Strategic Assessment of Educational Investments: A Cost-Benefit Analysis of Degree Attainment

Project Report

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## Background

Throughout our education, we have always been encouraged to continue through high school to higher education and obtain a college degree to succeed in life. It has always been expressed that the attainment of higher education would allow an individual to experience both personal and professional growth. But at what level do you stop attaining benefits from a higher degree? When do the costs outweigh the benefits in your search for knowledge through a higher educational degree? We seek to answer these questions through an in-depth Cost-Benefit Analysis (CBA) of the data provided by the 2021 National Survey of College Graduates (NSCG) and the U.S. Bureau of Labor Statistics. The goal of this analysis is to evaluate if the benefits of obtaining varying levels of degrees (e.g. bachelor's degree, master’s degree, and doctoral degree) outweigh the costs. We also seek to provide a recommendation based on our findings, including socioeconomic, financial, and demographic information.

## Proposal

### Objective

The objective of this study is to apply the principles of Cost-Benefit Analysis (CBA) to evaluate the feasibility and potential influence of obtaining varying educational degrees (e.g., bachelor's degree, master’s degree, and doctoral degree) and to provide a recommendation as to whether the attainment of these degrees results in overall positive benefits.

### Scope

In this cost-benefit analysis, we will focus on bachelor’s degrees, master’s degrees, and doctoral degrees. Although professional degrees are relevant, they were excluded from the dataset to avoid limiting the scope of the data. The benefits consist of the median salary of individuals by the level of degree, a close relation of job relevance, securing employment, acquiring certifications and licenses, and the positive probabilities relating to demographic factors (e.g., sex, age, race, ethnicity, and disability status). Meanwhile, the costs will be comprised of data such as those related to the median amount of money borrowed to finance the degrees, experiencing unemployment or not participating in the labor force, little to no relation of an individual’s employment and degree types, and negative probabilities relating to demographic factors.

### Key Factors

Various factors such as socioeconomic, financial, and demographic influences will be included in this analysis. Socioeconomic factors discussed in this analysis will include an individual’s status in the labor force, job relevance, and the acquisition of licenses and certifications. An individual’s status in the labor force is measured by being employed, unemployed, or not in the labor force with being employed considered as a benefit and being unemployed or not in the labor force as a cost. Job relevance is measured as closely related, somewhat related, and not related to the obtained degree with closely related being a benefit and not related being a cost, somewhat related is considered as a null value as this does not significantly influence the data analysis. Additionally, the acquisition of a certification or license is measured by whether the certification and license were obtained for work-related reasons as well as the primary field of the certification and license. This variable will be considered as a benefit if it was obtained for non-work-related reasons as this relates to our analysis of degree relevance in the professional world. Meanwhile, this will be considered a cost if the certification or license was obtained for work-related reasons as this acts like an additional cost to obtaining the degree. The financial factors will include monetary factors such as the median annual salary of a graduate, the median amount borrowed to finance the degree, the median annual salary by attainment of certification and license, and the average annual cost of the degree. The quantity borrowed will be considered as a cost while the annual salary will be considered as a benefit. Finally, demographic factors include the sex, age, race, ethnicity, nativity, and disability status of the surveyed individuals. The demographic factors will be analyzed for a positive or negative probability in comparison with other values in the dataset and will be considered as a benefit or cost as it relates to this probability. The quantity borrowed, the annual average cost of the degree, and the median annual salary with a certification or license are considered costs. Meanwhile, the benefits include the median annual salary and the median annual salary without a certification or license.

# Data Needs

The data in this report primarily originates from the National Survey of College Graduates (NSCG) and the U.S. Bureau of Labor Statistics from the year 2021. Through this data, we seek to conduct a cost-benefit analysis on the attainment of varying levels of college degrees. Our analysis is to be separated into two different studies, one of which will be conducted on the financial data and the other on the population data. These studies will then be used to conduct an overall CBA of obtaining varying educational degrees.

Overall, the data from the NSCG is comprised of approximately 164,000 surveyed individuals who have obtained at least a bachelor's degree before January 1st, 2020, live in the United States or Puerto Rico as of February 1st, 2021, and are younger than 76 years old. This data will primarily contain information from 2021, with a few tables including trend information from 2003 to 2021. Meanwhile, the data gathered from the U.S. Bureau of Labor Statistics is comprised of annual averages from household data gathered by the current population survey from 2021.

