

UNIVERSITY OF MAINE'S CONTRIBUTIONS  
TO STATE ECONOMIC DEVELOPMENT

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Executive Summary:

This report quantifies several of the ways in which the University of Maine enhances economic development in the state. Results show that, including multiplier effects, the University's day-to-day operations along with student and visitor spending annually contribute \$698.0 million in total output to the Maine economy, and support 9,818 full- and part-time jobs that provide \$296.3 million in income to Maine workers. With a leverage factor of 7.65, the results indicate that every \$1.00 invested by the state in the University of Maine generates approximately \$7.65 in total economic activity. Looking at longer-term benefits of University of Maine graduates, the results suggest that the aggregate lifetime earnings payoff to a single graduating class is \$515.5 million of additional income to the state economy. A single class of graduates from selected programs focusing on subjects key to Maine's knowledge economy contributes an additional \$145.8 million in lifetime earnings. University of Maine graduates help meet the state's workforce needs by obtaining the skills and knowledge necessary to work in Maine's fastest growing, and highest paying occupations.

# UNIVERSITY OF MAINE'S CONTRIBUTIONS TO STATE ECONOMIC DEVELOPMENT

## 1. INTRODUCTION

Economic development can be thought of as a sustainable improvement in well-being fueled by new technologies and expanded human, social, natural and physical capital. For people in Maine, economic development is finding a rewarding career and living in a vibrant community. For entrepreneurs in the state, it means generating novel ideas that lead to new jobs and the creation of wealth. For Maine businesses, economic development translates into investments that enhance the productivity of a skilled workforce. For the state as a whole, it is shared prosperity and expanded opportunities for the future.

The University of Maine is the state's leading driver of economic development. With an undergraduate enrollment of over 8,500 students and cutting-edge graduate programs in a wide variety of fields, the University educates and inspires the next generation of Maine citizens, workers, entrepreneurs and leaders. The University's extension and outreach programs cover the entire state, helping Maine people solve problems ranging from "how to keep a cedar hedge free from pests" to "how to write a business plan for development of a small motel on the coast." Faculty and student research projects generate knowledge and ideas that help launch new companies, and that enable existing businesses to grow and create jobs.

This report highlights several of the ways in which the University of Maine enhances the state's economy. First, we examine the economic contribution of the University's operations and student (and visitor) spending on state-level output (i.e., sales

revenue), income and employment. This analysis provides an update of our 2002 study on the economic impact of the University of Maine.<sup>1</sup> Next, we look at the long-term benefits that University of Maine graduates provide to the state's economy. This analysis focuses on the earnings premium in Maine associated with a college degree, with an emphasis on graduates who support the state's knowledge economy. Finally, we consider the fastest growing and highest paying occupations in Maine and see how the University is addressing the state's workforce needs.

## 2. UMAINE'S CONTRIBUTION TO THE STATE ECONOMY

The University of Maine generates substantial economic activity through its day-to-day operations. During FY2006, the University of Maine received \$291.6 million in revenues from a variety of in-state and out-of-state sources, and its expenditures on goods and services totaled \$286.9 million.<sup>2</sup> Payroll represents the University's largest expenditure category, with \$178.3 million spent in FY2006 on faculty and professional salaries, classified and student wages, and employee benefits. The University directly employed 5,556 full- and part-time workers in FY2006; 2,954 of these were student workers.<sup>3</sup>

Table 1 presents information on the statewide economic contribution of the University of Maine's day-to-day operations. Student and visitor spending, other key components of the University's total economic impact, are considered in a separate analysis. The direct impacts associated with the University's operations are the revenue

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<sup>1</sup> Allen, Thomas and Todd Gabe, "Economic Impact of the University of Maine," REP Staff Paper 512, December 2002.

<sup>2</sup> Revenue and expenditure figures are from the University of Maine FY2006 year-end "Statement of Revenues, Expenses, and Changes in Net Assets."

<sup>3</sup> Student employment figures were provided by the University of Maine, Office of Human Resources.

