CBCSE Report

The Benefits of Adequacy

Estimating the Economic Impacts of Pennsylvania's Basic Education Funding Commission Proposal

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1 Introduction

Pennsylvania's Commonwealth Court ruled in 2023 that the state must reform its K-12 education funding system. The current system relies heavily on local taxes to fund schools, creating wide funding gaps between low- and high-wealth districts. The resource constraints limit low-wealth districts' ability to adequately prepare their students for postsecondary success.

The Basic Education Funding Commission (BEFC), comprised of legislative and executive branch members, has recommended that the state provide an additional $5.1 billion in funding to 371 districts to address their inadequate funding.[i] In this report, we analyze the BEFC adequacy proposal to estimate the economic implications of the proposal on important aspects of education and the economy: school staffing, student outcomes, and long-term economic benefits for Pennsylvania.

We ground our estimates in rigorous causal research on the impact of state K-12 finance reforms on student outcomes and the associated long-term economic benefits. This research, along with Pennsylvania state data, allow us to quantify the impact of the BEFC's proposed adequacy funding on student educational attainment and earnings and the associated economic benefits for students and the state as a whole.

We focus our analysis on increases to high school graduation, human capital among high school graduates, and postsecondary enrollment. This is a conservative approach because it assumes that the effects of improving school quality would only be for those students who would not enroll in college under current circumstances. We make this choice to ensure that this investment is evaluated against high standards and because the research on state K-12 funding reforms finds consistent causal impacts for this population. Thus, our analysis is based on less than one-third of the population of students in the state following current educational attainment rates. Given the expansive benefits of school quality to human capital, this work should be interpreted as a portion of the expected benefits to the state.

Nonetheless, our analysis indicates that the BEFC adequacy proposal would generate societal economic benefits that exceed the investment from less than one-third of the student population alone. In the following sections, we first provide a brief overview of the current gaps between adequately funded and underfunded Pennsylvania school districts. We then analyze the potential impact of the funding on district staffing levels and salaries. In the final two sections we estimate the impact of funding on Pennsylvania student outcomes and the associated economic benefits for students and the state in a benefit-cost or "return on investment" analysis of the BEFC proposal.

[i] Note that House Bill 2370, the current legislative proposal to implement adequacy funding, would increase funds for 367 districts by an amount that is less than one percentage point lower than the BEFC proposal. We focus on the BEFC proposal, and results discussed throughout the report are substantively equivalent under HB 2370.

2 Current District Funding and Staffing Gaps

The BEFC analysis found that 74% of Pennsylvania school districts have inadequate state funding levels.[1] Table 1 compares these districts to adequately funded districts. It also breaks out the 100 most underfunded districts, which make up the bottom 20% of districts in terms of state funding adequacy.

Table 1: Comparison of Adequately Funded and Underfunded School Districts

Measure	Adequately Funded	Under-funded	100 Most Under-funded
Low-income students	36.7%	51.3%	62.0%
Total revenue per student	$25,156	$20,919	$20,222
Total revenue per need-weighted student	$21,859	$17,202	$15,862
Current expenditures per need-weighted student	$19,391	$15,088	$13,422
Teacher salary	$78,621	$67,991	$65,216
Principal salary	$120,497	$106,036	$102,692
Counselor salary	$80,674	$70,624	$68,029
Students per teacher	12.8	13.8	14.4
Need-weighted students per teacher	14.5	16.6	18.4
Students per counselor	311	372	404
Need-weighted students per counselor	354	451	519

Source: Pennsylvania Department of Education, 2022-23. See data sources spreadsheet for detail and technical appendix section 1 for complete variable descriptions.

Compared to adequately funded districts, underfunded districts have more low-income students, lower staff salaries, and higher student-to-staff ratios. Average total revenue per need-weighted student is $4,600 lower in these districts.[ii] The disparities are particularly stark for the 100 most underfunded districts, where total revenue per need-weighted student is $6,000 lower than in adequately funded districts.

