Are Returns to Research Quality Lower in Agricultural Economics than in Economics?

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Are Returns to Research Quality Lower in Agricultural Economics than in Economics?

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Abstract

We compare effects of research quality and quantity on the salary of academics in agricultural economics and economics departments of the same universities. Agricultural economists get a significantly lower payoff to research quality, whether measured in terms of citations or in terms of quality-weighted journal output (based on nine different weighting schemes). Instead, salary in these agricultural economics departments appears to depend on the quantity of journal articles. In contrast, article counts have no independent effect on economist salaries. One-third of academics in the agricultural economics departments studied here have doctoral training in economics; these very different reward structures for research may cause frustration for these faculty due to the muted returns to research quality that agricultural economics departments seem to offer.

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Keywords: Academic salary; Citations; Journal rankings; Research quality

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1. Introduction

Agricultural economics and economics are closely related disciplines, and many faculty in agricultural economics departments have graduate training in economics. In much of the world, the declining share of agriculture in the economy has seen agricultural economists absorbed into economics departments. In the United States the existence of separate departments may reflect a historical legacy of the Morrill Act rather than a deep disciplinary boundary. Yet despite the overlap in training, methods and topics, the research rewards in the two disciplines seem to be dissimilar, with evidence of a bigger impact on salary from publishing in the highest ranked journals in economics than in agricultural economics (Hilmer, Hilmer, and Lusk, 2012).

These different reward structures have implications for individual faculty and for departments. The openness of agricultural economics departments to hiring faculty with a PhD in economics, and long-standing norms in economics about publishing in top-ranked journals, may lead to tension. In particular, faculty in agricultural economics who were trained as economists may have expectations about salary impacts of publishing in top ranked journals, or from having highly cited papers, that are not met by the more muted salary rewards offered in agricultural economics. The same tension may also occur in terms of the quantity of research publications if the reward structure in agricultural economics is tilted more in favor of having lots of articles that may be in less highly ranked journals, or that individually have few citations, while faculty trained in economics may expect to publish fewer articles.

This paper reports on a comprehensive analysis of academic salaries that examines these differences in the returns to research quality and research quantity for academics in agricultural economics departments compared to those in economics departments. Specifically, we relate salary of 300 academics in economics departments and agricultural economics departments of the same universities (Illinois, Michigan State, Minnesota, Ohio State, Purdue, and Wisconsin) to their lifetime publications of almost 7000 journal articles in over 750 different journals, and to the 150,000 citations to those articles. In order to ensure that our results are robust, we use nine different journal weighting schemes when measuring research quality, and adjust for the length, page size, and co-authorship of each article. We also consider citations to these articles, and the distribution of those citations in terms of the share of citations that are for the most cited article or in terms of the *h*-index and the generalized *h*-index that Ellison (2013) advocates, as an alternative way to measure research quality.[1]

Our study builds on the analysis of Hilmer, Hilmer, and Lusk (2012), who used a larger sample but less comprehensive data to compare reward structures for research in economics and agricultural economics. That study counted articles within a classification of journals into various tiers to represent quality; one problem with this approach is that all journals within a tier are treated as of equal quality, which ignores the literature using formal processes to weight journals based on citations or impact-adjusted citations, or based on perception surveys.[2] Using the journal of publication as a proxy for quality also ignores the growing emphasis on citations, which are claimed to measure actual research impact while the prestige of the journal that publishes an article simply shows that, in the opinion of an editor and a few referees chosen by that editor, the research was expected to have an impact (Liebowitz, 2014).

In our sample, agricultural economists have a significantly lower payoff to measures of research quality. Conversely, agricultural economists appear to have a higher return to quantity

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[1] The *h*-index is the largest *h* such that an academic has published *h* articles with at least *h* citations (Hirsch, 2005).
[2] The perception surveys are typically of heads of economics departments and it is not clear how these relate to how others perceive the reputation of journals. Rigby et al (2015) show that perceptions of a journal in terms of the impact that publishing in it has on career progression differs from perceptions in terms of the impact beyond academia, and also differs from citations-based impact factors.

of research publications than do economists. The returns to various citations metrics are also lower for the agricultural economists. These differences in marginal effects are on top of a level effect, of academic salaries in agricultural economics departments being one-quarter lower, on average, than salaries in economics departments after controlling for differences in demographics (experience, seniority, and gender) and location.

Our evidence is just from a few universities that are all highly regarded public institutions in nearby states, so it may not apply to other universities. Yet the similarity of our findings with those of Hilmer, Hilmer, and Lusk (2012), who drew on a larger sample that had some less well regarded universities, suggests that the lower returns to research quality for agricultural economists compared to economists may be a widespread pattern. Whether this indicates more about agricultural economics than it does about economics is hard to say, although it is widely known that economics is unusual among academic disciplines in the emphasis it places on publication in a narrow set of top journals with much attention paid to the “top five” (Card and DellaVigna, 2013). One useful extension of the current study would be to compare economists in economics departments with those in policy schools of the same universities, to see if it is a policy orientation, which is typical of many agricultural economists, that leads to the more muted salary returns to research quality.

The remainder of the paper is structured as follows: Section 2 provides details on the sample and discusses the differences in average salary between the economists and agricultural economists; Section 3 describes the nine different sets of journal weights used to measure research quality, and the various citations measures, and provides descriptive statistics on these research-related determinants of academic salary; Section 4 covers the empirical methods and has the results of the salary regressions; and, Section 5 discusses the implications and concludes the paper.

2. Sample and Data Description

We started with a sample frame of the top 15 agricultural economics departments listed in RePEc (Research Papers in Economics). From amongst these we excluded any that were not universities (e.g. IFPRI) or that were not in the United States, and any that were private universities (Cornell) for whom public disclosure salary data would be unavailable, and also any with a combined economics and agricultural economics department (Iowa State). Any university where the public disclosure databases for state workers did not provide sufficient detail to let us restrict attention to fulltime faculty was also excluded (Berkeley, Davis, and Maryland).

For the six universities satisfying our selection criteria (Illinois, Michigan State, Minnesota, Ohio State, Purdue, and Wisconsin) we gathered salary data for fulltime faculty in economics and agricultural economics departments in 2013, which was the most recent year available across the various databases at the time that we collected the data (in early 2015). We also checked salary information from previous year's databases on as many of these academics as possible to ensure that the values for 2013 were not outliers (perhaps reflecting some one-off supplementary compensation). After excluding any faculty members with major administrative or extension duties, or primarily teaching appointments, our sample of 300 academics was split equally between those in agricultural economics departments and those in economics departments. A few academics have joint or courtesy appointments in both types of departments and we allocated these to a department based on the courses they teach or where they were physically located (e.g, was their office in the building housing the economics department).

