



THE ECONOMIC IMPACT OF THE UNIVERSITY OF HAWAII SYSTEM 2021 UPDATE

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THE ECONOMIC RESEARCH ORGANIZATION
AT THE UNIVERSITY OF HAWAII

The Economic Impact of the University of Hawai'i System 2021 Update

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EXECUTIVE SUMMARY

This report estimates the University of Hawai'i (UH) System's economic activity in the state of Hawai'i in fiscal year 2020, where we define economic impact as the direct, indirect, and induced economic activities generated by UH-related spending in the state economy.

- Total UH-related expenditures were \$2.31 billion in FY 2020, \$2.06 billion of which was spent in the local economy.
- Each UH-related dollar spent generated \$1.77 of total business sales, \$0.50 of employee earnings, and \$0.09 of state tax revenue; and each million dollars of spending generated 11 local jobs.
- Each research-related dollar went even further – generating \$1.83 of total business sales, \$0.59 of employee earnings, and \$0.10 of state tax revenue; and each million dollars of spending generated 13.5 local jobs.
- The \$2.31 billion of expenditures attributable to UH generated \$3.66 billion in local business sales, \$1.02 billion in employee earnings, \$186 million in state tax revenue, and over 22,500 jobs.
- Each dollar of state general fund spending on UH translated into \$7.21 of total business sales, \$2.01 of employee earnings, and \$0.37 of state tax revenue. For every dollar of state funds spent on UH, the university system was able to leverage an additional \$3.07 of spending in the state.
- In addition to the immediate economic activity generated by its expenditures, the UH system generates future financial benefits for degree recipients through higher estimated lifetime earnings. Net of tuition, fees, and forgone earnings while in school, the 9,345 degrees conferred to UH students during the 2019-2020 academic year are expected to produce over \$7 billion in lifetime earnings benefits over the next 40-50 years.

INTRODUCTION

The University of Hawai'i System includes three universities and seven community colleges across the state. With over 700 degree programs including law, medicine, over 50 Ph.D. programs and 90 master's programs, the university system's academic offerings range from certificate and vocational through doctoral degrees. Over 80 percent of the student body are Hawai'i residents, allowing the state to nurture and retain local talent and expertise. The remaining 20 percent of the approximately 50,000 students are from the U.S. mainland or international locations.

Aside from the university's role in educating future leaders and productive members of society, spending associated with the university system is an engine for economic growth and diversification in the state, stimulating the local economy with jobs, research and skilled workers. The purpose of this report is to document the extent of this economic impact, defined here as the direct, indirect, and induced economic activities generated by UH-related spending in the local economy. Impact metrics measured here include business sales, employee earnings, tax revenue¹, jobs, and higher future earnings for the university's students.

1 The state taxes in the 2017 I-O table (DBEDT 2020) include the following 13 categories: (1) general excise and use tax, (2) individual income tax, (3) corporate income tax, (4) transient accommodations tax, (5) fuel tax, (6) alcohol and tobacco tax, (7) PUC tax, (8) insurance tax, (9) unemployment compensation tax, (10) motor vehicle tax/fees, (11) conveyance tax, (12) bank and other financial institutions tax, and (13) licenses, permits, and others. Property taxes, other city and county taxes, and federal taxes are not included.

DATA

Data for this study were collected from a variety of sources. Fiscal year 2020 (FY20) expenditure records were obtained from the University's Kuali Financial System (KFS). The dataset was then subset into personnel and non-personnel entries and filtered according to Office of Research Services (ORS) and Non-ORS status. To be consistent with the previous 2013 UH System impact report (UHERO 2013), FY20 data entries coded as Research and Training Revolving Funds (RTRF) were transferred from the Non-ORS to the ORS category. All Research Corporation of the University of Hawai'i (RCUH) entries were removed to avoid double counting, as RCUH expenditures were accounted for in a separate dataset obtained from RCUH's financial management system. For non-personnel expenditures, entries were aggregated by KFS object code, and each of the 209 object codes was then assigned to one of the 20 industry codes used in the 2017 state condensed input-output (I-O) table (DBEDT 2020).

