

Measuring the Total Economic Value of State-Funded Higher Education in Iowa

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Introduction

This is an evaluation of the statewide total economic value of state-funded higher education in Iowa. The analysis is based on Fiscal Year 2010 final budgeted values for Iowa's three Board of Regents universities and their teaching hospital, as well as the state's 15 community colleges. Final budget year data were obtained from the respective state universities' web sites, from the Board of Regents, and from the Annual Condition of Iowa's Community Colleges, 2010, report published by the Iowa Department of Education. Additional information on employment was obtained from the Iowa Board of Regents using October 2009 employment levels as the official employment basis for FY '10.

The evaluation has three distinct components. It first looks at all Board of Regents higher education spending, which includes all university institutes, centers, extension activities, and other services. The University of Iowa Hospitals and Clinics (UIHC) are separately evaluated. While it is a teaching hospital, and an important educational institution to the state of Iowa, it is most properly measured primarily as a public hospital for the purposes of this study, not as an educational facility. Last, Iowa's 15 community colleges are evaluated as a combined, albeit distributed group of higher education providers.

Definitions and Procedures

Evaluating state-funded higher education in Iowa involves translating budgetary information into a form that aligns with standard inter-industrial accounting procedures. Inter-industrial accounting, input-output (IO) analysis, or impact modeling as it is more commonly called, begins with an up-to-date and state-specific estimate of all inter-industrial transactions that occur in Iowa. A baseline Iowa model was constructed using 2009 state of Iowa data purchased from Minnesota IMPLAN, a long-established source for input-output data relied upon for state and county analysis at Iowa State University for over two decades, as have hundreds of other university-level regional scientists across the U.S.

There are three initial data components in the evaluation process:

1. Defining total industrial / institutional output
2. Determining the components of value added
3. Specifying the total jobs associated with the entities that are measured

Total Industrial Output

In the private sector, industrial output represents the annual value of what is produced, regardless of whether it is sold during the measurement year or becomes an addition to inventory. In the public sector, as in this case, industrial output for higher education represents the total budgeted expenditures as reported by the Iowa Board of Regents or the Iowa Department of Education for the measurement year. Table 1 itemizes those values. As measured in this report, total expenditures for higher education, including the UIHC, was \$4.415 billion in FY '10.

Table 1

	FY '10 Final Budget
Iowa Public Universities	3,117,224,470
UIHC	793,696,274
Iowa Community Colleges	504,179,539
Total	\$4,415,100,283

Components of Value Added

Value added is composed of earnings that are paid to employees; normal returns to proprietors; payments that are made to investors in the form of dividends, interests, or rents; and indirect local, state or federal tax payments that are part of the cost of doing business. Labor income is a subset of value added composed of earnings to employees plus normal returns to proprietors. Labor income is composed of all wages and salaries plus the value of all health and retirement benefits that are paid on behalf of the employee or the proprietor, so it is a larger value than just a worker's salary.

Public institutions may contain profit-making components constituting something akin to a return on enterprise activities. This research does not evaluate whether, for example, a university athletic program, the UIHC, or its cultural offerings operate in the black in so far as they may generate net incomes to the universities or the state of Iowa. For the purpose of this study, value added was composed of the sum of all payments to workers. For the universities, \$261.1 million in student-aid is also treated as a component of value added in that it, in effect, becomes a payment to students to purchase higher education services. Value added amounts are in Table 2. As modeled in this study, Iowa's state funded higher education institutions had \$2.4775 billion in labor income and \$2.7386 billion in total value added in FY '10.

