



# Budget Model

## Total Cost of Universal Pre-K, Including New Facilities

**Summary:** We estimate that each new preschooler for a universal pre-K program requires about \$21,000 in new construction costs for facilities expansion. Including non-construction costs, a universal pre-K program for three- and four-year-olds will cost about \$351 billion over the 10-year budget window. If made permanent after 10 years, this program will have essentially no impact on long-run GDP. A pre-K program for just four-year-olds reduces the 10-year cost to \$196 billion and slightly increases long-run GDP, if that program is made permanent.

### Key Points

- We estimate that each new preschooler for a universal pre-K program requires about \$21,000 in new construction costs for facilities expansion.
- We estimate that nationwide universal preschool education for three- and four-year-olds will cost \$351 billion over the next 10 years, including \$41 billion (2022 dollars) in new facility construction costs over the first two years. This policy raises government debt by 2.41 percent in 2053 relative to baseline. GDP in 2053 remains essentially unchanged, as the negative effect of additional debt is offset with improved productivity from additional education and additional caregivers entering the labor market.
- A pre-K program for just four-year-olds would cost \$196 billion over the next 10 years, including new construction costs. This policy raises government debt by 1.42 percent in 2053 relative to baseline and raises GDP by 0.03 percent.

### Introduction

Nationwide and universal preschool requires adequate capital and labor in order to function and succeed. New preschoolers need classrooms, and existing public school buildings have limited capacity to absorb more students. These new students also need teachers, resulting in significant shifts in that labor market. We estimate a U.S. nationwide universal preschool program for three- and four-year-olds would cost about \$41 billion (in 2022 dollars) on facilities expansion over the first two years of the policy.

As in our previous analysis on [preschool](#), there are two main macroeconomic benefits expected from preschool programs. First, students enrolled in high-quality preschool are likely to have higher labor productivity when they eventually enter the workforce, though this effect does not manifest for a couple of

decades. Second, certain caregivers of preschoolers can increase participation in the current labor market because public preschool implicitly provides childcare services. In our current analysis, we incorporate productivity estimates from more recent studies and also account for construction costs.

Having higher labor productivity directly benefits individual workers, who can earn more and accumulate more wealth over time. When a significant portion of the workforce has higher productivity, overall wages in the economy are higher because a more productive workforce increases the marginal returns to capital. Higher capital returns provide an incentive to invest which leads to larger capital stock, making labor even more productive and thus raising wages. These positive feedback effects generate higher GDP than would be predicted from a purely static analysis of labor productivity improvements.

We estimate the effects of a nationwide universal preschool policy for three- and four-year-olds, which takes effect in 2023 and budgets the necessary startup costs of \$41 billion. This policy costs \$351 billion over the 10-year budget window. Under this policy, GDP is 0.03 percent higher than baseline in 2033 and unchanged in 2053. This policy raises government debt by 0.97 percent above baseline in 2033 and by 2.41 percent in 2053.

We also model a scenario where nationwide universal preschool is available only to four-year-olds. This policy requires an \$18 billion capital investment in preschool facilities. Total costs over the 10-year budget window for this policy are \$196 billion. GDP is the same as that of the baseline in 2033 and 0.03 percent higher in 2053. Preschool for four-year-olds raises government debt by 0.56 percent above baseline in 2033 and by 1.42 percent in 2053.

## Cost of Facilities

School facilities require substantial capital expenditures, and most school districts operate [close to capacity](#). Construction takes time, with the average school building taking [two years to be built](#) from the time funds are first allocated according to [Levelset](#) (a construction industry platform). Additions to existing buildings are an option to expand space, but the costs are highly variable as they are dependent on the design of existing structures and available land.