The salary data were obtained from public disclosure databases whose sources varied but in most cases a leading newspaper in each state would provide a 'front-end' search engine so that interested parties could examine their taxpayer dollars at work. For example, for the University of Wisconsin, the salary database can be searched through the Milwaukee *Journal Sentinel* (http://www.jsonline.com/watchdog/dataondemand/). Where possible, we obtained up to three years of salary data for each academic, so that we could check if the salary in 2013 was atypical; some databases would also report a separate line for one-off payments for activities unrelated to the base salary. The salary data are reported as annual totals and even though the databases show if someone has a fractional appointment they do not indicate if they are paid on a 9-month or an 11-month contract basis. While agricultural economics departments traditionally offer 11-month contracts, Hilmer et al (2012) note some switching to 9-month contracts to better match the usual arrangement for economists. We consider differences in contract length as part of the *level* effect of working in one department or the other while our main focus is the marginal effects on salary of changes in various indicators of research quantity and quality.[3]

The average annual salary across all of the academics in our sample is $156,000; for those in agricultural economics departments it is $129,000 and in economics departments it is $183,000 (Table 1). These raw averages may not be informative since productivity-related characteristics and locational effects are not controlled for. The average years of experience are similar, at 20.3 for the economics faculty and 21.1 for the agricultural economics faculty and the composition in terms of professorial rank is also similar, with 57 percent of the agricultural economists and of the economists being Professors.[4] The economists have spent slightly less time at the current university (14.2 years compared with 16.6 years for the agricultural economists) so they seem to have moved around more given that they have a similar length of

[3] Therefore the possible differences in contract length are one of several factors that may contribute to level differences, which we control for with an intercept dummy variable for the agricultural economics departments.
[4] One-sixth of the agricultural economists are Assistant Professors, compared with one-fifth for the economists, with the Associate Professor rank having slightly more agricultural economists than economists. So overall the average professorial rank of the agricultural economists is slightly higher than it is for the economists.

overall experience as do the agricultural economists. The other demographic factor that may affect the comparison of average salaries is gender; one-fifth of the agricultural economists are female while only 15 percent of the economists are female.

In order to further study the salary gap we use the following regression to adjust for the different demographic characteristics and for the different locations of the sample:

$$Salary = \beta_0 + \beta_1 AgEcon + \beta_2 Experience + \beta_3 Seniority + \beta_4 Male + Location\ Effects + \varepsilon$$

where *AgEcon* is a dummy variable for academics in agricultural economics departments, *Experience* is years of post-PhD experience, *Seniority* is years at the current university, *Male*=1 for males, the location effects are fixed effects for each university and ε is a random error. After controlling for these characteristics that may differ between the two samples (while not yet considering any variables related to research productivity) the adjusted gap in average salaries is not much different to the raw gap, with the average agricultural economist receiving $48,000 per year less from state coffers than what the average economist receives.[5] The similarity to the raw gap in average salary indicates that the samples of agricultural economists and economists are largely balanced in terms of location and demographic characteristics.

The other feature to note from Table 1 is the asymmetry in terms of field of doctoral training. Almost none of the faculty in economics departments have a PhD in agricultural economics (or in anything but economics) but 30 percent of the faculty in agricultural economics departments have a PhD in economics. Amongst younger agricultural economics faculty, defined as those with ten years or fewer experience, 38 percent have an economics PhD. Thus, academics with doctoral training in economics are likely to be a rising share of the faculty in agricultural economics departments. If the graduate experience in economics for these academics (or peer

[5] To the extent that economists may have more months per year free for other pursuits, if on 9-month contracts while agricultural economists are on 11-month contracts, the gap in all-source remuneration may be larger.

effects from classmates who now work in economics departments) has imbued some of them with norms about publishing in the top journals (and the rewards that are expected to follow from that) which differ from the traditional publishing norms that may hold in agricultural economics departments it may be a source of future intra-departmental tension.

3. Measures of the Quantity and Quality of Research

Our measures of research productivity are based on lifetime articles published (with pagination) up to the end of 2013 by these 300 academics. The articles were found by searching *EconLit*, RePEc, *Web of Science* (WoS), and curriculum vitae. In total there were almost 7000 refereed articles in over 750 different academic journals, and 150,000 citations to these articles. The citations are also to the end of 2013 and are from WoS, which is the most established citations database and is stricter in coverage than others such as *Google Scholar*, which includes citations to and from a variety of unpublished works. Some journals that these academics published in were not covered by WoS at the time (noting that coverage rises over time), and so citations to those articles appear to be zero even if they may have citations in other databases. The salary equations reported in Section 4 include an indicator for the proportion of articles that were published by each academic in journals that were not in WoS, at the time, so as to account for this potential under-coverage.

In order to have comprehensive measures of lifetime research, we need journal weights to convert output in different journals to a constant quality. A wide range of journal ranking and weighting schemes have been proposed, with no consensus on which is best. We therefore use nine different schemes to ensure that our results do not depend on the particular weights used to calculate quality-adjusted journal output. The full descriptions for each scheme are in Gibson *et al*. (2014), with their brief details as follows:

- Mason, Steagall and Fabritius: [MSF] reputational weights for 142 journals from a survey of economics department chairs. This is the least discriminating in down-weighting lower ranked journals but excludes many journals.
- Coomes and Linnemer: [CLm, CLh] is the most comprehensive, covering 1168 journals by using a *Google Scholar h*-index to extrapolate from citations for *EconLit* journals to all journals. They use two different rates of down-weighting lower ranked journals, with their medium variant (CLm) the second least discriminating, and their high variant (CLh) the fifth most discriminating of the nine schemes used here.
- RePEc is an impact factor from unweighted citations, covering 984 journals (when we collected these in May 2012), and is the fourth least discriminating of the nine schemes.
- Coupé is an average of 2-year impact factors for 1994-2000 from the *Journal Citation Reports* for 273 journals; this is the third least discriminating of the nine schemes.
- Kodrzycki and Yu: [K&Y_all, K&Y_econ] is an 'eigenfactor' approach where a journal is deemed influential if cited often by other influential journals. Sub-discipline citing intensity is adjusted for, with cites from all social science journals [K&Y_all] and just from economics [K&Y_econ]. These are the third and fourth most discriminating in down-weighting lower ranked journals.
- Kalaitzidakis, Mamuneas and Stengos: [KMS] is an eigenfactor approach, using the average of citations each year from 2003-2008 to articles published in the previous 10 years. This is the second most discriminating scheme, and ranks 209 journals.
- Laband and Piette: [LP] is an eigenfactor approach using citations to articles in journals from 1985-89 by articles published in 1990. This is the least permissive, covering just 130 journals, and is the most discriminating in down-weighting lower ranked journals.

