

A REVIEW OF PAYSCALE AND ITS COLLEGE EDUCATION ROI RANKINGS

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Kent Hill, Ph.D.

Research Professor, Department of Economics;
and Principal Research Economist, L. William Seidman Research Institute

Dennis Hoffman, Ph.D.

Professor, Department of Economics; Director, L. William Seidman Research Institute;
and Director, Office of the University Economist

Tom Rex, M.B.A.

Associate Director, Center for Competitiveness and Prosperity Research;
and Manager of Research Initiatives, Office of the University Economist

Center for Competitiveness and Prosperity Research
L. William Seidman Research Institute
W. P. Carey School of Business
Arizona State University
Box 874011
Tempe, Arizona 85287-4011

(480) 965-5362

FAX: (480) 965-5458

EMAIL: Dennis.Hoffman@asu.edu

wpcarey.asu.edu/research/competitiveness-prosperity-research
economist.asu.edu



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INTRODUCTION AND CONCLUSIONS

Having access to an accurate measure of the return on investment (ROI) in a college education is important to two groups of people:

- Potential students and their parents. The choice of whether to pursue a college education, and if so, which university to attend and which major to pursue, likely is one of the most significant sets of decisions that a person will make. An important consideration in making these decisions is the expected financial consequences over the course of an individual's lifetime. As well as the fundamental decision as to whether it makes sense for an individual to pursue a higher education or to enter the workforce immediately, the return on investment ideally is compared across universities and across majors.
- Policymakers and philanthropists. These parties use relative rankings of universities to guide decisions about supporting institutions. As performance-based investment decisions have become more common, information on ROI has been more highly utilized.

Thus, an accurate measure of ROI is useful to broad, diverse groups of people.

PayScale, a private company, provides a ranking by institution (colleges and universities) of the ROI of obtaining a bachelor's degree that is especially tailored to potential students. However, policymakers and philanthropists that view PayScale as an independent ranking of most institutions in the United States also may use PayScale's information.

An example of PayScale data being used is the recently released book "Is College Worth It?" written by William J. Bennett, former U.S. Secretary of Education, and David Wilezol that received attention from Yahoo on December 23, 2013 (<http://finance.yahoo.com/blogs/daily-ticker/only-150-3500-u-colleges-worth-investment-former-132020890.html>.) Based on PayScale's 2012 ranking of college education ROI — which used a different formula for computing ROI than that used for the 2013 rankings and which resulted in a 30-year dollar ROI less than one-third as high as the 2013 figure — the authors conclude that only 150 institutions of higher education are worth the investment. Such a conclusion is unfortunate and highly misleading since the ROI published by PayScale greatly underestimates the true ROI from attaining a bachelor's degree.

Due to data and methodological issues, PayScale's "College Education ROI Rankings" do not present accurate, unbiased estimates of the return on investment in a college education, even with the improvement in the calculation of ROI implemented by PayScale in the 2013 rankings:

- For all institutions, errors in the methodology employed by PayScale cause a significant underestimate of the return on investment. The unweighted average ROI after reducing college costs by the amount of financial aid received as reported by PayScale is 6.5 percent, compared to a figure of 11 percent after correcting for these errors.
- For some institutions, PayScale's methodology results in a relative underestimate in the ROI compared to other institutions. The ROI of institutions located in regions of the country with below-average prevailing wages and below-average living costs are underestimated relative to other institutions. Similarly, the ROI is understated for institutions that have an above-average proportion of nontraditional students who do not graduate in four years.

- The data used by PayScale are subject to various potential biases. Self-selection bias and misreporting are particular concerns.
- Due to the proprietary nature of the data used by PayScale, it is not possible to determine the extent of the error in the PayScale figures for any particular institution.
- Given the methodological errors and an obvious calculation error in the 2013 ROI of out-of-state students at public institutions after considering financial aid, other errors may be present that cannot be discerned by users.

These and other issues are discussed in the remainder of this document. For PayScale's ROI rankings to be useful and unbiased, these issues need to be addressed. The methodological issues could be resolved simply, but the data issue will be much more challenging. In the meantime, users need to be cautioned against placing much weight on the PayScale information in their college choice and investment decisions.