FY20 RCUH data, including extramural, intramural, revolving, and direct project fund expenditures were collected from the RCUH financial management system. Salaries, wages, and fringe benefits entries were grouped as personnel costs, and data entries in each of the remaining 31 non-personnel RCUH budget categories were matched to one of the 20 industry codes required for the I-O analysis.

FY20 UH Foundation (UHF) expenditure data were categorized first as either research or non-research. Personnel expenditures were then identified based on expense type in the UHF financial management system. This included entries for salaries, wages, and fringe benefits. In addition, in accordance with the FY12 personnel share of total UHF expenditures (UHERO 2013), a portion of FY20 expenditures categorized as regrants and UH agreements were reallocated to personnel spending. The remaining share was retained in the non-personnel category. Each of the data entries classified as non-personnel spending was then assigned to one of the 20 I-O industry codes based on its UHF expense category.

Given that the objective of the analysis was to assess the impact of UH-related spending within the state, it was important to distinguish between in-state and out-of-state spending, the latter of which was omitted from the final estimates. The structure of the expenditure datasets presented a challenge because in most cases, the only way to identify in-state spending on an entry-by-entry basis is to sort by vendor address, and local expenditures are sometimes associated with vendor addresses of parent companies located on the U.S. mainland or elsewhere out-of-state. However, using the available data with some adjustments based on discussions with various UH staff, an import share of 15.2% was estimated for FY20 expenditures. That is, roughly 15 cents out of every dollar spent by UH on goods and services ended up leaving the state, while the remaining 85 cents remained in-state to circulate within the local economy. Of note, the import share estimated in the 2013 UH System Impact Study (UHERO 2013) was also approximately 15%.

Student spending was also expected to be an important contributor to the local economy. Fall 2020 enrollment data was obtained from the University of Hawai'i System Institutional Research & Analysis Office (IRAO) for each of the 10 UH campuses (<https://www.hawaii.edu/institutionalresearch>). The headcounts were compared to Fall 2019 enrollment data to confirm that the totals were not uncharacteristically low as a result of the COVID-19 pandemic. Because conducting a survey on student spending was outside the scope of this study, the average spending per student by county reported in the 2013 UH system impact study (UHERO 2013) served as the basis for the total student spending estimate, after adjusting for inflation, in the current report (Table 1). Total estimated student expenditures amounted to approximately \$745 million.

TABLE 1. AVERAGE STUDENT EXPENDITURES BY COUNTY (ADJUSTED TO 2020 DOLLARS)

Spending Category	Honolulu	Hawai'i	Maui	Kaua'i
Housing	\$8,915	\$5,228	\$9,366	\$7,083
Durables/start-up	\$2,810	\$2,095	\$1,585	\$2,222
Books and supplies	\$1,567	\$2,506	\$3,024	\$2,049
Utilities	\$2,711	\$3,887	\$4,543	\$6,821
Food	\$4,565	\$4,904	\$5,672	\$4,614
Local transportation	\$2,069	\$2,658	\$2,483	\$3,358
Recreation/entertainment	\$1,096	\$791	\$624	\$813
Personal care	\$4,519	\$4,017	\$4,172	\$5,694
Travel	\$679	\$797	\$437	\$567
Total	\$28,931	\$26,884	\$31,905	\$33,220

Source: UHERO (2013)

Although much of the spending related to the UH system has an immediate impact on the state economy, the benefits to graduates of a UH education in terms of higher future earnings is not captured by the standard I-O approach. To address this limitation, data were collected from the UH System IRAO on degrees awarded during the 2019-2020 academic year by type (Associate, Bachelor's, Master's, Doctoral) and by gender. Information was also obtained for the projected benefits (increase in lifetime earnings) and costs (tuition, fees, forgone earnings while attending school) of a UH education from a previous study conducted by UHERO (Page et al. 2016; Table 2).