Using each of these sets of weights (which include zero for unranked journals) the pages for each article published by sample members are multiplied by the quality weight, with an adjustment for the number of authors and for the size of the typical page in that journal relative to the size of a page in the *American Economic Review* (*AER*) which we use as our numeraire:

$$Article\ Pages \times Size\ Correction \times \left(1/number\ of\ authors\right) \times Journal\ Assessment\ Weight.$$

With these data available there are several different ways that research output can be considered along quantity and quality dimensions. One approach is to consider the lifetime sum of quality-weighted, size-adjusted, and co-author-adjusted pages as an overall measure of quality-adjusted research output. If one then conditions on a quantity-oriented measure in the salary equations, by including the lifetime count of journal articles published, then conditional on that total, the quality-adjusted journal output measure should mainly capture the quality dimension of research, particularly if using the most discriminating journal weights.[6]

Another approach is to think of quality as simply augmenting quantity; for example, the median journal weighting scheme that we use puts a weight on the *American Journal of Agricultural Economics* (*AJAE*) that is three times the weight on the *Australian Journal of Agricultural and Resource Economics* (*AJARE*). Thus one could think of an academic who publishes only in the *AJAE* as effectively publishing three times as much as one who published the same number of articles (or size-adjusted per capita pages) in the *AJARE*. Under this decomposition, a measure of research quality can be derived by subtracting the total number of size-adjusted pages (with no weight for quality, so this is a pure quantity measure) from the total number of quality-adjusted pages. In other words, quality could be defined as the additional

[6] Gibson (2014) finds that salary of economists at the University of California is affected by both their lifetime quality-adjusted pages published in journals and the count of journal articles. These are two separate dimensions of the evaluation of research productivity even though most studies just use one or the other measure.

journal pages that effectively are produced by publishing in journals whose quality weights exceed the weights given to the lowest ranked (or unranked) journals.[7]

One concern with both of these approaches is that the nine sets of journal weights mainly have an economics focus so they may not seem like a ‘fair’ basis for assessing research quality of agricultural economists. While some agricultural economics journals, such as *Agricultural Economics* or the *Canadian Journal of Agricultural Economics*, are omitted by a couple of the weighting schemes (so implicitly get a zero weight) others such as the *AJAE* and the *AJARE* are included in all nine sets of weights. On average, the weight given to the *AJAE* is 15 percent of the weight given to the top ranked journal (which is either the *AER* or the *Quarterly Journal of Economics*) while the average weight for *AJARE* is six percent of that for the top ranked journal. If we were to increase these weights, under the argument that publishing in the leading journal in agricultural economics should be, for an agricultural economist, the same as for an economist publishing in the leading journal(s) in economics, it would be to tantamount to assuming the results that we want to estimate, and also would be inconsistent with the existing evidence on journal impacts. For example, Hilmer et al (2012) find that there is no impact on salary for economists publishing in agricultural economics journals. Moreover, even if these weights were felt to be ‘too low’ and therefore predispose us to finding a lower return to research quality for agricultural economists than for economists, there is no reason for the same potential bias to occur when we use citations to measure research quality since it is unclear why the citations database – *Web of Science* – would favor one discipline over another.

The summary statistics for the total counts of articles and of adjusted pages, and the various measures of quality-adjusted journal output are in Table 2. The agricultural economists

[7] Complications arise from the fact that the journal weighting schemes omit many journals. Our treatment of these complications is described in Section 4.

had an average of 25 articles published in the career to the end of 2013 and these yield a total of 129 *AER*-sized journal pages after adjusting for the number of co-authors. When this output is weighted according to the nine sets of journal quality weights, it ranges from an average of just 1.4 pages with LP weights (which are the most discriminating in down-weighting lower ranked journals) to 39.3 pages using MSF weights (the least discriminating). In contrast, while the economists had published fewer articles (an average of 21), these amounted to 178 size-adjusted per capita journal pages. This is higher than for the agricultural economists, who co-authored more; the average article by agricultural economists had three authors while the average article by the economists had just two authors. In terms of quality adjusted journal output, the average economist had produced from 31 pages using LP weights all the way up to 109 pages if using the least discriminating MSF weights. Based on these averages, the quality-adjusted per capita research output of the economists might be three times that of the agricultural economists, if using the less discriminating journal weights, but could be as high as 10-20 times that of the agricultural economists if using the most discriminating weights.

The lifetime citations to these articles for each agricultural economist average 380, and for economists they average 650. Since citations are highly skewed, a better comparison may be in terms of the medians; the median agricultural economist has 153 *Web of Science* citations across all of their articles while the median economist has 273 citations. Although most metrics show the economists having more citations, the most-cited academic in the sample, with just over 10,000 career citations, happens to be from an agricultural economics department. If attention is paid to the single most cited article published by each academic, for the agricultural economists this averages 75 citations (the median and maximum are 37 and 1260) and for the economists it averages 187 (with a median of 73 and a maximum of 3850).[8]

The average *h*-index is 8 for the agricultural economists and 9 for the economists; recall that this index gives the count of articles starting from the most cited and ending with the last article whose citations are more than that count. The generalized *h*-index proposed by Ellison (2013) as a better predictor of labor market outcomes in economics averages just 1.8 for the agricultural economists and 2.2 for the economists. This $h_{(a,b)}$ index is defined such that one has *h* articles each cited ah^b times, and we use $h_{(5,2)}$ because Ellison estimates a=5 and b=2 from a sample of economists from top-50 departments who average 22 years post-PhD (which is about the same level of experience as the current sample).[9] The citations measures indicate less of a productivity advantage for the economists over the agricultural economists compared to what the quality-adjusted journal output measures indicate. This is partly because the citations measures are not calculated on a per capita basis (so the greater co-authorship by agricultural economists is not penalized). The existing evidence is that the labor market does not discount citations for co-authorship (Hilmer, Ransom and Hilmer, 2015), in contrast to the co-author discounting of articles where the "1/n rule" cannot be rejected (Gibson et al, 2014).[10]

4. Results

In order to compare the returns to research quantity and quality for agricultural economists with those for economists we need well-specified earnings equations to use as the testing ground. In

[8] These citation numbers may seem low to many readers more familiar with *Google Scholar* citations. Hamermesh (2015) shows that for a sample of younger faculty from top-30 economics departments who have *Google Scholar* profiles, their citations in *Web of Science* increase at a rate of just 17.3 per 100 citations in *Google Scholar*. In other words, *Google Scholar* citations may be about six times as high as *Web of Science* citations for the same people.
[9] Ellison fitted this generalized *h*-index using *Google Scholar*, and it is not clear that one would put such a high weight on a few highly cited papers if using WoS citations.
[10] This empirical evidence guides the specification of our study, notwithstanding the strong normative arguments of Liebowitz (2014) in favor of a "1/n rule" for measuring production of journal articles, journal pages, and citations.