(i.e., output), payroll (i.e., income) and employment figures discussed above. The multiplier effects, estimated using the IMPLAN input-output model for the state of Maine, capture the indirect and induced impacts associated with expenditures made by the University (e.g., products and services purchased from other Maine businesses) and its employees.

Along with the economic activity summarized above, University of Maine student and visitor spending contribute to the Maine economy. A portion of the impact of student spending is captured in the figures shown in Table 1, since the direct income of \$178.3 million includes \$16.5 million in wages paid to student workers. However, the total expenditures made by University of Maine students far exceed the spending associated with wages earned through on-campus jobs. This is because, along with money earned at the University, student expenditures are financed through sources such as parental support, money earned through summer jobs and student financial aid. Using information on the composition of the University of Maine student body (e.g., full- versus part-time status, resident versus non-resident students) and average expenditures for room and board, books, travel and miscellaneous items, we estimate that University of Maine students spent approximately \$70.3 million on goods and services.<sup>4</sup>

The difference between the \$70.3 million in total student expenditures and the \$16.5 million received in student wages, which amounts to \$53.8 million in direct spending, is another source of economic activity associated with the University of Maine. Similar to our economic impact study from 2002, we assume that visitor spending is

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<sup>4</sup> Room and board expenditures are included for full-time students who live in off-campus housing. The economic activity associated with room and board expenditures made by resident students is captured in the figures shown in Table 1. Student expenditures are based on sample budgets from the University of Maine, Office of Student Financial Aid.

equivalent to 14 percent of University non-payroll expenditures on operations and construction.<sup>5</sup> Our estimate of \$15.2 million in visitor spending, when combined with the \$53.8 million in student spending not accounted for by wages earned through on-campus jobs, translates into \$69.0 million in additional direct expenditures associated with the University of Maine. The total impact of this spending, estimated using the Maine IMPLAN model, is shown in Table 2.

Table 3 summarizes the total contribution of the University of Maine to the state's economy. These figures include the output generated by University operations, employee and student spending, and the activity associated with University of Maine visitors. Including multiplier effects, the University of Maine annually contributes \$698.0 million in total output (i.e., sales) to the Maine economy, and supports 9,818 full- and part-time jobs that provide \$296.3 million in income to Maine workers.

The University of Maine has an output multiplier of 1.94, calculated as its total economic contribution (\$698.0 million) divided by direct output (\$360.6 million). This suggests that every \$1.00 in University revenue and student/visitor spending generates \$1.94 in total spending across the state. It is similar to the output multiplier (2.00 in FY2002) estimated in our earlier study.<sup>6</sup> Likewise, the income multiplier from the current study (1.54) is almost identical to the income multiplier (1.56) from the FY2002 analysis. The employment multiplier from the current study (1.52) is somewhat smaller than the employment multiplier (1.71) estimated using FY2002 figures. A reason for this difference is that the current analysis is based on a much larger number of student

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<sup>5</sup> A study published by the National Association of State Universities and Land Grant Colleges suggests that visitor spending is equivalent to 14 percent of university non-payroll spending on operations and construction.

<sup>6</sup> Allen, Thomas and Todd Gabe, "Economic Impact of the University of Maine," REP Staff Paper 512, December 2002.

employees (2,954 in FY2006 compared to an estimated 2,300 in FY2002). This inflates the base used in the calculation, resulting in a lower multiplier.<sup>7</sup>

Our current estimate of \$698.0 million in total output associated with the University of Maine represents a 21 percent increase above its total economic impact (\$577.5 million) in FY2002. In our earlier report, we calculated a “leverage factor” defined as the University of Maine’s total statewide economic impact divided by its state appropriation and the University’s share of research and development funding from the Maine Economic Improvement Fund (MEIF).<sup>8</sup> Based on our current analysis and a total state appropriation of \$91.3 million, we estimate a leverage factor of 7.65 for FY2006.<sup>9</sup> This suggests that every \$1.00 invested by the state government in the University of Maine generates approximately \$7.65 in total economic activity.

