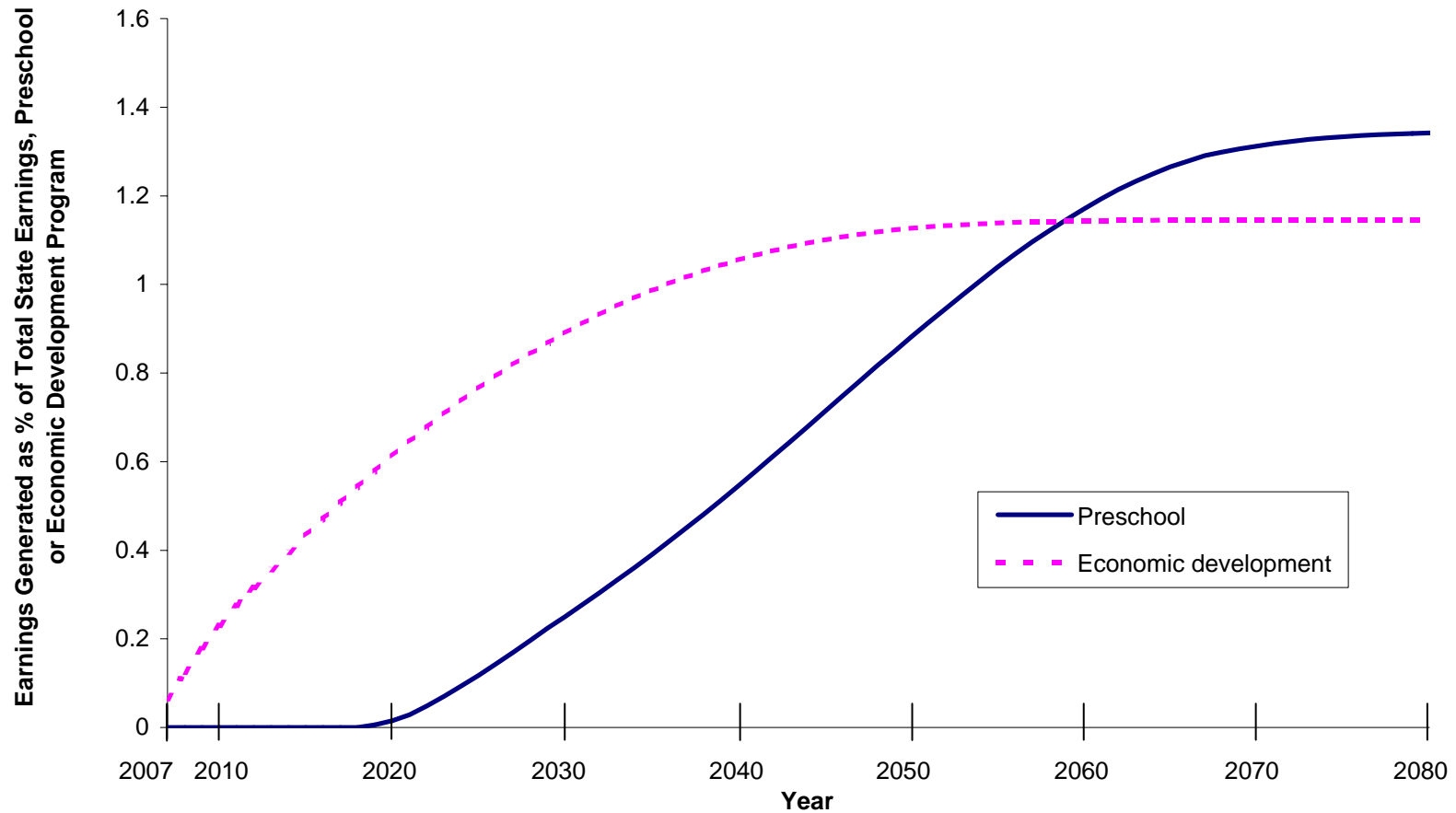
Notes: Derived from Table 1.

Figure 2. Jobs Generated for State Residents by Permanent Universal Preschool Program, Compared to Jobs Generated by Economic Development Subsidy Program of Same Cost



Note: The jobs generated for the preschool program are solely due to effects on participants and peers, and omit all other avenues of influence of preschool programs on job generation (e.g., balanced budget multiplier, labor supply of parents, etc.). The jobs generated as % of baseline employment compares jobs generated to total state baseline employment, which is assumed to grow at 0.3% per year. These percentage figures for preschool would apply to any state that adopted a universal preschool program of this design, or an economic development program that had same cost as such a program. Both programs are assumed to start in 2007.

Figure 3. Real Earnings Generated for State Residents by Permanent Universal Preschool Program, Compared to Real Earnings Generated by Economic Development Subsidy Program of Same Cost



Note: The earnings generated for the preschool program are solely due to effects on participants and peers, and omit all other avenues of influence of preschool programs on earnings generation (e.g., balanced budget multiplier, labor supply of parents, etc.). The earnings generated as % of baseline earnings compares earnings generated to total state baseline earnings, which is assumed to grow at 1.5% per year. These percentage figures for preschool would apply to any state that adopted a universal preschool program of this design, or an economic development program that had same cost as such a program. Both programs are assumed to start in 2007.