[ii] We use the basic education funding formula need-weighted student count, which weights for student need factors like poverty and English learner status. See technical appendix section 1.1 for details.

3 K-12 Workforce Expansion and Staffing Gap Closure

3.1 Evidence on the Impact of Increased Staff Expenditures

The most important resources in schools are the adults educating and supporting students. A large body of research indicates that the quality and supply of teachers are the most impactful school factors that influence student academic achievement.[2,3] Principals, counselors, and other support staff also have causal impacts on student outcomes.[4–6] School districts spend the majority of their budgets on staff, so districts will likely spend the bulk of their adequacy funding on staff, a wise use of funds as research suggests it will pay dividends in improved student outcomes.[7]

Districts and students would benefit from increased staff expenditures through two primary channels: lower student-staff ratios and higher staff salaries. Lower student-staff ratios means smaller class sizes and more individual attention for students. It represents further staffing possibilities as well. For example, it could reflect districts hiring teachers who specialize in CTE, STEM, or arts to expand curricular offerings, or reading and math specialists to support instruction.

Salary increases would improve underfunded districts' ability to compete for talented teachers, principals, and other staff. Research finds that increasing teacher salaries enables districts to compete with both nearby affluent districts and other higher-paying industries to attract and retain high-quality teachers, which in turn improves student achievement.[8,9] To the extent that increased salaries reduce attrition, a portion of that expenditure will be returned to districts through savings on teacher hiring costs. The current teacher shortage makes attracting teachers critical, and raising salaries could be a key strategy to combat the issue in Pennsylvania.

A recent report from Lapp and Shaw-Amoah (2023) finds substantial gaps in staffing levels and salaries between underfunded and adequately funded districts in Pennsylvania.[10] They find that underfunded districts would need to hire more than 11,000 teachers and 1,600 support staff to close staffing gaps and spend an additional $2.6 billion to close salary gaps. We build on these findings to estimate the potential impact of the BEFC adequacy proposal in closing these gaps.

3.2 Methods: Staffing Impacts[iii]

We estimate the potential impact of the BEFC adequacy proposal on underfunded districts' staffing levels and salaries using a parity framework. Our goal is to estimate if the BEFC proposal would allow underfunded districts to close the staffing gaps with adequately funded districts in the areas of student-staff ratios and salaries.

[iii] See the technical appendix section 2 for complete method details.

We limit our analysis to traditional school districts due to inherent challenges in estimating funding increases for individual charter schools. We therefore remove the estimated portion of each district's funds that will go to charter schools. We also assume that 20% of district funds will be used on non-staffing expenditures.[iv]

We model how districts may use the BEFC adequacy funds whereby districts pursue the goal of reaching parity with adequately funded districts on the following three measures, sequentially: 1) student-teacher ratio, 2) student-counselor ratio, and 3) teacher salary. This scenario provides a useful framework for demonstrating the potential for underfunded districts to close staffing gaps with adequately funded districts. The three parity target measures are the averages across all adequately funded districts, as presented in the table in the prior section.

We first calculate the number of additional teachers and counselors that would need to be hired in each underfunded district to reach parity. We also identify the teacher salary increases required to reach parity with the adequately funded district average. Then we calculate the cost of reaching parity on each of the three measures. Finally, we add benefits to salaries and use these full staff compensation figures in our cost calculations.

If districts cannot afford full parity during one of these steps, we assume they would use their remaining funds to come as close to parity as possible on the given measure.

For districts with funds remaining after reaching parity on all three measures, we calculate the number of additional teachers they could hire at the parity salary. Districts could spend this money in any number of ways, of course, but hiring additional teachers is a straightforward way to concretely demonstrate the potential for using the remaining funds.

A caveat is that districts will increase salaries over time due to inflation. However, the adequacy funds are specifically intended to close gaps as they currently exist. Current state proposals would continue basic education funding increases alongside the adequacy funding to address inflationary cost increases. Local revenue will rise with inflation as well. Therefore, we do not incorporate inflation into the current analysis. However, in the technical appendix section 7.1, we provide results of the analysis with inflation incorporated, which can be considered an extreme minimum bound of expected staffing impact.