Table 2

	Labor Income	Other Income	Value Added
Iowa Public Universities	1,588,674,609	261,087,759	1,849,762,368
UIHC	517,047,163	-	517,047,163
Iowa Community Colleges	371,766,262	-	371,766,262
Total	\$2,477,488,034	\$261,087,759	\$2,738,575,793

Jobs

Universities and community colleges have a wide variety of employees. Iowa’s universities employ professors, scientists, administrators, skilled professionals, and a wide array of support staff. They also employ students. The UIHC employs health professionals and allied health professionals, plus all of the support staff needed to run a nationally-prominent medical center. Community colleges have full-time professors and support staff, but they also depend heavily on adjunct-faculty for many of their courses, as well as large numbers of part-time and seasonal employees.

IO analysis measures the number of jobs, not the number of employed persons. It does not convert jobs into full time equivalents. Readers are reminded that people can have more than one job, so there are more jobs in an economy than employed persons.* Table 3 shows that, in all, there were 59,824 jobs at Iowa’s state-supported institutions of higher education and the UIHC in FY ‘10.

Table 3

	FY '10 Jobs
Iowa Public Universities	37,743
UIHC	7,050
Iowa Community Colleges	15,031
Total	59,824

Building Iowa-Specific Models

There are two main methods for conducting IO analysis. One approach involves using the default, average-industrial values from a regional or statewide IO model to simulate the economic outcomes that would be associated with, say, a change in jobs in an industry. We could, for example, measure the regional losses in Hamilton County that would result from the closing of the Electrolux factory in Webster City by subtracting 500 jobs from the electrical appliance sector of the IO model to see what the expected consequences of that closing would be.

* I receive salary payments from both Iowa State University as an associate scientist and separately from the University of Iowa as an adjunct faculty member. I therefore constitute two state-funded higher education jobs.

A second method of impact analysis would involve itemizing a “bill of goods” list of a firm’s expenditures for inputs and all of its payments to the components of value added. That approach uses model-derived and industry-specific multipliers to estimate the regional output, labor income, and job consequences of increasing or decreasing itemized purchases from the regional economy of scrutiny. A bill of goods approach to analysis is superior to using default model values when a high amount of information is known about the industry or the institution that is being evaluated, to include knowledge of precisely where purchases are made.

It is not feasible to do a highly detailed bill of goods analysis of Iowa’s public education or the UIHC without substantial effort on the part of their respective accounting departments. They are all geared towards providing information in forms that satisfy auditing requirements and other state reporting requirements. It also takes extraordinary processing to determine whether input purchases are made from in-state suppliers. Aligning vendor payments with spending categories and payment zip codes, for example, is data intensive. In addition, there is not a public university or a public hospital sector in the IO modeling structure, which precludes using the simple default value method described first. There are, however, sectors that represent private hospitals and private universities. To conduct a simulation of the value of Iowa’s public entities, three statewide models of Iowa were constructed to uniquely represent each of the aforementioned Iowa higher education institutions. As a relatively high amount of some budgetary detail was known, each of those models was modified within the modeling system so that it closely emulated the spending characteristics of the institutions to be evaluated. This allows for “bill of sale” hybrid modifications to the standard model of the Iowa economy that much more closely reflect the expected relationships of the studied institutions with the remaining Iowa economy.

Model 1: Iowa Public Universities

This model converted the private colleges sector on the original state of Iowa model so that it only contained the total industrial output, labor income, value added, and jobs numbers that have been listed in Table 1 through Table 3 for Iowa’s public universities.

The budgeted information obtained from the respective universities allowed for some additional modifications so that assumptions about energy use and sources, wholesale purchases of supplies and equipment, transportation spending, information technology, and capital spending were, as examples, much more reflective of actual Iowa public university spending than would have been contained in the original set of college industrial accounts for that year.

Model 2: The University of Iowa Hospitals and Clinics (UIHC)

The UIHC model converted the private hospitals sector in a separate, original state of Iowa model so that it contained only the total industrial output, labor income, value added, and jobs numbers that have been listed in Table 1 through Table 3 for the UIHC.

Adjustments were made within the model to reflect major spending categories as reported in their FY ’10 budget, but most of the industrial inputs into the modeling structure that were contained within the default model were left significantly unchanged as they were highly reflective of the normal array of technical, service, and commodity inputs that would be expected for a large hospital.

