What's an MIS Paper Worth? (An Exploratory Analysis)

T. Grandon Gill
Florida Atlantic University

Abstract

The article performs an economic analysis of MIS salary data and survey data from a variety of sources in order to estimate the marginal value of a published MIS refereed journal article to its author, a faculty member. The three main conclusions it reaches are:

- A published MIS refereed journal article can be worth approximately $20,000 in incremental pay, over an assumed five-year lifetime, to a faculty member. That value is derived from two sources: (1) the ability such a paper gives the author to move to higher-paying institutions, and (2) the incremental impact of the paper on an individual's compensation across institutions having the same teaching load.
- What constitutes a valid "article" is institution-dependent, so the faculty member must ensure that the publication outlets targeted for such an article are consistent with the institution's objectives and quality criteria.
- In order to realize the actual marginal value of a publication computed in this paper, a faculty member must be willing to relocate, perhaps on a reasonably regular basis, to ensure that he or she does not fall victim to the salary inversion phenomenon that is currently widespread within the MIS academic community.

The paper does not attempt to quantify the impact of a publication on a number of other potential contributors to its author's income, including the long-term possibility of becoming an eminent scholar and the possibility that publications will lead to outside income opportunities. As a consequence, it is quite possible that the actual value of an article may exceed the paper's estimate for some individuals.

ACM Categories: K3.2, K7

Keywords: salary survey, economic analysis, journal article

Introduction

The development and publication of articles for refereed journals is a critical component of the job assignment of most management information system (MIS) faculty members, teaching at the university level. As a discipline, we take it as a
matter of faith that the primary motivation for developing such articles is the opportunity to participate in the creation of knowledge. Having stated this, however, it must also be acknowledged that there are clear financial incentives associated with refereed publications. A strong track record of publication can lead to promotion, can make an individual more attractive on the academic job market, and may even allow an individual to move from his or her current position to a more prestigious institution (where the pay scales tend to be higher). There may also be outside incentives, such as improved ability to participate in consulting projects or to serve as a compensated director on company boards.

Although the existence of financial incentives for research productivity is widely recognized within the MIS community, there do not appear to be any explicit attempts to quantify those incentives. The purpose of the present paper is to make such an estimate of the "value" of a hypothetical MIS refereed journal article. Equally important, the process of performing the analysis necessary to develop the estimate provides an opportunity to review the existing literature on the subject of business faculty compensation, and discuss its potential implications for MIS faculty. During the current period of significant mismatch between MIS faculty supply and demand, such discussions and analysis may provide useful insights to administrators making faculty compensation decisions, and to MIS practitioners trying to understand why it is so hard for institutions to initiate and staff the new programs that industry desires.

Literature Review

Although there does not appear to have been any research specifically quantifying the pay impact of research productivity in MIS, a number of such attempts have taken place in other disciplines. The seminal work in the business faculty area is Gomez-Mejia and Balkin's (1992) study of the determinants of management faculty pay. Among the study's key findings:

- Career stage (a composite variable loaded with both years of experience and rank measures) was a significant contributor to pay.
- Cumulative number of top-tier publications on which the faculty member was listed as an author was a significant contributor to pay.
- Second tier publications were significant, but only at less research-oriented institutions (i.e., those with no doctoral programs). The number of times an article had been cited was also found to be significant, but only at more research-oriented schools.
- The number of times a faculty member had moved between institutions was a significant positive contributor to pay.
- Many factors that were expected to be important, most notably teaching performance, were not found to be significant in their impact except within isolated segments of the data.

As noted in their literature review, the Gomez-Mejia and Balkin (1992) study represented a considerable departure from earlier efforts to assess faculty pay in that it employed a widely used economic approach, agency theory, rather than relying on ad hoc statistical analyses. In their research model, pay was treated as a motivator used by administrators to achieve desired behaviors in faculty members, who were modelled as agents having considerable discretion in allocating their efforts.

The study computed the impact of a single top-tier publication (which might or might not have had multiple authors) to be a $1210 increment to salary that would be sustained over the faculty member's career. Adjusted for inflation, the present value of such an increment would be approximately $27,000 (see Appendix B for details).

Research Model

The research model used in the present paper, illustrated in Figure 1, is very similar in concept to the agency model used by Gomez-Mejia and Balkin (1992). It proposes that many potential factors impact an individual's compensation at a particular institution, the most important of which fall under the heading of (1) the characteristics of the individual (of which research productivity is just one example), and (2) the characteristics of the institution (of which research mission and teaching needs are just two examples).

The research model differs from the Gomez-Mejia and Balkin model in three important ways:
1. It assumes that institutions can be classified into distinct categories, each characterized by different research expectations that would be reflected in a faculty member’s assignment. Such an assumption should not be particularly troublesome, as a number of such classifications already exist (e.g., Carnegie, 1987) and are widely used in academic pay and productivity research (e.g., Fairweather, 1995; Long et al., 1998). Gomez-Mejia and Balkin did not explicitly include a research category variable, although they did have an institution “quality” measure that incorporated some of the same attributes and would probably be correlated.

2. It focuses on market pay in assessing the impact of papers, whereas Gomez-Mejia and Balkin explicitly chose to focus on pay for individuals who had remained at an institution for a long time (actually eliminating from the sample, for some of their analyses, any individuals who had changed affiliations within the previous 4 years).

3. It views research productivity in terms of its five-year impact on pay, rather than considering both short term and permanent impacts, as was done by Gomez-Mejia and Balkin. The reasons for having a limited publication time span were both opportunistic (i.e., only five-year publication data were available for the study) and a consequence of the study’s design, which focused on the “market value” of productivity. With respect to the “market value” aspect, a number of interviews conducted with participants in the field (including department chairs responsible for hiring new faculty), suggested that recent research productivity would typically weigh far more heavily than the candidate’s long term publishing history in making job offers and determining salary. Indeed, the Gomez-Mejia and Balkin study itself used four-year publication rates in order to estimate salary raises.
In the current paper's research model, four factors — all having potential financial consequences — may be impacted by research productivity:

- **Attractiveness to different institution categories**: As a general rule, institutions that are more heavily directed towards research in their mission tend to have lower teaching demands, and therefore expect greater research productivity (Hu & Gill, 2000). The ability to move across institutional categories, enabled by research productivity, could lead to differentials in compensation.

- **Pay within an Institution or Institution Category**: Within an institution, an individual's situation may be impacted by research productivity in a variety of ways, all of which could potentially impact compensation. Examples of such impacts include the likelihood or timing of an individual's promotion, the availability of merit pay, and even the likelihood of that individual receiving competing offers from other institutions. Where competing offers are received, incremental compensation could be realized either through the individual’s moving to the new institution, or through some form of salary matching on the part of the individual's original institution.

- **Availability of Grants**: An established research track record is often a prerequisite to getting external grants that, in turn, can lead to compensation, such as summer support. It should be noted, however, that the incentive impacts of getting such grants are often indirect, as many grants put significant limits on direct contributions to the researcher. In other words, a researcher who receives such a grant may be more likely to be promoted or given a raise, even if he or she does not receive extra compensation directly from the grant. Also, because grants tend to be correlated to research productivity measures (Fairweather, 1995), some of the impact of grants is likely to be captured in the form of increased paper counts.

