



# ESTIMATING THE RETURNS TO HIGHER EDUCATION USING ADMINISTRATIVE DATA: A CASE STUDY OF THE UNIVERSITY OF HAWAII SYSTEM

JANUARY 16, 2024





# UHERO

THE ECONOMIC RESEARCH ORGANIZATION  
AT THE UNIVERSITY OF HAWAII

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**Estimating the Returns to Higher Education Using Administrative Data: A Case Study of the  
University of Hawai'i System**

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## EXECUTIVE SUMMARY

What is the value of a degree from the University of Hawai'i (UH)? While college tuition has significantly increased nationally, tuition within the UH system has become more affordable over the last ten years when adjusted for inflation. Despite this improved affordability, college enrollment rates among Hawai'i's public school graduates have declined since the COVID-19 pandemic, with approximately 500 fewer graduates entering higher education each year. This report utilizes administrative data from the census of UH students to offer high-quality estimates of the economic returns to an investment in a college degree from the UH. Below, we outline our key findings.

UH tuition has become more affordable, despite large increases in tuition at the national level.

- The average cost of tuition amongst universities in the US has increased substantially over the past 20 years, even after adjusting for inflation.
- Conversely, in-state tuition across UH campuses has seen a 3 to 5% *decrease* in real terms since the 2013-2014 school year, enhancing affordability for residents.

A college education from the UH offers a significant investment return.

- Lifetime earnings for bachelor's degree holders are \$2.8 million, which is 27% higher than earnings for those who exited the program without a degree.
- Lifetime earnings for AS and AAS degree holders are \$2.7 million, which is 22% higher than earnings for those who left the program without a degree.
- Nine years after graduation, certificate holders earn 33% more than individuals with similar demographic characteristics who left college without completing their program.

When used as a stepping stone towards a bachelor's degree, AA degrees are a beneficial investment.

- AA degrees alone yield comparatively lower rewards in the labor market. However, utilizing the AA degree as a stepping stone to transfer into a bachelor's degree program paves an even more affordable path toward a 4-year degree.
- The lower cost of community college credits, combined with the higher earnings potential of a bachelor's degree, yields an even greater investment return for transfer students compared to those who did not start their education at a community college.
- When factoring in student loan payments, the internal rate of return for bachelor's degree holders who transferred from a community college is 19%.

For students from lower socioeconomic households, a degree from the UH reduces obstacles in the labor market and improves economic mobility across generations.

- Individuals receiving Pell Grants, often considered a proxy for lower socioeconomic status, encounter additional obstacles in the labor market, resulting in a wage penalty of 12 to 15%.
- Obtaining a college degree not only mitigates but potentially eliminates this wage penalty altogether, suggesting that college completion significantly boosts economic mobility.

## INTRODUCTION

The rising cost of college tuition has been of great concern amongst US policymakers. According to Kerr and Wood (2023), tuition at ranked public universities in the US has surged by 158% since 2004, amounting to a nearly 60% increase when adjusted for inflation. The increase in higher education costs is what prompted the Biden Administration's plan to forgive \$39 billion in student loans across roughly 800,000 borrowers. This increasing tuition cost has left many questioning whether higher education is a worthwhile investment.

Although college tuition has been on the rise, the discussion of increasing tuition costs often leaves out some important nuances. For example, there is ample price discrimination in the higher education market in which most students pay much less than the college's "sticker price" for tuition (Levine, 2023). In other words, because of scholarships and other grant programs, many students pay less than the full tuition. Aside from price discrimination, college tuition varies significantly by university, degree program, and other factors. For example, many of the critiques made by commentators may not be relevant to some community colleges and public universities whose tuition is much less than at private universities. Finally and most importantly, discussion around the costs of college needs to consider the benefits to a degree, which numerous studies have shown to be substantial.<sup>1</sup> Accordingly, to truly assess the returns to a college degree, one needs to compute the rate of return of that degree using detailed information on earnings while netting out the value of any student debt that has been accrued (Oreopoulos and Petronijevic, 2013).

In this report, we aim to quantify the value of a college degree obtained through the University of Hawai'i (UH) system. We first estimate the effect of earning a professional certificate, associate degree, or bachelor's degree from a college within the UH system on wages one, three, five, seven and nine years post-graduation. We employ econometric techniques that allow us to compare ostensibly similar students who have and do not have a degree. We then project earnings for graduates and non-degree holders and calculate the internal rate of return for a professional certificate, an associate degree, and a bachelor's degree.

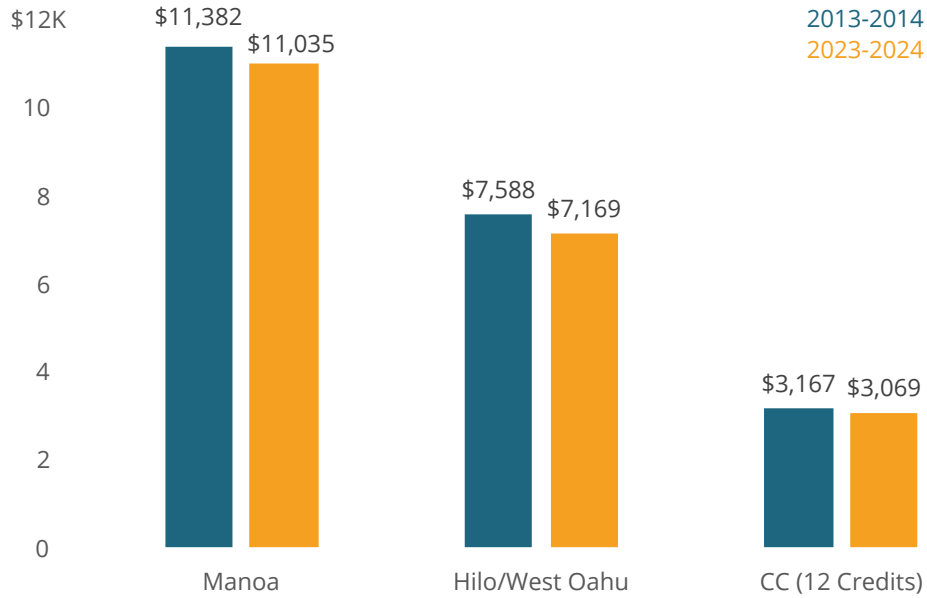
A degree from the University of Hawai'i system raises wages. These positive effects are evident starting five years after graduation. Furthermore, a college degree increases intergenerational mobility. In other words, a degree from the University of Hawai'i system reduces the labor market obstacles that those from poorer households face. Lastly, we account for college tuition expenses as well as the opportunity costs of obtaining a degree and find positive returns to higher education for a professional certificate, associate degree, and a bachelor's degree over a fifteen year horizon.

