What is it Worth? - Return on Investment Models for Higher Education in Colorado

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Executive Summary

The Colorado Department of Higher Education (CDHE) released a strategic plan at the beginning of 2023.[1] This plan included a goal that all higher education opportunities in the state will, at a minimum, result in students' lifetime earnings being greater than the cost of education.[2]

Measuring progress towards this goal would require calculating the return on investment (ROI) for higher education institutions and programs offered.[3] Colorado does not currently calculate ROI for institutions or programs in the state. As such, Colorado will need to create a model to calculate ROI.

The strategic plan starts to outline elements for calculating ROI. This includes calculating the positive or negative ROI using present value calculations of earnings and costs. The strategic plan also values students being better off financially and equity. There are still elements of ROI calculations that CDHE will have to decide on. Many organizations have created ROI models that Colorado can learn from and utilize in their ROI work.

This paper analyzed five potential ROI models to see how each aligned with CDHE's strategic plan. The process included expert interviews with staffers that worked on each model and document reviews. The analysis identified which models might be most useful for Colorado and key data elements needed for ROI calculations.

While the Postsecondary Value Commission (PVC) is the only model that expressly incorporates equity, all the models could be adjusted to account for that important goal. Third Way's price-to-earnings premium model is the most straightforward and easy to understand approach but is very different than what is described in the strategic plan. Research Improving People's Lives (RIPL) has similar outputs to what is described in the strategic plan but different calculations.

Georgetown's Center on Education and the Workforce (Georgetown) and the Foundation for Research and Equal Opportunity (FREOPP) models most closely resemble what is laid out in the strategic plan in terms of values, outputs, and calculations. Georgetown's calculations align more greatly though and the data needed for the calculations are currently available in Colorado which may make it the best option.

Colorado Postsecondary Education

Colorado has public, private, and private occupational schools in the state.[4] There are a total of 374 institutions.[5] This includes 14 four-year public institutions, 59 private non-profit institutions, 266 private occupational schools, and 13 community colleges.[6]

Higher education attainment and quality are important for the state. In 2012 Colorado created a goal to have 66 percent of Coloradans earn a postsecondary credential by 2025.[7] Colorado has been moving towards this goal. Between 2007 and 2020 statewide enrollment at higher education institutions went from 137,590 to 182,249.[8] This is a 32 percent increase. During the same period, credential completion increased by 81 percent, rising to 50,657 from 27,972.[9]

Link Between Education and Earnings

There has been research conducted on the link between formal education and earnings. Those holding a bachelor's degree earn 84 percent more than those with a high school diploma.[10] This postsecondary wage premium has been increasing over time.[11] The college versus high school wage gap has been increasing since the 1980s.[12] In 2012, the wage gap was 95 percent, an increase from around 45 percent in the 1980s.[13]

In addition to more formal education being linked to an increase in earnings, research has linked education to nonpecuniary benefits.[14] There is a link between more formal education and increased happiness and health.[15] Other benefits include being less likely to be in prison or to use public assistance programs.[16]

Cost of Education in the United States

Pursuing higher education in the U.S. is not always easy and requires students to invest time and money. Many students are graduating or leaving college with large amounts of student debt. One in seven Americans is still paying off their student debt.[17] The national student debt is close to $1.6 trillion.[18] Because of the cost associated with postsecondary education, it is important for students to fully understand the costs and benefits of going to college.[19]

Understanding Return on Investment Broadly

It is important to understand how different institutions and programs specifically are benefiting students. The more information students have, the more informed decisions they can make.[20] Calculating ROI for specific institutions and programs can provide this information. While calculated in different ways, ROI broadly is usually referred to as what a student will earn compared to the investment they made in their education.[21]

ROI measures can also hold institutions accountable.[22] If institutions have poor ROI that is made public, it can motivate the institution to improve its ROI or allow state agencies to help the institution. [23] These calculations can show the ROI for the student but also the larger societal costs and benefits.[24]

There are many models for ROI calculations, but they can include such factors as costs, time to credential completion, postgraduate earnings, demographics, and local economic conditions.[25] These factors can vary by degree, institution, program, major, demographics, and economic conditions.[26] It is important to then calculate ROI considering these factors.

There is a large discussion on what should and should not be included in ROI calculations.[27] Discussion on what should be included in the costs includes tuition and fees, incidental expenses, and debt or interest payment.[28] Some argue room and board should not be included in cost calculations as the student would be paying for those regardless.[29] Discussion around what should be included in earning calculations includes what students would have otherwise earned and what they earn post-graduation.[30]

There are challenges associated with calculating ROI.[31] ROI calculations assume the student graduates. Time to completion should be incorporated into calculations and a disclaimer included that calculations assume completion of the program.[32] Many models don't consider debt and loan repayment.[33] ROI calculations do not consider nonpecuniary benefits or viewpoints of the students. Limitations for existing models include lack of personalization, difficulty in interpreting outputs, and not establishing appropriate baseline costs and earnings.