[iv] Research indicates that districts typically spend 50-60% of funding increases on instructional staff, 20-30% on support staff, and the remainder on capital expenditures. Current proposals limit the allowable uses of adequacy funds to non-capital expenditures, so the assumed 20% set-aside would cover administrative hiring costs and any other non-staffing expenditure. See technical appendix section 2.1 for a more detailed discussion.

3.3 Results

Table 2 shows the results of the analysis. We find that 82% of underfunded districts could reach parity with adequately funded districts on student-teacher and student-counselor ratios and 42% would have enough funds remaining to reach teacher salary parity.

Table 2: Underfunded Districts That Reach Parity With Adequately Funded Districts and Corresponding Staffing Impact

Measure	Outcome
Teacher and Counselor Ratio Parity Reached	82%
Teacher Salary Parity Reached	42%
Teachers Hired	18,063
Counselors Hired	415
Average Teacher Salary Increase	$7,389

If districts hire additional teachers with all remaining funds, roughly 18,000 teachers and 400 counselors would be hired. Even in the extremely conservative inflation-adjusted version, we find a total staff increase of more than 10,000; see technical appendix section 7.1 for details. Charter schools will hire staff as well, making these figures underestimates of the total potential jobs created.

The average teacher salary increase in this scenario would be about $7,400, or about $9,600 among districts that could afford to make any salary increase.

This approach presents just one framework for the use of funds. We could have prioritized salary increases, for instance, and seen many more districts achieve salary parity. In reality, each district will have their own unique set of needs that dictate their spending priorities. Nonetheless, this analysis demonstrates the potential for the BEFC adequacy funds to create parity in staffing levels and salaries among Pennsylvania districts and in turn create thousands of additional jobs in the K-12 sector.

An important consideration is the current teacher hiring challenges facing districts. Districts will not necessarily be able to simply hire as many teachers as they want. While recent data indicate that the pandemic-era acute teacher shortage has reversed, Pennsylvania and the nation as a whole face an ongoing challenge of declining numbers of teachers entering the profession.[11–14] These are serious issues, but they are outside of the scope of the current analysis. The purpose here is to demonstrate the hiring potential that the adequacy funds would enable. The salary increases that the funds enable would also likely help with teacher hiring challenges.[8,15]

4 Student Outcome Estimates

4.1 Causal Effects of State K-12 Funding Reforms

The best way to predict the BEFC adequacy proposal's effects on student outcomes is to look at the outcomes in other states that have enacted similar K-12 funding adequacy reforms. At least 26 states have enacted such reforms since 1990, the beginning of the "adequacy era" of state K-12 finance.[16]

Advances in causal inference methods over the past two decades have enabled researchers to estimate the causal effects of funding increases driven by these state funding reforms (SFRs) and other forms of funding increases. Researchers analyzed the effects on test scores and educational attainment, and studies have found effects on other outcomes such as adult income and even crime.[7,17,18] A recent survey of this research by Handel and Hanushek (2023) shows that all 18 studies examining the impact of funding on educational attainment find positive effects, and 14 reach statistical significance.[19] Similarly, 14 of the 16 studies examining funding impacts on student test scores find positive effects, with nine reaching statistical significance.

SFR studies typically use a difference-in-differences (DD) design. The core of this approach is to compare the change in outcomes in a state before and after enacting an SFR, to the outcome change in states that do not enact SFRs over the same time period. In equation form, the design is:

$$\begin{aligned} effect \; = (&SFR\ state_{\textit{post-SFR years}} - SFR\ state_{\textit{pre-SFR years}}) - \\ &(non\text{-}SFR\ states_{\textit{post-SFR years}} - non\text{-}SFR\ states_{\textit{pre-SFR years}}) \end{aligned}$$

These comparisons are averaged across all states that enact SFRs to produce the final effect estimate.