TABLE 2. BENEFITS AND COST OF A UH EDUCATION BY DEGREE TYPE AND GENDER (MILLION \$\$)

Degree type	Men			Women			Overall		
	Increase in lifetime earnings	Costs (tuition, fees, forgone earnings)	Net benefit	Increase in lifetime earnings	Costs (tuition, fees, forgone earnings)	Net benefit	Increase in lifetime earnings	Costs (tuition, fees, forgone earnings)	Net benefit
Associate's	0.3	0.03	0.27	0.4	0.02	0.38	0.36	0.03	0.33
Bachelor's	1.5	0.09	1.41	0.64	0.08	0.56	0.95	0.09	0.86
Post-graduate	2.87	0.19	2.68	1.05	0.17	0.88	1.56	0.18	1.38

Source: Page et al. (2016)

METHODS

Using the collected expenditure data, standard empirical research methods (e.g., UHERO 2013, 2019; DBEDT 2019, 2020) were employed to assess the economic impact of the University of Hawai'i system on the state, where the impact was defined as the direct, indirect, and induced economic activities generated by UH-related spending in the local economy. As noted in the discussion of data sources above, out-of-state spending was subtracted from total spending before undertaking the impact analysis. The 2017 state input-output model prepared by DBEDT (2020) also requires that each dollar flowing into the model be matched to one of 20 sectors: agriculture, mining and construction, food processing, other manufacturing, transportation, information, utilities, wholesale trade, retail trade, finance and insurance, real estate and rentals, professional services, business services, educational services, health services, arts and entertainment, accommodation, eating and drinking, other services, or government. Once matched, local expenditures were aggregated for each sector.

In order to properly estimate the economic impacts of UH-related expenditures, the in-state spending data must be converted from the retail level to the producer level because all transactions in the DBEDT 2017 I-O model are valued at producer prices, i.e., the economic multipliers used to compute economic impacts are based on producer level data. Following the methodology used in a recent UHERO impact study (UHERO 2019), retail level expenditures on good and services were converted to producer level expenditures for each sector by subtracting sector-specific retail, wholesale and transportation margins, based on Appendix C in the 2017 State Input-Output report (DBEDT 2020). The subtracted margins were then aggregated and added back to each of their respective sectors (retail trade, wholesale trade, and transportation). For example, the transportation margins subtracted from the expenditure totals for each of the 19 other sectors were summed and added to the expenditure total for the transportation sector before the economic multipliers were applied.

As noted in the discussion of the data gathering process, personnel expenditures were separated from non-personnel expenditures because labor earnings, which ultimately result in personal consumption expenditures (PCEs), are treated as an additional producing sector in the economy with its own unique set of assumptions regarding the share allocated to in-state versus out-of-state spending (via imports), as well as a different set of economic multipliers. Labor earnings were converted to PCEs using the 2017 Condensed Input-Output Transactions Table for Hawai'i (DBEDT 2020), which suggests that approximately 83.7% of employee earnings are spent in the local economy, while the remaining 16.3% are spent on imported goods and services.

To estimate the short-term impacts of UH-related expenditures in FY20 on the state economy, we applied Type II multipliers from DBEDT's 2017 I-O model (DBEDT 2020). Type II multipliers are widely used in impact analyses because they capture the direct effect of the original dollar, the additional spending by industries created by that dollar (indirect effect), and the additional spending by households in the economy from increased income attributed to that original dollar (induced effect). Impacts on output, earnings, state tax revenue, and employment for each sector were computed by multiplying producer level expenditures by their respective Type II multipliers (Table 3). For example, the output multiplier for mining and construction is 2.12. This means that for every \$1 change in final demand for the mining and construction industry, the economy's total output increases by \$2.12, which includes the direct effect of the initial dollar (\$1.00) and the combined indirect and induced effects (\$1.12). Total statewide impacts in terms of output, earnings, state tax revenue, and jobs were then calculated by summing the individual industry impacts.