## Population Data

The population data includes employment status, job-degree alignment, numerous demographic influences (e.g. race, sex, disability status, etc.), attainment of certifications and licenses, and long-term employment trends. Benefits include a close job-degree relation, employment status as employed, attainment of a certification or license for personal reasons, and positive trends among the demographic influences, and long-term employment figures. Conversely, costs include a poor job-degree relation, employment status as unemployed or not in the labor force, attainment of a certification or license for work purposes, and negative trends among the demographic influences, and long-term employment figures. Additionally, in the variable of job-degree alignment, a “somewhat close” relation is regarded as a null value as this does not have a strong relation to the costs or benefits in this analysis.

## Financial Data

The financial data includes the median annual salaries of full-time employed college graduates, the median amount borrowed to finance undergraduate degrees, average of degrees, and the median annual earnings of full-time employees by attainment of certifications and licenses. Benefits include the median annual salary of full-time employed college graduates and the median annual earnings of full-time employees who did not attain certifications or licenses by various characteristics. Costs include the median amount borrowed to finance undergraduate degrees, the average cost of degrees, and the median annual earnings of full-time employees who attained certifications or licenses.

# Methodologies

This section details the methodological approach utilized to perform a benefit-cost analysis of the feasibility and effects of acquiring various academic qualifications. The analysis is divided into two primary sections: financial data and population data. At the end of the individual analyses, both primary sections will be compared to provide a comprehensive analysis regarding the benefit-cost relationship for acquiring different college degrees. All calculations and analyses will be conducted using Excel, which will be used for data organization, formula implementation, and visualization of results through graphs and tables.

## Population Data

The population data is measured by the quantity of the surveyed individuals who responded with the characteristics in question. This data will undergo similar analyses to the financial data including a net benefit analysis, BCR, PV benefits, PV costs, ROI, and NPV. This data will also be evaluated using a trend analysis which will be conducted using the historical data provided by the NSCG to examine the shifts in long-term employment, demographic influences, and occupations. This will allow us to assess the effect of acquiring different academic credentials with regard to the population data. Throughout this process, Excel will be used to structure the data, perform analyses, and generate visualizations, including charts and trend lines, to improve clarity and facilitate interpretation.

## Financial Data

The financial data is measured in dollars ($) by an average annual amount. A net present value (NPV), present value (PV) benefits, PV costs, return of investment (ROI), benefit-cost ratio (BCR), net benefit analysis, and trend analysis will be conducted on the financial data in order to evaluate the financial feasibility of pursuing various educational credentials. NPV will be calculated by finding the difference between PV benefits and PV costs. The PV benefits and costs will be calculated using built-in functions in Excel. The ROI value will be found by dividing the net benefits by the total costs. The BCR will be calculated by comparing the benefits, such as median annual salaries, with the costs associated with the attainment of various educational degrees. The net benefit analysis will be calculated by subtracting the costs from the benefits for each type of educational degree, providing a clear measure of overall financial gain or loss. A trend analysis will also be conducted to examine the shifts in numerous demographic factors across the attainment of varying levels of educational degrees throughout a series of years. Throughout this process, Excel will be utilized to organize the data, calculate data analyses, and create visualizations to enhance clarity and interpretability.

# Data Observations

Analyzing data trends is foundational for understanding the broader implications of educational attainment. This section examines key patterns such as employment and unemployment rates among degree holders, the alignment between degrees and jobs, and the broader population and financial dynamics related to educational attainment. The population data section explores probabilities related to employment and unemployment trends, degree-job alignment, and workforce distribution. Concurrently, the financial data section identifies patterns in education costs, salaries, and borrowing trends, providing context for later quantitative analyses.

## Population Data

For bachelor’s degree holders, the observations reveal that approximately 74% of graduates are employed, highlighting the economic advantage of attaining a college degree. Among these, 44% report a close alignment between their jobs and their degrees, underscoring the practical value of a bachelor’s education in preparing individuals for relevant career opportunities. However, 26% of graduates report their jobs are unrelated to their degrees, indicating that while a majority benefit from job-degree alignment, a notable proportion do not experience the same level of professional relevance. These findings are significant as they illustrate that while bachelor’s degrees provide a strong foundation for entering the workforce, some individuals may still face challenges in finding closely aligned positions, which could limit their perceived value of the degree.