Model 3: Iowa Community Colleges

As in Model 1, the private college sector of an original but separate state of Iowa model was converted so that it only contained the total industrial output, labor income, value added, and jobs numbers that have been listed in Table 1 through Table 3 for Iowa's community colleges. This, again, is a completely separate model from the other two.

That model was further modified given broad spending categories reported in the FY '10 final budgets, to include capital spending, supplies and services, and spending associated with operating the physical facilities of the state's community colleges.

All three newly-created models were then re-estimated using standard IO mathematics so that the modeled entities interacted with the remainder of Iowa's 395 industrial and institutional sectors. Once finalized, the modeling structure produces an array of multipliers that uniquely apply to the institution under scrutiny and which allow the simulation of the value of the three institutions to the Iowa economy.

Input-Output Analysis Terminology

The expected total statewide economic values of Iowa's state-supported institutions of higher education are measured using three separate input-output (IO) models of the state of Iowa.

The tables that are produced in the IO models display the amount and the type of total state economic activities that are expected to be generated through the operation of these institutions. Those amounts will be described in terms of total industrial output, value added, labor income, and jobs, which were defined above. There are also three dimensions of economic activity that are summarized in IO tables.

- ▶ Direct activity. This refers only to the annual budget of each of the higher education or medical institutions, their labor income payments, and the total jobs.
- ▶ Indirect activity. All of Iowa's higher education institutions require supply and service inputs, to include wholesale goods, equipment, transportation, banking services, and utilities as major examples. When levels increase or decrease in the direct sector, that influences the demand for inputs.
- ▶ Induced activity. This economic activity occurs when workers in Iowa's institutions of higher education and workers in the indirect (supplying) sectors convert their labor incomes into household consumption. This stimulates another round of statewide economic activity that, in turn, stimulates requires jobs to deliver and pays those jobs incomes.

The sum of these three levels of economic activity provides the estimate of the total economic value of a particular kind of industrial production we are measuring.

Readers will notice that I use the phrase “total economic value” instead of the common phrase “economic impact” to describe Iowa’s public institutions’ relationship to the Iowa economy. The term “economic impact” more properly describes economic activity that enhances statewide net productivity that is in excess of amounts required to satisfying residential needs. Accordingly, properly measured, the economic impact of Iowa’s public universities and the UIHC is a subset of their total economic values.

Iowa’s state universities, its teaching hospital, and its community colleges exist primarily as an educational and health delivery service to Iowans. Nonetheless, Iowa’s universities do in fact “export” educational services to non-Iowans, as do to a much lesser extent Iowa’s community colleges. They also export research and scientific services in so far as research is funded by sources external to the state and the research activity would not have occurred “but-for” the external demand. The UIHC system also serves out-of-state patients, and in so doing derives revenues from non-Iowa payers. The degree to which Iowa’s institutions of higher education produce for export sales is not a focus of this particular study, however. This report only gauges the linked value of all Iowa transactions as they relate to the total annual budget of the state’s institutions of higher education, and it does not attempt to apportion net state productivity gains associated with operating these institutions.

The Total Economic Values

Iowa Public Universities

Table 4 displays the modeled results for Iowa’s public universities. Iowa’s universities had \$3.117 billion in estimated spending from all sources in FY ’10. In so doing, they paid \$1.59 billion in labor incomes to 37,743 workers. Those universities indirectly stimulated \$915.6 million in inputs into the university systems, which required an additional 7,876 workers making \$318.96 million in labor incomes. When the university workers and the indirect workers converted their labor incomes into household spending, they induced \$1.51 billion in total industrial output, which in turn required 15,013 jobs making \$497.7 million in labor incomes. Combined, Iowa’s public universities accounted for \$5.546 billion in state output, \$3.2 billion in value added (or Iowa gross domestic product), \$2.41 billion in labor income, and 60,632 Iowa jobs.