- **Availability of Outside Income**: A strong publication record could, in theory, lead to a variety of lucrative part-time opportunities within the private sector (e.g., consulting, directorships). Outside income effects could also include increased opportunities for royalties derived from writing non-academic books, such as textbooks and trade books.

While the potential significance of the last two of these factors — grants and outside income — needs to be acknowledged, there are simply no MIS-specific data available that we can use to evaluate their potential importance, much less quantify them. Thus, this exploratory study is limited to considering a publication’s impact on salary within an institution, and on salary differentials between institutions in different institution categories.

**Research Questions**

In order to estimate the marginal value of an MIS paper, three research questions must be answered. The first two relate to the impact on compensation of moving across institution categories:

1. **To what extent does research productivity, measured in the form of the number of journal articles published over a period of time, make an individual more or less attractive to a given institution category?**

2. **To what extent do differences between institution categories manifest themselves in the form of compensation differentials?**

In order to assess the impact of publications within an institution or institution category, a third question must be answered.

3. **To what extent are the variations in compensation within a given institution, or institution category, based on research productivity, as measured in terms of published journal articles?**

Because of the exploratory nature of this research, these are left as research questions, and are not framed as formal hypotheses.

**Data Sources**

In attempting to answer the three research questions, two existing data sets were acquired and analyzed. The first was a survey of MIS programs conducted by Gill and Hu (1998), which included data on research productivity (Hu & Gill, 2000). This data set included about 240 usable responses, representing about 45% of the institutions in the US with MIS programs. The primary purpose served by this data set was to establish estimates of faculty productivity (measured in refereed jour-
nal articles published over a five year period) at
different rank levels and teaching loads.

The second source of data was a web site of
about 156 usable MIS salary offers, collected
during the year 2000 (Galletta, 2000), adjusted for
a known data entry error. In this data set, the
names of the individuals receiving offers and the
identities of the institutions making the offers were
only optionally disclosed, and then only to the
researcher (Galletta). This data set was primarily
used to establish compensation patterns across
faculty ranks, experience levels and teaching
loads. By relating the results of the two surveys
using data common to both (e.g., rank, teaching
loads, institution categories), and by making a
number of assumptions (to be discussed), es-
imates of the hypothetical impact of research pro-
ductivity on compensation could be developed.

From an external validity standpoint, it must be
noted that the data in both sets were collected
without any sampling protocol. The Gill and Hu
data consisted of responses returned from a sur-
vey sent to all known MIS faculty members. The
MIS offer site, in contrast, was a purely voluntary
site, developed by its author in conjunction with
the Association for Information Systems (AIS) and
maintained over several years. Its stated purpose
was to inform the MIS faculty community about
the state of the job market.

Having noted that the origins of these data sets
were obviously less than ideal for research pur-
poses, there are also reasonable arguments in
their favor. Most important, as shall become
apparent, the analyses that were performed
involved many computations of marginal values,
but did not rely on the fact that the distribution of
data was the result of a random sample from the
population of MIS faculty. In fact, the nature of the
analysis made it far more desirable that data sets
have a significant range of values represented
within them than that they were necessarily rep-
resentative of the IS universe as a whole. In this
respect, at least, both samples provided more than
reasonable coverage. Specifically:

• The MIS survey (Gill & Hu, 1998; Hu & Gill,
2000) contained a significant number of
responses across all academic ranks, course

loads and a large band of self-reported refer-
eed journal article counts, the key measures
used in this analysis.
• The salary offer data set also provided the full
range of course load values and institutional
characteristics, a large band of salary offers,
and a full set of academic ranks (although the
nature of the site, involving the collection of
salary offers, resulted in a far greater number of
Assistant Professor observations than would
be representative of the MIS faculty population
as a whole).

The ranges of values for several variables con-
tained in the data sets are summarized in a series
of tables, compiled in Figure 2.

It would obviously be a mistake to be complacent
about the nature and source of these data sets.
Nonetheless, the variety of observations and
range of key variables contained within them sug-
gested they could be useful — at least for
exploratory purposes — in analyzing the relation-
ship between compensation and research pro-
ductivity.

Analysis

In the analysis of the two sample data sets, the
objective was to provide answers, albeit
exploratory ones, to the three research ques-
tions that were posed earlier, after the compensa-
tion model was presented.

1. To what extent does research productivity,
measured in the form of the number of journal
articles published over a period of time, make
an individual more or less attractive to a given
institution category?

There is strong pattern of research productivity
differing across institution categories for universi-
ties as a whole (Fairweather, 1995). In answering
the first of the three questions specifically for the
MIS field, there is also evidence that research pro-
ductivity does vary by institution category. The
Hu and Gill (2000) study collected two data items
that were of particular relevance: a self-reported
count of refereed articles published over the past
five years and an estimate of hours spent teach-
ing every week. These results, listed in Figure 3
(taken from Table 3b of Hu & Gill, 2000; p. 17)
show a significant pattern whereby productivity
(i.e., measured in the form of median 5-year paper
count) rises as teaching load declines.
Interestingly, no such pattern is seen across academic rank (Table 3a), suggesting that institutional expectations for productivity may remain relatively constant over the course of an academic career.

Translating these figures into traditional class loads (e.g., 4 classes/year=6 hours, 5 classes/year=7.5 hours, 6 classes/year=9 hours, 8 classes/year=12 hours, etc.) and interpolating, we can derive a table of estimated productivity means broken down by class load, presented in Table 1.

Research productivity is typically found to be of greatest concern in more research-oriented institutions (Fairweather, 1995). Within the more research-oriented universities in the MIS survey (e.g., those with 4, 5 and 6 course loads), we compute that 1.5 papers (per five year period) appear to account for a single class decline in teaching load. Stated another way, for every extra 1.5 MIS papers published over the previous 5 years, the faculty member has the potential to
move up an additional institutional category (measured as a reduction in assigned teaching load).

It should also be noted that while teaching load is treated primarily as an inter-institutional variable for the purposes of this study, it is also widely used as an intra-institutional mechanism for distinguishing between research-oriented and teaching-oriented faculty. The Hu and Gill (2000) study did not distinguish between inter- and intra-institutional effects in tabulating paper counts for different teaching loads.

2. To what extent do differences between institutional categories manifest themselves in the form of compensation differentials?

In attempting to answer the second question, the MIS job offers data set is used. Before proceeding to analyze the data, another assumption is required, however. Specifically, we must assume that the relative priority given to research by an institution, i.e., its institution category, is closely correlated to its teaching load. This assumption is supported by Gill and Hu's (1998) finding that percentage of faculty time spent teaching varies inversely with time spent on research, as illustrated in Table 2. (Table A.2, which appears in Appendix A, also breaks down reported percentage of time spent on research by class load). This assumption is also supported by findings gathered across all university departments (Fairweather, 1995). It therefore seems consistent to treat institutional category as the inverse of teaching load. It should also be added, as already noted, that while the model treats teaching load as an inter-institutional measure, it can be — an often is — used an intra-institutional means of identifying the importance of research in the assignment of a particular faculty member. This, in no way, changes the analysis — although in future studies it would be interesting to distinguish and compare between inter- and intra-institutional pay impacts of assigned teaching load.