Master’s degree holders demonstrate even stronger labor market outcomes, with an employment rate of 76%. Notably, 66% of individuals report a close job-degree relationship, suggesting that higher specialization enhances the ability to secure roles that align with one’s field of study. This increased alignment is critical in fields such as healthcare and education, where specialized knowledge is essential. However, the 12% reporting no job-degree alignment reflects the continued need for career planning and alignment with industry demands. The significance of these observations lies in their confirmation that advanced degrees generally translate to greater professional relevance and job security.

For doctoral degree holders, the data highlight an employment rate of 81%, the highest among the groups analyzed. Moreover, 80% of respondents report a close alignment between their degree and job, reflecting the highly specialized nature of doctoral-level education and its demand in academic, research, and professional settings. This alignment is significant as it reaffirms the necessity of doctoral training for roles that require extensive expertise and qualifications. However, the small proportion (5%) with unrelated roles suggests that even at this level, challenges can exist in translating education into employment.

Across all degree levels, the combined data show that 75% of graduates are employed, with 54% experiencing close job-degree alignment. The significance of these aggregated findings lies in their ability to affirm the overall positive impact of higher education on employment outcomes. However, variations among degree levels also highlight the importance of aligning educational pursuits with career aspirations to maximize the benefits of higher education.

## Financial Data

For bachelor’s degree holders, the median annual salary of $70,000 reflects the financial benefit of earning a degree, demonstrating the tangible monetary advantage over individuals with no degree. However, the median amount borrowed to finance a bachelor’s degree is $12,448.92, which introduces a financial cost that must be weighed against future earnings. The significance of these values lies in illustrating the balance between financial investment and earning potential, highlighting that bachelor’s degrees remain a viable pathway to improved financial outcomes.

Master’s degree holders earn a median salary of $84,000 annually, a substantial increase over bachelor’s degree holders, while the median borrowing amount of $11,530.19 reflects the higher costs associated with advanced education. These values are significant because they emphasize the financial return associated with a master’s degree, even when accounting for the decreased cost of borrowing. The higher salary potential provides evidence of the economic feasibility of pursuing a master’s degree, particularly in fields requiring advanced specialization.

Doctoral degree holders command the highest median salary of $100,000, reflecting the premium placed on extensive education and expertise. However, this comes with a median borrowing amount of $7,233.49, the lowest among the degree levels analyzed. These observations confirm that while doctoral degrees require a substantial financial commitment, they offer the highest earning potential, validating their value for individuals pursuing careers in academia, research, or other specialized fields.

**Figure 1**

Proportional Borrowing Across Degree Levels

When data from all degree levels are aggregated, the median salary of $77,000 and the median borrowing amount of $31,212.59 illustrate the overall economic benefit of higher education. These values are significant as they provide a comprehensive view of the financial implications of pursuing higher education. Despite the associated costs, the positive correlation between degree attainment and salary potential underscores the financial advantage of obtaining advanced degrees.

# Data Analyses

This section provides an in-depth analysis of the costs and benefits of higher education using a consistent framework for both population and financial data. Metrics such as net present value (NPV), net benefit, benefit-cost ratio (BCR), return on investment (ROI), and present value (PV) costs and benefits are applied to assess the economic and probabilistic feasibility of pursuing bachelor’s, master’s, and doctoral degrees. By integrating these analyses, the study ensures a comprehensive evaluation of education's value from both demographic and economic perspectives.

In conducting the data analyses for this report, two key assumptions were made to calculate PV, NPV, and other financial metrics: the discount rate and the number of periods (nper). A discount rate of 4% was chosen to represent the average cost of borrowing for students and the typical rate of return on conservative investments. This rate provides a realistic benchmark for evaluating the opportunity cost of pursuing higher education. The nper value, representing the number of periods, was set at 4 to reflect the typical duration of full-time study for a bachelor’s degree. This assumption aligns with standard educational timelines and allows for consistency in comparing degree programs.

These values are critical because they directly influence the calculations of future costs and benefits, adjusting them to their present value for a more accurate comparison. By using these standardized assumptions, the analysis ensures that the results are both realistic and comparable across the various levels of educational attainment. This foundation supports a robust assessment of the economic feasibility and value of pursuing higher education degrees.