TABLE 3. 2017 CONDENSED OUTPUT, EARNINGS, STATE TAX, AND EMPLOYMENT TYPE II MULTIPLIERS FOR HAWAII

Industry	Output	Earnings	State Tax	Jobs (per million \$s)
Agriculture	2.08	0.70	0.08	25.5
Mining and construction	2.12	0.69	0.13	11.0
Food processing	2.21	0.51	0.08	12.9
Other manufacturing	1.34	0.20	0.03	4.7
Transportation	1.88	0.50	0.08	10.0
Information	1.84	0.39	0.09	7.1
Utilities	1.67	0.30	0.07	4.8
Wholesale trade	1.87	0.50	0.07	9.9
Retail trade	1.85	0.55	0.11	14.8
Finance and insurance	2.16	0.54	0.11	10.7
Real estate and rentals	1.55	0.23	0.06	4.7
Professional services	2.21	0.81	0.14	14.3
Business services	2.18	0.80	0.14	17.5
Educational services	2.00	0.86	0.13	26.0
Health services	2.21	0.78	0.14	14.3
Arts and entertainment	1.89	0.74	0.12	22.7
Accommodation	2.18	0.58	0.17	10.8
Eating and drinking	2.17	0.66	0.12	16.8
Other services	2.37	0.81	0.12	17.3
Government	1.84	0.79	0.08	13.5
Personal Consumption Expenditures	1.57	0.42	0.08	8.9

Source: DBEDT (2020)

One of the largest long-term impacts of UH-related expenditures not captured by the standard I-O analysis is the benefit of higher future earnings enjoyed by UH graduates. To estimate total lifetime earning benefits, the number of degrees awarded during the 2019-2020 academic year of each type (Associate, Bachelor's, Post-graduate) was first multiplied by its degree- and gender-specific projected increase in lifetime earnings net of costs (Table 2). We then summed the net benefits of each degree-gender combination.

RESULTS

In FY20, research expenditures for the UH system (ORS, RCUH, part of UHF) summed to \$476.9 million, and non-research expenditures (Non-ORS, part of UHF, students) summed to \$1.8 billion for a grand total of \$2.3 billion. As summarized in Table 4, \$1.4 billion of that total was attributed to spending on local goods and services, \$840.3 million to labor income, and \$110.8 million went toward imported goods and services.

TABLE 4. FY20 UH EXPENDITURE BREAKDOWN BY RESEARCH VS. NON-RESEARCH (000\$S)

	Research	Non-Research	Total UH System
Total local goods and services	223,488	1,137,312	1,360,799
Total labor income	213,551	626,718	840,269
Imports	39,813	70,971	110,784
Total expenditures	476,852	1,835,001	2,311,852

The total economic impacts for research, non-research, and total UH-related expenditures are presented in Table 5. Values in the “direct local spending” column represent the direct economic effect of expenditures. Note that these values do not match the totals in Table 4 because they are net of imported goods and services and labor income has been converted to PCEs. The remaining columns present the combined indirect and induced economic impacts of expenditures in terms of business sales, income, state tax revenue, and employment. The results suggest that the \$2.1 billion in total direct local spending in FY20 generated \$3.7 billion in business sales, \$1.0 billion in income, \$186.8 million in state tax revenue, and 22,559 jobs.

TABLE 5. FY20 ECONOMIC IMPACTS OF UH-RELATED EXPENDITURES

	Direct local spending (000\$S)	Business sales (000\$S)	Income (000\$S)	State tax (000\$S)	Employment (Jobs)
Total (local) expenditures	2,063,878	3,659,231	1,022,229	186,848	22,559
Research	402,172	734,858	236,861	41,167	5,428
Non-Research	1,661,706	2,924,373	785,367	145,681	17,130