CDHE's Return on Investment Approach to Date

Each year CDHE publishes a higher education ROI report for Colorado. While titled the "Higher Education Return on Investment Report," this report does not provide ROI calculations for postsecondary institutions in the state. It instead includes trends in enrollment and credential completion, labor force participation trends, and demand and wages for jobs requiring a postsecondary degree. The report provides an overview of the earnings and labor force trends in Colorado, but it does not provide ROI calculations for individual institutions or programs within the state.

CDHE also has a Postsecondary Degree Earning Outcomes Tool. This tool allows individuals to see median earnings at one, five, and ten years after completion. There is data for public and some private institutions in the state. While a powerful tool for those looking at potential earnings outcomes it provides neither costs nor ROI calculations.

CDHE Strategic Plan

CDHE released its new strategic plan, Building Skills for an Evolving Economy, at the beginning of 2023. [34] Part of the strategic plan includes a goal that at a minimum postsecondary education will result in lifetime earnings greater than the cost of attendance.[35] There are three strategic pillars. Two pillars addressed the use of ROI calculations for higher education. The first is identifying and improving programs with a negative return on investment.[36] The second pillar is helping more students succeed in programs with a positive return on investment.[37] The third pillar goes further to align workforce and education needs and creating new educational pathways.[38]

The strategic plan explained how CDHE plans to measure whether a program results in lifetime earnings greater than the cost of attendance. This includes calculating ROI to see if it is positive or negative.[39] The value of a program will be the "present value of expected median incremental lifetime wages."[40] These are wages for a field of study at an institution compared to the median lifetime earnings of a high school graduate.[41] The cost of attendance will be calculated using net tuition and fees and forgone wages.[42]

Strategic Plan ROI Elements:

Value - net present value of median lifetime earnings compared to those of a high school graduate

Cost - median net tuition and fees, forgone wages

Output - ROI being greater than or less than zero, positive representing a good ROI

The ROI calculations outlined in the strategic plan are meant to help inform institutions of higher education, policymakers, CDHE, and the Colorado Commission on Higher Education (CCHE).[43] It will not be published where the public can see it.[44]

There were two values that were idenitified in CDHE's strategic plan when it comes to ROI. The first is the economic value of higher education. The plan calls for institutions to at a minimum enable students to have lifetime earnings that are greater than the cost of attendance.[45] This sentiment appears throughout the plan as it focuses on career opportunities for students and the economic mobility of students.

The second value portrayed is equity and closing equity gaps in education.[46] The plan calls for closing these gaps, providing opportunities for all students, and disaggregating data by race, ethnicity, gender, and socioeconomic background.[47]

While much work and thought has already gone into this strategic plan and determining some of the aspects of ROI calculations, CDHE still has to determine exactly how it will calculate ROI for Colorado higher education institutions. There are many organizations that have come up with different ROI models. These models can help inform CDHE's work on ROI.

Overview of Methods

Five ROI models were analyzed to better understand their components and how they aligned with CDHE's strategic plan. This is not an extensive review of all work on ROI. All ROI models discussed in this report were identified by staffers at CDHE as potential ones suited for Colorado. Appendix B has information on work some other states have done around ROI.

This report was assembled by reviewing documentation on each ROI model and discourse on ROI. This document review was then supplemented by interviewing staffers who have worked on the ROI models. Staffers from the Institute for Higher Education Policy (Postsecondary Value Commission), Research Improving People's Lives (RIPL), FREOPP, Third Way's Price to Earnings Premium, and Georgetown's Center on Education and the Workforce (Georgetown) were interviewed to gain more perspectives on their ROI model.

During the interviews, staffers were asked questions about the decisions that went into their ROI calculations, what should be included in costs and benefits, the values underlying the models, data limitations, and what recommendations they have for governments looking to calculate ROI.

Each ROI model was analyzed using the information from document reviews and interviews to identify the respective pros and cons. The models were then analyzed to see how they aligned with the values identified in CDHE's strategic plan and the ROI calculations described. The analysis of how the models aligned with the strategic plan was used to create recommendations on which models may prove most useful for Colorado.

Each ROI model calculates the ROI for the individual student and not the government or society at large. The models all address the economic ROI of higher education. None of the models address the nonpecuniary benefits of education. The staffers that were interviewed all acknowledged that higher education does have nonpecuniary benefits but that they are harder to quantify for ROI.