## Population Data

From a population perspective, the metrics for educational degrees provide valuable insights into their overall benefits and costs. A bachelor’s degree demonstrates a robust BCR of 3.10, indicating that for every dollar spent, over three dollars in benefits are realized. With an NPV of $23.62 and an ROI of 2.10, it is evident that pursuing a bachelor’s degree offers substantial economic advantages. The PV benefits of $34.89 and PV costs of $11.27 further highlight the affordability and utility of this degree level for students, making it an excellent choice for most individuals.

In comparison, a master’s degree also offers significant economic value, albeit slightly less pronounced than a bachelor’s. Its BCR of 2.93 and ROI of 1.93 show that the additional investment required for this degree still yields positive returns. The NPV of $13.29 indicates meaningful long-term benefits, although they come at a higher cost, with PV benefits of $20.19 and PV costs of $6.90. The data underscores that while master’s degrees provide a good return on investment, the margin of benefit narrows compared to bachelor’s degrees.

Doctoral degrees, while showcasing the highest BCR of 5.84 and ROI of 4.84, present a more nuanced picture. The PV benefits of $14.14 and PV costs of $2.42 emphasize their high value relative to cost, but the net benefits of 13.71 suggest that doctoral education is highly context-dependent. Achieving the significant returns associated with this level of education often depends on alignment with specific career paths or research-driven goals, making it less universally advantageous than lower degrees.

**Figure 2**

Population Data Metrics by Educational Degree

Figure 2 provides a comparative breakdown of key metrics across different educational levels, offering a visual context to the accompanying analysis. By presenting the net benefits, benefit-cost ratio (BCR), present value (PV) benefits and costs, net present value (NPV), and return on investment (ROI), the chart highlights the relative strengths of each degree type. The bachelor's degree stands out with a balanced combination of affordability and significant net benefits, reflecting its broad applicability and accessibility. Master's degrees demonstrate a competitive yet slightly diminished return compared to bachelor's degrees, underscoring their value for individuals pursuing specialized career advancements. While showcasing exceptional ratios like BCR and ROI, Doctoral degrees emphasize their high value relative to cost. However, the comparatively lower net benefits underscore their niche applicability. Figure 2 reinforces the detailed numerical insights, making the differences and trends between degree levels more apparent, and aiding readers in identifying the degree's potential in alignment with their goals.

## Financial Data

From a financial perspective, the cost-benefit analysis provides a different view of the feasibility of higher education degrees. A bachelor’s degree stands out as a financially sound investment, with a BCR of 1.27 and an ROI of 0.27. The PV benefits of $118,999 far exceed the PV costs of $93,497.56, resulting in an NPV of $25,501.45. These results confirm that, financially, a bachelor’s degree is a worthwhile endeavor for most individuals.

For master’s degrees, the financial data also suggests positive outcomes, though with reduced margins. The BCR of 1.19 and ROI of 0.19 indicate a modest return, with PV benefits of $147,457.14 and PV costs of $123,840.77 leading to an NPV of $23,616.37. While the benefits exceed the costs, the narrower difference compared to a bachelor’s degree suggests careful consideration of individual career goals and financial circumstances.

In contrast, the financial feasibility of pursuing a doctoral degree appears less favorable. A BCR of 0.84 and ROI of -0.16 indicate that costs outweigh benefits for most individuals. The PV benefits of $161,134.01 fall short of the PV costs of $192,527.11, resulting in a negative NPV of -$31,393.10. These findings suggest that financially, doctoral degrees may not be worth pursuing unless other non-financial benefits, such as personal fulfillment or specialized career opportunities, are significant considerations.

**Figure 3**

Financial Data Metrics by Educational Degree

Figure 3 illustrates the net benefits, present value (PV) benefits, PV costs, and net present value (NPV) for bachelor's, master's, and doctoral degrees from a financial perspective. The bachelor's degree emerges as the most financially viable option, with PV benefits significantly exceeding PV costs and yielding a positive NPV. This highlights its widespread financial appeal and accessibility for individuals seeking a degree with strong economic returns. The master's degree, while offering notable benefits, has a narrower margin between benefits and costs, reflecting its potential for specialized career paths but requiring greater financial consideration. The doctoral degree, however, shows a negative NPV, emphasizing the higher costs associated with its pursuit relative to financial benefits. Figure 3 emphasizes the importance of balancing costs with long-term financial outcomes when evaluating higher education options.