THE PAYSACLE ROI MEASURE

In their “College Education ROI Rankings” at <http://www.payscale.com/college-education-value-2013>, PayScale provides the following information for each public and private institution within their database:

- Type of institution: public in state, public out of state, private for profit, private not for profit.
- Category of institution: such as research, liberal arts, engineering, and Ivy League.
- Cost: the cost of attending college, including tuition and room and board, weighted to represent those who graduate in four, five, or six years.
- 30-year net ROI in dollars: estimated earnings differential between a bachelor’s degree and a high school diploma over 30 years, less cost of attending college, and less opportunity cost (wages that could have been earned during the years of attending college).
- Annual ROI: annualized net return on investment as a percentage.
- Rank: based on the 30-year net ROI in dollars.

PayScale also reports an alternative calculation for the dollar and percentage ROI measures. In the alternative, the cost of attending college is reduced by the weighted average amount of financial aid received by undergraduates at each institution. The percentage of students receiving financial aid and the average amount of aid are displayed for each institution.

A number of issues related to the quality of the data used by PayScale have been raised (see, for example, <http://aroundlearning.com/2013/09/8-problems-with-payscale-coms-college-rankings-and-one-solution/>). These issues can be summarized as follows:

- Self-selection bias is present, in that the data on salary and institution attended are collected only from those who visit the PayScale website (<http://www.payscale.com/>). The sample is not random.
- While PayScale does review the information entered by customers, there is no way to fully check accuracy. In particular, it is well known that the accuracy of self-reported earnings is problematic in any survey.
- Due to the proprietary nature of PayScale, it is impossible for an outsider to fully evaluate the quality of the data and the methodology employed by PayScale. The respondents may be over- or under-sampled on a variety of criteria, such as geographic location. Though some institutions have been excluded by PayScale due to small sample sizes, it is unclear whether a sufficient number of observations are present for each of the institutions that are included in the ranking.
- From the information that is available from PayScale, it is clear that young workers (recent graduates) are oversampled substantially. Discrepancies are seen between the salaries reported by PayScale and those reported by other sources.
- Results are not weighted by major, though it is well known that salaries are highly correlated to majors. For example, all else equal, the ROI of an institution with a high percentage of engineering graduates will be higher than that of an institution with a broader range of majors.
- Those with graduate degrees are excluded from the PayScale database. While this exclusion is reasonable since those with graduate degrees earn more than those with bachelor’s degrees, it results in bias. For example, at some institutions and for some majors, a relatively high proportion of those earning a bachelor’s degree obtain an

advanced degree. Had these individuals not pursued further education, it is likely that their salaries would have been above the norm for those with a bachelor's degree. Since these individuals are excluded from the PayScale database, the ROI at their undergraduate institutions likely is underestimated.

- PayScale does not differentiate between those who attended only one institution while earning a bachelor's degree and those attending multiple institutions. Salaries of the two groups may differ.

In addition to these issues, those using the return on investment rankings from PayScale should be aware of other characteristics of this ranking:

- Public institutions are included twice in the rankings, once using in-state tuition and once using out-of-state tuition. In 2013, the PayScale list includes 1,486 programs: 19 private, for profit institutions; 599 private, not for profit institutions; in-state students at 434 public institutions; and out-of-state students at the same 434 public institutions. It would be better to have two sets of rankings, one for private schools and public in-state tuition and the other for private schools and public out-of-state tuition.
- The calculation of ROI used by PayScale has changed over the years so that the figures from 2010 through 2013 are not consistent.
- The ranking of each institution is based on the ROI measured in dollars. While the results can be sorted by each type of information presented by PayScale, the schools are not re-ranked. The ROI in dollars probably is most meaningful for prospective students, but the percentage measure likely is more meaningful for philanthropists. PayScale should rank schools on each measure.
- PayScale's ranking is made without considering financial aid. For most purposes, financial aid should be considered in calculating the ROI. PayScale should reverse the presentation of the results, making the primary ROI measures those that consider financial aid while the measures excluding financial aid become the alternatives.
- The 2013 calculation of ROI for out-of-state students at public institutions after considering financial aid is incorrect for all 434 public institutions — the results are the same as those not considering financial aid.

These are not the only issues with PayScale's rankings. In the next section, the PayScale results are compared to those derived using the methodology of the recent Arizona State University Office of the University Economist paper "Has the Return to Investing in a College Education Declined?" (<http://economist.asu.edu/p3/education>).