Table 4

Total Economic Values for Iowa Public Universities

	Direct	Indirect	Induced	Total	Multiplier
Total Output \$	3,117,224,470	915,575,245	1,512,857,916	5,545,657,631	1.78
Value Added \$	1,849,762,368	461,825,103	891,365,929	3,202,953,400	1.73
Labor Income \$	1,588,674,609	318,959,621	497,699,690	2,405,333,920	1.51
Jobs	37,743	7,876	15,013	60,632	1.61

Table 4 also contains a column of multipliers. A multiplier is merely the total value divided by the direct value. It reflects the total change in an economy due to a one unit change in the direct value measured.

For example, the total output multiplier of 1.78 means that for every dollar’s worth of expenditure among Iowa’s public universities, there is \$.78 in additional industrial output in the remainder of the economy. The value added multiplier of 1.73 means that for every dollar of value added (nearly all of which is labor income) among Iowa’s public universities, there is \$.73 in additional value added sustained in the rest of the Iowa economy. A labor income multiplier of 1.51 means that for every dollar in labor income paid in the direct sector, an additional \$.51 of labor income is supported in the rest of the economy. Finally, a jobs multiplier of 1.61 means that for every job at an Iowa university, there is 61/100th of a job in the rest of the economy.

The University of Iowa Hospitals and Clinics

Table 5 provides the findings for the University of Iowa Hospitals and Clinics (UIHC). With a final budgeted expenditure of \$793.7 million, the UIHC required 7,050 jobs making \$517.05 million in labor income. The UIHC indirectly stimulated \$181.4 million in industrial output among Iowa’s supplying sectors, which supported 1,679 jobs making \$68.6 million in labor income. In converting their labor incomes to household spending, those workers induced \$394.9 million in output, requiring 3,968 more jobs making \$127.4 million in labor income. Summed, the UIHC accounted for \$1.37 billion in industrial output in Iowa, \$859.2 million in value added, \$713.03 million in labor income, and supported 12,697 Iowa jobs.

Table 5

Total Economic Values for the University of Iowa Hospitals and Clinics					
	Direct	Indirect	Induced	Total	Multiplier
Total Output \$	793,696,274	181,396,236	394,933,658	1,370,026,168	1.73
Value Added \$	517,047,163	106,645,290	235,508,386	859,200,840	1.66
Labor Income \$	517,047,163	68,588,206	127,397,179	713,032,548	1.38
Jobs	7,050	1,679	3,968	12,697	1.80

Iowa Community Colleges

Table 6 provides the community college results. With expenditures of \$504.2 million in FY ’10, Iowa’s community colleges required 15,031 jobs of all kinds making \$371.8 million in labor incomes. They indirectly stimulated \$94.02 million in output among the supplying sectors, which required 733 jobs making \$28.2 million. In converting labor incomes to household spending, the indirect and direct jobs induced \$281.6 million in additional Iowa industrial output, which necessitated 2,813 more jobs making \$92.1 million in labor incomes. In all, Iowa’s community colleges combined accounted for \$879.8 million in output, \$586.2 million in value added, \$492.02 million in overall labor income, and 18,577 jobs.

Readers will notice that both job and labor income multipliers are significantly lower for community colleges as compared to the previous examples. There are two reasons: first, a much higher fraction of community college spending is salaries, and their respective demands from Iowa based suppliers of goods and services are much lower. Second, average earnings, considering all of the different types of jobs, are much lower in community colleges (remember we count all of the jobs in the system, not full time equivalents). Accordingly, in the case of the jobs multiplier, the denominator in the ratio is inflated

with a large number of part-time and adjunct jobs. Iowa’s public university job multipliers also have a very large number of part-time student jobs, but their demands for inputs and the higher average pay in the institutions boosts their relationship to the induced sectors enough to produce much higher job and labor income multiplier ratios.