One fact to keep in mind when reading about the ROI models is that most of the models utilize College Scorecard data that is compiled and published by the federal government. There are many limitations to this data that impacted how the ROI models were created, such as the data cannot be broken down by different demographic traits like race. CDHE would have access to more administrative data that could potentially allow them to do different calculations.

ROI Models

Below are summaries of each of the five ROI models reviewed and overview tables. These tables are meant to show at a glance what data is needed for each model, the pros/cons of the models, the values portrayed, and how the models align with the CDHE strategic plan. For more detailed information on each model and how it aligns with the strategic plan, refer to the one-page summaries on each model in Appendix C. Appendix C also presents example outputs based on calculations done by the organization that created the model. Appendix A includes equations used by three of the models.

Postsecondary Value Commission (PVC)

The Postsecondary Value Commission is a group of 30 higher education leaders working to address the definition of postsecondary value, a way to measure value, and urge action to improve equity.[48] The Commission created a framework that recognized both economic and non-economic benefits of postsecondary education while accounting for equity.[49] The framework creates a series of thresholds from zero to five that measure returns on education. [50]

After completing calculations, a university can be assigned a threshold depending on which one it meets. A higher number means that a university has a higher ROI and more equitable outcomes for minority and low-income students. The thresholds can be found in the PVC one-pager in Appendix C.

Third Way - Price to Earnings Premium

Third Way, a national think tank, developed a price-to-earnings premium approach.[51] It measures the amount of time it takes on average for a student to recoup the costs associated with their education. [52] The first step is to determine the amount the student pays out of pocket to attend the institution. The median salaries of attendees 10 years after graduation and the median salaries of those with a high school degree are collected.[53] The difference between the two median earnings is taken and divided by the cost of education.[54] The quotient is then the number of years it takes to recoup the net costs of education.[55] The equation used can be found in Appendix A.

Research Improving People's Lives (RIPL)

RIPL, a non-profit that uses data and technology to inform policy, takes a value-added approach.[56] The model measures the value the program adds for the student.[57] RIPL cautions against measuring the average earnings of a program's graduates.[58] This incentivizes the program to admit students that will be successful after graduation regardless of the program.[59] Calculating the value added of the program removes the incentive to admit those who would be successful regardless. RIPL estimates the probability of employment and expected wages of a program graduate prior to entering the program based on characteristics and demographic data.[60] This expected wage is compared to the actual average wages of the program graduate to determine the average gain or loss of earnings for students.[61] This is the value added of the program. This value added is compared to the cost of education to calculate ROI.[62]

Georgetown University- Net Present Value

Georgetown's Center on Education and the Workforce ranks 4,500 U.S. colleges and universities.[63] It uses data from the College Scorecard, a federal online tool to compare costs and value of education, to calculate net present values (NPV) at 10, 15, 20, 30, and 40 years.[64] This shows the value of the degree in current dollars even though the value is realized in the future. These calculations include costs, future earnings, and the length of time it takes to earn money over a fixed time.[65] The cost is the net price of the degree and so includes tuition, fees, room, board, books, and other expenses.[66] Using NPV calculations the costs and earnings are added together at a discounted rate of 2%.[67] See Appendix A for the equation used.

FREOPP

FREOOP, a non-profit think tank focusing on economic opportunity, has calculated ROI for associate degrees, certificates, and bachelor's degrees.[68] For their ROI calculations on associate degrees and certificates, there were three components. These components were estimated earnings, counterfactual earnings (earnings one would have received without higher education), and cost.[69] Cost data included tuition, fees, and other expenses. It did not include living expenses as individuals would have living expenses regardless of attending college.[70] The ROI calculations on bachelor's degrees are defined as the increase in lifetime earnings minus the direct and indirect costs of education.[71] Calculations include accounting for the chance of dropping out.[72] See Appendix A for the equation used.

Overview Tables

The overview tables include pros and cons, data needed, values, and alignment with the strategic plan. The elements in each table were identified during interviews with staffers, document reviews for each model, and the larger ROI literature.

Table 1. Pros for Each Model

	Postsecondary Value Commission	Third Way - Price to Earnings Premium	Research Improving People's Lives	Georgetown - Net Present Value	FREOPP
Incorporates Equity	✓				
Incorporates Wealth	✓				
Easy to Interpret	✓	✓			
Counterfactual earnings	✓	✓			✓
Time to Completion		✓	✓	✓	✓
Long term calculations				✓	
Nuanced/Complexity			✓	✓	✓
Dropout risk included					✓

All models except the PVC have the benefit of incorporating time to completion into their calculations. The PVC and FREOPP have the most pros of any of the models, each having four of the eight pros listed. RIPL has the fewest number of pros with only two of the eight listed.