For our analysis of the time and cost of construction to support expanded public preschool, we make the following assumptions:

1. Existing facilities have no additional capacity.
2. For each additional preschool "seat," \$21,272 (in 2022 dollars) is spent on building construction.<sup>1</sup>
3. New buildings become available two years after construction begins. We assume no delays in starting construction.
4. Most existing private preschool facilities are incompatible with a public preschool program, so there are no ready buildings or other facilities which can be purchased or leased to accommodate the new preschoolers.

To calculate the cost of building preschools, we take the elementary school building cost per square foot from [Gordian's RSMMeans data](#) (a construction cost database) and adjust it by the new school building construction cost growth rate obtained from [the U.S. Bureau of Labor Statistics and the Federal Reserve Bank of St. Louis \(FRED\)](#). Our adjusted cost in 2022 dollars is \$213 per square foot. Preschools face legal restrictions governing usable classroom space per student but also must have additional square footage in the overall facility. A [report on preschool design and construction](#) published by the Community Investment Collaborative for Kids states preschools should have approximately 100 square feet per child. Combining these statistics, we

estimate the buildout cost per student to be \$21,272 in 2022 dollars. To obtain the aggregate buildout cost, we multiply the cost per student by the projected change in public preschool enrollment. We estimate the aggregate cost of building additional preschool facilities to accommodate projected enrollment growth to be \$41 billion in 2022 dollars.<sup>2</sup>

## Labor Market Effects

As well as the expansion of public facilities across the country, universal preschool requires additional educators and staff. Personnel expenses are the bulk of the costs of running a preschool program. According to a cost study [analysis](#) of the North Carolina preschool program, "in public schools, the costs associated with employees, both salaries and benefits, accounted for 72% percent of the total cost per slot. In Head Start programs, the percentage was 77%. The percentage for private child care centers was 72%."

We calculate the average annual salary for preschool and kindergarten teachers utilizing data from the U.S. Bureau of Labor Statistics' (BLS) [Occupational Employment and Wage Statistics](#). Taking an average over the five most recent years of wage data (2015 through 2019), we estimate the average annual salary is \$35,779 for preschool teachers and \$60,449 for kindergarten teachers (in 2022 dollars).<sup>3</sup>

Teaching is a profession that requires a level of training and credentials, so workers in other fields cannot easily switch to preschool teaching. Individuals who want to become preschool teachers need to invest in specialized and costly training and have some assurance of the value of return on that investment. Different U.S. states have varying credentialing requirements for preschool teachers. Based on the latest [NIEER State of Preschool Report](#) and other sources, existing requirements (in 63 state-funded preschool programs in 44 states and DC) for teachers vary:

- 36 state-funded preschool programs require preschool lead teachers to have a bachelor's degree,
- 51 programs require specialized training in early childhood education and/or child development from preschool lead teachers,
- 19 programs require an associate's degree, Child Development Associate (CDA) credential, or a similar credential for preschool assistant teachers
- 12 programs in 10 states require a bachelor's degree for teachers in public settings, but not for teachers in non-public school settings,
- the state of Pennsylvania has four state-funded pre-school programs, each with a different requirement for joining the teaching staff.

However, the scarcity of qualified teachers has caused many states to create 'alternative' credentialing paths. The states of New Jersey, Texas, and California, hire more than one-third of their new teachers from alternative routes, and forty-seven states and the District of Columbia have some form of alternative-route program for teachers.<sup>4</sup>

Therefore, preschool expansion requires addressing questions of shortages and expected growth in teacher labor supply. Also, the expected wages for public, as well as private preschool teachers affect the cost of preschool. We model preschool teacher wages by assuming: (1) public preschool teacher salaries reach parity with public kindergarten teacher salaries, (2) institutional wage rigidities prevent additional wage gains even in the face of higher demand for teachers, (3) additional labor supply arises to meet demand, and (4) private preschool teacher salaries continue to lag behind public preschool teacher salaries.