Table 6

Total Economic Values for Iowa Community Colleges					
	Direct	Indirect	Induced	Total	Multiplier
Total Output \$	504,179,539	94,019,317	281,589,063	879,787,919	1.74
Value Added \$	371,766,262	48,370,545	166,088,533	586,225,339	1.58
Labor Income \$	371,766,262	28,185,928	92,064,041	492,016,232	1.32
Jobs	15,031	733	2,813	18,577	1.24

All Values Combined: Iowa Institutions of Higher Education

Total values for all of Iowa’s state supported institutions of higher education are contained in Table 7. All institutions combined had total FY ’10 expenditures of \$4.42 billion, and required 59,824 total jobs making \$2.48 billion in labor income. Those institutions indirectly stimulated \$1.19 billion in industrial output among Iowa supplying sectors, which required 10,288 jobs making \$415.7 million in pay. Those direct and indirect workers caused \$2.19 billion in induced output, which required 21,793 jobs making \$717.2 million in labor income. Combined, Iowa’s institutions of higher education supported \$7.8 billion in total industrial output, \$4.65 billion in value added, \$3.61 billion in labor income, and 91,906 Iowa jobs.

Table 7

Total Economic Values for State of Iowa Institutions of Higher Education				
	Direct	Indirect	Induced	Total
Total Output \$	4,415,100,283	1,190,990,798	2,189,380,637	7,795,471,718
Value Added \$	2,738,575,793	616,840,939	1,292,962,847	4,648,379,579
Labor Income \$	2,477,488,034	415,733,756	717,160,910	3,610,382,700
Jobs	59,824	10,288	21,793	91,906

Discussion

Total spending by Iowa’s institutions of higher education is supported by a very wide array of revenue sources. The state of Iowa contributes general funding towards education, all university public services, and health care. Students pay tuition and substantial fees to attend colleges. Patients at the UIHC are supported by private-paid, insurance-paid, state-paid, and federally-paid sources. Iowa’s universities receive substantial grant and other sponsored programming assistance to conduct research, demonstration projects, or to engage in cultural or artistic activities. Lastly, a very wide spectrum of users supports university and college athletics, cultural affairs, workshops, and seminars. All of these revenue sources result in higher education and health care expenditures among the institutions measured. No effort was made to apportion the fractions of total economic values attributable to, for

example, general funding, tuition, Medicare, all sponsored research, or, as an example, athletic attendance. This analysis looks at the institutions as whole operational units regardless of funding sources.

There are tangential elements of economic activity that are not measured in this analysis.

1. **Student life spending:** All college students will consume off-campus-supplied goods and services. Substantial fractions will live in off-campus housing, and substantial fractions will purchase their dining, service, and other retail needs from area stores and providers. Those activities for Iowa's public universities in fact do constitute a highly localized economic impact in so far as that spending would not occur locally were it not for the presence of the university. Statewide, however, that spending would have occurred nonetheless as an expected component of higher education support for the students. The addition of student life spending is generally legitimate when looking at a particular institution, but less so when looking at all institutions combined. Iowa's foreign students do, in fact, contribute regional and statewide spending that otherwise would not have occurred statewide were it not for the universities, but again, those tangential values were not estimated in this study.
2. **Visitor effects:** Iowa's universities draw visitors from across the state and from outside of the state to attend athletic events, attend seminars and cultural events, participate in workshops, and go to an array of summer camps for a variety of opportunities ranging from activities for the elderly to activities for children. Patients at UIHC also receive family visitors incidental to their stays. This list might also include the occasional visits by out-of-state parents with their children while attending Iowa higher education institutions. While a large fraction of event attendee spending at the universities in the form of admissions, fees, and workshop payments, as examples, have already been measured in the preceding analysis, this research makes no effort to estimate external attendee spending incidental to participating in university activities. This spending takes the form primarily of dining, lodging, and transportation spending in the host communities. That type of evaluation requires a well-crafted, wide-ranging, longitudinal survey of clusters of participants at university activities. There has been to date no such survey conducted that would apply to all of Iowa's higher education institutions that would pass standard survey muster. Until a reliable survey has been conducted, there are no economic values to even be speculated about in this general area.
3. **Other spillover effects:** University employees are entrepreneurs. Many start their own businesses in their communities, and a very large fraction of faculty and professional staff engage in private consulting. University cultural and scientific activities may also result in regional or statewide economic spillovers in that firms may be attracted to a particular university or a particular cluster of university researchers. This may also be the case for a particular community college that has a specialized regional training program that serves a particular type of industry. All of these economic activities, however, are separate from and external to the states institutions' annual activities. The degree to which X amount of higher