<table>
<thead>
<tr>
<th>Highest MIS Program Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctoral</td>
</tr>
<tr>
<td>Teaching &amp; course preparation</td>
</tr>
<tr>
<td>Research</td>
</tr>
<tr>
<td>Total Teaching &amp; Research</td>
</tr>
</tbody>
</table>

Table 2. Percentage of IS Faculty Time Spent in Teaching and Research, Broken Down by Highest MIS Degree Offered (Derived from Gill & Hu, 1998, Table 7)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary</td>
<td>Annual 9-month salary specified by the job offer, the dependent variable</td>
</tr>
<tr>
<td>Years teaching</td>
<td>Number of years teaching experience of the candidate</td>
</tr>
<tr>
<td>Doctorate</td>
<td>1 if candidate has doctorate, 0 otherwise</td>
</tr>
<tr>
<td>Course load</td>
<td>Course load, expressed in courses per year</td>
</tr>
<tr>
<td>Assistant</td>
<td>1 if Assistant Professor position is sought, 0 otherwise</td>
</tr>
<tr>
<td>Associate</td>
<td>1 if Associate Professor position is sought, 0 otherwise</td>
</tr>
<tr>
<td>Full</td>
<td>1 if Full Professor or Chair position is sought, 0 otherwise</td>
</tr>
<tr>
<td>Tenure</td>
<td>1 if the offer included tenure, 0 otherwise</td>
</tr>
<tr>
<td>Urban</td>
<td>1 if the institution is in an urban setting, 0 otherwise</td>
</tr>
<tr>
<td>Suburban</td>
<td>1 if the institution is in a suburban setting, 0 otherwise</td>
</tr>
<tr>
<td>Public</td>
<td>1 if the institution is public, 0 otherwise</td>
</tr>
<tr>
<td>South</td>
<td>1 if the institution is in the U.S. south, 0 otherwise</td>
</tr>
<tr>
<td>West</td>
<td>1 if the institution is in the U.S. west, 0 otherwise</td>
</tr>
<tr>
<td>Midwest</td>
<td>1 if the institution is in the U.S. midwest, 0 otherwise</td>
</tr>
<tr>
<td>Northeast</td>
<td>1 if the institution is in the U.S. northeast, 0 otherwise</td>
</tr>
<tr>
<td>Doctoral</td>
<td>1 if the institution grants doctoral degrees, 0 otherwise</td>
</tr>
<tr>
<td>AACSB</td>
<td>1 if the institution is AACSB accredited, 0 otherwise</td>
</tr>
</tbody>
</table>

Table 3. Listing of Variable Definitions Used in Salary Regression
Regression Statistics

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept*</td>
<td>76752.947</td>
</tr>
<tr>
<td>Years teaching*</td>
<td>901.733</td>
</tr>
<tr>
<td>Doctorate</td>
<td>139.831</td>
</tr>
<tr>
<td>Course load***</td>
<td>-4630.458</td>
</tr>
<tr>
<td>Assistant*</td>
<td>9268.604</td>
</tr>
<tr>
<td>Associate*</td>
<td>14281.862</td>
</tr>
<tr>
<td>Full***</td>
<td>37995.604</td>
</tr>
<tr>
<td>Tenure</td>
<td>6785.588</td>
</tr>
<tr>
<td>Urban**</td>
<td>7658.323</td>
</tr>
<tr>
<td>Suburban</td>
<td>4241.027</td>
</tr>
<tr>
<td>Public</td>
<td>-3896.944</td>
</tr>
<tr>
<td>South***</td>
<td>15772.093</td>
</tr>
<tr>
<td>West**</td>
<td>14532.816</td>
</tr>
<tr>
<td>Midwest***</td>
<td>21485.854</td>
</tr>
<tr>
<td>Northeast**</td>
<td>13504.344</td>
</tr>
<tr>
<td>Doctoral*</td>
<td>4703.065</td>
</tr>
<tr>
<td>AACS B</td>
<td>-5542.519</td>
</tr>
</tbody>
</table>

*5% significance, **1% significance, ***0.1% significance

Figure 4. Regression of Salary Offers Against Various Individual and Institutional Characteristics

Accepting that we can use teaching load as a reasonable proxy for institutional category, the challenge becomes separating out the influence of all the other institutional and individual factors that could impact salary offers. This is accomplished through the use of multiple regression, the results of which follow in Table 3 and Figure 4.

Overall, the regression analysis shows a very respectable R-squared of 0.725, and an adjusted R-squared of over 0.69. The most significant individual variable was course load, our proxy for institutional research mission, with a value of -$4630. In other words, for each additional course that is added to an individual's assigned course load, the expected decline in annual salary would be over $4600, which is the question we set out to answer. (For a more detailed analysis of the individual variables, and a comparison of their values with the values found in an earlier study, see Appendix B.)

To address the issue of potential multicollinearity in the data, a matrix of independent variable correlations was computed, presented in Appendix C. For the most part, serious correlations between dependent variables were not observed, with four exceptions:

- Expected negative correlations between partitioning dummy variables (e.g., academic rank variables, location variables) were observed.
- A correlation between academic rank variables and years teaching was observed. This correlation was presumed to be valid.
- A correlation between academic rank and tenure was observed. Again, this correlation appeared to be expected.
- Correlation between certain geographic dummy variables and certain institution types. This relationship, it was believed, was more
likely to be coincidental than indicative of any serious relationship.

Because years of teaching and rank were both significant coefficients, it was felt that both variables needed to be included in the regression, and their correlation acknowledged. In the case of the tenured dummy variable, however, a new regression was performed omitting tenure. A similar regression was performed replacing individual location variables with a US/non-US dummy variable. The revised regressions showed no significant changes in the remaining coefficients, implying that multicollinearity was not a serious problem. As a result, the original model was retained.

3. To what extent are the variations in compensation within a given institution, or institution category, based on research productivity, as measured in terms of published journal articles?

The third question that was posed is the most challenging to answer, in that: a) it is (intentionally) very difficult to gather information regarding pay differentials within most institutions, and b) it is nearly impossible to gather that information correlated with research output. As a consequence, a considerable amount of educated guessing is required to assess how productivity may be rewarded within institutions.

One possible internal incentive for productivity would be promotion. Interestingly enough, the results of the regression analysis suggest two different phenomena occur with respect to rank. First, there was a significant salary differential between the ranks of assistant/associate and full professor. There was also evidence of some sort of major long-term reward for sustained research — probably measured over a period much longer than 5 years\(^2\). Since we don't have any cumulative publication rates for the small number of Full Professor offers in the actual sample (-9), it is probably best to leave that particular payoff for papers unquantified. Its magnitude, however, suggests that there exists a potential upside for outstanding research productivity that can be quite significant, even beyond the estimates developed in this paper. In addition, it suggests there may be an impact of research that extends far beyond the five year time horizon used in this paper.

The regression coefficients for the Assistant and Associate Professor dummy variables were not significantly different\(^3\). This suggests that other factors, most notably years of experience (which adds ~$900/year to salary), are probably more important in terms of compensation than actual rank, at least below the rank of Professor.

Having stated that rank does not appear to be the critical determinant of compensation (at least at the assistant/associate professor level), there remains considerable variation in our salary estimates—for example, the standard error (SE) of the regression is about $11,000, as seen in Figure 4. Since none of the independent variables in the regression attempted to measure each candidate's relative research productivity within an institution category, however, it stands to reason that some fraction of the $11,000 standard error is likely to be accounted for by a productivity measurement (such as our already-used number of refereed journal articles published over the past five years). Unfortunately, absent any data, there is no empirical way to determine the fraction of salary SE accounted for by productivity. On the other hand, we can make arguments regarding reasonable values for this parameter, as discussed in Appendix A.