The key causal assumption is that the non-SFR states are valid comparison states. That is, the changes in outcomes post-SFR would have been the same in the SFR and non-SFR states had there been no SFR enacted. While this cannot be tested, researchers can show that the year-to-year changes in outcomes *before* the SFR enactment were roughly the same. Indeed, this demonstration of "parallel pre-trends" is a prerequisite for a valid DD study.

A feature that makes the court-ordered SFR research particularly strong is that the timing of the court decisions is quasi-random. In other words, logistical features of states' legal systems that are unrelated to funding or outcomes result in decisions being handed down at somewhat arbitrary times. Combined with parallel pre-trends, this makes a strong case that the court-ordered SFRs are indeed the cause of the observed difference in outcome changes.

4.2 State Funding Reform Studies Used in Current Analysis

We narrow our focus to educational attainment and adult incomes for the current analysis because we can rigorously quantify economic benefits for these outcomes. Two studies have estimated the nationwide effects of adequacy SFRs on these outcomes. We conduct analyses using both sets of estimates. For simplicity, we present results using the more conservative study, Rothstein and Schanzenbach (2022) in this report.[17] We present alternative results from Candelaria and Shores (2019) in the technical appendix section 7.2.[20]

Rothstein and Schanzenbach (2022) estimate the effect of adequacy SFRs on high school graduation, college enrollment, and adult incomes. The SFRs drove average increases of $912 per student (2013 dollars). For each year of exposure to the increase, high school graduation increased by 0.20 percentage points and college enrollment increased by 0.14 percentage points. They also examined the adult earnings differences among students at different education levels. The earnings gain for high school graduates compared to dropouts increased by 3 percentage points post-SFR, and it grew by another 0.67 percentage points for each additional year spent in K-12 post-SFR.

Two potential mechanisms may explain this earnings effect. First, receiving a stronger education likely increased students' human capital development and thus improved their labor market performance. Second, the stronger local education systems may have improved communities' ability to attract business investment, creating better regional job opportunities.

We use all effect estimates outlined above in our analysis. We limit attainment predictions to high school graduation and college enrollment, as the evidence for these two outcomes is clear and consistent.

4.3 Methods: Student Outcome Effect Estimates[v]

We multiply the effect estimates outlined above by each district's per-student BEFC adequacy funding to estimate the plan's effects on the three outcomes. We assume a seven-year phase in of the funding increases in accordance with current proposals.

Effects will vary year-to-year based on the following factors: 1) the increase in funding per student, 2) the number of years a student spends in K-12 post-reform, and 3) inflation. We therefore estimate unique effects for each graduating cohort in each district over the next 20 years by multiplying a) the effect per dollar increase, b) the average inflation-adjusted BEFC increase, and c) the number of K-12 years students are exposed to the increase.

$$district\text{-}cohort\ effect = effect\ per\ \$ \times avg\ \$\ increase \times years\ exposed$$

[v] See the technical appendix section 3 for complete method details.

The result is a percentage point increase in outcomes for each district-cohort. We then multiply the estimated high school graduation and college enrollment increases by districts' graduating cohort size to estimate the number of additional high school graduates and college enrollees. We use PDE projections of future cohort sizes to account for projected enrollment declines.

We impose a 10 percentage point cap on the maximum high school graduation rate increase in any district-cohort. Capping individual district effects is a conservative approach; it is a blunt instrument that prevents overestimation but tolerates underestimation at the district level. While this approach can potentially result in underestimating the aggregate statewide effects, we err on the side of caution, preferring conservative estimates. See the technical appendix sections 3.4 and 5 for an in-depth discussion and analysis of this cap.

4.4 Results

Table 3 presents the estimated effects for three selected cohorts: students who will enter high school, middle school, and kindergarten next school year. The effects grow with each successive cohort because funding increases and the number of K-12 years students are exposed to these increases grow. The cohort that enters high school next school year would see roughly 900 additional students graduate from high school due to the funding increase. For the cohort that enters kindergarten next year, the estimated increase grows to 3,800, a 4.5 percentage point overall increase in the graduation rate in underfunded districts. The estimated increase in college enrollees grows from 700 for those entering high school next year to 3,850 for those entering kindergarten. It grows faster than high school graduation due to the cap we place on graduation rate increases. Finally, lifetime earnings for those whose highest education level is high school increase by a predicted 4% for those entering high school next year and 12% for those entering kindergarten next year.