### 3. BENEFITS OF UMAINE GRADUATES TO THE MAINE ECONOMY

Along with the substantial economic impacts associated with its day-to-day operations, the University of Maine provides a long-term benefit to the state’s economy through its graduates who live and work in the state. Close to two-thirds of baccalaureate degree recipients who find full-time work after graduation typically stay in Maine.<sup>10</sup> Using this figure and accounting for graduates who do not immediately enter the workforce (e.g., those who go to graduate school), we estimate that 786 of the baccalaureate degree recipients from FY05-06 are currently working full time in Maine.

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<sup>7</sup> Another factor to consider is the part-time, temporary nature of many student jobs. This would contribute to a low employment multiplier.

<sup>8</sup> We estimated a leverage factor of 6.60 in our study for FY2002.

<sup>9</sup> The total appropriation includes an unrestricted state appropriation of \$81.7 million and a restricted (MEIF) state appropriation of \$9.6 million.

<sup>10</sup> This information is from the University of Maine, Office of Institutional Studies.

Collectively, based on 2000 U.S. Census statistics that reveal a \$16,397 annual wage premium in Maine for a college degree (and no further education), these students will receive a \$515.5 million earnings premium associated with a University of Maine education over a 40-year career. With the addition of graduate students (whose earning premiums are even higher) and those who return to Maine after working elsewhere, the aggregate lifetime earnings payoff to a single graduating class is well over one-half of a billion dollars.

The University is important to the state's goal of promoting the creative economy, as well as efforts geared at stimulating knowledge- and technology-based development. These are the keys to economic prosperity in Maine and all other regions of the world. U.S. Census statistics from the 2005 American Community Survey show that slightly over one-quarter of Maine residents aged 25 to 64 have at least a four-year college degree. However, when focusing only on Maine residents included in Richard Florida's "Creative Class," this figure rises to 58 percent of the state's creative workforce.

The University of Maine's contributions to the state's knowledge economy are particularly impressive. Knowledge generation (in the form of faculty and student research) and transmission (in the form of education and outreach programming) are at the heart of the University's activities. Figure 1 illustrates the importance of knowledge to a regional economy. It is a scatter plot showing the relationship between median earnings in U.S. metropolitan areas and a region's knowledge earnings premium.<sup>11</sup> The

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<sup>11</sup> The data shown are for 324 U.S. metropolitan areas, including Portland, Bangor and Lewiston – Auburn. However, you would see the same general picture using state-level or county-level data. Technical details about the knowledge earnings premium are discussed in the report entitled "Knowledge and Earnings" by Todd Gabe.

strong positive correlation ( $p=0.75$ ) between these two variables indicates that a vibrant knowledge economy is a key factor supporting high regional earnings.

For comparison purposes, Figure 2 is a scatter plot illustrating the relationship between median earnings and the proportion of adults in the region who have (at least) a 4-year college degree. Although it shows that educational attainment enhances median earnings, the correlation ( $p=0.37$ ) is much lower than that found between earnings and knowledge. The reason behind this difference is that educational attainment counts all degrees as equal, while the knowledge earnings premium places a higher emphasis on those subjects that are most valued in the U.S. economy. This takes into account the fact that “[y]ears of education... is a coarse measure of skill: all colleges do not deliver the same product to their students, [and] all degrees are not equivalent in terms of the skills they encompass.”<sup>12</sup>

The regional knowledge premium represents the proportion of an area’s workforce in occupations that require high knowledge about the 29 subjects shown in Table 4. Possessing high knowledge about some of these topics (e.g., medicine and dentistry, sales and marketing, computers and electronics) substantially increases a person’s earnings, while knowing a lot about other subjects is not rewarded in the labor market.<sup>13</sup> The subjects denoted with an asterisk (\*) in Table 4 all increase a person’s earnings by ten percent or more (above the premium associated with a college degree).

Table 5 shows the 10 knowledge areas (of those considered in the analysis) that are most important to the Maine economy. Here, importance is measured by the percentage of total income in Maine that is generated by workers with high knowledge

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<sup>12</sup> This quote is from the article “The Returns to Skill” by Beth Ingram and George Neumann, published in the peer-reviewed journal *Labour Economics*.