**Figure 4**

Financial Data Ratio Metrics by Educational Degree

Figure 4 focuses on the financial efficiency of educational degrees, represented by the benefit-cost ratio (BCR) and return on investment (ROI). The bachelor's degree again stands out with a BCR above 1 and a positive ROI, confirming its strong financial returns for the majority of students. The master's degree follows closely with slightly reduced metrics, underscoring its moderate but still positive financial returns. Conversely, the doctoral degree's BCR below 1 and negative ROI signify a financially less advantageous investment, often requiring justification through non-financial rewards, such as personal growth or access to specialized career roles. Figure 4 provides a concise visual summary of the financial practicality of each degree type, aiding readers in making informed educational decisions.

# Sensitivity Analysis

Given the uncertainties in both population and financial data, sensitivity analysis is critical. For population data, this section evaluates how variations in probability estimates impact key outcomes, while for financial data, it examines the effects of changes in assumptions like tuition costs, salary growth, and discount rates. This analysis strengthens the reliability of the findings by addressing potential variability.

The sensitivity analysis uses specific adjustment weights to reflect real-world scenarios influenced by economic trends, policy changes, and demographic factors. Employment probability adjustments of ±10% capture moderate economic fluctuations, such as job market improvements or downturns during typical economic cycles, while ±20% adjustments reflect more extreme events like recessions or economic booms, as demonstrated by the unemployment rate spike during the COVID-19 pandemic. Similarly, unemployment rates are modeled with ±10% adjustments for mild economic changes and ±20% for significant shifts, illustrating the sensitivity of employment metrics to macroeconomic conditions. Labor force participation adjustments of ±10% account for gradual changes, such as policy incentives drawing individuals into the workforce or demographic trends like retirement. Larger adjustments of ±20% represent major impacts from economic downturns or robust job creation efforts during strong economic growth. These weights align with observed trends and data provided by the Bureau of Labor Statistics (BLS), which tracks employment and labor force dynamics.

The relevance of degrees to jobs incorporates weights of ±15% to reflect moderate misalignments or improvements in the alignment between education and industry demands, such as small-scale skill mismatches or targeted reforms. Larger adjustments of ±30% account for transformative changes, such as widespread automation reducing job relevance or significant educational reforms enhancing alignment with labor market needs. These adjustments are supported by reports like McKinsey & Company’s analysis of automation, which predicts that up to 50% of current jobs could become irrelevant by 2030. For job and degree alignment, similar weights highlight how educational reforms or disruptions can drastically affect employment outcomes, as seen in studies linking humanities graduates to higher rates of unrelated employment.

Demographic factors are also weighted to capture group-specific sensitivities. Gender adjustments of ±10% reflect variations in employment opportunities based on gender equality initiatives or persistent disparities, while stable male employment is modeled with minor adjustments to reflect trends like automation in male-dominated industries. Racial and ethnic group adjustments vary, with larger weights (e.g., ±50%) for groups like American Indian or Alaska Native populations, reflecting systemic barriers and significant policy sensitivity, and smaller weights (e.g., ±15%) for groups like Asians, reflecting relatively stable yet policy-influenced employment conditions. For individuals with disabilities, adjustments of ±25% account for substantial disparities in employment opportunities compared to those without disabilities, who exhibit smaller adjustments due to baseline stability.

Adjustments for foreign-born and U.S.-born workers further illustrate sensitivity to policies and economic conditions. Foreign-born employment, influenced by immigration policies and economic inclusion efforts, uses ±15% adjustments to capture variability, while U.S.-born workers, representing a stable majority of the labor force, use smaller weights of ±5%. Overall, these weights were chosen to model observed historical trends and potential scenarios, emphasizing the influence of economic cycles, policy changes, and systemic disparities on employment outcomes. The sensitivity analysis highlights how variations in these factors affect employment metrics, providing insights into the complex interplay between education, the labor market, and demographic characteristics.

## Population Data

The sensitivity analysis for population data highlights key factors influencing employment and job relevance outcomes for graduates. Employment probabilities demonstrate significant sensitivity, with a baseline of 75.46%. A ±10% adjustment in employment probability shifts the values to 83.01% and 67.92%, respectively, indicating a strong impact on overall outcomes. Similarly, job relevance, reflecting the alignment between a degree and employment, has a baseline value of 54.14%. Adjustments of ±15% shift this value to 59.56% and 48.73%, while larger changes (±30%) produce even greater variation, emphasizing the importance of degree relevance to job placement.