education activity caused Y amount of regional or statewide economic spillover is at best speculative. And a case could be made, for example, that a community college's offerings were a direct result of an established regional industry's particular needs, not *vice versa*. Determining which caused which would be very problematical.

There have been a few estimates of the statewide economic impacts of Iowa's universities, some of its community colleges, and the UIHC over the years. Two public studies by this writer evaluated dimensions of Iowa State University contributions to overall state and regional economic activities using methods very similar to those employed in this analysis. * A recent study of the University of Iowa along with the UIHC sponsored by the University of Iowa, however, did not utilize actual Iowa input-output models.** An evaluation of the results of that externally conducted analysis indicates that output, labor income, and job impacts were highly inflated, and the research firm used sets of multipliers that were determined by an institution that had not conducted any type of evaluation of the Iowa economy in determining its values. In short, that research used multiplying factors that were not constructed using an Iowa-based input-output modeling system. In addition, that study attempted via selective and non-generalizable survey methods to estimate purported visitor effects, the results of which are also unreliable.

All economic impact analysis in the U.S. and in Iowa should be viewed with a high degree of skepticism. In evaluating the research, reviewers should ask many questions. Among the more pertinent would be:

- ▶ Are the analysts using actual and detailed institutionally-supplied information?
- ▶ Was a modeling system employed that in fact simulated the overall industrial structure of the economy to be studied? Did the model and its assumptions fit the geographic territory analyzed?
- ▶ Were methods of analysis used that indicated sensitivity to the unique characteristics of the industry that was evaluated?
- ▶ Were distinctions made in the analysis between total economic activity measured as compared to net increments to regional or statewide economic activity that is attributable to the event or the institutions evaluated? Stated differently, were the results reported in a manner that identified the difference between total economic values versus net new productivity (or economic impacts)?
- ▶ Were the detailed data going into the model as well as the results presented in the report in enough detail to allow for a reasonable evaluation of the inputs and the methods by which they were converted?

* See for example Swenson, David A. and Liesl Eathington, The Economic Impacts of Iowa State University in Fiscal 2006, found here: <https://www.econ.iastate.edu/sites/default/files/publications/papers/p11224-2007-11-01.pdf> and Swenson, David A. and Liesl Eathington, The Economic Impact of Iowa State University, 1999. Department of Economics Staff Report, Iowa State University, March 1999.

** Tripp Umbach, The University of Iowa Economic Impact Study, September 2010, found here: <http://www.uiowa.edu/impact/pdf/UI%20Economic%20Impact%20Study%209-29-2010.pdf>

- ▶ Finally, were the findings fitting within the context of the overall economy that was evaluated? Stated different, do the findings strain credulity or fit within a general understanding of one's regional or state economy?

Reviewers of this report might be inclined to view this research as institutionally self-serving; the researcher is, after all an employee of the institutions that he is evaluating. In an era where all public institutions are under intense budget-cutting scrutiny, any research emanating from institutions so threatened should be looked at skeptically.

Be that as it may, I can offer no defense of my objectivity beyond my experience conducting studies of this sort for the past two decades and the transparency of the methods employed.

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