<sup>13</sup> Full results from this analysis are presented in the report “Knowledge and Earnings” by Todd Gabe.

about the topic. This is calculated as the U.S. knowledge earnings premium (for a given topic) multiplied by the proportion of Maine workers with high knowledge about the subject. For each of the topics, we estimated the average earnings premium in Maine associated with high knowledge about the subject. As an example, a Maine worker possessing high knowledge about computers and electronics would earn an average of \$7,243 more per year than an otherwise similar individual (e.g., same education, age, gender, etc.) without such knowledge.

We used these wage premiums to estimate the contributions of selected University of Maine graduates to the state's knowledge economy. First, we matched colleges and departments to the knowledge areas shown in Table 5.<sup>14</sup> Second, we examined the number of undergraduate and graduate degrees conferred from these academic units over the five-year period between academic years 2001-02 and 2005-06. Third, we calculated a one-year average number of graduates, which we adjusted to account for students who leave Maine after graduation (see above).<sup>15</sup> Finally, we used our estimates of the number of graduates (from the selected college and departments) who stay in Maine along with the wage premiums shown in Table 5 to estimate the statewide contributions of University of Maine graduates to the selected areas of knowledge.

Using this approach, we estimate that a single graduating class of University of Maine students (from the selected programs) contributes \$145.8 million to Maine's

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<sup>14</sup> The selected colleges and departments are: College of Engineering, Computer Science, Economics, Maine School of Business, Nursing, Psychology, Public Administration, Resource Economics and Policy, and Social Work. Department names and graduation figures are from the University of Maine, Office of Institutional Studies.

<sup>15</sup> Using information from academic years 2001-02 to 2005-06, we estimate that in a typical year 514 graduates from the selected academic units work in Maine after graduation.

knowledge economy over a 40-year working career. As noted above, this earnings estimate is above and beyond the earnings premium associated with a college degree. Thus, when the contributions of all University of Maine graduates (\$515.5 million) are considered along with the subset of high knowledge workers (\$145.8 million), the total statewide earnings impact of a single graduating class is \$661.3 million over a 40-year career.

#### 4. UMAINE ADDRESSING THE STATE'S WORKFORCE NEEDS

Supporting the state's workforce needs is one of the most important ways the University of Maine can promote regional economic development. Below, we identify the occupations that are expected to grow in Maine into the next decade. This information is from the "Maine Employment Outlook to 2014" report released by the Maine Department of Labor in September of 2006.

Table 6 presents projected employment growth statistics by major occupational category. The wage ratio shown in the table is calculated as the average annual wages in the occupational category divided by the average annual wages of all Maine workers. A wage ratio greater than 1.0 indicates that annual wages in the selected group of occupations are higher than the statewide average.

The University of Maine is especially beneficial to the state's workforce needs by educating students in topics relevant to well paying occupations that are projected to experience growth in the state. Five occupations are ranked in the top one-half of the 22 categories both in terms of projected growth rates in Maine and average annual wages. They are *computer and mathematical occupations; life, physical, and social science*

*occupations; community and social service occupations* (note that wages are slightly below statewide average); *legal occupations*; and *healthcare practitioners and technical occupations*.<sup>16</sup> According to Maine Department of Labor projections, these five occupational categories are expected to experience net employment growth of 11,599 jobs between 2004 and 2014. This translates into 5,800 jobs over a five-year period.

We identified 26 University of Maine programs that fall under the five broad occupational categories listed above.<sup>17</sup> Over the five-year period between academic years 2001-02 and 2005-06, the University of Maine conferred 4,323 undergraduate and graduate degrees to students from these programs.<sup>18</sup> This is equivalent to almost 75 percent of the five year projected net job growth in the fastest growing, highest paying occupations in Maine.<sup>19</sup> Some examples of University of Maine departments closely related to these fields include Computer Science, Electrical/Computer Engineering, and Spatial Information Science (*computer and mathematical occupations*);

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<sup>16</sup> In addition, the categories of *management occupations*, and *business and financial operations occupations* pay relatively high wages, and are expected to experience moderate growth in Maine. High growth occupations that pay relatively low wages include *healthcare support occupations; personal care and service occupations*; and *food preparation and serving related occupations*.