## BACKGROUND INFORMATION

At the national level, college tuition has increased substantially over the last 20 years. According to Kerr and Wood (2023), tuition at ranked public universities have increased by roughly 60% in real terms since 2004. Interestingly, over the last decade, the growth in college tuition for public universities has decelerated, with the average cost of inflation-adjusted tuition at public universities increasing by just 0.3% since the 2013-2014 school year. While in-state tuition at UH campuses increased by 20 to 24% in nominal terms over the last decade, inflation-adjusted tuition has actually *decreased*. Since the 2013-2014 school year, inflation-adjusted tuition for residents at UH Mānoa and the community colleges decreased by 3%, while inflation-adjusted tuition UH Hilo and UH West O'ahu decreased by 5%.

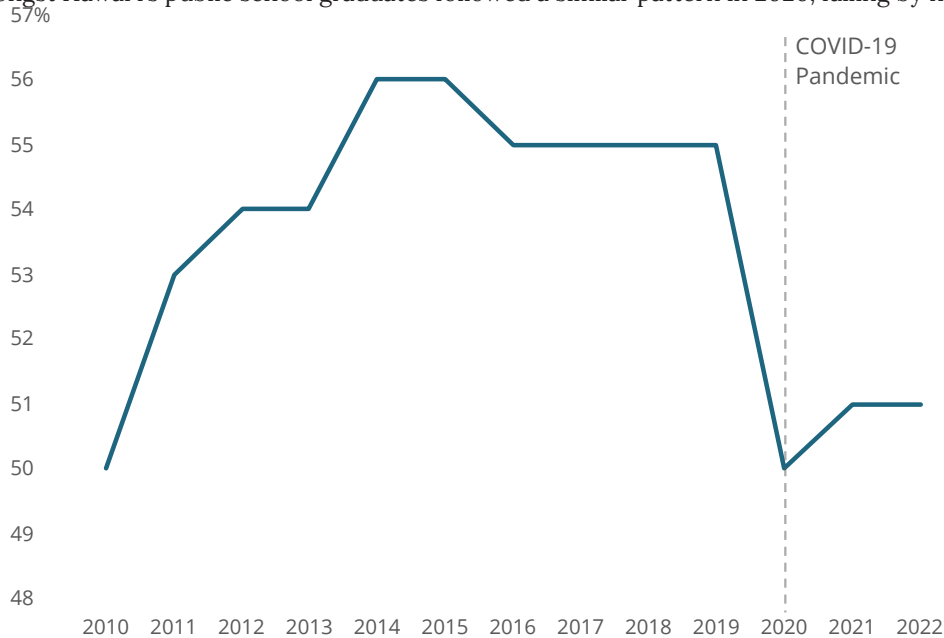
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<sup>1</sup> Card (1993) shows an additional year of postsecondary education increases earnings by 10% to 14%. Brand and Xie (2010) found that those with a very low probability of completing college experienced a 30% increase in wages after completing their degree. Those with a high probability of completing college saw an increase of 10% in wages after graduating. Zimmerman (2014) found students who barely met admissions standards at Florida International University saw an increase in wages of 22% eight to fourteen years after completing their degree.



**University of Hawai'i in-state tuition by campus (in 2022 dollars)**  
*Inflation-adjusted tuition at University of Hawai'i campuses has become more affordable over the last decade.*

Hawai'i's public school students have historically enrolled in community colleges and four year universities at a lower rate than the national average. In 2019, 55% of Hawai'i's public high school graduates enrolled in college compared to 66% at the national level. After the pandemic, the US college enrollment rate fell by four percentage points to 62%. The college entrance rate amongst Hawai'i's public school graduates followed a similar pattern in 2020, falling by five percentage



**Hawai'i Public School Graduates College Entrance Rate**  
*The COVID-19 pandemic reversed gains to college entrance rates amongst Hawai'i's public high school graduates.*

points. The Hawai'i public school college entrance rate currently sits at 51% - the lowest point since 2010. This equates to roughly 500 fewer public school graduates entering college per year compared to the pre-COVID era.

Aside from tuition expenses, there are a number of other factors that have contributed to the recent decline in college enrollment. While lockdown mandates over the pandemic aimed to reduce the spread of COVID-19, these policies also led to enormous learning losses that disproportionately impacted disadvantaged pupils (Goldhaber et al. 2023). Poorer secondary education performance could have reduced the number of students who were qualified to enter college, particularly 4-year degree programs. Additionally, tight labor market conditions in Hawai'i also played a role. Hawai'i's labor market was relatively healthy as tourism from the mainland US market surged post-pandemic, creating a high need for labor. To this end, employees had greater bargaining power thus creating a greater incentive to delay or forgo college for job opportunities in the labor market. Finally, it is possible that the perceived value of a college degree has decreased. Some students may have believed that job experience would produce greater returns and fewer costs than higher education.

## DATA

We employ data from the Hawai'i Data eXchange Partnership (DXP), a collaboration between five of Hawai'i's state agencies.<sup>2</sup> We obtain educational records for all degree-seeking students who enrolled in college courses within any campus in the UH system. We also obtain employment information for all UH students (including graduates and non-graduates) who worked in Hawai'i post-college and had wages reported by employers to the state unemployment insurance system for individuals covered by Hawai'i Employment Security Law.<sup>3</sup>

Because of this, we do not have wage information for UH students who have only been employed outside the state, employed by the federal government, or are self-employed. However, we do have employment information for the majority of private sector, state, and municipal workers in Hawai'i.