Table 2. Cons for Each Model

	Postsecondary Value Commission	Third Way - Price to Earnings Premium	Research Improving People's Lives	Georgetown - Net Present Value	FREOPP
More data needed	X		X		X
No time to completion	X				
Lead to undermatching		X			
Only one point in time	X	X			
No explicit equity		X	X	X	X
Complicated			X	X	X
No counterfactual earnings			X	X	
Subjective discount rate				X	

All models except the PVC have the drawback of not explicitly incorporating equity. All the models would have the ability to incorporate equity though through data cuts. The models could run different calculations for different demographic groups to see how they differ thus incorporating equity.

Both RIPL and Georgetown have the most drawbacks, with four out of the eight listed. The PVC, Third Way's price-to-earnings premium model, and FROPP all have the least amount of cons with three of the eight listed.

Table 3. Data Needed for Each Model

	Postsecondary Value Commission	Third Way - Price to Earnings Premium	Research Improving People's Lives	Georgetown - Net Present Value	FREOPP
High School Earnings	x	x			x
Graduate Earnings	x	x	x	x	x
Graduate Characteristics	x		x		
Wealth Data					
Occupational level data					
Cost of Education		x	x	x	x
Expected Earnings Before					
Time to Completion				x	
Dropout Risk					

X - data that CDHE collects or could possibly obtain from another state agency

All models require graduate earnings for their calculations. All models except the PVC also require the cost of education for the calculations. The PVC has the most data needs, as it requires five of the nine data aspects listed. Third Way's price-to-earnings premium model and Georgetown's model require the least amount of data. They require three of the nine aspects listed.

Each black "X" denotes data that CDHE has identified they have or may be able to get from another state agency. Third Way's price-to-earnings premium model and Georgetown's model are the only models for which CDHE currently has all the data available that is needed for calculations.

Table 4. Values of the Models

	Postsecondary Value Commission	Third Way - Price to Earnings Premium	Research Improving People's Lives	Georgetown - Net Present Value	FREOPP
Equity	▦				
Better off Financially	▦	▦	▦	▦	▦
Transparency/ Accountability		▦	▦	▦	
Conservative Assumptions				▦	
Value Added of Program			▦		
Data Sharing			▦		
Simplicity		▦			
Wealth	▦				

Each model has the value of ensuring students are left better off financially after pursuing their education. Three out of the five models also had a shared value of transparency/accountability. Many of the staffers in interviews expressed that students and families don't have enough easily accessible information on the costs and benefits of certain institutions and programs. They also saw it as a way to hold those institutions and programs accountable to benefiting students.

The PVC is the only model that explicitly valued equity and wealth. Third Way's price-to-earnings premium model is the only one to value simplicity. RIPL is the only one to value data sharing and the value added of a program. The value added of a program is the value the student gets from the specific institution or program that they wouldn't get at another institution.

Table 5. Alignment with CDHE Strategic Plan

	Postsecondary Value Commission	Third Way - Price to Earnings Premium	Research Improving People's Lives	Georgetown - Net Present Value	FREOPP
Shared value of better off financially	� shaded	▰	▰	▰	▰
Shared value of equity	▰				
Similar calculations described				▰	▰
Similar outputs described			▰	▰	▰

All the models shared the value expressed in the strategic plan that students are left better off financially after pursuing their education. The PVC was the only model to also share the value of equity. Every staffer acknowledged that their models could be adjusted to calculate ROI for different groups of students and thus incorporate equity.

Third Way's price-to-earnings premium model aligned the least with the strategic plan. The calculations and outputs described in this model are very different than what is described in the strategic plan. The strategic plan calls for net present value calculations and an output that results in a positive ROI being a good ROI and a negative ROI being a bad ROI. Third Way's price-to-earings premium model does not include net present value calculations. The output for this model also is the number of years it takes to recoup the costs of education. As such, a larger positive number is bad and a smaller or negative number would be good.

Georgetown and FREOPP align the most with the strategic plan. The calculations and outputs described in both models most closely align with the strategic plan. Both involve net present value calculations, although FREOPP does include more in its calculations such as the dropout risk. The models also produce outputs that are similar to what is described in the strategic plan. The outputs show a monetary value with a positive number being a good ROI and a negative number being a bad ROI.