### ***Assumption 1: Pay Parity***

With an expansion of public preschool, it seems likely that preschool teachers will be paid comparably to kindergarten teachers. This assumption follows the [National Institute for Early Education Research's \(NIEER\) cost estimate for high-quality preschool](#). Furthermore, this assumption is in line with a recent trend of state-funded preschool programs pursuing pay parity<sup>5</sup> and we conjecture that a national-level preschool expansion would accelerate that trend.

### ***Assumption 2: Wage Rigidity***

In labor markets with competitive pricing, a sudden increase in the demand for labor generates higher wages. The wage-setting process for public school teachers in the U.S. is less responsive since, in general, it "compensates teachers according to a school-district-determined single salary schedule—a matrix that fixes a teacher's salary based solely on the years of experience teaching in that school district and his or her educational attainment" (James and Wyckoff 2020).<sup>6</sup> Because of this institutional wage rigidity, we assume public preschool teacher salaries are unresponsive to increased demand (beyond reaching parity with kindergarten teacher salaries). Even though teacher shortages are common, as a conservative estimate, we assume that the supply of new teachers will be sufficient by 2025 when preschool enrollment expansion occurs. If labor market dislocations are larger and longer-lived, our labor cost estimate may be too low and the quality of schooling may be lower due to teacher shortages.

### ***Assumption 3: Adequate Labor Supply***

Although according to [NIEER's The State of Preschool 2021 Report](#), most state-funded preschool policies require lead teachers to have bachelor's degrees, we assume the two-year facilities buildout lag provides enough time for college-educated workers in dissimilar fields to supplement their education with specialized early childhood education training. Additionally, current college students may enter the preschool teaching field at a higher rate as demand for preschool teachers continues to rise and wages rise to reach parity with elementary school educators. Thus, we assume by the time new preschool facilities are built, the supply of preschool teachers will be ready to meet increased demand.

### ***Assumption 4: Private-Public School Wage Gap***

While public school preschool teacher salaries are likely to reach parity with kindergarten teachers, the effects on private school salaries are less clear. According to Barnett and Kasmin in a [NIEER report about preschool pay parity](#), "[I]n Iowa, pre-K teachers in the public schools who are covered by collective bargaining are paid fairly similarly to K-12 teachers, while their counterparts in the private sector providing state pre-K are paid nearly \$20,000 a year less." Economic theory suggests that competition for labor should cause comparable jobs—in this case, preschool teachers—to have comparable pay, so the persistence of a pay gap may imply that either (a) the jobs of public versus private preschool teachers are sufficiently different or that (b) private preschool provides specific benefits (such as flexibility in the curriculum) which may compensate for lower salaries. We, thus, assume that the universal preschool policy does not significantly affect private preschool teacher salaries. We note that, if private preschool teacher salaries increase, the resulting increase in the cost of private preschool would likely raise the take-up of public preschool and thereby require more government spending to accommodate these new students.

## Updates to Labor Productivity

There is little direct empirical work on universal preschool's effects on future income in the U.S. since it takes decades before treated cohorts enter the labor market. We use two approaches to produce our estimates: (a) studies that determine the additional years of schooling as a result of preschool allow us to project future labor productivity from known effects of extra schooling, and (b) studies that measure the performance of treated students on standardized tests allow us to project future labor productivity from test scores.

While some studies observe a positive treatment effect of preschool enrollment on [academic performance](#) or [educational attainment](#), [a new study focused on Tennessee's Voluntary Pre-K initiative](#) finds that those who were enrolled in this means-tested program show lower performance in achievement tests, as well as increased disciplinary infractions and lower attendance. Rather than rely on any single study, we aggregate various studies into our estimate.

We use the following methodology to convert preschool education effect studies into estimates of changes in adulthood earnings:

- Test score studies

For preschool education studies that measure the effect of preschool on future test scores, we apply the grade-specific conversion ratio suggested by [Chetty et al.](#) (0.495 percent increase in earnings for a one percentile increase in kindergarten test scores; 12 percent increase in earnings from a one standard deviation increase in fourth through eighth-grade test scores).