<sup>17</sup> The 26 departments are Animal Science, Anthropology, Biochemistry/Microbiology, Biological Sciences, Chemistry, Computer Science, Earth Sciences, Ecology and Environmental Sciences, Economics, Electrical/Computer Engineering, Food Science/Human Nutrition, Forestry, History, Kinesiology, School of Marine Sciences, Mathematics, Nursing, Physics, Plant Sciences, Political Science, Psychology, Resource Economics and Policy, Social Work, Sociology, Spatial Information Science, and Wildlife Ecology. These “example” departments were selected based on a reasonably close match between the program’s name and a specific job title listed under the five broad occupational categories. Although the broad categories are characterized by high growth and high wages, some of the individual occupations may not meet one or both criteria. Department names and graduation figures are from the University of Maine, Office of Institutional Studies.

<sup>18</sup> Note that other University of Maine programs provide the skills and knowledge required to work in the high growth, high pay occupations. For example, students from across the College of Engineering and programs such as New Media are well trained to work in computer and mathematical occupations. Likewise, the University of Maine has “pre-med” and “pre-law” students from a variety of undergraduate programs who ultimately work in health- and legal-related fields.

<sup>19</sup> This ratio is based on figures for the total number of degrees conferred from the 26 departments and aggregate projected job growth for the five occupational categories. It would not apply to each of the individual broad occupational categories, or the specific job titles under each of the occupations. The task of estimating separate ratios for each of the broad occupational categories is complicated by the fact that many of the “example” departments provide students with the skills needed to work in one or more of the occupational categories.

Biochemistry/Microbiology, Plant Sciences, and Psychology (*life, physical, and social science occupations*); Social Work (*community and social service occupations*); and Nursing and Kinesiology (*healthcare practitioners and technical occupations*).

## 5. SUMMARY

This report looked at several of the ways in which the University of Maine enhances economic development in the state. We found that, including multiplier effects, the University's day-to-day operations contribute \$698.0 million in total output (i.e., sales) to the Maine economy, and support 9,818 full- and part-time jobs that provide \$296.3 million in income to Maine workers. In addition, with a leverage factor of 7.65, our analysis shows that every \$1.00 invested by the state government in the University of Maine generates approximately \$7.65 in total economic activity. Focusing on longer-term benefits of University of Maine graduates, we found that the aggregate lifetime earnings payoff to a single graduating class is \$515.5 million of additional income to the Maine economy. A single class of graduates from programs focusing on subjects key to Maine's knowledge economy contributes an additional \$145.8 million in lifetime earnings. University of Maine graduates obtain the skills and knowledge necessary to work in the state's fastest growing, and highest paying occupations.

Table 1. Economic Impact of University of Maine Operations

	Direct Impact	Multiplier Effect***	Total Impact***
Output	\$291.6 mil	\$314.0 mil	\$605.6 mil
Income*	\$178.3 mil	\$96.1 mil	\$274.4 mil
Employment**	5,556	3,107	8,663

\* Direct impact is the total university payroll, including benefits and student payroll.

\*\* Direct impact includes student employment, which is part-time, seasonal and often highly variable.

\*\*\* Estimated using the Maine IMPLAN model.

Table 2. Economic Impact of University of Maine Student and Visitor Spending\*

	Direct Impact**	Multiplier Effect***	Total Impact***
Output	\$69.0 mil	\$23.4 mil	\$92.4 mil
Income	\$14.3 mil	\$7.6 mil	\$21.9 mil
Employment	885	270	1,155

\* Student spending does not include money earned from on-campus employment. The impacts of student payroll are included in Table 1.

\*\* Direct income and employment figures are estimated using the Maine IMPLAN model.