Additional Research to Inform ROI

The models by different organizations outlined above are not exhaustive of all the work related to ROI. This section gives a brief overview of other work on ROI, specifically on economic mobility, that can help inform CDHE's work on the issue. CDHE staffers identified economic mobility as a topic of interest in discussions around ROI.

Race and Economic Mobility (REM)

The Institute for College Access and Success (TICAS) created a measure that focuses more on equity.[73] Not every student has the same opportunity for upward economic mobility. TICAS believes that while current models center on value and measuring economic benefits, the models do not take into account race.[74]

TICAS uses the Race and Economic Mobility (REM) metric.[75] This metric looks at the value of postsecondary education for different populations.[76] This is done by looking at the economic indicators, such as earnings and debt, of institutions with similar distributions of marginalized students.[77] Examples include looking at the average median earnings of similar institutions with similar distributions of students.[78]

REM uses race explicitly and not economic proxies.[79] Disaggregating data by race is not always possible though which limits the conclusions that can be drawn.[80] This idea could help inform CDHE's work though as many of the above models do not explicitly consider equity. Incorporating ideas from REM into other models may help CDHE better address equity concerns.

Economic Mobility

There has been extensive work on how institutions of higher education contribute to economic mobility. Raj Chetty and Opportunity Insights have gone through and determined the mobility rates, success rates, and access rates of different universities across the country.[81]

The access rate is the percentage of students whose parents are in the bottom one-fifth of the income distribution.[82] The success rate is the conditional probability that a student in the bottom one-fifth ends up in the top one-fifth after graduation.[83] The mobility rate is achieved by multiplying the access rate and success rate.[84] This results in the fraction of students who come from families in the bottom one-fifth of the income distribution who end up in the top one-fifth.[85]

The Research Institute at Dallas College has built on Chetty's economic mobility work.[86] Dallas College created the EMI2.[87] This uses three variables to assign a 0-100 grade to institutions that reflect how well they foster economic mobility.[88] The three variables are the ten-year ROI of low-income students, student loan debt of low-income students, and the share of low-income students who complete.[89] The variables are normalized on a 0-100 scale and given equal weight.[90] The EMI2 is the average of each of the variable's percentile ranks. Dallas College then created five tiers. Tier one is the top 20% of EMI2 and tier 5 is the bottom 20%.[91]

Measuring economic mobility takes a different approach than the other models discussed above. It is also different than the ROI that is described in the strategic plan. But this work around economic mobility does value students being better off financially and could help CDHE if they want to start measuring the economic mobility of students.

Stakeholder Perspectives

During interviews, in addition to questions about their respective ROI models, staffers were also asked about data and key questions to consider when doing ROI calculations. This section outlines the findings from those conversations. This includes insights into the minimum data needed for ROI calculations, data limitations, and important questions for a state to consider when creating ROI models.

Minimum Data Needed

Staffers from the organizations that were interviewed described what data they felt was minimally needed to do ROI calculations. They also expressed that administrative data that states collect has a wealth of useful information. Below is a list of the data that they mentioned:

- Enrollment records
- When students complete
- Graduation rates
- Degree and field of study information
- Costs of education and financial aid

- Earnings data, potentially from Unemployment Insurance forms
- Counterfactual earnings
- Location of graduates
- Labor market information
- Demographic information

Data Limitations and Factors

There were also numerous data limitations and considerations that were discussed in the interviews. Most of the data limitations came from how the College Scorecard reports data as most of the models used that data. But there were also limitations and considerations that would apply to any data source.

One important consideration is understanding what groups are represented by your data. For example, the College Scorecard is only reporting data for students that receive federal financial aid and so there is a group of students missing from the data. It is important to understand if the data is missing an important group of people or not. This might include understanding if the data is reflecting part-time students, full-time students, or both.

Similarly, it is also important to understand that the data may have inequities already baked into it. For example, earnings data is already going to have inequities in it due to inequity in the labor market for genders and races. Understanding how your data may or may not be reflecting this can ensure that your output is interpreted appropriately.

Counterfactual data can also be tricky to calculate. Some models use high school graduate earnings as a counterfactual and this is described in the strategic plan. This can be important to show how students that pursued higher education are earning more than they would have otherwise. But staffers cautioned to be diligent in these calculations to account for selection bias. This is the idea that those who select to go to college may be inherently different from those who do not. As such you will want to try to ensure that the high school graduate earnings data comes from those who have similar characteristics to those who go to college. This helps avoid selection bias.

States looking to do this work will also find data-sharing agreements among state agencies as very important. But these can be hard as it requires many different agencies to have similar goals and be on board. It is something to keep in mind when creating an ROI model and looking for data.