Table 3: Estimated Changes in Outcomes for Selected Student Cohorts in Underfunded Districts in the 2024-25 School Year

	Entering High School	Entering Middle School	Entering Kinder-garten
Funding Inputs			
Total students in cohort	93,709	90,663	85,031
Average annual funding increase per student	$1,656	$2,664	$3,650
Years exposed to funding increases	4	7	13
High School Graduation Increase			
High school graduate increase	924	2,303	3,800
HS graduation percentage point increase	1.0	2.5	4.5
New 4-year cohort graduation rate	87.1%	88.9%	91.1%
College Enrollment Increase			
College enrollee increase	711	1,807	3,859
College enrollment percentage point increase	0.8	2.0	4.5
Earnings Increase, HS Highest Education Level			
Earnings advantage increase for HS grads vs dropouts	7.5%	14.7%	24.6%
Lifetime earnings increase, HS highest education	3.6%	7.0%	11.7%

The analysis underscores that sustained investment yields greater effects. The estimated effects grow as graduating cohorts spend more of their K-12 years exposed to the funding increases. Both SFR studies we examine demonstrate this phenomenon empirically; see the technical appendix section 5.3 for a detailed discussion.

It is important to note that policy impacts are sensitive to contextual factors. The actual realized effects will depend on other future state policies, economic trends, and a range of additional factors that are currently unknowable. The most direct example in our analysis is the assumption that the state will sustain the adequacy investment indefinitely. The assumed inflation rate is another example. Predictive analyses are inherently limited by these unknowable future contextual factors. That said, we root our predictions in the best available evidence, the average realized effects across all other states. Doing so captures the influence of all contextual factors in other states and smooths across them to provide the strongest indicator of the effects we can expect.

5 Economic Benefit-Cost Analysis

5.1 Overview of Economic Benefit-Cost Model

Decades of research document substantial benefits of increased educational attainment for individuals and society on a range of outcomes.[21,22] Economists have developed rigorous models that quantify these benefits in dollar values. To estimate the economic benefits of the adequacy proposal, we use a widely applied model that estimates the accrual of benefits over the life course of individuals who increase their human capital.[23] While the greatest benefits accrue to the individuals themselves, taxpayers and other members of society broadly benefit as well.

The model identifies the following benefits of increased educational attainment: improved individual earnings, health, economic productivity, and reduced crime and government dependency. All of these outcomes have strong research bases demonstrating their causal relationship with educational attainment.[24] Better health reduces government spending on health care, and it also reduces the social burden associated with poor health, such as caring for chronically ill family members. Similarly, less crime reduces government spending on criminal justice and corrections, and it also reduces the social burden of crime, borne primarily by crime victims. Economic productivity gains occur because a more educated populace drives greater business investment, and workers and community members learn from one another, creating educational spillovers.[25]

The modeling approach is to identify the "educational gradient" of these outcomes, or the change in the outcomes when an individual moves to the next highest level of education. We focus on the three education levels of less than high school, high school graduate, and some college, as these are the levels for which we estimate effects of the adequacy funding proposal.

The model was recently populated with Pennsylvania-specific data and up-to-date social science research by Belfield (2020, 2021) and submitted as expert reports in the adequacy trial.[24,26] The reports provide the following three figures that we use in the current analysis: a) the earnings benefits of graduating high school, b) the total benefits of graduating high school, and c) the total benefits of attending some college. Again, these benefits are defined as the result of moving up a single education level.

5.2 Methods: Economic Benefit-Cost Estimates[vi]

We estimate societal economic benefits by multiplying the estimated number of additional high school graduates and college enrollees by their associated PA-specific economic benefits. The societal benefits associated with moving from high school dropout

[vi] See the technical appendix section 4 for complete method details.

to graduate are roughly $520,000 per student in the baseline year.[vii] The benefits associated with moving from graduating high school to attending some college are roughly $155,000.