recent studies that use similar salary and productivity data from other university systems, particularly the University of California, the effects of seniority and experience on log salary are found to be best modeled as quadratics, there is some evidence of a salary premium for males, and the location fixed effects are found to be highly significant (Gibson, 2014; Gibson et al, 2014). These location effects capture not only cost of living differences but also university reputational effects, and other amenities.[11]

When the same variables from these previous studies are used here, their effects on the logarithm of salary are similar for the samples of agricultural economists and of economists, in unreported initial equations that were estimated without yet including any research productivity variables.[12] While the agricultural economists have a slightly smaller salary premium for males, and a slightly flatter pattern of salary increase with respect to experience, neither of these nor any of the other interaction effects were statistically significant in a model that pooled the two samples. Therefore in testing for disciplinary differences in the returns to research quality and research quantity we use regressions where the other covariates (experience, seniority, gender, and location) are constrained to have the same effects on salary for the two samples. These regressions include the *AgEcon* intercept dummy to account for the lower average salary of the agricultural economists and that dummy is interacted with each of the research productivity measures in order to allow a test of the hypothesis of disciplinary differences in the reward structures for research.

[11] The literature that estimates earnings functions for academic economists covers many of these patterns in greater depth and is recently reviewed in Hamermesh and Pfann (2012).

[12] Research productivity can be measured with the count of lifetime journal articles, the quality-weighted adjusted sum of the pages in those articles, and the citations to those articles. These measures are quite collinear; for example, the correlation between lifetime citations and adjusted journal pages ranges from 0.53 to 0.67 depending on the quality weights used. We therefore prefer to make specification choices over other parts of the model, which are of less interest, before settling on the particular research productivity measures used to compare the rewards for research quantity and research quality for agricultural economists with economists.

Our first approach to this testing is to include the lifetime count of published journal articles in the salary regressions, as a quantity-oriented measure, and to then test whether, conditional on that total, salary returns to quality-adjusted journal output differ between agricultural economists and economists. Since quantity is already controlled for, quality-adjusted journal output should mainly capture the quality dimension of research. The results are reported in Table 3, with each column representing a separate regression where a different set of journal weights is used to construct the quality-adjusted research measure. Although our interest is not in the demographic effects, the coefficients on these variables are also reported but for reasons of space we do not report the coefficients on the location effects.[13]

There is clear evidence of a lower return to quality-adjusted research output for the agricultural economists. In all nine salary equations, the interaction of the quality variable with the dummy variable for the agricultural economics departments is negatively signed and statistically significant at the one percent level (or at the five percent level, if using LP weights). Since the dependent variable is in logarithms, and the level effect of lower average annual salaries in agricultural economics departments is already controlled for, we can interpret this result as showing that there is a smaller proportionate increase in salary from an increase in the output of quality-adjusted research, conditional on the total number of articles published, for the agricultural economists than for the economists.

This significantly lower payoff is in terms of the research dimension that seems to matter most to academic salary. The quality-adjusted (and size-adjusted and co-author-adjusted) career journal pages published to the end of 2013 are statistically significant determinants of salary at

[13] These were largest for Wisconsin, where conditional salaries were about 20 percent higher than the reference category (Illinois), and Purdue where they were about 15 percent higher. For the other universities the location effects were statistically insignificant.

the one percent level in eight equations and at the five percent level in the other (using the MSF weights, which are the least discriminating). In contrast, the count of journal articles is statistically significant in only six of the earnings equations (two at the five percent level). Moreover, in standardized terms the magnitude of the coefficient on the article counts is just one-half of the magnitude of the coefficient on quality-adjusted journal output.

In addition to the clear evidence that the agricultural economists face a lower return to quality-adjusted research output there is some evidence that they may face a higher return to the quantity of research outputs. In three of the salary equations, using the CLm, RePEC, and Coupé journal weights, the interaction term from crossing the dummy variable for agricultural economics departments with the number of journal articles published is positive and statistically significant (at the ten percent level). In terms of magnitudes, in economics departments an extra article, conditional on the total stock of quality-adjusted pages, leads to a three to four percent higher salary but in agricultural economics departments an extra article raises salary by five to six percent. Since this effect holds constant the quality-adjusted stock of total research output it represents the return to restructuring a publication portfolio in a more quantity-oriented way by publishing more articles. In other words, two academics may have the same quality-adjusted research output where one publishes more articles either by publishing in journals of the same average quality but writing shorter (or more multi-authored) articles, or else by writing articles of the same length but publishing them in lower weighted journals so that they are effectively shorter in quality-weighted terms.[14] This approach could be described as making many small research contributions rather than fewer but heftier ones.

[14] Gibson (2014) refers to this effect of the number of articles being a significant determinant of salary even when the stock of quality-adjusted journal pages is held constant as “article illusion” since it results in a longer curriculum vitae from the same impact on the literature and thus gives the illusion of a more substantial research record than is actually the case. This effect can also be considered as ‘idea splitting’ and using a ‘least publishable unit’ strategy.

Although not our main focus, here we briefly comment on results for the other variables in Table 3. Conditional on overall years of experience and the salary premium from being more experienced, academic salaries fall the longer one spends at the current university (which is here called *Seniority*), at a diminishing rate that turns after 37 years; this is a widely reported pattern in the literature that is discussed in detail in Ransom (1993). On the other hand, conditional on seniority, salary rises with overall experience, which is measured by the years since the PhD, at a diminishing rate with a profile that peaks at 35 years. The last pattern amongst the demographic variables is that, conditional on experience and seniority, and on location in terms of the department and university where employed, and also holding constant the various measures of research productivity, there appears to be a salary premium for male academics of about ten percent and this is statistically significant at the one percent level in all nine equations.

Finally, the level effect of being in an agricultural economics department is that someone with the sample mean demographic characteristics and research record in terms of the number of articles and the quality-weighted journal output, would expect their salary to be from $36,000 to $71,000 lower than the equivalent person located in an economics department of the same university. This salary penalty for the agricultural economists varies with each of the journal weighting schemes and also varies across the universities. The estimated penalty is always smallest at Purdue, where it ranges from $35,000 using RePEc weights to $41,000 using MSF weights, and is always largest at Wisconsin where it varies from $45,000 (using RePEc) to $71,000 (using LP weights). The simple average of this salary penalty over the six universities ranges from $45,000 using RePEc weights to $53,000 using LP weights.[15]

[15] Since the models are semi-logarithmic, Duan's (1983) smearing estimator is used to calculate predicted salary in dollar terms for these comparisons. It may seem surprising that the conditional salary gap is similar to the raw gap, given the much lower quality-adjusted research output of the agricultural economists shown in Table 2. The reason is that the payment structure in agricultural economics only weakly rewards (or penalizes low) research quality.