Demographic factors also exhibit varied influences. Female graduates show a moderate positive relationship with employment (51.18%), with a ±10% sensitivity range from 46.06% to 56.29%, while male graduates are comparatively less represented among positively associated factors. Racial and ethnic demographics reveal disparities, with White graduates demonstrating the strongest positive relationship (68.33%), while groups such as Native Hawaiian or Other Pacific Islander (0.26%) and American Indian or Alaska Native (0.24%) display relatively minimal positive associations. Disability status also plays a significant role, as individuals without disabilities have a higher baseline positive relationship (87.76%) compared to those with disabilities (12.24%), with sensitivity adjustments further amplifying these disparities. These findings underscore the critical roles of demographic characteristics, degree-job alignment, and overall employment probabilities in shaping graduate outcomes.

## Financial Data

The sensitivity analysis conducted on the financial data of various educational investments indicates how changes in key factors, such as median annual salary and the amount borrowed for education, impact the overall financial outcomes of obtaining a degree. The analysis reveals that a 10% increase in the median annual salary results in a corresponding 10% increase in metrics like Net Benefits, Benefit-Cost Ratio (BCR), Net Present Value (NPV), and Return on Investment (ROI). Conversely, a 10% decrease in median salary leads to a similar decrease in these metrics. This demonstrates that salary is a crucial factor driving the financial benefits of educational investments. Additionally, the sensitivity analysis on the amount borrowed to finance the degree shows that an increase in the average amount borrowed results in a higher cost, which could impact the overall financial outcomes. The values for the average amount borrowed, median annual salary with certification, and total costs show a direct relationship between increased education-related expenses and the financial benefits, reinforcing the importance of considering both the financial investment and the expected salary return when evaluating educational investments.

# Conclusions

The analysis demonstrates that the decision to pursue higher education depends heavily on the degree level and the individual's circumstances. For the majority, obtaining a bachelor’s degree is the most economically advantageous choice, offering substantial net benefits, a high BCR, and a strong ROI from both financial and population perspectives. Master’s degrees remain a positive investment, though their narrower margins suggest the need for strategic planning regarding career relevance and financial feasibility.

Doctoral degrees, however, emerge as the most polarizing option. While their population metrics suggest significant returns in certain contexts, the financial data underscores the risks of high costs exceeding benefits. From a purely financial standpoint, doctoral degrees often become "not worth it" unless the individual has specific career ambitions that align with this level of education or places a high value on non-monetary benefits.

Ultimately, these findings encourage individuals to weigh the costs and benefits of higher education carefully. Future studies could explore the impact of professional degrees, alternative educational pathways, and changing labor market dynamics on the value of educational attainment, providing a more comprehensive framework for decision-making.

# Recommendations

While this report provides a comprehensive analysis of the costs and benefits of higher education, there are numerous avenues for future exploration. A more in-depth examination of population data could include demographic segmentation to uncover how education impacts different groups, such as variations across age, gender, or ethnicity. Regional comparisons could highlight the influence of local factors like cost of living or industry prevalence, while international comparisons might provide insights into how education systems and returns differ globally. Additionally, analyzing the effects of technological advancements, such as AI and automation, could offer valuable perspectives on the evolving relevance of degrees in the workforce. Longitudinal studies tracking the long-term outcomes of education across decades would also help identify persistent trends or shifts in the value of higher education.

In terms of financial data, further research could delve into the implications of various student loan repayment plans or forgiveness programs, examining their impact on financial feasibility. Tax benefits, deductions, and credits related to education represent another critical area, potentially reducing net costs for individuals. Studying earnings volatility across industries and job roles would add depth to the understanding of financial risks and rewards. Investigating the financial returns on non-traditional education paths, such as trade schools, professional certifications, or bootcamps, could also be particularly relevant given the rise of alternative learning methods.

Future works combining population and financial data could address broader societal impacts, such as the social returns of education in reducing crime, improving public health, and fostering civic engagement. Analyzing the intergenerational benefits of education could reveal how educational attainment influences opportunities for future generations. The rise of remote learning and online degrees deserves further study, particularly regarding its effect on accessibility, costs, and benefits. Additionally, examining how individuals with varying levels of education fare during economic downturns or crises could provide valuable insights into resilience and adaptability.