- Educational attainment studies

For preschool studies that measure the effect of preschool on future educational attainment (e.g. additional years of schooling), we use [Kane and Rouse's estimate](#) that one additional year of post-secondary education leads to a five percent increase in future wages.

We apply this methodology to the estimates of 11 studies on preschool enrollment effects and find that most produce single-digit percentage point increases in adulthood earnings. These studies are consistent in finding that children from economically disadvantaged families tend to benefit more than their non-disadvantaged peers from public preschool education. We, therefore, separate our estimates into two groups based on family background. Estimated treatment effects are a 3.8 percent increase in adulthood earnings for disadvantaged children and a 2.3 percent increase for non-disadvantaged children. These return rates are applied to the cohorts of students who take up preschool under the universal expansion and who were not expected to enroll in preschool otherwise.

When preschool is provided as a public good, the opportunity cost of increasing labor market participation decreases for certain caregivers. According to our estimation, an additional 13 percent of four-year-olds (and 18 percent of three-year-olds) from economically disadvantaged families would be enrolled after the universal preschool expansion. We calculate the corresponding maternal labor supply change based on the findings of [Malik \(2018\)](#) that a one percentage point increase in preschool enrollment rate would result in a one percent increase in the maternal labor supply among such households. The preschool policy only for four-year-olds thus has a smaller impact on caregiver labor supply than the policy which covers both three- and four-year-olds.

Middle and high-income families who previously sent their children to private preschools switch to public preschool when it is an option. We estimate that among this non-disadvantaged group, seven percent of four-year-olds (and 10 percent of three-year-olds) are likely to switch. Households who switch from private to

public receive an implicit income transfer since they save money they previously would have spent on preschool tuition. In our modeling, we do not increase this group's labor productivity because their preschool treatment did not change, rather the cost is shifted from private to public.

## Estimated Economic Effects

We analyze two scenarios: (a) fully implemented universal public preschool for three- and four-year-olds, and (b) fully implemented universal public preschool for four-year-olds alone. In both scenarios, we assume that all needed expenses are deficit-financed and that long-run annual spending is equal to the cost of providing universal preschool permanently. Since the construction of new facilities takes the first two years of the programs' implementation, the first cohort of kids enters expanded preschool in 2025. Table 1 summarizes program costs, including both capital costs and operating costs.

Table 1: Projected costs for universal preschool policy scenarios.

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<b>Budget Window</b>	<b>Cost Type</b>	<b>Policy (a) - Preschool for 3- and 4-Year-Olds</b>	<b>Policy (b) - Preschool for 4- Year-Olds</b>
2023-2032	Buildout	41.0	18.1
	Operating	309.9	178.2
2033-2042	Operating	435.8	250.6
2043-2052	Operating	520.9	299.5

Note: All costs are reported in billions of 2022 dollars.

Table 2 shows the macroeconomic effects of these policies.

Table 2: Macroeconomic effects of universal preschool policy scenarios.

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<b>Output (% deviation from baseline)</b>		
<b>Year</b>	<b>Policy (a) - Preschool for 3- and 4-Year-Olds</b>	<b>Policy (b) - Preschool for 4-Year-Olds</b>
2033	0.03	0.00
2043	-0.01	-0.02
2053	0.00	0.03
<b>Effective labor units supplied (% deviation from baseline)</b>		
<b>Year</b>	<b>Policy (a) - Preschool for 3- and 4-Year-Olds</b>	<b>Policy (b) - Preschool for 4-Year-Olds</b>
2033	0.08	0.03
2043	0.10	0.05
2053	0.21	0.16
<b>Capital (% deviation from baseline)</b>		
<b>Year</b>	<b>Policy (a) - Preschool for 3- and 4-Year-Olds</b>	<b>Policy (b) - Preschool for 4-Year-Olds</b>
2033	-0.07	-0.05
2043	-0.23	-0.15
2053	-0.40	-0.22
<b>Government debt (% deviation from baseline)</b>		
<b>Year</b>	<b>Policy (a) - Preschool for 3- and 4-Year-Olds</b>	<b>Policy (b) - Preschool for 4-Year-Olds</b>
2033	0.97	0.56
2043	1.81	1.08
2053	2.41	1.42
<b>Available labor productivity per capita (% deviation from baseline)</b>		
<b>Year</b>	<b>Policy (a) - Preschool for 3- and 4-Year-Olds</b>	<b>Policy (b) - Preschool for 4-Year-Olds</b>
2033	0.08	0.03
2043	0.09	0.04
2053	0.21	0.15