We also factor in the benefit of increased earnings for those with a high school diploma as their highest education level. We take a conservative approach, focusing purely on the earnings increase and ignoring potential spillovers such as reduced government dependence. We first estimate the percentage of each district's cohort that will graduate high school but not attend college. We do so using educational attainment data from the US Census American Community Survey. The average across districts is 26% and ranges from 22% to 28%. We multiply this estimated percentage by district's cohort size to obtain the estimated number of students who will graduate high school and not attend college in each district.

We then multiply the earnings advantage associated with high school graduation by its estimated adequacy funding-driven increase. The earnings advantage is slightly less than $350,000 in year one post-reform, and we adjust for future inflation. Finally, we multiply this estimated increase in earnings by the estimated number of students who will graduate high school and not attend college to obtain the total economic benefit associated with this earnings increase.

We must make the following adjustments to accurately account for these three benefit sources working in tandem. We add the earnings increase for high school graduates to the high school graduation benefits, and we subtract this earnings figure from the college enrollment benefits. We also subtract the new college enrollees from the estimated number of students whose highest education level is high school.

Finally, we aggregate the district-specific benefits to obtain the estimated total statewide societal economic benefits associated with the three outcomes.

Once we have determined the benefits, we calculate the cost to compare. Costs are spread across 13 cohorts each school year, so we must compute the cumulative amount of funds spent on a given cohort across their K-12 career. To do so, we multiply a) the average annual per-student funding increase that a cohort experienced, b) the number of K-12 years they are exposed to the increases, and c) the number of students in the cohort. We can then examine whether the benefits exceed this cost.

5.3 Results

Table 4 presents the results of the benefit-cost calculations. For simplicity, we present the estimates for three selected cohorts of students: those who will enter high school, middle school, and kindergarten next school year.

[vii] We adjust the benefits figures provided in Belfield (2020, 2021) for inflation. See technical appendix section 4.1 for inflation adjustment methodology.

We stress that these are the estimated benefits from a relatively small portion of the overall population that will generate societal benefits. These benefits are derived from less than one-third of each cohort in underfunded districts who would not eventually attend at least some college under current circumstances. This is a conservative approach, as it assumes that the effects of improving school quality would only be for those students who do not enroll in college. Given the expansive benefits of school quality to human capital, this should be interpreted as a portion of the expected benefits to the state.

Table 4: Costs and Societal Economic Benefits for Selected Student Cohorts in Underfunded Districts in the 2024-25 School Year