Methodological advancements offer another promising avenue for future research. Dynamic models could be employed to project future trends in education costs, earnings, and employment. Behavioral economics could provide a framework for understanding how individuals make decisions about education, incorporating factors like risk aversion and personal preferences. Using multi-criteria decision analysis (MCDA) would allow researchers to assess education levels by balancing financial, demographic, and qualitative considerations.

Finally, emerging themes present exciting opportunities for exploration. Investigating the role of education in sustainability and the growth of green jobs could align higher education with global priorities. Similarly, studying how formal education prepares individuals for transitions in an AI-dominated job market would address contemporary workforce challenges. As the economy shifts towards a skill-based model, research could focus on how education systems adapt to meet these changing demands. Together, these future directions could deepen our understanding of higher education's value and inform policies and decisions that benefit individuals and society.

# Appendix

This appendix provides a comprehensive overview of the supporting data and calculations used in the analysis of educational investments across different degree levels. It includes detailed tables for each data type—financial and population data—highlighting critical metrics such as median salaries, costs, and probability values. Additionally, the appendix outlines the formulas applied to derive calculated values such as net benefits, BCR, NPV, ROI, and other key indicators. This section is designed to offer transparency and clarity, ensuring that all methodologies and underlying data are accessible for review and verification.

## Population Data

This includes Tables:

|  |  |
| --- | --- |
| Excel Sheet Title | Data Description |
| 1-1 | Employed, unemployed, and not in the labor force |
| 1-3 | Job-degree relation |
| 2-1 | Employed college graduates by demographics |
| 2-2 | Full-time employed college graduates by demographics and degree |
| 2-6 | Cause for certification/license attainment |
| 5-4 | Employed college graduates by nativity |
| 6-1 | Time-series trends among employed scientists and engineers |
| 6-3 | Time-series trends among employed college graduates by gender |
| 6-4 | Time-series trends among employed college graduates by nativity |

All population data was calculated using the following formula:

This creates probability data for the population category which allows for a comprehensive analysis of this qualitative data. This probability data was then evaluated through the use of built-in filtering functions in Excel. Each value was compared to those in the corresponding column and considered a cost or a benefit to this analysis with green and yellow denoting benefits and orange and red as costs.

The time-series trends were found by creating scatterplots and including a trendline with the appropriate slope equation.

## Financial Data

This includes Tables:

|  |  |
| --- | --- |
| Excel Sheet Title | Data Description |
| 4-1 | Median annual salaries for full-time employed college graduates |
| 5-3 | Median amount borrowed to finance the degree |
| Med. Annual Salary by Cert. Demos | Median annual salary by attainment of certification and license |

Table 5-3 was used to calculate the median amount borrowed for degrees. These values were categorized in monetary brackets (e.g., $1-10,000, $10,001-20,000, etc.) with populations in each bracket. To find the weighted average for each population and bracket the following formulas were used:

This allowed for a comprehensive analysis of this financial variable with accurate and degree-specific data.

The median annual salary by certification and license attainment was calculated using weekly data. We also created related variables using this data for a better overall analysis. Therefore, the following formulas were used:

## Data Analyses

This includes Tables:

|  |  |
| --- | --- |
| Excel Sheet Title | Data Description |
| BCA Visualization | Visualizations of the benefit-cost analysis of all analyses data |
| BCA-All | BCA of all degrees |
| BCA-B | BCA of bachelor’s degrees |
| BCA-M | BCA of master’s degrees |
| BCA-D | BCA of doctorate degrees |

The BCA tables include the costs and benefits associated with each degree type as well as the analyses conducted for the CBA. The following formulas were used to calculate the analyses values:

\*0.04 is the discount rate and 4 is the nper value, as discussed in the report above.

\*0.04 is the discount rate and 4 is the nper value, as discussed in the report above.

This allows for a comprehensive analysis of the dataset.

## Sensitivity Analysis

This includes Tables:

|  |  |
| --- | --- |
| Excel Sheet Title | Data Description |
| SA-All | Sensitivity analysis of all degrees analysis data |

Sensitivity analysis:

# Works Cited

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