Our treatment variable is an indicator that equals one for any UH student who completed their degree and equals zero otherwise. We define a student to be a graduate if they obtained a degree or certificate in their chosen program between academic year (AY) 2009–2010 and AY 2016–2017. For students who enrolled in multiple degree programs at UH, we consider the highest degree program in which they graduated from. A student is defined as a non-degree holder if they did not earn the degree or certificate that they sought and their last term of enrollment was between AY 2009–2010 and AY 2016–2017. In addition, to be classified as an individual who left college without a degree, students had to be degree or certificate-seeking in their last term of UH enrollment.

**Table 1: Summary Statistics (Student Demographics)**

Variable	Degree Holders		Non-Degree Holders	
	Mean	Std. Dev.	Mean	Std. Dev.
Female	0.57	0.50	0.51	0.50
Birth Year	1990.69	3.58	1992.49	3.44
Attended Hawaii Public School	0.73	0.45	0.84	0.37
Attended Hawaii Private School	0.19	0.39	0.09	0.29
Attended Non-Hawaii High School	0.09	0.28	0.07	0.25
Pell Grant Awardee	0.47	0.50	0.42	0.49
White	0.10	0.29	0.09	0.28
Black	0.00	0.07	0.01	0.10
Chinese	0.06	0.24	0.02	0.12

<sup>2</sup> Agencies within the Data eXchange Partnership include the Department of Health, Department of Labor and Industrial Relations, Department of Education, Department of Human Services, and the University of Hawai'i.

<sup>3</sup> These workers include all workers in the state except for those who are self-employed, employed by the federal government, or employed by an entity outside of Hawai'i.

Variable	Degree Holders		Non-Degree Holders	
	Mean	Std. Dev.	Mean	Std. Dev.
Filipino	0.18	0.39	0.16	0.37
Hispanic	0.01	0.09	0.01	0.12
Japanese	0.12	0.33	0.04	0.20
Korean	0.02	0.15	0.01	0.10
Mixed Asian	0.11	0.31	0.06	0.24
Other Asian	0.02	0.13	0.01	0.10
Micronesian	0.00	0.04	0.01	0.11
Pacific Islander	0.01	0.08	0.03	0.18
Native Hawaiian, Part Hawaiian	0.22	0.41	0.38	0.49
Mixed Ethnicity	0.15	0.35	0.15	0.36
American Indian, Alaskan Native	0.00	0.03	0.00	0.04

Data on University of Hawai'i system students are collected by the Hawaii P-20 Data eXchange Partnership. Exit years refers to the academic year that a student either graduated with a degree or left college without a degree. The data includes students who exited the University of Hawai'i system from 2010 to 2017.

In Table 1, we report descriptive statistics on the demographic composition of our sample. Degree holders constitute the majority of our sample at 58%. Degree holders in our sample are 57% female with an average birth year of 1990. We see that 73% attended a public high school in Hawai'i, whereas 19% attended a private high school in the state. The remaining 9% attended a high school outside of Hawai'i. A large portion of these students displayed exceptional financial need at the time of enrollment as indicated by the 47% of degree holders that were Pell Grant recipients.<sup>4</sup> Summary statistics for non-degree holders are similar to those who completed their college degrees with 42% of the sample obtaining a Pell Grant. Interestingly, non-degree holders have a smaller share of females at 51% and are slightly younger with an average birth year of 1992. Moreover, the share of Hawai'i public high school graduates is larger in the non-degree holder sample at 84%. Private high school attendees from Hawai'i make up 9% of non-degree holders while the remaining 7% are from outside of Hawai'i.

The sample reflects the racial and ethnic diversity of Hawai'i. Roughly 10% of the sample is white with 90% of the remainder being either Asian, Native Hawaiian, Pacific Islander, or multi-ethnic amongst both degree and non-degree holders. Of the remaining ethnic groups, the three most common are Native Hawaiians, Filipinos, and mixed ethnicity individuals. The ethnic make-up among degree and non-degree holders are similar with the exception of Native Hawaiians which make up 38% of non-degree holders compared to just 22% of degree holders.

In Table 2, we provide descriptive information on our education and employment variables. Interestingly, the majority of non-degree holders were enrolled in associate degree programs (78%) while 18% were enrolled in a bachelor's program. In contrast, the majority (62%) of degree holders obtained a bachelor's degree while 29% obtained an associate degree.

**Table 2: Summary Statistics (Education and Employment)**

Variable	Degree Holders		Non-Degree Holders	
	Mean	Std. Dev.	Mean	Std. Dev.
Cumulative High School GPA	3.25	0.52	2.68	0.64
Professional Certificate	0.09	0.29	0.04	0.19

<sup>4</sup> Federal Pell Grants are typically awarded to undergraduate students who have not obtained a bachelor's, graduate, or professional degree and display exceptional financial need. To learn more about who qualifies for the Pell Grant, see <https://studentaid.gov/understand-aid/types/grants/pell>.

Variable	Degree Holders		Non-Degree Holders	
	Mean	Std. Dev.	Mean	Std. Dev.
Associate Degree	0.29	0.46	0.78	0.41
Bachelors Degree	0.62	0.49	0.18	0.38
Real Wages (1 Year Post-College)	25,636.55	19,860.75	17,777.68	15,429.12
Real Wages (3 Years Post-College)	39,171.90	26,392.04	26,999.63	19,773.99
Real Wages (5 Years Post-College)	47,698.29	30,408.28	33,695.71	23,910.04
Real Wages (7 Years Post-College)	54,148.11	33,564.46	38,580.85	27,468.36
Real Wages (9 Years Post-College)	60,767.74	36,793.57	42,801.31	30,906.23
Numebr of Jobs (1 Year Post-College)	1.78	0.97	1.71	0.95
Numebr of Jobs (3 Years Post-College)	1.57	0.86	1.63	0.91
Number of Jobs (5 Years Post-College)	1.45	0.75	1.53	0.84
Number of Jobs (7 Years Post-College)	1.37	0.68	1.46	0.79
Number of Jobs (9 Years Post-College)	1.33	0.67	1.41	0.73

Data on University of Hawai'i system students are collected by the Hawaii P-20 Data eXchange Partnership. Exit years refers to the academic year that a student either graduated with a degree or left college without a degree. The data includes students who exited the University of Hawai'i system from 2010 to 2017. Wages are in inflation-adjusted 2022 US dollars and do not include income from unemployment insurance, federal jobs, self employment, or jobs outside of Hawai'i.