ROI CALCULATION:

PAYSCALE COMPARED TO THE OFFICE OF THE UNIVERSITY ECONOMIST

The general magnitude of the returns estimated by PayScale is much lower than the return calculated in the Office of the University Economist (UE) paper. Considering financial aid, and after adjusting for possible upward biases in the UE estimates, an average internal rate of return of around 11 percent is calculated when using nationwide averages for earnings and tuition. The unweighted mean return in the full PayScale sample is 6.5 percent — a difference of 4.5 percentage points — but the average for PayScale is understated due to PayScale’s error in calculating the annualized percentage return for out-of-state students at public institutions. Based on the calculations by PayScale, just one institution has a return of at least 11 percent without considering financial aid and only 25 do after incorporating financial aid.

PayScale does not release its primary data on earnings by institution. So, as noted earlier, it is not possible to evaluate the statistical properties of these data. PayScale does provide, however, a relatively detailed explanation of its methodology. By using the national data collected for the UE analysis, sources of bias in the PayScale methodology can be identified and quantified. Based on this analysis, the PayScale methodology provides a significant general downward bias in the estimated returns on college investment. Over and above these general tendencies, there is also likely to be an additional downward bias in the estimates for institutions such as Arizona State University (ASU) that are located in low-wage, low cost-of-living states and that serve a student population with a relatively low four-year graduation rate.

General Biases in the PayScale Methodology

There are three elements of the PayScale methodology that generally serve to bias downward their estimates of the return on investing in a college education. These are biases that are present in all of the estimated ROIs.

A1. The financial formula used by PayScale to calculate the return on investment does not deliver an estimate of the “internal rate of return” (IRR), the theoretically preferred financial concept that considers the time value of money. PayScale uses a simple formula for return on investment. Based on the national data collected for the UE report, the formula used by PayScale appears to understate the true IRR by at least two percentage points. The return on investment formula used by PayScale and the internal rate of return formula follow for an individual who receives a bachelor’s degree in four years:

Let x_i = earnings of those with a high school diploma at age i ($i=18...51$)
 y_i = earnings of those with a bachelor's degree at age i ($i=22...51$)
 t = annual tuition

PayScale annualized ROI:

Calculate $Z = (\text{Sum}_{i=22...51} y_i - \text{Sum}_{i=18...51} x_i) / 4t$
Raise Z to the 1/30 power and subtract 1

Internal rate of return:

Find r such that
 $\text{Sum}_{i=22...51} y_i / (1+r)^{i-18} - \text{Sum}_{i=18...51} x_i / (1+r)^{i-18} - \text{Sum}_{i=18...21} t / (1+r)^{i-18} = 0$

A2. The PayScale analysis commits the elementary mistake often pointed out in Principles of Economics courses of including room and board as a cost of going to college. Food and shelter expenses (either out-of-pocket or imputed) will be incurred whether the individual goes to college or not. So they should not be part of analysis. The mistake is numerically significant. Looking at nationwide averages, four years of full-time tuition and fees net of scholarships (the appropriate measure of direct cost) are approximately \$44,000. If room and board is included, the costs of attending college are \$93,000. The UE's spreadsheet model indicates that this overstatement of cost serves to bias downward the estimated return to going to college by 2½ percentage points.

A3. PayScale tries to account for delayed graduation by weighting the direct costs and the opportunity costs (foregone earnings) of attending college by the percentage of graduates who complete a bachelor's degree in four, five, or six years. Incorporating the effects of delayed graduation on the effective return on investment is sensible. But PayScale makes this adjustment in a way that biases downward the estimated return. There is no recognition of the fact that students who take more than four years to graduate often work part-time while in school and do not take full course loads.

Biases Specific to Some Institutions

Two elements of the PayScale methodology are likely to provide a particular downward bias in the estimated return for institutions such as ASU.