Key Design Questions to Consider

Staffers who were interviewed were also asked what key questions a state should consider when starting to look at calculating ROI. These questions included the following:

- What is the ultimate goal of the calculations?
- How long after graduation will you measure earnings? How do the earnings evolve over a lifetime?
- What do you include in the costs of education?
- What is the counterfactual and how does selection bias impact it?
- If doing NPV calculations, what is the discount rate? A higher discount rate values future earnings less.
- How can this contribute to continuous improvement and scalability?
- How quickly can it be implemented?

The staffers also had more general advice around thinking about ROI calculations. This includes being deliberate about the decisions you make and having justification for them. In conversations with staffers from Georgetown, they expressed that they took a conservative approach to their assumptions. They did this as there are many trajectories that people's lives can take and many nuances to ROI calculations.

Contextualizing the output number is also important. A number by itself does not tell a reader if it is a good or bad ROI. Providing context to the number allows for a better understanding. Context also allows ROI calculations to not reinforce the idea that certain degrees are the better investment. There also may be context required around geography. The cost of living differs with geography and one income or ROI may be good in one geography and not another. So providing context of where graduates are living and the cost of living in the area can be helpful.

ROI calculations require complex components, data, and analysis. This will require expertise from different people. Cleaning data, running calculations, analyzing outputs, and developing models may all require different people. Even with the many components, a staffer also cautioned against making perfect the enemy of good. Instead, they encouraged states to use what data they do have so they can start creating transparency and holding institutions accountable.

Many of the models had a value of transparency or accountability. The staffers see their work as a way to give prospective students the tool to make the correct decision. Right now they don't see enough transparency in the system. As a result, one staffer encouraged ROI calculation be made public so that prospective students can benefit from the information.

Staffers also expressed that ROI should not be the only tool used to measure the value of a program. As previously mentioned, there are many nonpecuniary benefits of higher education. Furthermore, the ROI for a degree in STEM may be higher than one in teaching but teaching also adds a lot of value to society that is not measured through ROI.

Recommendations

CDHE's new strategic plan calls for making sure that postsecondary institutions give students, at a minimum, lifetime earnings that are greater than the cost of attendance. This requires ROI calculations for higher education institutions in the state. The strategic plan outlines calculating the positive or negative ROI using present value calculations of earnings and costs. Students being better off financially and equity were two values expressed throughout the strategic plan.

There are several different ROI models that CDHE could use or draw from in creating their own model. After analyzing five ROI models to see how they align with the strategic plan, below are the recommendations.

Georgetown and FREOOP are the two models that align with most aspects of the strategic plan. Those aspects are the shared value of students being better off financially, similar calculations described, and similar outputs described. FREOPP's calculations are similar to what is described in the strategic plan but incorporate more aspects and are more complicated. Georgetown's model is simpler and uses NPV calculations that are described in the strategic plan. All the data needed for Georgetown's model are also currently available which may make it the best option for Colorado.

The only model that outright incorporates equity is the Postsecondary Value Commission. The other models could incorporate equity though through data cuts, incorporating elements of Race and Economic Mobility (REM), or incorporating work on economic mobility. Otherwise, the PVC model only aligns with two out of the four aspects of the strategic plan as shown in Table 5 above. Those two aspects are the shared values of students being better off financially and equity.

Third Way's price-to-earnings premium model is best for a simple approach that is easy for policymakers and prospective students to understand and know how the number was calculated. But this model only aligns with one of the aspects of the strategic plan as outlined above. That aspect is the shared value of students being better off financially.

RIPL aligns with two aspects of the strategic plan, sharing the value of students being better off financially and having similar outputs described. RIPL would be useful if CDHE wants to focus on the value added of the program.

CDHE can pull aspects, assumptions, and ideas from many of the ROI models. Georgetown and FREOPP's models most clearly align with the strategic plan. Due to data availability, Georgetown's model may be the best model for Colorado.

Appendix A - Equations

Georgetown's Net Present Value Equation

$$NPV = - \sum_{t=0}^{T_{PL+1}} \frac{Cost}{(1+r)^t} + \sum_{t=T_{PL+1}+1}^{T_H} \frac{Earnings}{(1+r)^t}$$

Third Way's Price to Earnings Premium Equation

Total Average Net Price / (Post–Enrollment Earnings – Typical Salary of a High School Graduate) = Number of Years to Recoup Net Cost

FREOPP's Equations

Present value of lifetime earnings - present value of counterfactual earnings - present values of tuition, fees, books, and equipment

Appendix B - Work in Other States

After researching state ROI models, it was determined that many states take a similar approach to Colorado. Most states do not calculate ROI for specific institutions. Instead, states have tools like Colorado's Postsecondary Degree Earning Outcomes Tool previously discussed. The states below were the only states identified to perform some form of ROI calculations.