The wage data indicate substantial growth over a nine year period upon exiting UH. Average wages for degree holders increased from roughly \$26,000 in the first year after exiting to over \$60,000 the ninth year post-college.<sup>5</sup> Non-degree holders also see substantial growth over the nine year period, but wages are much lower at just \$18,000 one year post-college and \$43,000 nine years post-college.<sup>6</sup> We also see an increase in employment stability over the same period amongst both degree and non-degree holders. Both groups hold an average of roughly 1.7 jobs one year after graduating which declines to 1.3 and 1.4 jobs nine years post-college for degree and non-degree holders respectively.

In Table 3, we provide information on the years that our data cover. The exit years from UH are listed in the first column of the table. They span eight years from academic year 2009-2010 to academic year 2016-2017. Employment information comes from the State of Hawai'i Department of Labor and Industrial Relations (DLIR) one, three, five, seven, and nine years upon exiting UH. The years in which employment outcomes were measured for each exiting cohort are listed in the body of the table.

**Table 3: Employment Measurement Years**

Exit Year	Measurement Year				
	Year 1	Year 3	Year 5	Year 7	Year 9
2009-2010	2010-2011	2012-2013	2014-2015	2016-2017	2018-2019
2010-2011	2011-2012	2013-2014	2015-2016	2017-2018	2019-2020
2011-2012	2012-2013	2014-2015	2016-2017	2018-2019	2020-2021
2012-2013	2013-2014	2015-2016	2017-2018	2019-2020	2021-2022

<sup>5</sup> Wages are reported in inflation-adjusted 2022 US Dollars.

<sup>6</sup> While our main findings suggest that degree holders face wage penalties in the short-run after college, aggregate statistics show that on average degree holders earn more than non-degree holders. This is because those with a bachelor's degree earn substantially more on average (even in the short-run) which increases average wages at the aggregate level.



Exit Year	Measurement Year				
	Year 1	Year 3	Year 5	Year 7	Year 9
2013-2014	2014-2015	2016-2017	2018-2019	2020-2021	n/a
2014-2015	2015-2016	2017-2018	2019-2020	2021-2022	n/a
2015-2016	2016-2017	2018-2019	2020-2021	n/a	n/a
2016-2017	2017-2018	2019-2020	2021-2022	n/a	n/a

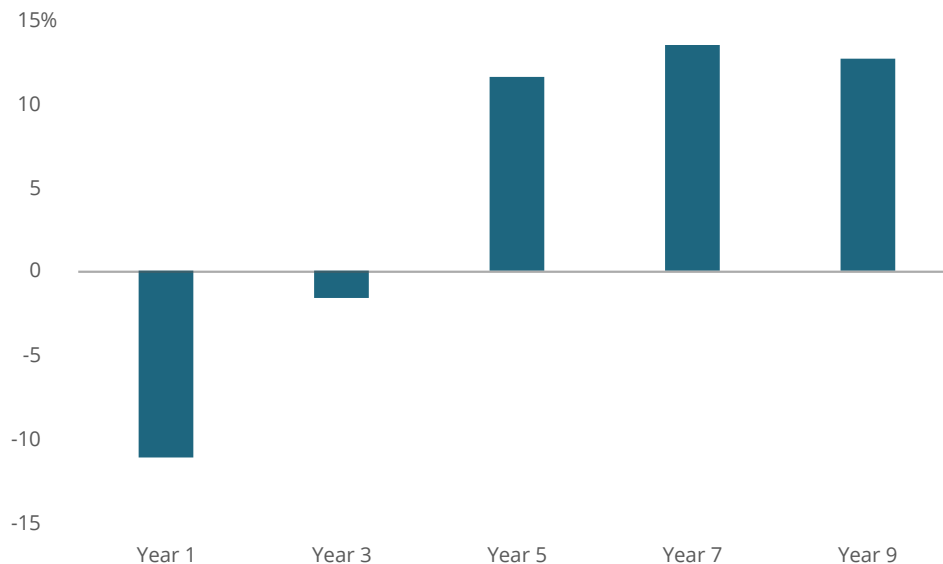
Exit Year is the academic year that the student left UH. Measurement Year is the time frame from which the DLIR wage come.

## RESULTS

### Core Findings

To look at the effects of obtaining a college degree on wages, we estimate a linear regression using ordinary least squares (OLS). We compare college graduates to drop-outs within the same degree program while adjusting for a host of confounds (see the Technical Appendix for more details).

In the long-run, there is a premium associated with college completion. However, initially, we find that there is a wage *penalty* associated with degree completion one year after graduation and almost no effect of having a college degree three years post-graduation. One explanation for this is that drop-outs may have had stronger labor market ties that resulted in higher wages initially. While a degree may not offer a wage premium in the short-run, there is a substantial premium in the longer run. Five years after college, degrees increase wages by over 11%. The premium slightly increases seven to nine years after graduation. This wage premium in the long-run is likely due to higher paying positions requiring college degrees and the labor market remunerating human capital. Thus, college completors experience higher wage growth over time. We re-emphasize that these effects sustain after adjusting for a number of other factors (i.e., gender, ethnicity, high school GPA, socioeconomic status, etc.) which bolsters our contention that they are estimates of causal parameters.



**Impact of a college degree on wages by year**  
Higher education increases wages in the long-run.

### By Degree Type

While our core results show that obtaining any type of college degree leads to long-run wage premiums, this masks important differences by degree type.<sup>7</sup> To this end, we estimate the effects of college completion on wages by degree type.