The approach used in Table 3, of considering the count of articles as a quantity measure, is not the only way to decompose research output into quantity and quality dimensions. Consider someone who is totally unaware of the rankings or prestige of the various journals; such a person might consider 100 pages in the *AJARE* to be the same as 100 pages in the *AJAE* and the same as 100 pages in the *AER* (leaving aside the adjustments for physical size of pages in each journal). Thus a pure quantity measure of research output can be formed by working with the lifetime sum of per capita *unweighted* journal pages, which effectively says that 'all journals are equal'. To measure research quality one could subtract this sum from the quality-weighted sum of journal pages, which gives a non-negative measure of quality since a page in a higher ranked journal is equivalent to (much) more than one page in a lower ranked journal. The issue in implementing this is that none of the journal weighting schemes cover the entire universe of journals so assumptions have to be made about how to incorporate the excluded journals.

To deal with the excluded journals our first approach was to give all of them the weight of the lowest non-zero weighted journal in each of the nine journal weighting schemes. We then made all weights relative to that lowest value, by dividing by it; in some cases this resulted in very large values (e.g. a weight of 10000 given to the *AER* under the rebased KMS weights). The results using this approach are reported in Panel A of Table 4, and they support the patterns seen in Table 3. Specifically, there is a statistically significantly higher return to research quantity for agricultural economists than for economists in five of the salary equations, and a significantly lower return to quality for agricultural economists compared with economists in all nine of the equations. The hypothesis that these interaction terms for disciplinary differences in rewards to research are jointly zero is soundly rejected (at the one percent level in six of the equations and at the five percent level in the other three).

The second approach to dealing with the excluded journals is one that also limits the range of scales used by the different weighting schemes. We re-index the weights by giving the top-ranked journal an index weight of 100 and then add one to the weight for all journals, including the excluded journals who were implicitly given a weight of zero in the original weighting scheme. Thus, the range of transformed weights vary over the interval from 1 to 101. The results using this approach are in Panel B of Table 4, and they also are very supportive of the patterns seen in Table 3. There are five equations that have positive and statistically significant Quantity × Ag Econ interaction terms and all nine equations have negative and statistically significant Quality × Ag Econ interaction terms. Thus, if quality is defined as augmented quantity, the evidence again points to a different reward structure in agricultural economics, with much smaller returns to research quality than those experienced by economists. Conversely, there appear to be somewhat larger returns to the quantity of research outputs for agricultural economists (at least when using some of the journal weighting schemes).

4.1 Using Citations to Measure Research Quality

The literature on salaries of academic economists typically uses counts of articles, possibly in tiers of journals, and citation-based metrics to represent research quality (Hamermesh and Pfann, 2012). Several different citations metrics are used, including total citations, citations to the most cited article, and increasingly the *h*-index of Hirsch (2005) and generalized forms of the *h*-index that put more weight on a few highly cited articles. For economists of similar experience to the sample studied here, Ellison (2013) finds that an $h_{(5,2)}$ index, defined such that one has *h* articles each cited $5h^2$ times, does best at explaining academic labor market outcomes.

We start by using these four citations metrics in separate models of academic salary that initially do not include any other indicators of research productivity (but which do control for location and demographics). The aim is to find the best-fitting citations metric, without other correlated measures of research output interfering with the comparison. The chosen citations metric will then be used in models that are extensions to those in Table 3 to see if the conclusion of a lower return to research quality for agricultural economists than for economists is also found when using citations as a measure of research quality.

A model with total citations (in thousands) to the journal articles published up until the end of 2013 is reported in column (1) of Table 5. The salary of economists is 11 percent higher for every 1000 citations. For agricultural economists salary is just five percent higher from the same number of citations (the six point gap percent is statistically significant at the one percent level). If the share of citations to the most cited article is included in the model, there appears to be a penalty for having citations concentrated on just one article and that penalty is larger for agricultural economists (and the gap in their return to total citations versus what economists get also rises). The salary regressions in columns (3) and (4) use a (generalized) *h*-index as another way to get at the distribution of citations. For the economists, salary rises by 2.5 percent for every one point increase in the *h*-index (the mean is nine so the average economist had published nine articles that each had at least nine citations). For the agricultural economists, salary rises by just 1.5 percent for every one point increase in their *h*-index, and the gap in the returns compared with what economists get is statistically significant (t=3.26). The same pattern, of a lower return to citations for the agricultural economists, is observed using the $h_{(5,2)}$ index; contrary to Ellison (2013) the original *h*-index is a better predictor of salary than is the generalized form.[16]

In columns (5) to (8) of Table 5 the models with the four different citations metrics are augmented by including the count of journal articles, to make them somewhat analogous to the

[16] Model selection tests using Akaike's Information Criterion (AIC) support the column (3) model using the *h*-index amongst the four models in columns (1) to (4) of Table 5.

models in Table 3 with a pure quantity component, but with quality measured by citations rather than by quality-adjusted journal output. Including the article counts does not alter the finding that agricultural economists get a significantly smaller percentage boost in salary than do economists from total citations or from a higher (generalized) *h*-index. The model using the original *h*-index (in column (7)) provides the best-fitting equation and this model continues to reveal a significant (t=3.27) lower payoff to having a higher *h*-index for agricultural economists than for economists. This model in column (7) also shows a positive payoff to the number of articles for agricultural economists, whose salary rises by over four percent per article, compared to economists who have no return to the number of articles conditional on their *h*-index for citations.

Our final set of estimates combine article counts, quality-adjusted journal output, and the *h*-index for citations (Table 6). For all nine equations, with the different journal weights, the regression models indicate that the agricultural economists get a significantly lower return to quality-weighted journal output and to the *h*-index for citations, and a higher return to the number of journal articles, compared to the returns that economists get. The joint test of zero terms on the three interaction variables, for the number of articles, the quality-adjusted journal output, and the *h*-index, is statistically significant at the one percent level in eight equations and at the five percent level in the last equation. These results in Table 6 provide very clear evidence of significant differences in the returns to research quantity and quality for academics in agricultural economics departments compared to those in economics departments.

5. Discussion and Conclusions

The results reported here add to the small literature that examines differences in the rewards for research in the closely related disciplines of agricultural economics and economics. We build on the existing evidence from Hilmer et al (2012) by using more comprehensive data. The salary of economists is found to vary with quality-adjusted lifetime output in refereed journals (using nine different sets of journal weights), and with citations (using four different metrics). In contrast, agricultural economists have significantly lower returns to these indicators of research quality and face salary structures that vary more according to how many times their research output appears in refereed journals.