\*\*\* Estimated using the Maine IMPLAN model.

Table 3. Economic Impact of the University of Maine: Operations, Student and Visitor Spending\*

	Direct Impact	Multiplier Effect	Total Impact
Output	\$360.6 mil	\$337.4 mil	\$698.0 mil
Income	\$192.6 mil	\$103.7 mil	\$296.3 mil
Employment	6,441	3,377	9,818

\* All figures are combined totals of the impacts presented in Tables 1 and 2.

Table 4. Selected Knowledge Areas

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Administration and Management*	Biology
Clerical	Psychology*
Economics and Accounting	Geography
Sales and Marketing*	Medicine and Dentistry*
Customer and Personal Service	Therapy and Counseling
Personnel and Human Resources	Education and Training
Production and Processing*	English Language
Food Production	Fine Arts
Computers and Electronics*	Philosophy and Theology
Engineering and Technology*	Public Safety and Security
Design	Law and Government*
Building and Construction	Telecommunications
Mechanical	Communications and Media
Mathematics*	Transportation*
Chemistry	

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\* Possessing high knowledge about these topics raises individual earnings by 10 percent or more.

Table 5. Knowledge Areas Important to the Maine Economy\*

Knowledge Area	Average Wage Premium per Maine Worker with High Knowledge
Medicine and Dentistry	\$16,804
Law and Government	\$10,404
Sales and Marketing	\$8,177
Computers and Electronics	\$7,243
Engineering and Technology	\$6,581
Administration and Management	\$5,409
Psychology	\$4,706
Production and Processing	\$4,235
Therapy and Counseling	\$3,086
Economics and Accounting	\$2,785

\* Workers with high knowledge about these topics provide the largest impact on state earnings, calculated as the U.S. knowledge premium multiplied by the proportion of Maine workers with high knowledge about the subject.

Table 6. Projected Employment Growth by Major Occupational Category

Occupational Category	Projected Maine Employ. Growth, 2004-2014 <sup>a</sup>	Projected U.S. Employ. Growth, 2004-2014 <sup>b</sup>	Maine Wage Ratio, 2006 <sup>b</sup>	Maine Employment, 2006 <sup>b</sup>
Management occupations	9.9%	11.3%	2.06	31,130
Business and financial operations occupations	9.2%	19.1%	1.48	21,000
Computer and mathematical occupations	15.7%	30.7%	1.61	8,010
Architecture and engineering occupations	0.3%	12.5%	1.66	8,930
Life, physical, and social science occupations	10.0%	16.4%	1.41	4,850
Community and social services occupations	17.2%	20.8%	0.96	13,950
Legal occupations	13.4%	15.9%	2.01	3,380
Education, training, and library occupations	5.5%	20.0%	1.08	42,040
Arts, design, entertainment, sports, and media occupations	10.5%	14.9%	0.92	7,330
Healthcare practitioners and technical occupations	17.7%	25.8%	1.78	35,120
Healthcare support occupations	20.0%	33.3%	0.67	19,340
Protective service occupations	10.6%	14.0%	0.89	9,720
Food preparation and serving related occupations	12.5%	16.0%	0.55	52,400
Building and grounds cleaning and maintenance occupations	10.1%	17.0%	0.65	20,470
Personal care and service occupations	17.8%	21.0%	0.60	13,520
Sales and related occupations	7.8%	9.6%	0.85	58,260
Office and administrative support occupations	0.9%	5.8%	0.80	102,660
Farming, fishing, and forestry occupations	1.3%	-1.3%	0.84	2,900
Construction and extraction occupations	2.5%	12.0%	0.96	32,230
Installation, maintenance, and repair occupations	7.9%	11.4%	1.03	25,840
Production occupations	-8.7%	-0.7%	0.87	41,740
Transportation and material moving occupations	6.2%	11.1%	0.77	42,120

Sources: Maine Department of Labor <sup>a</sup> and U.S. Bureau of Labor Statistics <sup>b</sup>.