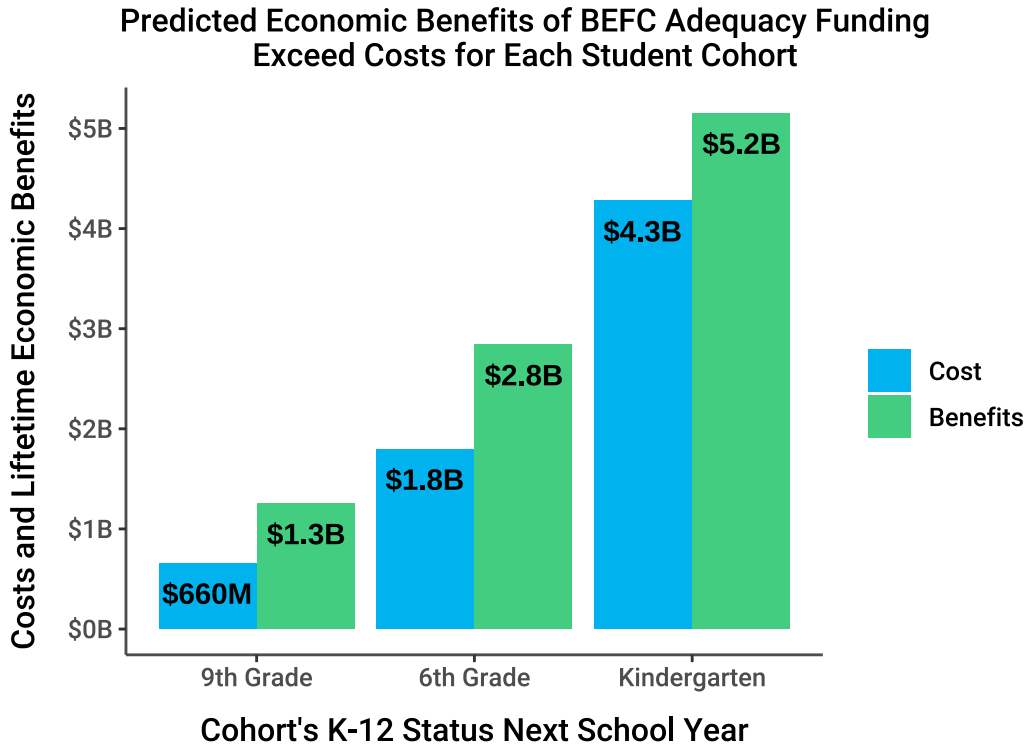
	Entering High School	Entering Middle School	Entering Kindergarten
Cost			
Total students in cohort	93,709	90,663	85,031
Avg annual funding increase per student	$1,656	$2,664	$3,650
Years exposed to funding increases	4	7	13
Total cost for the cohort	**$657M**	**$1.796B**	**$4.277B**
Societal Benefits Across Students' Lifetimes			
HS graduation	$572,471	$637,081	$784,516
HS graduate increase	924	2,303	3,800
College enrollment	$138,415	$121,399	$100,621
College enrollee increase	711	1,807	3,859
Lifetime earnings, HS highest ed level	$26,497	$53,124	$98,010
Total students, HS highest ed level	23,582	21,702	18,182
Total Benefits of BEFC Adequacy Funding			
Total societal benefits	**$1.252B**	**$2.839B**	**$5.151B**
Benefits surplus (benefits – cost)	**$595M**	**$1.043B**	**$875M**

Notes:
(a) High school graduation benefits include the earnings increase for those whose highest education level is high school, which contributes to the large growth over time. College enrollment benefits have the earnings increase for high school graduates subtracted from them, which causes the decrease over time.
(b) The benefits surplus is smaller for the cohort entering kindergarten than those entering middle school primarily because of the cap we place on high school graduation rate increases. This is a mechanical feature of our model and should not be interpreted as a substantive decline in return on investment for younger cohorts.
(c) The total cost for the kindergarten cohort is $4.3 billion because the full adequacy investment would not be reached for seven years. So, the full cumulative $5.1 billion investment would first be experienced by the cohort entering kindergarten in seven years, conceptually speaking.

We find that the estimated benefits exceed the costs for every cohort from this small portion of the student population alone. Students entering ninth grade in the upcoming school year would experience an increased investment of $650 million across their four years of high school. Based on the life course benefits model, these students would yield benefits of $1.25 billion, nearly double the investment. Students entering kindergarten next year would experience nearly the full adequacy investment by the time they graduate, a cumulative $4.3 billion. The model estimates that these funds would yield $5.15 in societal economic benefits across the lifetimes of these students, roughly $875 billion more than the investment.

We present results for the rest of the 20 student cohorts analyzed in the technical appendix section 7.2. Benefits exceed costs for all cohorts. Figure 1 visually depicts benefits compared to costs for the three selected cohorts presented in Table 4.

Figure 1



6 Conclusion

Our analysis indicates that, from an economic perspective, the BEFC adequacy proposal is a wise investment that would yield quantifiable benefits to Pennsylvania's students, economy and society that exceed the funding increase. Enhancements to the K-12 workforce would improve the quality of education while expanding the state economy. The stronger education system would increase students' human capital development and educational attainment. These educational improvements will translate to societal economic benefits that exceed the costs. The full benefits will likely be far greater.

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