<sup>7</sup> For a complete listing of academic programs by degree type, see [https://www.hawaii.edu/admissions/academic\\_programs.pdf](https://www.hawaii.edu/admissions/academic_programs.pdf)

We estimate our associate degree results separately for AA degree holders and AS/AAS degree holders since their career trajectories differ significantly.

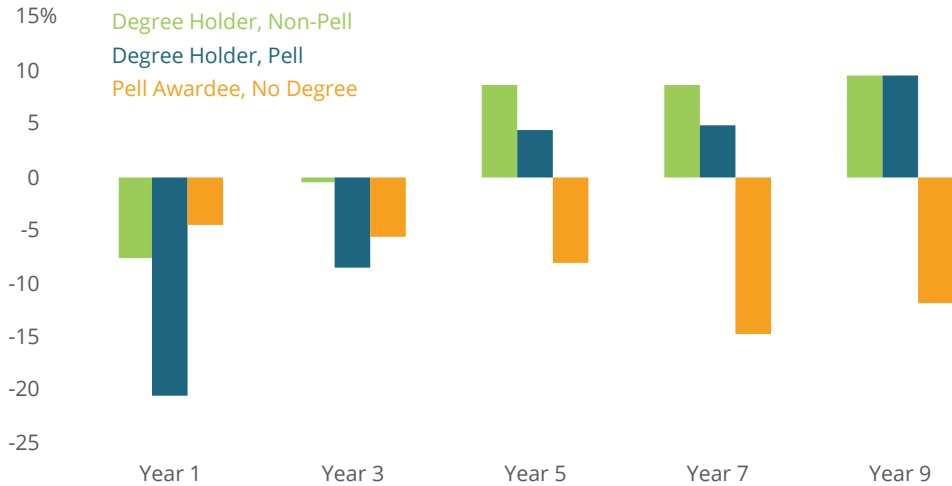
We report four main findings. First, initially the completion of a professional certificate confers no wage premium, but it does confer a premium that ranges between 21 and 33% seven and nine years upon exit. Second, while there is no short-run wage premium for AS/AAS degree holders a year after graduation, we find their wages are 12 to 24% higher than those who left their degree program starting three years after graduation. In contrast, there is a wage penalty for AA degree holders over the entire sample period. We explain more on mechanisms behind this in section VI. Finally, we estimate very large wage premiums upon completion of the bachelor's degree in both the short-run and long-run. These premiums range from 17 to 34% up to nine years from exiting the UH. These estimates are in line with Card (1993) which shows each year of higher education raises wages by 10 to 14%, although they are on the lower end of this range.



### By Pell Grant Recipient Status

We now explore if there are different effects of degree completion for students who were awarded Pell Grants. Because Pell Grant awardees tend to come from poorer households, this exercise is informative of the extent to which higher education can narrow the well documented effects of parental background on earnings (Mazumder, 2005, 2018). To do this, we estimate a simple variant of our main specification (see section I in the technical appendix) in which we interact the degree holder indicator variable with an indicator for being a Pell Grant recipient while also adjusting for degree completion and being a Pell Grant recipient.

Our findings indicate that degree completion mitigates and perhaps eliminates the wage gap between Pell Grant awardees and non-awardees, especially in the long-run. Between seven and nine years after graduation, having a Pell Grant, which one can view as a proxy for lower socioeconomic status, is associated with a 12 to 15% decrease in wages. This is likely because those from poorer households face additional obstacles in the labor market. Mitigating these effects is that the returns to college completion are higher for Pell recipients than non-recipients. Because of this, the total net wage premiums for Pell recipients and non-recipients are comparable. By year nine post-graduation, we find that Pell Grant status no longer has a negative effect on wages for degree holders. Thus, nine years after graduation, returns for degree holders are similar in the long-run *regardless of socioeconomic background*. This indicates that college completion mitigates the intergenerational transmission of socioeconomic status.



**Effect of degree and pell grant status on wages 1-9 years post-graduation**  
*College completion mitigates wage penalties for pell grant recipients in the long-run.*

## ESTIMATING INVESTMENT RETURNS TO HIGHER EDUCATION

While our OLS estimates show college degrees have a positive effect on wages, these estimates do not take into account the costs of higher education. College tuition is arguably one of the biggest costs of higher education. During the 2023-2024 academic year, in-state tuition for full time undergraduate students was \$11,304 at UH Manoa and \$7,344 at UH Hilo and UH West O’ahu. Tuition at UH community colleges was \$131 per credit. Aside from tuition expenses, there are further costs to a college degree. Time spent in school equates to time spent out of the labor market. Therefore, the majority of students who enroll in college full time forgo wages at a full time job.

We take both these costs into account and estimate the internal rate of return (IRR) for college degrees in the long-run, fifteen years post-graduation and a lifetime IRR. The IRR, a tool commonly used in finance, is the annual growth rate an investment is expected to generate. In this context, the IRR estimates the average annual rate of return to a college degree in which the return is labor earnings. This measurement incorporates financial costs (tuition) and opportunity costs (forgone labor market earnings while in school). We focus on those obtaining a professional certificate, AA degree, AS/AAS degree, and bachelor’s degree. The comparison group for these programs (college leavers) are likely entering the labor force with just a high school diploma. The IRR will reveal the returns to a college degree accounting for tuition and forgone earnings that graduates could have received in the labor market while enrolled in school. We discuss the methodology for our IRR estimates in the technical appendix.

We report our IRR estimates in Panel A of Table 4. Due to data limitations, we are unable to estimate lifetime earnings for certificate holders and are therefore unable to generate a lifetime IRR. However, certificates produce an IRR of more than 12% fifteen years after graduation. Returns for AS/AAS degrees are also substantial with a fifteen year IRR of 13% and a lifetime IRR of 16%. In the short term, the return on a bachelor’s degree is slightly smaller at 4% due to the higher cost of tuition. However, the return grows over time with a lifetime IRR reaching nearly 10%.