Figure 1. Knowledge and Earnings in US Metro Areas (n=324)

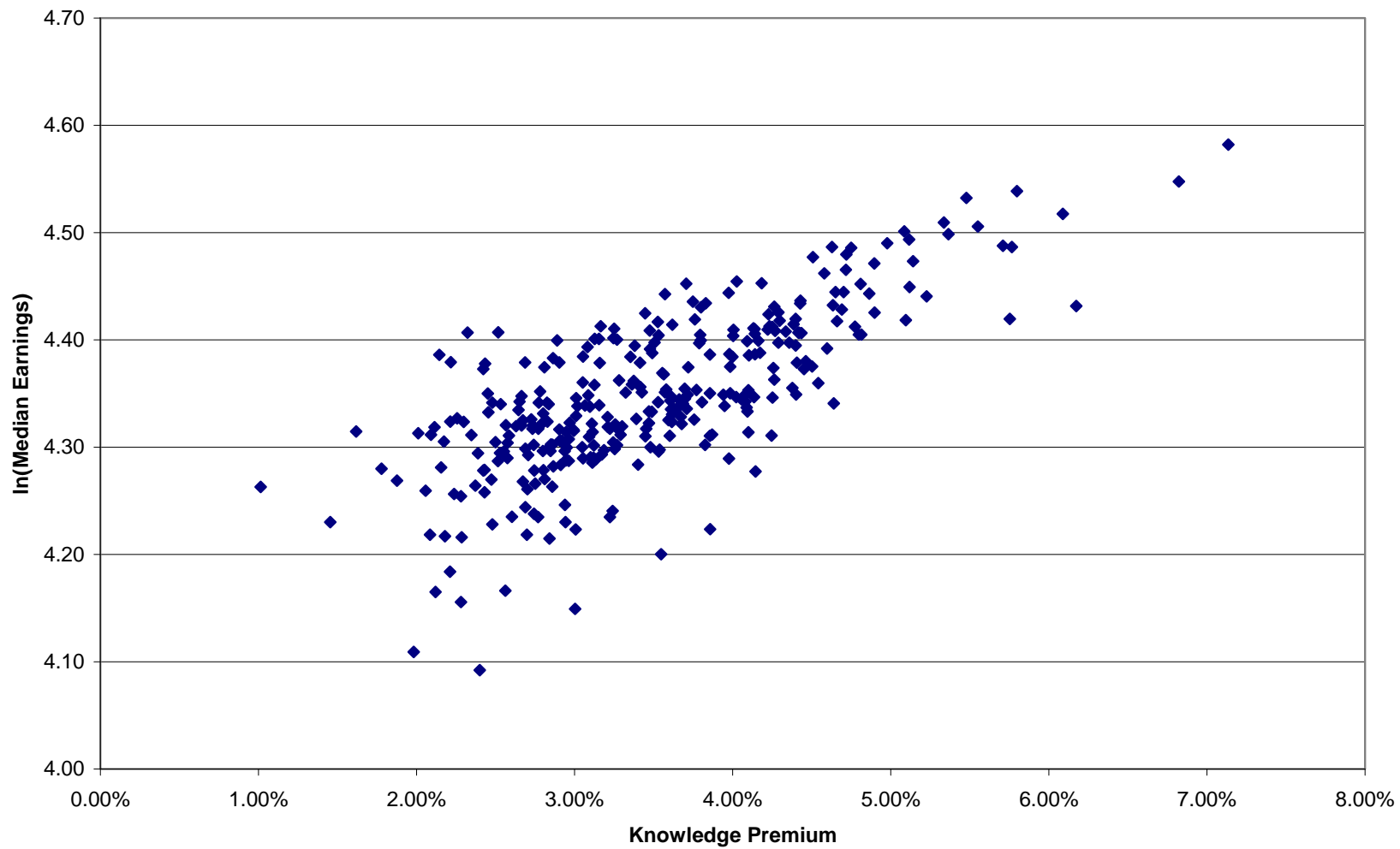


Figure 2. Education and Earnings in US Metro Areas (n=324)