Our evidence is from a relatively small sample of large, well-regarded, public universities in nearby states. Thus, the findings may not extend to other types of universities. However, the somewhat homogeneous (and balanced) sample, and the comprehensive data on aspects of research quality provide well-fitting models that explain about 70% of wage variation.[17] Thus our salary regressions should provide a good testing ground for comparing the rewards for research quantity and quality in agricultural economics departments with those in economics departments without too much risk of bias due to omitted variables.

These data take more effort to gather than just counting articles in a few tiers of journals, so discussing the additional insights gained is appropriate. A problem with counting articles is that counts do not determine the salary of economists in the current sample, even when using the six tiers of journals used by Hilmer et al (2012): the first tier was top five economics journals; the second tier was other 31 journals listed by Scott and Mitias (1996); the third tier was other economics journals; the fourth tier was four core journals in agricultural economics; the fifth tier was seven regional journals in agricultural economics; and the last tier was other agricultural economics journals. If counts of articles in these six tiers of journals are included in salary regressions for our economist sub-sample, along with the *h*-index and quality-weighted journal output, the hypothesis that the coefficients on the count variables are jointly zero is never

[17] In contrast, Hilmer et al (2012) explain 55-64 percent of salary variation with their most comprehensive models.

rejected (the *p*-values range from 0.102 to 0.288 across the equations based on each of the nine sets of quality weights, with an average *p*-value of 0.19). In contrast, journal quality and citations are always jointly significant with *p*-values that range from 0.005 to 0.015 (and average 0.009).

While agricultural economists do appear to be paid according to the count of articles they have published, in the current sample there is no benefit of disaggregating that count by journal tiers. Specifically, if the total count of journal articles is used in a salary equation for agricultural economists then adding counts for five of the six journal tiers (with one excluded to avoid perfect multicollinearity with the total counts) provides no additional explanatory power. The hypothesis that article counts in the five journal tiers can be excluded from the model is not rejected (p=0.59). In other words, at the universities studied here, pay for agricultural economists varies on a simple count of articles while for economists it varies with citations and with quality-weighted journal output and counts of articles have no predictive power. Thus, there are very different compensation regimes for the research produced by two closely related disciplines.

Where do these differences in the reward structure come from? In all six universities studied here, the agricultural economics department is in a separate College from the economics department. While economics is usually in a College of Arts and Sciences, or Liberal Arts or Social Sciences (only at Purdue is economics in a management school), agricultural economics is always in a College of Agriculture or of Agriculture and Natural Resources or the Environment. The other departments in the colleges where agricultural economics is located will be staffed by scientists, who tend to write short papers with lots of authors and, as a result, tend to quickly generate a long curriculum vitae. This is not a conducive environment for adopting research norms from economics, which prioritize a few articles in highly ranked journals. If decisions about salary advancement have to get past college-level gatekeepers, who may not know the difference between the *AER* and the *AJAE* and who may just count articles, a quantity-oriented publication strategy may be sensible. In contrast, economists may claim that the rigor of their research, and the value of their outside non-academic options, justifies much higher rewards for research than those offered in other social sciences within their colleges.

If agricultural economics and economics were unrelated disciplines, the very distinctive reward structures for research might be interesting but need not cause any practical concern. In fact the disciplinary boundary is very permeable, in one direction, with a flow of PhD graduates from economics programs into agricultural economics departments. In the current sample, almost one-third of the faculty in the agricultural economics departments had a PhD from an economics department, with a higher share for younger faculty. Since the reward structure for research differs so greatly between economics and agricultural economics, if younger agricultural economics faculty with doctoral training in economics bring with them the publishing norms from economics, they may become frustrated by the muted returns to research quality that agricultural economics departments seem to offer.

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Table 1: Average Salaries and Demographic Characteristics

	Agricultural Economics		Economics	
	Mean	Std Dev	Mean	Std Dev
Academic Salary				
Illinois	116543	25568	167561	42578
Michigan State	128753	35738	161366	52877
Minnesota	120211	32515	236144	87203
Ohio State	123701	30240	164310	66234
Purdue	136701	33377	172412	57470
Wisconsin	141252	25910	219257	86655
Average for all six universities	128588	32135	182886	70792
Demographic characteristics				
Experience	21.08	11.17	20.33	12.66
Seniority	16.64	11.17	14.18	11.01
Male	0.799	0.402	0.853	0.355
PhD is in Economics	0.302	0.461	0.967	0.180

Notes: The salary values are for 2013. N=149 agricultural economists and N=150 economists.

Table 2: Summary Statistics for Indicators of Research Quantity and Quality

Variable	*Economists* Mean	*Economists* Std Dev	*Agricultural Economists* Mean	*Agricultural Economists* Std Dev	Description
Number of articles	20.97	20.96	25.34	22.86	Career articles (in EconLit, RePEc, or Web of Science)
Number of pages	178.32	173.32	129.23	134.99	Size-adjusted and co-author-adjusted pages from articles published in career
Citations to articles	648.29	1146.61	376.86	897.82	Total WoS citations to those articles to end of 2013
Cites to most-cited	176.45	422.20	75.5	132.55	Total WoS citations to the most cited article
h-index	8.70	7.41	7.85	6.14	Academic has *h* articles with *h* or more citations
$H_{(5,2)}$-index	2.17	1.47	1.78	1.13	Generalized h-index; *h* articles with $5h^2$ citations
Quality-weighted, size-adjusted and co-author-adjusted journal output using journal weights from:[a]					
MSF	109.36	113.91	39.33	54.68	Mason, Steagall and Fabritius reputational ranking
CLm	85.42	88.98	24.22	30.14	Combes-Linnemer medium convexity weights
CLh	57.54	62.58	7.99	11.67	Combes-Linnemer high convexity weights
RePEc	48.41	51.96	10.56	15.89	RePEc Simple Impact Factor
Coupé	29.72	30.80	10.25	13.58	Average of 2-year impact factors for 1994-2000
K&Y_all	29.11	33.20	3.08	6.63	Kodrzycki and Yu eigenfactor ranks, cites from all journals
K&Y_econ	27.12	30.74	2.89	6.20	Kodrzycki and Yu ranks, cites just from econ journals
KMS	30.35	31.65	2.92	6.21	Kalaitzidakis, Mamuneas and Stengos eigenfactor weights
LP	31.30	36.25	1.41	3.55	Laband and Piette eigenfactor weights

Notes: The statistics are for articles (with pagination) produced over the career until the end of 2013. *N*=149 for agricultural economists and *N*=150 for economists.

[a] The journal weights are in their raw format, which differ in terms of the maximum and minimum values, and also their variability, with the coefficient of variation of the weights across journals ranging from 1.6 to 5.7.