Returns for associate degree programs differ significantly for AA degrees compared to AS/AAS degrees. We find that when projecting earnings for AA graduates, these individuals earn less than those who exited the program early over the entire projection period. Therefore, we are unable to compute an IRR for AA degrees. We will explain more on this in section VI. However, this does not mean that AA degrees are not a beneficial investment choice. AA degrees are designed as a stepping stone towards a bachelor’s degree. For students who choose to take this path, IRRs are very high due to the lower cost of tuition in the first two years as a student combined with the high earnings potential of a bachelor’s degree. Fifteen years after college, IRRs for bachelor’s degree graduates who transferred from an AA program are 9%, nearly double that of traditional bachelor’s degree students. The lifetime IRR for these graduates is nearly 14%.

**Table 4: Internal Rate of Return (IRR) by Degree Type**

<b>Panel A: No Student Loans</b>	<b>15 Year IRR</b>	<b>Lifetime IRR</b>
Professional Certificate	12.51%	N/A
Associate Degree (AA)	N/A	N/A
Associate Degree (AS/AAS)	12.96%	16.48%
Bachelor’s Degree	4.39%	9.89%
AA transfer to Bachelor’s Degree	9.43%	13.57%
<b>Panel B: With Student Loans</b>	<b>15 Year IRR</b>	<b>Lifetime IRR</b>
Professional Certificate	13.26%	N/A
Associate Degree (AA)	N/A	N/A
Associate Degree (AS/AAS)	14.35%	17.81%
Bachelor’s Degree	5.61%	12.96%
AA transfer to Bachelor’s Degree	14.91%	18.90%

IRRs use actual costs to attend the University of Hawai`i over time for students who graduated in 2017. To calculate tuition, we assume students were taking a full course load and were residents of Hawai`i paying in-state tuition. We also assume degree holders graduated on time within each representative degree program. We assume student loan interest rates are 4.14% over a 5-year repayment schedule for a certificate, 10-year for an associate degree, and 15-year for a bachelor’s degree.

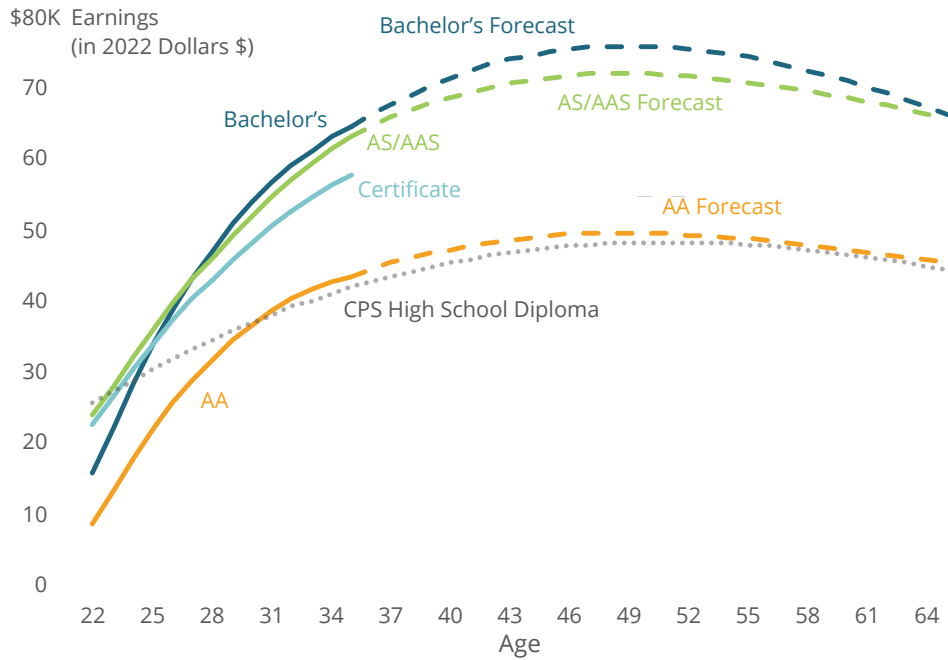
Despite tuition expenses and forgone labor market earnings, we find that college degrees yield positive returns. However, many students do not have the financial means to pay for their tuition and are forced to take out student loans as a result. In Panel B of Table 4, we assume that students in our sample take out student loans on the *entire* cost of tuition at a 4.14% interest rate.<sup>8</sup> After including student loan payments in our investment measurements, the lifetime IRR and fifteen year IRR is *larger* than estimates without student loans across all degrees. Lifetime earnings for AA students who transfer to bachelor’s degree programs are the highest at nearly 19%. This shows how lines of credit can be a beneficial tool since students who take out loans forgo paying a large lump sum cost up front with the downside of paying interest over time.

## INCOME PROJECTIONS BY DEGREE TYPE

It is important to note that the higher IRRs do not equate to higher wages. Because bachelor’s degrees are the most costly in terms of both financial expenses and time spent in school, their fifteen year IRRs are lower than certificates and AS/AAS degrees. However, bachelor’s degree holders earn the most compared to degree holders from other programs in this study. At age 35, those with a bachelor’s degree earn roughly \$64,000. AS/AAS degree holders make nearly as much at \$63,000 followed by certificate holders at \$58,000. AA degree holders earn the least compared to other degree programs at \$43,000.

We extend our earnings estimates to predict lifetime earnings for graduates using data from the Current Population Survey (CPS). See the technical appendix for more on our methodology. The earnings trajectory for bachelor’s degree holders show the most acceleration, especially in the earlier years of their career. Upon graduating in their early to mid 20’s, these individuals earn slightly less than certificate holders and AS/AAS degree holders. However, their wages increase at a faster rate and they start to out-earn all other degree program graduates by their late 20’s. This is likely because many higher paying jobs require a minimum of a bachelor’s degree.

<sup>8</sup> The federal student loan interest rate averaged 4.14% over the years 2013 to 2017. We assume a tuition payment schedule of five years for certificate holders, ten years for associate degree holders, and fifteen years for bachelor degree holders.