B1. The college earnings data used by PayScale are from their own survey. By being institution specific, they are also somewhat state or region specific. The earnings data used by PayScale for those with only a high school diploma, on the other hand, are national averages. This will generate an upward bias in the estimated return for institutions that place their graduates in parts of the country with generally high wages (after adjusting for educational attainment) and high cost of living, such as the Northeast and the Pacific Coast. The estimates will be biased downward, on the other hand, for schools whose graduates work in low-wage, low cost-of-living regions, such as the South. Per capita personal income in Arizona has long been below the national average for reasons other than education, skill level, and other factors that can be controlled for. (One proposed explanation is the "sunshine factor" — workers are willing to accept a subpar wage in exchange for perceived qualitative advantages to living in Arizona, such as the climate.) The bias from using national data for high school graduates but local data for those with a bachelor's degree is potentially significant. For example, all else equal, if the median earnings of high school graduates used by PayScale is 5 percent too high for Arizona, ASU's ranking among the 167 public universities categorized by PayScale as "research" (without an engineering specialty) rises from 42nd to 29th (for in-state students using the dollar ROI measure after reducing college costs for financial aid).

B2. ASU and other public, urban universities serve a broad student population, with many nontraditional students who enter the university knowing that they will need to work part time while in school and will not be able to finish their degree in four years. As a result, the downward bias identified in point A3 above is particularly relevant to ASU and similar universities.

ASU'S RANKS

PayScale once again reported a broad range of outcomes in 2013 among the programs it ranks, from an annualized return, considering financial aid, of +15 percent to less than -15 percent. As published by PayScale, the data for ASU are shown in Table 1. The ROI calculation apparently changed between 2011 and 2012. It changed again in the 2013 rankings, as noted by PayScale, with the earnings differential between high school graduates and those with a bachelor's degree no longer being adjusted for the graduation rate of each institution. The rank and percentile of the rank for Arizona State University by measure of ROI is shown in Table 2.

The published rank of ASU has improved over time, particularly on a percentile basis, as the total number of programs ranked by PayScale has increased from 852 in 2010 to 1,486 in 2013. ASU is among the top 20 percent of all programs in 2013, based on in-state tuition. However, among the Pacific Coast Conference schools in 2013, ASU ranked ahead of only the University of Arizona, the University of Oregon, and the University of Utah. ASU compared more favorably to other schools in the Southwest.

**TABLE 1
PAYSCALE DATA FOR ARIZONA STATE UNIVERSITY**

	Rank	Not Considering Financial Aid				Considering Financial Aid			
		Per- cent- ile	Cost	30-Year Net ROI	Annual ROI	Percent With Aid	Average Aid Amount	30-Year Net ROI	Annual ROI
In State									
2013	231	16%	\$95,460	\$752,000	7.7%	83%	\$9,573	\$795,300	9.9%
2012	275	22	87,640	220,900	8.2	69	8,223	242,000	10.1
2011	305	29	81,760	446,600	10.7	69	8,223	467,800	12.9
2010	273	32	83,250	442,200	10.9	NA	NA	NA	NA
Out of State									
2013	297	20	151,800	695,600	6.0	83	9,573	695,600	6.0
2012	329	26	143,700	189,400	6.7	69	8,223	210,600	7.7
2011	344	33	136,100	416,200	9.0	69	8,223	437,300	10.0
2010	301	35	138,300	411,400	9.2	NA	NA	NA	NA

NA: the ROI considering financial aid was not calculated by PayScale in 2010.

Source: PayScale (<http://www.payscale.com/college-education-value-2013>).

**TABLE 2
RANKS FOR ARIZONA STATE UNIVERSITY
BASED ON VARIOUS MEASURES OF ROI IN 2013**

	In State		Out of State	
	Rank	Percentile	Rank	Percentile
All 1,486 Programs				
30-Year \$ ROI	231	16	297	20
Annualized % ROI	91t	6	442t	30
30-Year \$ ROI, considering financial aid	239	16	356	24
Annualized % ROI, considering financial aid	94t	6	NA	NA
All 434 Public Institutions				
30-Year \$ ROI	63	15	67	15
Annualized % ROI	78t	18	89t	21
30-Year \$ ROI, considering financial aid	62	14	67	15
Annualized % ROI, considering financial aid	72t	17	NA	NA
All 167 Public Research Institutions*				
30-Year \$ ROI	42	25	45	27
Annualized % ROI	49t	29	49t	29
30-Year \$ ROI, considering financial aid	42	25	45	27
Annualized % ROI, considering financial aid	43t	26	NA	NA

* Without an engineering specialty

t: tie

NA: not available due to the calculation error by PayScale.

Source: Calculated from PayScale data.