Using the total impacts presented in Table 5, which were computed by summing the impacts resulting from the application of 20 industry-specific multipliers in DBEDT’s I-O model, we estimated the multiplier effects for research, non-research, and total UH-related local expenditures (Table 6). Our results suggest that every dollar of UH-related local expenditures generated \$1.77 in business sales, \$0.50 in earnings, and \$0.09 in state tax revenue. In addition, every million dollars of spending generated roughly 11 jobs. Although non-research expenditures had approximately four times the total direct impact of research expenditures (Table 5), research spending generated larger multiplier effects. That is, every dollar spent on research generated more business sales, earnings, state tax revenue, and jobs. This does not yet account for the lifetime earnings benefits of UH graduates, however, which are a product of both non-research and research spending, the former of which is supported by instructional and administrative expenditures, and the latter of which attracts and retains high quality faculty who provide a quality education to UH students.

TABLE 6. FY20 MULTIPLIER EFFECTS PER DOLLAR OF UH-RELATED EXPENDITURES

	Business Sales per \$ of Spending	Earnings per \$ of Spending	State Taxes per \$ of Spending	Jobs per Million \$ of Spending
Total (local) expenditures	1.77	0.50	0.09	10.93
Research	1.83	0.59	0.10	13.50
Non-Research	1.76	0.47	0.09	10.31

State general funds spent on the UH system totaled \$507.6 million in FY20. That means for every dollar of state money spent, UH was able to leverage an additional \$3.07 of spending in the local economy. Taking into account the multiplier effects, each dollar of state funds translated into \$7.21 in business sales, \$2.01 in income, and \$0.37 in state tax revenue for Hawai'i. In addition, every \$1 million in general funds spent on the UH system generated 44 local jobs.

The UH system awarded 3,641 Associate, 4,473 Bachelor's, and 1,231 Post-graduate degrees in academic year 2019-2020. Women earned more degrees than other genders in all degree categories.² After accounting for gender-specific differences in both projected lifetime earning benefits and costs, the net benefit for all 9,345 graduates totaled nearly \$7.1 billion.

TABLE 7. NET LIFETIME EARNINGS BENEFITS OF 2019-2020 UH GRADUATES (MILLION \$\$)

	Associate	Bachelor's	Post-graduate	All Degrees
Men				
Count	1,633	1,721	457	3,811
Benefit	441	2,427	1,225	4,092
Women				
Count	1,941	2,726	760	5,427
Benefit	738	1,527	669	2,933
Unspecified Gender				
Count	67	26	14	107
Benefit	22	22	19	64
All Students				
Count	3,641	4,473	1,231	9,345
Total Benefit	1,201	3,976	1,913	7,089

LIMITATIONS OF THE STUDY

Our estimate of the UH system's economic impact on the local economy is largely dependent on the data underlying the computations. Although the spending data provided by UH was very detailed, there are likely other UH-related expenditures not captured by those datasets. For example, some visitors who come to Hawai'i spend at least part of their time on the islands participating in UH-related activities and/or visiting UH campuses, all while spending money on local goods and services. This type of direct spending was not included in our calculations due to lack of data for FY20, which suggests that our impact estimates may be slightly conservative in that regard, although visitor spending on UH-related goods and services comprised only 0.6% of total spending in FY12 (UHERO 2013).

² While women earned 42% more degrees than men, the total value of these degrees is 28% less, likely due to an over-representation of men in higher-earning STEM fields.

Similarly, data on student spending was not available for FY20. Given the magnitude of this particular source of spending, however, omitting it from the calculations would substantially bias the impact estimates downward. Thus, student spending totals for the current report were computed based on average spending estimates derived from survey responses collected in FY12, after adjusting for inflation. Our estimated total direct spending by students consequently exceeds or falls short of actual FY20 student spending if FY20 students tended to spend less/more on average than FY12 students and/or the distribution of spending across expenditure categories was significantly different between FY12 and FY20 students.

One of the bigger caveats of our results is that the analysis does not explicitly include counterfactual scenarios, i.e., how the local economy would operate in the absence of the UH system. Christophersen et al. (2014) argue that only benefits generated by students who would otherwise be unable to obtain an alternative education should be included. While some states on the mainland are home to dozens of peer institutions, the primary alternatives to the UH system in Hawai'i are Brigham Young University, Chaminade University, and Hawai'i Pacific University, which have a combined enrollment equal to roughly 10% of the UH system. Thus, while some UH students and specialized faculty would likely have ended up at one of the three peer institutions, we believe that the vast majority would have sought education or employment outside of the state.