Based on the analysis presented in the appendix, we make the assumption that k\(^2\) (the percentage of the total remaining salary variance, after we have performed our regression, that is explained by research productivity in the form of paper count) is roughly equal to the percentage of the faculty member's time assigned to research, about 25%. That implies that k, the fraction of salary SE explained by variations in research output, at 0.5 (0.25\(^2\)). Using an estimated average error in paper count of 5.55 (from Hu & Gill, 2000), we then compute the marginal value of a paper as being $991 ($11,000*0.5/5.55). This estimate may well be conservative, given that research productivity has been found to be the most important

\(^2\) Two offers, one of $180,000 and one of $210,000 contained in the data set suggested that there was at least one eminent scholar candidate who recorded his or her offers.

\(^3\) Note: the base case was Instructor, with both Associate and Assistant being significantly different from the base case. It has also already been noted that the rank coefficients were correlated with years of experience, which could serve to mask differences that might otherwise have been significant.
determinant of merit pay at AACSB-accredited institutions (Whitman et al., 1999), as noted in the appendix.

Summary of Results

Having developed approximate answers to all three of the questions in the analysis section, it is now possible to estimate the actual monetary value of a particular MIS paper. The value includes two components: (1) the contribution the paper makes towards qualifying the researcher for a particular institution category, and (2) the incremental value of a paper within an institution of a particular category. The estimate can be summarized as follows:

1) Value of Qualifying to Move Between Research Categories:
   - Salary value of moving down a course in teaching load: $4630
   - Marginal difference in the mean number of papers between teaching loads: 1.5
   - Marginal value per paper = $4630/1.5 = $3087

2) Within-Category Value:
   - Standard Error of salary estimate after regression: −$11,000
   - Standard deviation of paper count over 5 years: 5.55
   - Assumed percentage of salary variance explained by paper count: −25%
   - Fraction of salary error explained by paper count: −50%
   - Marginal value per paper = $11,000/0.5/5.55 = −$991

3) Total Value Per Paper:
   - Value of paper per year: $3087 + $991 = $4078
   - Number of years that the productivity measure is affected by a single paper: 5
   - Total value of a paper: 5 × $4078 = $20,390

Discussion

In reaching the estimate of over $20,000 value per MIS journal article, numerous assumptions — and, occasionally, guesses — had to be made. Since these were already identified in the analysis, they will not be repeated here. Beyond those assumptions, however, there are two issues that remain to be addressed explicitly if the results are to be interpreted correctly:

1. What constitutes a "paper?" and
2. What must a faculty member do to realize the estimated value per paper?

1. What Constitutes a Paper?

There are two issues that consistently plague investigators interested in measuring researcher productivity: multiple authorship and quality. The first of these, multiple authorship, is relatively easy to address for the purposes of this analysis. In the Gill and Hu data set, each author is presumed to have included co-authored papers in his or her five-year paper count without any fractional adjustment. As a consequence, the results in the present paper are based on the same assumption. Interestingly enough, although productivity scores are often used to rank institutions, normal paper counts remain the most common way to rank individual researchers (e.g., Im, Kim & Kim, 1998; Gomez-Mejia & Balkin, 1992).

The issue of article quality is much more difficult to resolve. Throughout the analysis, we have treated refereed journal articles as if they were commodities whose only property was a numeric count, making no effort to quantify the quality of the actual paper, the reputation of the journal in which it was published, or the degree to which it has impacted thinking in the MIS field. While such an oversimplification was a necessary artifact of the data that was available, it certainly represents a serious source of potential weakness in the model used to estimate paper value. Indeed, some prior research has found top-tier publications to be the only significant contributor to pay within some types of institutions, with second tier publications being insignificant (Gomez-Mejia & Balkin, 1992).

While it is not possible to estimate, precisely, the impact of paper quality on the economic returns of a paper, it is possible to propose a number of qualitatively different models, then use empirical data to assess which is more plausible:

- Model 1: Paper quality is not nearly as important as paper quantity in determining compensation. In this extreme-case model,
which treats the impact of productivity on compensation as the function \( f(\text{quantity}) \), any attempt to model quality would have no impact on improving the predictive power of our paper valuation model.

- **Model 2:** Paper quality is all-important, and the number of papers an individual publishes is irrelevant as far as compensation is concerned. This model, also presented as an extreme case, treats the impact of productivity on compensation as the function \( f(\text{peak-quality}) \), which assumes that a researcher's record is judged entirely based on his or her best work. We would therefore expect to see little or no correlation between paper count and compensation (aside from the fact that at least one paper would be required to establish an initial basis for assessing quality).

- **Model 3a:** Paper quality and quantity of papers are both important, and some weighting scheme can be found to identify the contribution of both that applies across all institutions. In this model, we assume that there is some underlying function, e.g., \( f(\text{peak-or-average-quality}, \text{quantity}) \), that could be used to estimate the impact of research productivity on compensation. We further assume that the model does not vary much across institutions or institution categories. An example of the application of this model would be the productivity scores proposed by some researchers (e.g., Gillenson & Stutz, 1991). An alternative function form, that has also been proposed, is that a researcher's quantity will count more — regardless of publication outlet — if he or she has published some articles in top-tier outlets (Gomez-Mejia & Balkin, 1992).

- **Model 3b:** Both paper count and quality can be important in determining the monetary value of a paper, but that the effect is moderated by the nature of the institution involved. In this model, we make the assumption that while the relationship, \( f(\text{peak-or-average-quality}, \text{quantity}) \), of Model 3a may hold within a particular institution, or institution category, the function may differ across institutions.

In contrasting the models, we can quickly deduce that Models 1 and 2 (which were proposed primarily as a means of illustrating the two extreme cases), are not reflective of reality. Model 2 can be rejected out of hand, because we have already observed that paper count appears to rise as an institution's mission becomes more research-oriented. Thus, quantity does matter. Similarly, the number of published articles that attempt to establish relative rankings between MIS journals or apply such rankings (e.g., Whitman et al., 1999; Im, Kim & Kim, 1998; Hardgrave & Walstrom, 1997; Malhotra & Kher, 1996; Gillenson & Stutz, 1991) provide indirect evidence that quality is perceived to be important — at least in terms of the quality of the publication outlet. Publication quality has also been found to be very important in gauging the impact of publications on salary within the management discipline (Gomez-Mejia & Balkin, 1992). There have also been studies of appraisal systems at business schools (e.g., Clement & Stevens, 1989) concluding that administrators do, at a minimum, consider outlet (e.g., refereed vs. non-refereed) as an important factor in gauging research productivity.

It is somewhat more difficult to determine whether the same general approach to assessing research quality and quantity is employed across all institutions. There is evidence, however, that there are significant differences in the types of journals targeted by different institutions, which would imply institutional differences in ranking productivity. Im, Kim and Kim (1998), for example, found that 54% of the MIS articles in the top six publication outlets came from 50 selected universities (out of a universe of approximately 415 universities with MIS programs). It follows, therefore, that if this were reflective of their general research productivity, these 50 universities would need to have published articles at a rate that was an order of magnitude higher than that of the other 365 universities. In other words, one possible explanation might be that the dominance of top journals by these universities was simply a reflection of their dominance of all journals.