**Lifetime earnings projections**

*Bachelor's degrees and AS/AAS degrees significantly increase lifetime earnings.*

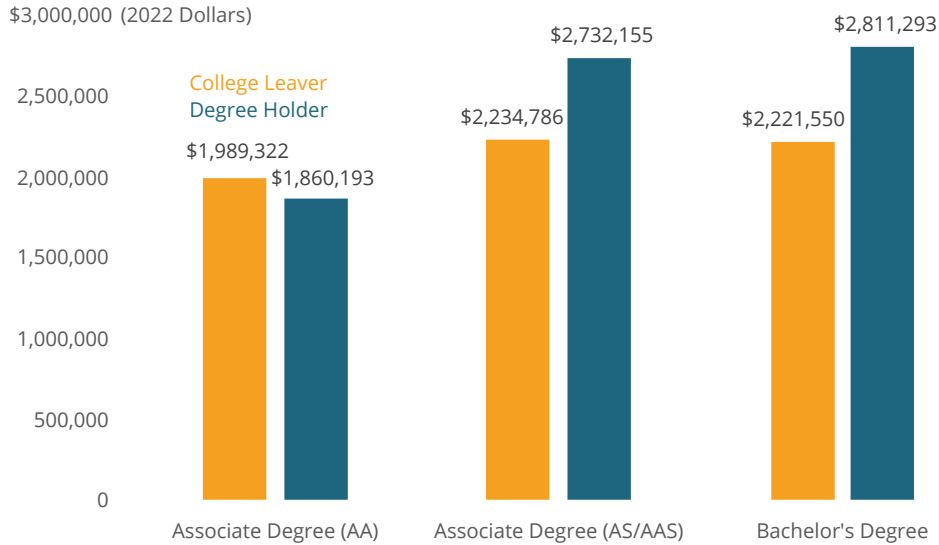
Note: Data on earnings comes from the Hawaii Data eXchange Partnership. Forecasted earnings are estimated using data from the Current Population Survey. The CPS High School Diploma Average is based on data from the Current Population Survey. Due to a lack of data availability, lifetime earnings for certificate holders cannot be calculated.

When comparing lifetime earnings of graduates to those who exited the program early, we find that bachelor's degree holders earn 27% more than those who dropped out of the program, earning roughly \$2.8 million over their lifetime. AS/AAS degree holders earn 22% more than their college leaving peers with lifetime earnings of \$2.7 million. The differential between lifetime earnings for AA degree holders and program leavers are relatively small. AA degree holders earn nearly \$1.9 million in lifetime earnings, making roughly \$130,000 less than AA program leavers.

There are a couple of mechanisms that explain this disparity. Firstly, unlike individuals obtaining an associate degree in a science field (AS/AAS), AA degrees are perceived as a pathway to a bachelor's degree and are not inherently rewarded in the labor market. Additionally, those with an AA degree often opt for careers that, on average, yield lower pay compared to individuals who leave the program, and vice versa. For instance, there is a notable disparity with six times as many AA program leavers employed in the construction industry, which tends to offer higher wages, compared to AA graduates. Conversely, 13% of AA graduates work in lower-paying education service occupations, compared to just 3% of program dropouts in similar roles.

**CONCLUSION**

The increase in college tuition over the past couple of decades has been of great concern, leaving many to question whether a college degree is a worthwhile investment. In this report, we show that a degree from the University of Hawai'i system delivers high rewards. We estimate positive returns to college completion. Wage premiums range from 11 to 13% five to nine years after graduating on average across all degrees. These estimates control for a number of factors including ethnicity, socioeconomic status, gender, and other confounds. Importantly, we find that those who receive Pell Grants have a wage penalty of 12 to 15%. This wage penalty is due to the additional obstacles in the labor market that are tied to lower socioeconomic status. However, nine years after graduation, a college degree mitigates and perhaps eliminates the wage penalty associated with lower socioeconomic status. Moreover, Pell Grant recipients with degrees see similar returns to their education as those from wealthier backgrounds. This is crucial evidence that college completion mitigates the intergenerational transmission of socioeconomic status.



**Lifetime earnings by degree program (in 2022 dollars)**  
*Bachelor's degrees and AS/AAS degrees substantially increase lifetime earnings.*

There are also differential returns by degree type. We find large returns to a bachelor’s degree immediately after graduating amounting to a 17 to 34% wage premium over those who dropped out of the program up to nine years post-graduation. There are also high rewards for certificates in the long run. These graduates earn 21 to 33% more than those who left the program early seven and nine years upon graduation. AS/AAS degree holders earn 12 to 24% more than those who dropped out of the program starting three years after graduation. In contrast, there is a wage *penalty* for AA degree holders over the entire sample period likely because of selection bias and a relatively low value of an AA degree in the labor market.

While our regression estimates show positive returns to a college degree, these findings do not take into account the costs associated with higher education. To this end, we also estimate the internal rate of return to a college degree that takes opportunity costs and financial costs into consideration. When accounting for these costs, we still find positive returns to higher education. Fifteen years after college, the IRR for a certificate is roughly 13%. For a bachelor’s degree, the lifetime IRR ranges from 10 to 13%. The lifetime IRR for an AS/AAS degree is 13 to 14%. Those who obtain an AA and transfer to a bachelor’s degree program see the highest IRR at 19%. We also estimate lifetime earnings projections for the bachelor’s, AA, and AS/AAS degree programs. Lifetime earnings for bachelor’s degree holders are over \$2.8 million while lifetime earnings for AS/AAS degree holders are \$2.7 million. Lifetime earnings for those who receive an AA are smaller at \$1.9 million.

Despite the rising cost of college, this report suggests that on average, college degrees from the University of Hawai‘i system are well worth their investment for residents. Not only does college completion propel graduates ahead of their non-degree holding counterparts, but it is also an engine of social mobility. A college education foments economic mobility, builds human capital, and increases lifetime earnings. As such, lower college enrollment rates among Hawai‘i’s DOE high school graduates are a major concern in the State of Hawai‘i. Increasing the college readiness of Hawai‘i’s young adults and promoting college enrollment should be a top priority for the state’s policymakers.