Kentucky

Kentucky created a 2020 report that looked at the return on investment for students and the state. The calculations for student ROI include total net cost, loan debt, median annual earnings, and opportunity cost in lost wages. This is one of the few models that accounts for loan debt. The total median college investment is the sum of the total net cost, opportunity cost, and student loan interest. The state ROI includes net general fund investment, financial aid investment, taxes, and spending.[92]

New Jersey

New Jersey created an NJ Utilizing Labor Market Information Pilot Program. Part of this program included a financial impact section and ROI calculations. The ROI calculations were for one-year post-program. The calculations included annual earnings one-year post-graduation as a percentage of the typical amount paid for the program. This shows a simplified model a state can use to calculate ROI.[93]

Appendix C - Model One-Pagers

The following pages have one-page summaries for each of the ROI models analyzed.

Postsecondary Value Commission (PVC)

Summary:

The <u>Postsecondary Value Commission</u> is a group of 30 leaders working to address the definition of postsecondary value, a way to measure value, and urge action to improve equity. The Commission created a framework that recognized both economic and non-economic benefits of postsecondary education while accounting for equity. The framework creates a series of thresholds from zero to five that measure returns on education. After completing calculations, a university can be assigned a threshold depending on which one it meets. A higher number means that a university has a higher ROI and more equitable outcomes for minority and low-income students.

Data Needed:

- High school earnings
- Earnings of graduates
- Graduate characteristics such as gender and race
- Wealth data
- Occupational level data

Pros:

- Incorporates equity
- Takes into account wealth
- Easily interpretable number
- Threshold zero addresses the idea of a counterfactual

Cons:

- Requires more data, such as wealth data
- Collection of occupational data needed for threshold number 1
- Does not consider time to completion

Example Output:

0 - Minimum Economic Return: The student earns as much as a high school graduate and recoups their investment within ten years
1 - Earning Premium: The student has median earnings within their field of study
2 - Earnings Parity: Students of color, low-income students, and women reach the median earnings of their more advantaged peers
3 - Economic Mobility: The students' level of earnings is enough to enter the 4th income quintile
4 - Economic Security: Students reaches median levels of wealth
5 - Wealth Parity: Students of color, low-income students, and women reach the median wealth of their more advantaged peers

Values:

Better off Financially

Wealth

Equity

How it Aligns with CDHE's Strategic Plan:

Better off Financially

Equity

This model shares both of the values in the strategic plan. This model goes further by incorporating wealth calculations. It is one of the few models that explicitly takes into account equity. It would require more data collection though to implement with the need for occupational and wealth data.

Recommendations:

This model is ideal for incorporating equity. Otherwise, this model is not ideal due to the need to collect more data and it goes further than what the strategic plan outlines.

Third Way - Price to Earnings Premium

Summary:
Third Way, a national think tank, developed a price-to-earnings premium approach. It measures the amount of time it takes on average for a student to recoup the costs associated with their education. The first step is to determine the amount the student pays out of pocket to attend the institution. The median salaries of attendees 10 years after graduation and the median salaries of those with a high school degree are collected. The difference between the two median earnings is taken and divided by the cost of education. The quotient is then the number of years it takes to recoup the net costs of education.

Example Output:

University of Colorado Boulder
3.9 years to pay down the total net cots

Data Needed:
- Out-of-pocket cost of education
- Financial aid data
- High school earnings
- Graduate earnings 10 years after graduations

Pros:
- Has a counterfactual of high school earnings
- Easy to interpret number
- Time to completion considered through the cost of education

Cons:
- Can lead to undermatching
- Does not allow for the interpretation of different points post-graduation
- No explicit equity component

Values:

Better off Financially

Transparency/Accountability

Simplicity

How it Aligns with CDHE's Strategic Plan:

Better off Financially

This model shares one value of the strategic plan as it does not explicitly take into account equity. You could in theory though make the calculations for different groups of students to see how the price-to-earnings premium changes. There has been work done on economic mobility with this model. It would not calculate ROI in a positive or negative number as the strategic plan calls for. In this model a higher number is a worse ROI.

Recommendations:
This model creates an easy-to-interpret number and does consider the counterfactual of a high school degree. But the model takes a very different approach than is outlined in the strategic plan and may not be ideal for Colorado.