To test if authors from top-rated institutions did, indeed, publish articles at a rate an order of magnitude greater than that of their colleagues, the Im, Kim and Kim (1998) top 50 rankings were coded into the Gill and Hu (1998) data set containing self-reported productivity data. The results, summarized in Table 4, clearly show that while researchers employed at these “top 50” universities did, indeed, have significantly higher
The existence of differing standards for quality (or, at least, journal ranking) between institutions supports the proposition that, at a minimum, the marginal contribution of a given paper will be influenced by its outlet — particularly at the most prestigious institutions. For example, a recent study of rewards for MIS research found that AACSB accredited institutions were more likely to consider article outlet than non-accredited institutions in promotion, tenure and merit pay decisions (Whitman et al., 1999). This conclusion is also strongly supported by findings in the Management area, where the pay impact of paper quality was significantly different between doctoral and non-doctoral degree granting institutions (Gomez-Mejia & Balkin, 1992), with the former appearing to reward only top-tier publications, while the latter rewarded all publications. This finding appears particularly relevant for the MIS area because both the Management and MIS fields share a distribution of publications in which a small percentage of researchers and institutions account for a disproportionately high percentage of the top-tier journal articles⁴.

It follows, then, that what constitutes an acceptable paper is likely to be dependent on the institution or institutional research mission. Simply accumulating huge paper counts is unlikely to be sufficient to move an individual up into an institution with a higher focus on research. Such higher-than-average paper count must be accompanied by corresponding increases in the quality of targeted outlets, if the full marginal value of each paper is to be obtained.

2. What must a faculty member do to realize the estimated value per paper?

An entirely different issue warranting discussion is the circumstances under which a faculty member can actually obtain the projected marginal monetary value of each paper that he or she writes. The primary source of economic data used throughout the present paper was a database of MIS job offers. In some commodity markets—most notably markets characterized by perfect exchange of information and lacking in all stickiness, such as relocation costs, personal relationships and long term contractual relationships (e.g., tenure)—the computed benefits of marginal research productivity would soon be realized by all market participants. Unfortunately, for the purposes of this analysis, the characteristics of a robust free market are notably absent from the academic job market. Indeed, the stickiness of the US MIS job market in recent years has led to a situation entirely inconsistent with a “perfect market” assumption: salary inversion on a national level. As an illustration of how widespread the phenomenon has become, the AACSB Newsline⁶ (Winter, 2000) reported that MIS Associate

---

⁴ Regression analysis was performed to determine that both course load and a dummy variable reflecting inclusion in the top 50 institutions were significant in predicting publication count, at the 0.05% level.

⁵ For example, in MIS, the top 12% of all institutions account for about 54% of the publications in the 6 top tier journals (Im, Kim & Kim, 1998). In Management, the top 17% of all researchers account for nearly 50% of top-tier publications in 21 journals (estimates from Table 7, p. 945, Gomez-Mejia & Balkin, 1992), with the 6 and 21 respective number of journals used in the two surveys being roughly comparable given the relative number of faculty in both fields (~2000 in MIS, ~8000 in Management). Also consistent is the fact that roughly 40% of all MIS faculty did not contribute to a top-tier journal over a six year period—based on the fact that approximately 1200 did — while 30% of all management faculty did not contribute to their top tier during the course of their career (with a sample median for years of academic experience of 5-6 years).

⁶ Site: http://www.aacsb.edu/publications/newsline2000/wmsalsurv_1.html
Professor salaries in the US were, on average, actually lower than salaries being offered to new hires, directly out of PhD programs. Such a situation indicates that the marginal analysis performed using the MIS job offer data set is unlikely to apply to those individuals content to remain at the same institution over the course of their entire career.

In the face of such salary inversion, it is apparent that in order to realize the marginal benefits of high publication rates computed in this paper, an individual must be prepared to move between institutions, perhaps on a fairly regular basis. Indeed, even without discipline-wide salary inversion, moving has been found to be a significant contributor to salary for Management faculty, where an average increment in base salary of $10,520 per move was estimated (Gomez-Mejia & Balkin, 1992). While such moves need not necessarily actually occur (as some institutions will choose to match competing offers in order to retain especially talented faculty), the willingness to enter the job market and solicit competing offers would seem to be a critical prerequisite to ensure that compensation is reflective of research productivity—although this could, in principle, also be affected by the degree of activism exhibited by the institution’s administration and personnel areas.

It is also reasonable to suppose that changing institutions will tend to increase the relative weight that an individual's research record plays in determining his or her compensation, when contrasted with remaining at a single institution. The reasoning for this parallels arguments made in estimating the fraction of salary variance that might be explained by research productivity, presented in Appendix A. While some studies of academic institutions have found that teaching, rather than research, is the most critical factor used in evaluating faculty (Clement & Stevens, 1989), it is much more difficult to assess the teaching skills of a job candidate than his or her tangible research output—which can easily be quantified using measurements such as a count of refereed journal articles (Gomez-Mejia and Balkin, 1992). As a result, increased weight is likely to be given to a job candidate's research record—which is both salient and certain—relative to his or her teaching record, which is subject to much greater uncertainty.

Naturally, the stickiness of the MIS faculty job market can work in the opposite direction, as well. After compiling an admirable research record, a faculty member could simply stop publishing and, having tenure, could continue to be compensated based on research productivity that was achieved much more than 5 years earlier. Given the presence of COLA clauses or other automatic raises that appear in many academic contracts, particularly at unionized institutions, the individual's salary might even continue to rise with no further research output. An implication of this is that an individual planning to engage in a sustained period of non-productivity could perceive that the marginal value of a paper published prior to that period would be even greater than what was calculated here—as its presumed effect would last far longer than the 5 years assumed in the model. Indeed, in such situations the marginal value of a paper could rival the much higher projections of lifetime paper value computed by other researchers (e.g., Gomez-Mejia & Balkin, 1992).

For a number of reasons, we would not expect such situations to occur very often within the MIS field, at least at the present time. To begin with, the current strong MIS faculty job market makes it unlikely that automatic salary increases will keep pace with market salaries. Thus, the non-productive individual would experience a negative impact, at least relative to his or her colleagues, from that lack of productivity—although the effect might take longer than 5 years to be noticeable. Also, purely as a practical matter, Hu and Gill (2000) found that there was little difference in average research productivity, either across ranks or as a result of tenure, within a given institution category. Thus, situations where faculty members are receiving high compensation for substandard productivity would seem to be relatively isolated.

**Directions for Future Research**

The exploratory research conducted in the present paper provides a rich source of potential hypotheses that are intended to be the subject of a future investigation. For example, each observed regression coefficient in Figure 4 could be the subject of subsequent testing (e.g., years of teaching experience will result in higher salary). More important, many of the central conclusions of the present paper would also benefit from further testing. For example:
Number of refereed publications is hypothesized to be an important determinant of faculty salary

Quality of refereed publications is hypothesized to be an important determinant of salary, one that is likely to be impacted by the nature of the university employing the faculty member

Publication history is hypothesized to be particularly critical in determining compensation when faculty members are seeking to change institutions.

While the present paper identified a number of strong arguments that these relationships are likely to exist, much of the support for these arguments comes from data sets that were not designed with testing these hypotheses in mind, and data sets related to other disciplines (e.g., Management). Such support, while useful in framing appropriate research questions and hypotheses, is no substitute for rigorous research design. As a result, plans are underway to conduct a follow up study that focuses on formal hypothesis testing. The design of the study will employ an experimental method to test the MIS research productivity-faculty compensation relationships identified in the present paper, and validate a number of the assumptions that were made.