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## TECHNICAL APPENDIX

### Methodology

In this section, we discuss the methods that we employ to estimate the returns to a UH degree. We adopt a simple selection on observables strategy to identify the ostensibly causal effect of a UH degree on subsequent earnings. This entails adjusting for as many observable confounding variables as possible to ensure that the potential for any omitted variables bias has been minimized to the largest extent possible.

Letting  $i$  denote students,  $c$  denote the college campus, and  $t$  denote the year that the individual either obtained their degree or exited the UH, we consider the following model:

$$Y_{ict} = \alpha + \beta * DEGREE_{ict} + \Pi_{p(i)} + \gamma X_{ict} + \mu_{m(i)} + \vartheta_c + \theta_t + \varepsilon_{ict}$$

The dependent variable,  $Y_{ict}$ , is the individual's log wage measured at one, three, five, seven, and nine years upon exiting the UH system. Our treatment variable,  $DEGREE_{ict}$ , is a binary indicator for whether or not the individual obtained their degree in the highest degree program in which they enrolled. It is equal to one if the individual obtained either a professional certificate, associate, or bachelor's degree from UH and it is equal to zero if the student exited their program prior to earning their degree. The fixed effect,  $\Pi_{p(i)}$ , indicates the highest degree program in which the student enrolled at UH (e.g., associates, bachelor's, etc.) These program indicators adjust for heterogeneity in wages across students by their program of study (e.g. bachelor's degree students tend to earn more than community college students.) Accordingly, the premium that is captured by  $\beta$  is relative to what students in a given program will earn without their degree.

We also adjust for a host of potential confounds. The vector  $X_{ict}$  includes gender, ethnicity, year of birth, a Pell Grant indicator, and high school GPA. We include fixed effects for field of study  $\mu_{m(i)}$ , campus  $\vartheta_c$ , and exit year  $\theta_t$  which is defined as the year that students either graduated with a degree or left college without a degree.<sup>9</sup> Any remaining unobserved variables are contained in the residual,  $\varepsilon_{ict}$ .

Inclusion of the variables in  $X_{ict}$  and the fixed effects will attenuate but perhaps not eliminate any omitted variables bias. Controlling for high school GPA is an imperfect adjustment for cognitive ability and certain personality traits (e.g. conscientiousness) that may influence a student's choice to graduate or exit college without a degree. The indicators for chosen fields of study will provide additional controls for student ability and personality traits as different types of students will sort into different programs. In addition, given that Pell Grants are provided to households in economic need, the Pell Grant indicator will partially adjust for the student's economic background. Ethnicity is also correlated with familial resources and, hence, should provide an additional control for economic background. We cannot eliminate all potentially biasing omitted variables from the estimation, but we suspect that these efforts will move us closer to credible estimates of the causal impact of obtaining a UH degree on earnings.

### Earnings Projections

Before estimating the IRR, we conduct an earnings projection separately for each degree program as follows:

$$Wage_{it} = \alpha + \beta_1 Age_{it} + \beta_2 Age_{it}^2 + \beta_3 Degree_{it} + \beta_4 Age_{it} * Age_{it}^2 + \beta_5 Age_{it} * Degree_{it} + \beta_6 Age_{it}^2 * Degree_{it} + \beta_7 Age_{it} * Age_{it}^2 * Degree_{it} + \varepsilon_{it}$$

Where  $Wage_{it}$  is the wages of individual  $i$  in year  $t$ . The terms  $Age_{it}$  and  $Age_{it}^2$  are the individual's age and squared age. These terms capture how wages change as the individual ages.  $Degree_{it}$  is a dummy variable equal to 1 if the individual obtained their degree and 0 otherwise. We estimate this equation by degree program.

<sup>9</sup> Field of study is based on the Classification of Instructional Programs (CIP). To learn more about the CIP, see <https://nces.ed.gov/ipeds/cipcode>.



Using coefficients from the above equation, we predict earnings by age until age 35 and calculate a series of net benefits:

$$NB_{jt} = W_{jt} - CLW_{jt} - tuition_j$$

where  $W_{jt}$  is predicted wages for degree program  $j$  at age  $t$ . The term  $CLW_{jt}$  are the predicted wages for individuals who did not finish the program and thus likely entered the job market with just a high school diploma (college leavers). The term,  $tuition_j$  is the total tuition for each degree program. We calculate tuition assuming that the student graduated in 2017 from their respective degree program, is a resident of Hawai'i who paid in-state tuition, and graduated on time.<sup>10</sup> We calculate predicted net benefits for students ten and fifteen years after graduating from their programs. Using this time series of net benefits, we then calculate IRRs.

### Lifetime Earnings Projections

We estimate lifetime earnings using data from the Current Population Survey (CPS). Using the CPS, we conduct an earnings projection separately for each degree program as follows.

$$Wage_{it} = a + \beta_1 Age_{it} + \beta_2 Age_{it}^2 + \beta_3 Degree_{it} + \beta_4 Age_{it} * Age_{it}^2 + \beta_5 Age_{it} * Degree_{it} + \beta_6 Age_{it}^2 * Degree_{it} + \beta_7 Age_{it} * Age_{it}^2 * Degree_{it} + \epsilon_{it}$$

Where  $Wage_{it}$  is the wages of individual  $i$  in year  $t$ . The terms  $Age_{it}$  and  $Age_{it}^2$  are the individual's age and squared age. These terms capture how wages change as the individual ages.  $Degree_{it}$  is a dummy variable equal to 1 if the individual obtained their degree and 0 otherwise. We estimate this equation by degree program. We categorize individuals in the CPS data as those with a bachelor's degree, an associate degree, and some college but no degree. Using the coefficients from the above equation, we predict earnings by age. We then measure the growth rate at each year of age from age 35 to age 65. We apply the growth rates to our earnings projections from the Hawaii Data eXchange sample and extend these earnings projections to age 65.

<sup>10</sup> We assume a 4-year track for a bachelor's degree, 2-year track for an associate degree, and 1-year track for a professional certificate.

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