Research Improving People's Lives (RIPL)

Summary:

RIPL, a non-profit that uses data and tech to inform policy, takes a value-added approach. The model measures the value the program adds for the student. RIPL cautions against measuring the average earnings of a program's graduates. This incentivizes the program to admit students that will be successful after graduation regardless of the program. Calculating the value added of the program removes the incentive to admit those who would be successful regardless. RIPL estimates the probability of employment and expected wages of a potential student based on characteristics and demographic data. This expected wage is compared to the actual average wages of the student to determine the average gain or loss of earnings for students. This is the value added of the program. This value added is compared to the cost of education to calculate ROI.

Data Needed:

- Student characteristics, demographic data
- Earnings after the program
- Cost of education
- Expected earnings before enrolling the program

Pros:

- Looks at the value added of a program
- Can incorporate equity through data cuts
- Considers time to completion through cost of education

Cons:

- Requires more data than other models
- More complicated to explain
- No conterfactual

Example Output:

RIPL has not made its data and outputs publicly available. The output should be a positive or negative number in dollar terms.
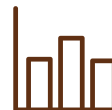
Values:

$ Better off Financially

🔍 Transparency/Accountability

⊕ Value added of the program

📊 Data Sharing

How it Aligns with CDHE's Strategic Plan:

$ **Better off Financially**

This model shares one value of the strategic plan as it does not explicitly take into account equity. You can incorporate equity through data cuts though. This model would give you an output in line with the strategic plan and would focus on the added value a student is getting from the program.

Recommendations:

This model is more complicated to explain and calculate. But this model does result in outputs that are in line with the strategic plan making it a possible option for Colorado.

Georgetown - Net Present Value

Summary:

Georgetown's Center on Education and the Workforce ranks 4,500 U.S. colleges and universities. It uses data from the College Scorecard, a federal online tool to compare costs and value of education, to calculate net present values (NPV) at 10, 15, 20, 30, and 40 years. This shows the value of the degree in present dollars. These calculations include costs, future earnings, and the length of time it takes to earn money over a fixed time. The cost is the net price of the degree and so includes tuition, fees, room, board, books, and other expenses. Using NPV calculations the costs and earnings are added together at a discounted rate of 2%.

Example Output:

University of Colorado Boulder
10-year NPV is $94,000

Data Needed:

- Cost of education
- Time it takes to complete a degree
- Earnings data at different points post-graduation

Pros:

- Allows for long term calculations
- Considers time to completion
- Understands and allows for nuances

Cons:

- More complicated calculations, harder to interpret
- Discount rates are subjective and can change results
- Does not provide a counterfactual
- Don't explicitly take into account equity

Values:

- Better off Financially
- Transparency/Accountability
- Conservative Assumptions

How it Aligns with CDHE's Strategic Plan:

Better off Financially

This model shares one value of the strategic plan as it does not explicitly take into account equity. You can incorporate equity through data cuts though. This calculations are closest to what is described in the strategic plan and is what is typically thought of when thinking about ROI calculations.

Recommendations:

This model can result in a hard-to-interpret number. Not everyone understands NPV calculations, and the number alone does not mean anything without context. But these calculations are similar to what is described in the strategic plan and so may be an option for Colorado.

FREOPP

Summary:

FREOOP, a non-profit think tank focusing on economic opportunity, has calculated ROI for associate degrees, certificates, and bachelor's degrees. For their ROI calculations on associate degrees and certificates, there were three components. These components were estimated earnings, counterfactual earnings (earnings one would have received without higher education), and cost. Cost data included tuition, fees, and other expenses. It did not include living expenses as individuals would have living expenses regardless of attending college. The ROI calculations on bachelor's degrees are defined as the increase in lifetime earnings minus the direct and indirect costs of education. Calculations include accounting for the chance of dropping out.

Data Needed:
- Graduate earnings
- High school graduate earnings
- Cost of education
- Dropout risk/rate

Pros:
- Has a counterfactual
- Takes into account drop out risks
- More nuanced
- Considers time to completion through costs

Cons:
- Doesn't consider all costs of getting a degree
- Does not explicitly take into account equity
- Number harder to interpret

Example Output:

University of Colorado Boulder **Business Major ROI before completion adjustment is $847,489**

Values:

 Better off Financially

How it Aligns with CDHE's Strategic Plan:

 Better off Financially

This model shares one value of the strategic plan as it does not explicitly take into account equity. This model believes that at a minimum, programs should "do no harm" and leave student better off financially. This idea is in line with the goals of the strategic plan. The output number is also similar to what is described in the strategic plan.

Recommendations:
This model can result in a hard-to-interpret number. The calculations are more complicated and the number alone does not mean anything without context. But these calculations are similar to what is described in the strategic plan and so may be an option for Colorado.

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