Table 3: Salary Regressions With Article Counts and Quality-Adjusted Journal Output

	Journal Weighting Scheme for Calculating Quality-Adjusted Journal Output Over Lifetime Comes From:								
	MSF	CLm	CLh	RePEc	Coupé	K&Y_all	K&Y_econ	KMS	LP
Seniority (years)	-0.021	-0.022	-0.022	-0.023	-0.022	-0.023	-0.023	-0.022	-0.022
	(3.87)**	(4.32)**	(4.38)**	(4.48)**	(4.21)**	(4.46)**	(4.49)**	(4.35)**	(4.25)**
Seniority squared (÷100)	0.023	0.029	0.029	0.031	0.028	0.030	0.031	0.030	0.027
	(1.77)+	(2.21)*	(2.25)*	(2.43)*	(2.22)*	(2.33)*	(2.39)*	(2.30)*	(2.13)*
Experience (years)	0.032	0.033	0.033	0.033	0.033	0.034	0.034	0.033	0.033
	(6.22)**	(6.52)**	(6.77)**	(6.74)**	(6.60)**	(6.93)**	(6.93)**	(6.90)**	(6.83)**
Experience squared (÷100)	-0.044	-0.045	-0.046	-0.047	-0.047	-0.048	-0.048	-0.048	-0.046
	(3.79)**	(4.03)**	(4.24)**	(4.36)**	(4.34)**	(4.50)**	(4.52)**	(4.43)**	(4.32)**
Male	0.101	0.095	0.093	0.093	0.097	0.094	0.094	0.091	0.093
	(3.94)**	(3.76)**	(3.65)**	(3.71)**	(3.87)**	(3.68)**	(3.69)**	(3.56)**	(3.55)**
Ag Econ intercept dummy	-0.248	-0.240	-0.235	-0.237	-0.236	-0.235	-0.234	-0.224	-0.230
	(7.46)**	(7.20)**	(7.33)**	(7.35)**	(7.33)**	(7.39)**	(7.39)**	(7.30)**	(7.31)**
Number of journal articles	0.038	0.025	0.032	0.025	0.025	0.042	0.041	0.037	0.044
	(2.14)*	(1.40)	(2.18)*	(1.61)	(1.57)	(3.07)**	(3.01)**	(2.86)**	(3.20)**
Number × Ag Econ	0.023	0.036	0.022	0.028	0.030	0.007	0.009	0.013	0.003
	(1.12)	(1.79)+	(1.40)	(1.67)+	(1.68)+	(0.50)	(0.63)	(0.94)	(0.22)
Quality-adjusted pages	0.009	0.016	0.021	0.029	0.047	0.036	0.040	0.041	0.033
	(2.24)*	(3.03)**	(4.07)**	(4.21)**	(4.18)**	(3.76)**	(4.17)**	(5.04)**	(4.30)**
Quality × Ag Econ	-0.019	-0.033	-0.053	-0.048	-0.071	-0.072	-0.080	-0.087	-0.090
	(3.49)**	(3.64)**	(3.24)**	(3.54)**	(3.82)**	(3.06)**	(3.12)**	(3.12)**	(2.31)*
R^2	0.674	0.683	0.687	0.690	0.685	0.685	0.687	0.688	0.686
F-test (interactions=0)	12.01**	7.84**	5.32**	6.57**	8.46**	5.04**	5.13**	4.91**	2.73+

Note: The dependent variable is ln (salary). The intercept and fixed effects for each university (with Illinois as the base category) are not reported. *N*=299, robust *t* statistics in parentheses, + significant at 10%, * significant at 5%, ** significant at 1%. The *F*-test of interactions is for the null hypothesis that the coefficients on Number × Ag Econ and Quality × Ag Econ are jointly zero but does not test that the Ag Econ intercept dummy is zero.

Table 4: Salary Regressions With Alternative Quality-Quantity Decompositions of Research Output

	Journal Weighting Scheme for Calculating Quality-Adjusted Journal Output Over Lifetime Comes From:								
	MSF	CLm	CLh	RePEc	Coupé	K&Y_all	K&Y_econ	KMS	LP
	A. Excluded journals are given the lowest non-zero weight, and indexed as lowest=1								
Ag Econ intercept dummy	-0.235	-0.221	-0.213	-0.219	-0.215	-0.215	-0.214	-0.197	-0.206
	(6.22)**	(5.86)**	(5.82)**	(6.14)**	(6.17)**	(6.12)**	(6.13)**	(5.82)**	(5.90)**
Quantity (unweighted pages)	0.622	-0.698	2.069	-0.118	0.454	3.918	3.627	3.688	4.314
	(0.20)	(0.27)	(0.96)	(0.05)	(0.18)	(1.91)+	(1.79)+	(2.02)*	(2.25)*
Quantity × Ag Econ	11.723	9.229	5.626	7.608	6.898	3.024	3.407	3.451	1.957
	(3.11)**	(2.63)**	(2.13)*	(2.70)**	(2.38)*	(1.32)	(1.50)	(1.59)	(0.94)
Quality (weight-unweight)	8.796	1.049	0.050	0.022	1.000	0.004	0.004	0.002	0.032
	(2.49)*	(4.09)**	(4.35)**	(4.71)**	(4.35)**	(3.20)**	(3.60)**	(4.40)**	(3.83)**
Quality × Ag Econ	-23.501	-1.939	-0.122	-0.033	-1.395	-0.008	-0.009	-0.004	-0.105
	(4.37)**	(2.82)**	(2.68)**	(4.07)**	(3.94)**	(3.75)**	(3.83)**	(3.13)**	(2.57)*
R^2	0.663	0.666	0.669	0.673	0.668	0.666	0.667	0.672	0.667
F-test (interactions=0)	10.84**	4.10*	3.69*	8.36**	8.51**	7.48**	7.63**	4.91**	3.31*
	B. Weights are indexed as top ranked journal = 100, and index +1 is used so as to include all journals								
Ag Econ intercept dummy	-0.236	-0.222	-0.213	-0.219	-0.215	-0.215	-0.214	-0.197	-0.207
	(6.36)**	(5.89)**	(5.82)**	(6.14)**	(6.17)**	(6.12)**	(6.13)**	(5.82)**	(5.90)**
Quantity (unweighted pages)	0.023	-0.014	0.020	-0.001	-0.001	0.039	0.036	0.037	0.043
	(0.63)	(0.51)	(0.94)	(0.05)	(0.03)	(1.91)+	(1.79)+	(2.01)*	(2.23)*
Quantity × Ag Econ	0.109	0.111	0.057	0.076	0.078	0.030	0.034	0.035	0.020
	(2.52)*	(2.80)**	(2.15)*	(2.71)**	(2.54)*	(1.32)	(1.50)	(1.59)	(0.96)
Quality (weight-unweight)	0.001	0.002	0.002	0.004	0.006	0.004	0.004	0.004	0.003
	(1.68)+	(4.01)**	(4.35)**	(4.71)**	(4.29)**	(3.20)**	(3.60)**	(4.40)**	(3.83)**
Quality × Ag Econ	-0.003	-0.004	-0.006	-0.006	-0.008	-0.008	-0.009	-0.010	-0.011
	(3.74)**	(2.99)**	(2.70)**	(4.07)**	(3.96)**	(3.75)**	(3.83)**	(3.13)**	(2.58)*
R^2	0.657	0.666	0.669	0.673	0.667	0.666	0.667	0.672	0.667
F-test (interactions=0)	9.96**	4.55*	3.72*	8.36**	8.56**	7.48**	7.63**	4.91**	3.34*