Conclusions

The analysis and accompanying discussions in this paper have led to three main conclusions:

1. A published MIS refereed journal article can be worth approximately $20,000 in incremental salary, over an assumed five-year lifetime, to a faculty member. That value is derived from two sources: (1) the ability such a paper gives the individual to move to higher-paying institutions, and (2) the incremental impact of the paper on an individual's salary (or offered salary) within an institution, or across similar institutions, having the same teaching load.

2. What constitutes a valid "publication" is institution-dependent, so the faculty member must ensure that the publication outlets targeted for such an article are consistent with the institution's standards and objectives.

3. In order to realize the actual marginal value of a publication computed in this paper, a faculty member must be willing to relocate, perhaps on a reasonably regular basis, to ensure that he or she does not fall victim to the salary inversion phenomenon that is currently widespread within the MIS academic community.

It is also worth noting that the values computed in this paper are not necessarily an upper bound. Specifically excluded from the analysis were both the rewards for extraordinary research (e.g., salaries received by eminent scholars) and the impact of research productivity on opportunities for outside compensation. Since both of these sources of income have the potential of being quite large, some researchers may realize substantially greater rewards for incremental productivity than were calculated here.

As a final conclusion, it must also be observed that the large potential value per article (Conclusion 1), when taken together with the need to change positions in order to realize that value (Conclusion 3), creates a serious dilemma for administrators and department chairs—one that is particularly acute for those seeking to build the research capabilities of their institution. By strongly encouraging their brightest junior faculty to engage in high quality research leading to large numbers of publications, these administrators are setting the stage for almost inevitable demands for major salary increases, or the departure of prized faculty. As the MIS job market grows ever tighter, the situation will undoubtedly worsen before it gets better. Hopefully, creative administrators and department chairs will recognize the need to develop new incentive systems to meet the challenges that we face as the result of the high value of an MIS article. Otherwise, the only faculty who will have a financial incentive to remain at an institution throughout their entire career will be those who achieve tenure, then decide to cut back dramatically on their publication rate.

References


About the Author

Dr. T. Grandon Gill is an associate professor at Florida Atlantic University, where he has taught since 1991. His educational background includes three degrees from Harvard University: an undergraduate degree in Applied Mathematics (cum laude) from Harvard College, a Masters of business administration (high distinction) from Harvard Business School and a Doctor of business administration in the management of information systems, also from Harvard Business School. His current teaching areas include programming, management of information systems, database design, the Internet and case research. Dr. Gill's research interests include artificial intelligence, the implementation of complex information systems, data communications and IS education.

E-mail: grandon@fau.edu

Appendix A: Estimating Marginal Contribution per Paper (Cp)

In order to estimate the marginal contribution of a research paper (referred to as Cp) within an institution or institution category, we begin by assuming that some fraction of salary variance is accounted for by productivity (k²), measured in the form of five-year article count. We are then able to break our total salary error term into two components:

\[ R_i = C_p (p_i - \mu) + E_i \]

Where Ri is the residual error in observation i, P_i is the paper count (productivity measure) for observation i, \( \mu_p \) is the mean of the distribution of paper counts, C_p is a constant reflecting the actual salary impact (contribution) per paper, and E_i is the error from remaining sources. Assuming all the distributions are normal, it would then follow that:

\[ \sigma_{Sy^2} = C_p^2 \cdot \sigma_y^2 + (1-K^2)\sigma_y^2 \]

where k² is defined above, \( \sigma_y^2 \) is the variance of our salary error terms and \( \sigma_y^2 \) is the variance in paper counts. We can then estimate that:

\[ k^*SE = C_pSE \]
where PE is error derived from the unknown productivity distribution (i.e., standard error of paper count) and k is the fraction of salary standard error that is explained by paper count.

Now, as it turns out, there is an estimate for PE, the standard error in paper count, that is contained in Figure 2 (Table 3b) from Hu and Gill (2000). Specifically, for 5-7 hour weekly course load (approximately 4 courses/year), the error is 6.591 and for 8-11 hour weekly loads (approximately 7 courses per year), the error is 4.511. Based on this, we could develop estimates for Cp, our marginal return for papers, across the range of possible values of k. These estimates could be developed in two ways.

The first approach to estimating Cp is to make the assumption that all the paper counts, for course loads ranging from 3 to 7, came from populations having the same variance. (Since the difference between the 6.591 and 4.511 errors was not statistically significant, this is a plausible assumption.) To perform the actual computation, we could then average our two error estimates, leading to a point estimate of standard error of 5.55. Cp can then be calculated given k (our "guess" factor). For example, if k is 0.5 (i.e., k² is 25%), meaning that about 25% of the remaining variance in salary is explained by paper count), the value of Cp is $991/paper ($11,000 SE of salary * 50% of SE based on variance explained/5.55 SE of papers). Table A.1 contains a range of values of Cp for different assumed values of k² and k.

<table>
<thead>
<tr>
<th>Percentage of remaining salary variance explained by paper count (k²)</th>
<th>Fraction of remaining salary error applied to paper count error (k)</th>
<th>Dollar value, in salary terms, per paper (Cp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>0.10</td>
<td>$198</td>
</tr>
<tr>
<td>0.10</td>
<td>0.32</td>
<td>$627</td>
</tr>
<tr>
<td>0.25</td>
<td>0.50</td>
<td>$991</td>
</tr>
<tr>
<td>0.75</td>
<td>0.87</td>
<td>$1716</td>
</tr>
</tbody>
</table>

Table A.1. Estimated Salary Impact per Paper

An alternative approach to estimating Cp would be to assume that the different institutional categories actually come from populations with inherently different paper count variances, and that they may also have different values of k. Presumably, the greater the research mission, the greater the percentage of variance explained by paper count (i.e., k rises with institutional research category). For example, suppose that k² was actually proportional to the percentage of a faculty member’s time that was spent performing research. The underlying justification of such an estimate would be that overall salary variance should be explained by the individual variances in the individual’s performance on the different components of his or her assignment (e.g., research productivity, teaching and service), each weighted according to their relative importance in his or her assignment. On the surface, and in the type of ideal world that economists are most comfortable assuming, this would certainly seem to be a reasonable conjecture. We would then have a separate expression:

\[ \sigma_s^2 = C_p \sigma_p^2 + (1 - k_i^2) \sigma_s^2 \]

for each distinct institution category (j). Since we are making the assumption that:

\[ k_i^2 \propto RF_i \]

it then follows that:

\[ k_i = k_0 \times (RF_i)^{1/2} \]

where k_0 is an underlying constant. It would then follow that:

\[ C_p \propto (RF_i)^{1/2} / PE_i \]

within each research category (assuming the salary SE to be constant across the sample).