Under a universal preschool policy for three- and four-year-olds, 1.0 million more three-year-olds and 0.8 million more four-year-olds enter public preschool in 2025.<sup>7</sup> The enrollment of these children translates into an immediate increase in hours available for economic activities for their caregivers. Indeed, in 2033, there is a 0.08 percent increase in effective labor supply with respect to the baseline. This effect is smaller under the policy of universal preschool for four-year-olds only—a 0.03 percent increase. With time, as treated cohorts join the labor market, the supply of labor (in effective units) increases beyond this caregivers' effect and reaches 0.21 percent and 0.16 percent in 2053 for policies (a) and (b), respectively. This labor supply expansion is a reflection of those treated cohorts' higher labor productivity.

However, in the long run, the negative growth effects of a larger government debt offset the extra labor supply under policy (a), which is the more costly program. Policy (a) raises government debt by 0.97 percent above baseline in 2033 and by 2.41 percent in 2053. As the program's expenses continue to grow the debt, capital crowd-out reduces the productive capital of the economy, which offsets the increase in GDP from a larger labor supply. In 2033, output is higher by 0.03 percent relative to baseline under policy (a), but by 2053, output is effectively back to the baseline level.

Since it serves only four-year-olds, policy (b) has a lower cost and amounts to a lower debt increase throughout the years. For this reason, the capital crowd-out is not as strong and, in the long run, it is dominated by the labor supply effect. Preschool for four-year-olds only raises government debt by 0.56 percent above the baseline in 2033 and by 1.42 percent in 2053. GDP is the same as baseline in 2023 and 0.03 percent larger in 2053.

*This analysis was conducted by [Daniela Viana Costa](#), [Maddison Erbabian](#), and [Youran Wu](#) under the direction of [Efraim Berkovich](#). Prepared for the website by [Mariko Paulson](#).*

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1. We estimate the cost per preschool seat at \$21,272 using union construction labor. If the schools are instead built with open shop construction labor, the cost per preschool seat will be \$19,456. ↩
  2. We assume that the construction cost growth rate stays at its current level (5.5 percent, which is the producer price index growth in the last 12 months) for another year, and then returns to the longer-term average (3.7 percent, which is the average over the 2017-2021 period). Due to high price inflation over the last year and the possible continuation of high inflation, this cost growth assumption may be an underestimate. ↩
  3. BLS reports data in nominal wages. We adjust the wage data according to historical data and our projections of chained CPI-U. ↩
  4. **Economic Approaches to Teacher Recruitment and Retention** S Loeb and J Myung Economics of Education (2020) ↩
  5. From <https://www.preschoolteacher.org/salaries/>: "[T]here's a clear trend toward pay parity throughout the country, with many states/regions recently making big moves toward aligning pre-K teacher salaries with public school teacher salaries." ↩
  6. James, J. & Wyckoff, J. (2020). Teacher labor markets: An overview. In S. Bradley & G. Green (Eds.), *The Economics of Education: A Comprehensive Overview* (2nd ed.). Oxford, England: Elsevier / Academic



Press. ↩

7. These numbers include children who would otherwise be in no formal preschool without this universal expansion, as well as those who would shift from private preschools or other childcare centers to public preschools. ↩