Note: The dependent variable is ln (salary), each regression also has quadratics in experience and seniority, a dummy variable for males, and fixed effects for each university. *N*=299, robust *t* statistics in parentheses, + significant at 10%, * significant at 5%, ** significant at 1%. The *F*-test of interactions is for the null hypothesis that the coefficients on Quantity × Ag Econ and Quality × Ag Econ are jointly zero but does not test that the Ag Econ intercept dummy is zero.

Table 5: Academic Salary Regressions With Various Citations Metrics Used to Measure Research Quality

	Only using citations measures				Including the number of articles			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ag Econ intercept dummy	-0.252	-0.201	-0.219	-0.183	-0.275	-0.222	-0.206	-0.176
	(8.76)**	(4.38)**	(6.36)**	(4.90)**	(8.21)**	(4.18)**	(6.18)**	(4.61)**
Career total citations (÷1000)	0.112	0.112			0.064	0.068		
	(6.49)**	(6.75)**			(2.88)**	(3.01)**		
Total citations × Ag Econ	-0.064	-0.076			-0.078	-0.076		
	(2.80)**	(3.89)**			(2.95)**	(2.85)**		
Share of citations to most cited article		-0.133				-0.072		
		(2.45)*				(1.46)		
Share of most cited × Ag Econ		-0.174				-0.131		
		(1.89)+				(1.42)		
h-index (has *h* articles with ≥ *h* citations)			0.025				0.026	
			(10.22)**				(4.27)**	
h-index × Ag Econ			-0.010				-0.025	
			(3.26)**				(3.27)**	
$H_{(5,2)}$ index: *h* articles with $5h^2$ citations				0.112				0.078
				(9.03)**				(3.90)**
$H_{(5,2)}$ index × Ag Econ				-0.047				-0.072
				(2.86)**				(2.51)*
Number of journal articles					0.049	0.044	-0.001	0.041
					(3.13)**	(2.78)**	(0.03)	(2.82)**
Number × Ag Econ					-0.004	-0.009	0.045	0.003
					(0.25)	(0.54)	(1.74)+	(0.16)
R^2	0.635	0.654	0.671	0.645	0.667	0.673	0.681	0.675
F-test (interactions=0)	7.84**	8.12**	10.62**	8.20**	13.81**	10.46**	11.14**	8.60**

Note: The dependent variable is ln (salary) and each regression also has quadratics in experience and seniority, a dummy variable for males, the proportion of articles not in WoS, and fixed effects for each university. N=299, robust t statistics in parentheses, + significant at 10%, * significant at 5%, ** significant at 1%. The F-test of interactions in columns (1) to (4) is for the null hypothesis that the coefficients on the citations measure(s) × Ag Econ are zero and in columns (5) to (8) it further includes a test of the coefficient on Number × Ag Econ being zero. The F-test does not test that the Ag Econ intercept dummy is zero.

Table 6: Salary Regressions With Article Counts, Quality-Adjusted Journal Output, and the *h*-index for Lifetime Citations

	Journal Weighting Scheme for Calculating Quality-Adjusted Journal Output Over Lifetime Comes From:								
	MSF	CLm	CLh	RePEc	Coupé	K&Y_all	K&Y_econ	KMS	LP
Ag Econ intercept dummy	-0.206	-0.209	-0.210	-0.215	-0.215	-0.211	-0.211	-0.202	-0.207
	(5.88)**	(6.14)**	(6.29)**	(6.42)**	(6.38)**	(6.34)**	(6.35)**	(6.14)**	(6.29)**
Number of journal articles	-0.010	-0.018	-0.008	-0.009	-0.007	-0.002	-0.001	-0.005	0.001
	(0.41)	(0.75)	(0.36)	(0.41)	(0.31)	(0.09)	(0.06)	(0.22)	(0.05)
Number × Ag Econ	0.076	0.079	0.062	0.062	0.060	0.050	0.050	0.053	0.045
	(2.77)**	(2.85)**	(2.37)*	(2.38)*	(2.32)*	(1.93)+	(1.93)+	(2.09)*	(1.73)+
Quality-adjusted journal output	0.005	0.012	0.016	0.022	0.033	0.026	0.030	0.031	0.024
	(1.81)+	(2.60)**	(3.16)**	(3.22)**	(2.88)**	(2.94)**	(3.22)**	(3.34)**	(3.13)**
Quality × Ag Econ	-0.015	-0.028	-0.047	-0.041	-0.056	-0.063	-0.070	-0.076	-0.082
	(3.08)**	(3.13)**	(2.85)**	(3.04)**	(2.99)**	(2.70)**	(2.76)**	(2.68)**	(2.06)*
h-index for citations	0.022	0.019	0.018	0.016	0.016	0.018	0.017	0.018	0.017
	(3.48)**	(3.00)**	(2.70)**	(2.43)*	(2.40)*	(2.70)**	(2.62)**	(2.58)*	(2.78)**
h-index × Ag Econ	-0.023	-0.018	-0.016	-0.015	-0.014	-0.016	-0.016	-0.016	-0.016
	(2.92)**	(2.35)*	(2.06)*	(1.86)+	(1.74)+	(2.02)*	(1.96)+	(1.91)+	(2.04)*
R^2	0.689	0.695	0.697	0.697	0.692	0.695	0.696	0.697	0.694
F-test (interactions=0)	8.30**	6.30**	4.84**	5.51**	6.98**	5.27**	5.13**	4.64**	3.72*

Note: The dependent variable is ln (salary) and each regression also has quadratics in experience and seniority, a dummy variable for males, the proportion of articles not in WoS, and fixed effects for each university. *N*=299, robust *t* statistics in parentheses, + significant at 10%, * significant at 5%, ** significant at 1%. The *F*-test of interactions is for the null hypothesis that the coefficients on Number × Ag Econ, Quality × Ag Econ and the *h*-index × Ag Econ are jointly zero but does not test that the Ag Econ intercept dummy is zero.