As already noted, however, the Gill and Hu (1999) data set included self-reported estimates by respondents

---

1 An alternative choice here would have been percentage of a faculty member’s time assigned to research which, presumably, would itself be proportional to actual time spent.
Table A.2. Estimating the Change in Marginal Value per Paper Across Teaching Loads

<table>
<thead>
<tr>
<th>Teaching load (hours per week)</th>
<th>Productivity standard error (SE) from Figure 2</th>
<th>Percent of time spend in research (RF)</th>
<th>( RF^{1/2}/PE )</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-7</td>
<td>6.591</td>
<td>28.3%</td>
<td>0.081</td>
</tr>
<tr>
<td>8-11</td>
<td>4.511</td>
<td>19.71%</td>
<td>0.098</td>
</tr>
<tr>
<td>12-14</td>
<td>2.107</td>
<td>11.81%</td>
<td>0.163</td>
</tr>
</tbody>
</table>

of percentage of time spent performing research. As shown in Table A.2, using these values led to reasonably similar values for \( (RF)^{1/2}/PE \) for the two highest research categories. The implication is that \( C_p \) may be reasonably stable across the most research-oriented categories of institutions, regardless of how \( k \) may change with category. It also means the first approach to \( C_p \), assuming both \( k \) and the \( PE \) are constant, probably yields results similar to the more complex estimation of \( C_p \) for each research category.

In terms of actually estimating a value for \( k \), we have already argued that a good starting point might be to propose that \( k^2 \) varies according to the percentage of the individual's time spent in research. The simplest estimate would be to treat \( k^2 \) as equal to that percentage (e.g., about 24%, using the single \( k \) approach). Interestingly enough, reasonable arguments can be made that such a choice of \( k \) would either understate or overstate the actual importance of research record. Examples of arguments that it is too low include:

1. Actual percentage of time, as reported by faculty members, included time engaged in outside activities. Such activities were unlikely to be part of the individual's assignment, and it would therefore be more likely that research—as a percentage of assigned activities—would be the basis for determining compensation. This percentage would be higher than the reported value.

2. The available measures of research productivity (e.g., number of papers) are likely to be more salient to decision-makers than other indicators of a faculty member's performance, particularly where the faculty member is applying for a job at another institution. High salience of information often results in a decision-maker's excessive reliance on that information in making choices (Evans, 1989). In other words, because a job candidate's research productivity is one of the easiest aspects of his or her record to examine and validate, that record will receive a higher weight in determining an offer than it would if research were as hard to assess as, say, teaching skill. While most applicable to the job search situation, the same bias may even be experienced within an institution, although to a lesser degree.

3. Historically, in other fields, research productivity appears to have had an impact on pay that is disproportionate to its percentage of a faculty member's assignment, especially when contrasted with teaching (e.g., Fairweather, 1995; Gomez-Mejia & Balken, 1992). A recent study of MIS faculty (Whitman et al., 1999) also found respondents reported research to be more critical than teaching (and much more critical than service) in promotion, tenure and merit pay decisions at AACSB accredited institutions.

On the other hand it could be argued that such an estimate of \( k \) is too high:

1. A simple measure, such as paper count, is unlikely to be sufficiently robust to capture all the nuances of research productivity, even if our estimate of \( k \) happened to be perfectly accurate for a "true" measure of productivity. Thus the value of \( k \) we'd be likely to find using real data would probably be less.

2. The underlying rationale for choosing a value of \( k \) that is equal to percentage of time spent in research is that all salary variance left unexplained by the regression can be attributed to differences in faculty-member performance relative to assignment. Such an assumption seems unrealistic, however, even in a perfectly deterministic model. Other factors—such as the negotiating skills of the candidate and chair, the economy of the region where the institution is located, the economic
condition of the institution, and the simple lack of perfect information—would all be expected to contribute to the variance. As a result, the sum of the assignment-related components of salary variance should be substantially less than one, in order to leave room for other sources of variance.

Based on these arguments, it is hard to determine if the overall estimate of 24% for \( k^2 \) is too high or too low. For the purposes of this paper, then, an "educated guess" is that \( k^2 \) is approximately 0.25, meaning that \( k \) is 0.5, implying a Cp of \( \$991 \) (see Table A.1). In other words, we should expect to see \( \sim \$1000 \) contribution to pay (per paper per year, over a 5-year period) within an institution or institution category.

### Appendix B: Comparison of Results with Gomez-Mejia and Balken (1992) Study

The seminal study of determinants of business school faculty salary is Gomez-Mejia and Balken's (1992) study of salaries within the Management discipline. As a test of external validity, it is therefore useful to compare the findings of the present paper with the findings of that study.

#### Factors Determining MIS Faculty Salary

In Figure B.1, the results of this study's regression were compared with the findings of the earlier study, where an R-squared of 0.63 was achieved. The pattern of agreement was very strong. For example, years teaching, rank and tenure variables (all of which loaded to the "Career Stage" factor in the earlier study) had the same impact (positive) and overall significance (except the tenure dummy variable, which had the

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Consistency with Gomez-Mejia, et al., (1992) [Note 1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years teaching*</td>
<td>901.733 Consistent w/ career factor</td>
</tr>
<tr>
<td>Doctorate</td>
<td>139.831 N/A</td>
</tr>
<tr>
<td>Course load***</td>
<td>-4630.458 Much more significant than quality factor</td>
</tr>
<tr>
<td>Assistant*</td>
<td>9268.604 Consistent w/ career factor</td>
</tr>
<tr>
<td>Associate*</td>
<td>14281.862 Consistent w/ career factor</td>
</tr>
<tr>
<td>Full***</td>
<td>37995.604 Consistent w/ career factor</td>
</tr>
<tr>
<td>Tenure</td>
<td>6785.588 Consistent w/ career factor</td>
</tr>
<tr>
<td>Urban**</td>
<td>7658.323 More significant than COL factor</td>
</tr>
<tr>
<td>Suburban</td>
<td>4241.027 Consistent w/ COL factor</td>
</tr>
<tr>
<td>Public</td>
<td>-3896.944 Not consistent</td>
</tr>
<tr>
<td>South***</td>
<td>15772.093 Consistent w/ COL factor</td>
</tr>
<tr>
<td>West**</td>
<td>14532.816 Consistent w/ COL factor</td>
</tr>
<tr>
<td>Midwest***</td>
<td>21485.854 More significant than COL factor</td>
</tr>
<tr>
<td>Northeast**</td>
<td>13504.344 Consistent w/ COL factor</td>
</tr>
<tr>
<td>Doctoral*</td>
<td>4703.065 Consistent</td>
</tr>
<tr>
<td>AACSB</td>
<td>-5542.519 N/A</td>
</tr>
</tbody>
</table>

* 5% significance, **1% significance, ***0.1% significance

Note 1: Values are compared with regression coefficients for Gomez-Mejia and Balken (1992) study. Values are labeled "Consistent" if the sign and significance are the same for either a variable or a factor used in that study.

Figure B.1. Regression of Salary Offers Against Various Individual and Institutional Characteristics, Contrasted with Gomez-Mejia and Balken Results
correct sign but was not significant). Similarly, the variables from the salary study which would have been accounted for by the earlier study's "Cost of Living" (COL) or "Median Yearly Family Income" (Family Income) variables—urban, suburban and the various US region dummy variable (the base case was an offer from a non-US school)—were generally consistent with the earlier results, which found neither COL nor Family Income to be significant. The exception here was that offers from urban schools were found to significantly higher than offers from rural schools (the base case), and that offers from the Midwestern region of the US were significantly higher than offers from other US regions. Another slight difference was that in the earlier study, public institutions were found to pay slightly more, whereas in the current study they were found to pay slightly less, with the difference not being statistically significant in either case.