Our model also does not consider the alternative use of funds. As discussed in the results section, approximately \$508 million of state general funds was spent on the UH system in FY20. If those dollars had not been spent on UH, they would have been spent elsewhere in the economy, i.e., the UH system is crowding out spending in other industries (Christophersen et al. 2014). In a recent cost-benefit and fiscal impact analysis of Hawaii's film tax credit (DBEDT 2021) the opportunity cost of the tax credit was calculated based on the assumption that those funds would have been spent on the state's capital improvement projects (CIP) fund. More specifically, they estimated that if the \$65.5 million cost of the tax credit were not spent on the CIP fund, lost earnings would be \$41.9 million. Using the same ratio, the \$508 million of state general funds spent on the UH system results in a loss of \$325 million in earnings that otherwise would have been generated if the money had been spent on CIP. In the case of UH-related expenditures, however, we saw that each dollar of general funds spent leveraged an additional \$3.07 of spending for the local economy, which is not the case for expenditures on capital improvement.

Overall, the UH system's net benefit to the local economy would clearly still be positive, even if the alternative use of funds and counterfactual scenarios for UH students and employees were taken into consideration, although the final impacts would be smaller. The estimates in this report represent the gross benefit of UH to the local economy, and therefore should be interpreted as the total contribution, including multiplier effects, to the state.

One additional concern is that UH system expenditures in FY20 (July 1, 2019 – June 30, 2020) were negatively impacted by the ongoing COVID-19 pandemic. Examination of historical spending data suggests that RCUH and UHF expenditures had been trending downward since FY12 and FY17 respectively, and both actually saw a slight uptick in FY20. Expenditures from the UH Operating Budget similarly were already on the decline since FY18, well before the pandemic. Despite the potentially dampening effect of the pandemic, total direct local spending saw a slight uptick in FY20 to \$2.06 billion from the \$1.84 billion reported in the last UH system impact report (UHERO 2013). Furthermore because the university system discontinued in-person classes after spring break in 2020 due to the pandemic, the final months of student spending may be slightly overestimated, though we assume most students remained in state until the end of the spring 2020 semester, so their total in-state spending was not severely reduced.

CONCLUSION

While the value of the UH System goes far beyond its economic value, quantifying the system's contribution to business sales, employee earnings, tax revenue, and jobs is an important component. This report quantified the university system's economic value to the state, using impact analysis and future earnings projections.

Total UH-related expenditures were \$2.31 billion in FY 2020, \$2.06 billion of which was spent in the local economy. Each UH-related dollar spent generated \$1.77 of total business sales, \$0.50 of employee earnings, and \$0.09 of state tax revenue; and each million dollars of spending generated 11 local jobs. We found that research-related dollars went even further – generating \$1.83 of total business sales, \$0.59 of employee earnings, and \$0.10 of state tax revenue; and each million dollars of spending generated 13.5 local jobs.

The \$2.31 billion of expenditures attributable to UH generated \$3.66 billion in local business sales, \$1.02 billion in employee earnings, \$186 million in state tax revenue, and over 22,500 jobs. Each dollar of state general fund spending on UH translated into \$7.21 of total business sales, \$2.01 of employee earnings, and \$0.37 of state tax revenue. For every dollar of state funds spent on UH, the university system was able to leverage an additional \$3.07 of spending in the state.

In addition to the immediate economic activity generated by its expenditures, the UH system generates future financial benefits for degree recipients through higher estimated lifetime earnings. Net of tuition, fees, and forgone earnings while in school, the 9,345 degrees conferred to UH students during the 2019-2020 academic year are expected to produce over \$7 billion in lifetime earnings benefits over the next 40-50 years.

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