The major area of difference between the MIS salary offer results and the earlier Management study was in the area of assigned teaching. The earlier study did not include assigned teaching load as one of its explanatory variables—although it did include a "School Quality" factor that would normally be inversely correlated with teaching load, and was found to be non-significant as a determinant of pay. In direct contrast, assigned teaching load was the most significant single variable in the present model.

Oddly enough, the significance of teaching load in the present model (contrasted with its absence in the Management model) actually provides additional confirmation of one of the key assumptions of the present model: that an institution's teaching load will be inversely related to research output. The argument here is simple. The earlier study found a strong significance for paper count—data that was not explicitly collected by the MIS salary study. If research output increases as teaching load declines (as found by Hu and Gill, 2000 and as assumed throughout the study), however, we would then expect that teaching load would act as a proxy for the candidate's research output (with a negative sign). Since teaching load is, in fact, the only variable in the MIS salary data set that would appear to be a suitable proxy, it would then follow that it should be very significant—just as research productivity was very significant in the earlier study.

Estimates of Value Per Paper

On the surface, the $991 value computed by the present paper for intra-institution or inter-institution contribution of research appears to be the same order of magnitude as the $1210 marginal contribution to pay made by a top-tier publication (within an institution) that was estimated by Gomez-Mejia and Balkin (1992). The numbers are more different than they at first appear, however. The biggest difference between the estimates of the earlier paper and the present paper is a result of the assumptions, in the earlier paper, that all publications contribute to base pay equally, and without respect to timing. Using this assumption, the value per top-tier publication of $1752 (adjusted to year 2000 dollars) computed by the earlier paper would need to be multiplied by some factor to reflect the discounted value of the publication over time. For example, assuming the author was 42, the sample median, expected to retire at 65, and discounted at a risk-free rate of 4% (appropriate for a raise), the present value of the $1752 raise would be about $27,000, in year 2000 dollars. This value is definitely not comparable to the $4955 computed by the current study for the intra-category contribution of a paper over its assumed five-year lifetime.

In comparing the two studies, however, there is another adjustment that needs to be made. Although the earlier study appeared to be measuring intra-institution pay increases, the data set included the pay effects of inter-category changes, as well. Because the coefficients used to compute the marginal value per paper were established prior to including any effects of job changes (i.e., job changes were added during a later step in their stepwise regression), any inter-category effects would have been embedded in the productivity coefficients. This point is significant, because the job change effects proved to be large ($10,520 per job change), highly significant, and likely to be highly indicative of inter-category changes. The reasons for believing inter-category shifts were an important component of the job change effects include:

- Job moves were highly, and positively, correlated with number of top-tier publications (49% correlation coefficient).
- Individuals having a cumulative number of top-tier publications above the median value for the sam-
people received an estimated salary increment per move that was 70% higher than that received by individuals having a below-the-median top-tier publication count.

Taken together, these factors strongly suggest a situation where higher-than-average publication counts were a primary factor in causing a faculty member to move, very much consistent with the inter-category model proposed in the present paper. As a result, the estimated $27,000 computed by the earlier study would appear to be most directly comparable to the current paper's combined estimate of intra-category and inter-category contribution (i.e., the "full" value of a paper, estimated to be $20,390), as opposed to the pure intra-category number*. Furthermore, the $27,000 estimate from the earlier study was based on top-tier publications only, meaning that the MIS number would also need to be adjusted upwards to reflect that fact. Thus, the earlier results appear to be reasonably consistent with those of the current study.

### Appendix C: Correlation Matrix of Regression Variables

<table>
<thead>
<tr>
<th></th>
<th>Years teaching</th>
<th>Doctorate</th>
<th>Course Load</th>
<th>Assistant</th>
<th>Associate</th>
<th>Full</th>
<th>Tenure</th>
<th>Urban</th>
<th>Suburban</th>
<th>Public</th>
<th>South</th>
<th>West</th>
<th>Midwest</th>
<th>Northeast</th>
<th>Doctoral</th>
<th>AACSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years teaching</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doctorate</td>
<td>0.06</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Load</td>
<td>-0.18</td>
<td>-0.33</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistant</td>
<td>-0.86</td>
<td>0.15</td>
<td>-0.01</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associate</td>
<td>0.27</td>
<td>0.08</td>
<td>-0.04</td>
<td>-0.62</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full</td>
<td>0.79</td>
<td>0.05</td>
<td>-0.25</td>
<td>-0.49</td>
<td>-0.08</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tenure</td>
<td>0.78</td>
<td>0.07</td>
<td>-0.22</td>
<td>-0.64</td>
<td>0.35</td>
<td>0.76</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>-0.01</td>
<td>0.04</td>
<td>-0.03</td>
<td>0.03</td>
<td>-0.10</td>
<td>0.00</td>
<td>0.02</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suburban</td>
<td>0.05</td>
<td>0.08</td>
<td>-0.03</td>
<td>0.02</td>
<td>-0.13</td>
<td>0.02</td>
<td>0.02</td>
<td>-0.67</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>-0.13</td>
<td>0.09</td>
<td>0.00</td>
<td>0.12</td>
<td>-0.01</td>
<td>-0.08</td>
<td>0.12</td>
<td>-0.08</td>
<td>0.11</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South</td>
<td>-0.06</td>
<td>-0.01</td>
<td>0.01</td>
<td>0.10</td>
<td>-0.07</td>
<td>-0.05</td>
<td>-0.08</td>
<td>-0.09</td>
<td>0.00</td>
<td>0.26</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>0.04</td>
<td>0.09</td>
<td>-0.04</td>
<td>-0.14</td>
<td>0.18</td>
<td>0.03</td>
<td>0.10</td>
<td>0.16</td>
<td>-0.07</td>
<td>0.04</td>
<td>-0.29</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td>0.03</td>
<td>0.10</td>
<td>0.20</td>
<td>0.05</td>
<td>0.02</td>
<td>0.02</td>
<td>-0.05</td>
<td>0.02</td>
<td>-0.13</td>
<td>0.10</td>
<td>0.17</td>
<td>-0.33</td>
<td>-0.21</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>-0.06</td>
<td>-0.09</td>
<td>-0.18</td>
<td>0.04</td>
<td>-0.10</td>
<td>-0.04</td>
<td>-0.06</td>
<td>0.04</td>
<td>-0.04</td>
<td>-0.46</td>
<td>-0.43</td>
<td>-0.27</td>
<td>-0.31</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doctoral</td>
<td>-0.17</td>
<td>0.12</td>
<td>-0.45</td>
<td>0.19</td>
<td>-0.16</td>
<td>-0.01</td>
<td>-0.09</td>
<td>0.13</td>
<td>-0.02</td>
<td>0.24</td>
<td>0.03</td>
<td>0.03</td>
<td>-0.10</td>
<td>-0.03</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>AACSB</td>
<td>0.13</td>
<td>0.03</td>
<td>-0.25</td>
<td>-0.03</td>
<td>0.11</td>
<td>0.09</td>
<td>0.12</td>
<td>0.12</td>
<td>0.07</td>
<td>-0.10</td>
<td>0.10</td>
<td>0.07</td>
<td>0.01</td>
<td>0.22</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

* Indeed, this mirrors the argument—made in the previous section—that teaching load (used to distinguish between institution categories in the current model) was actually acting as a proxy for research productivity, and therefore needed to be included in order to make the regression results of the earlier study comparable with those of the present study.