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Do Economists Swing for the Fences after Tenure?

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Tenure is pervasive in American higher education: every one of the top 500 colleges and universities in the United States as ranked by *US News and World Report* has some kind of tenure-granting system. The "philosophical birth cry" of the academic tenure system (Metzger 1973) was the 1915 statement of the American Association of University Professors (AAUP). Formalized in the 1940 Statement of Principles on Academic Freedom and Tenure (available at https://www.aaup.org/report/1940-statement-principles-academic-freedom-and-tenure), a joint statement of the AAUP and the Association of American Colleges (AAC) proclaimed: "Tenure is a means to certain ends; specifically: (1) freedom of teaching and research and of extramural activities, and (2) a sufficient degree of economic security to make the profession attractive to men and women of ability. Freedom and economic security, hence, tenure, are indispensable to the success of an institution in fulfilling its obligations to its students and society."

It is clear why associations of professors favor the intellectual freedom and economic security provided by the institution of tenure. The benefits of tenure could also be more philosophical: academic freedom in teaching and research is important for reasons other than the generation of highly cited papers. But for economists, it is natural to ask a more specific question: Under what conditions is

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tenure part of an optimal contract? After all, the incentives provided by the threat of termination are perhaps the starkest incentives faced by most employees, and tenure removes those incentives.

A variety of additional justifications for tenure have been proposed (for a discussion in this journal, see McPherson and Shapiro 1999). For example, the carrot of tenure can incentivize effort pre-tenure, allow for lower salaries, induce more selective hiring, or attract risk-averse but talented individuals to academia. As one example of prominent work in this area, Ito and Kahn (1986) argue that tenure-style assurances of the possibility of long-lived employment—not only in academia, but also in civil service, law and accounting firms, and a number of other workplaces—can be viewed as an efficient method of risk-sharing when an employer wants an employee to make a risky human capital investment. Other reasons for tenure can arise due to peculiarities in the nature of academia. For example, professors are the members of a university best able to identify talented prospective hires, and without tenure, they might fear losing their jobs if they hire too well (Carmichael 1988; see also Friebel and Raith 2004; Siow 1998). In addition, tenure, which both protects senior faculty from dismissal and makes them residual claimants on any rents in the institution, gives senior faculty the incentive to monitor university leadership (Brown 1997).

Finally, society may benefit more from research that is truly groundbreaking than research which is more incremental. Trying to do something innovative and failing looks a lot like shirking, so motivating risky innovation may require the assurance of tenure (Manso 2011).[1] Our focus is on this last argument: do academics respond to receiving tenure by attempting more ground-breaking "home run" research and in this way "swinging for the fences"?

In order to answer this question, we hand-collect a sample of all academics who pass through economics or finance departments at top 50 US schools from 1996 through 2014. From this sample of over 2,000 faculty, we consider two variables in the years before and after each academic receives tenure: the total number of publications and the number of "home run" publications. The number of publications is a measure of the quantity of output; the number of home run publications focuses on *highly influential* output and is a measure of the quality of output.

We find that both variables have values that peak at tenure and decline thereafter. The average number of annual publications falls by approximately 30 percent over the two years after tenure is granted and falls by an additional 15 percent over the subsequent eight years. The average number of annual home run publications also falls by 30 percent over the two years following tenure, but falls by an additional 35 percent over the subsequent eight years. Combining these facts, we find that not

[1] Some additional theories relevant to academic tenure include the discussion of "up-or-out" employment settings, where workers either receive a promotion or are let go at some stage. Kahn and Huberman (1988) examine employers with "up-or-out" promotion practices in a situation of two-sided uncertainty and moral hazard, while Waldman (1990) emphasizes the role of signaling in up-or-out settings. Demougin and Siow (1994) consider careers within hierarchies, and the conditions under which firms will prefer to promote from within.

only do both the overall publication rate and the home run rate fall, but the likelihood of a given publication being a home run falls by approximately 25 percent during the ten years following tenure. Conversely, papers in the bottom 10 percent of citations are actually published more frequently in the years following tenure than in the tenure year.

These patterns suggest two insights. First, the fall in publication rates over the two years following tenure is consistent with the notion that tenure tends to be granted when publication success has been achieved, and so a degree of reversion to the mean is expected. The timing of tenure is at least in part endogenous: faculty can advance early if they are highly productive early in their careers, and they can switch employers if they are unlikely to get tenure at a first institution. Further, the timing of publication is endogenous: faculty can time their efforts on various projects to maximize the number of publications before their tenure clock expires.

A second insight, more relevant for our paper, is that publication behavior from years two through ten after tenure suggests that after receiving tenure, economics faculty reduce risk-taking and the quality of their output falls. This might occur in a number of ways: adding coauthors; advertising new papers less at conferences and seminars; working on easier topics, which can be published in good journals but have less impact; or any number of other behaviors. We consider several alternatives to our explanation—increased nonresearch service work post-tenure or an increased tendency of tenured researchers to branch out into new subject areas—and show that none can fully explain what we find.

This paper does not evaluate the broad and multidimensional case for and against tenure. But it does suggest that at least for economists, tenure is not providing incentives to undertake research in the same quantity and quality that led up to the tenure decision.

Quantity and Quality of Research: Pre- and Post-Tenure

To construct our sample, we hand-collected employment and publishing data among economics and finance professors. We began by including all faculty who were employed at any of the top 50 economics or finance departments in the United States in any year from 1996 through 2014. This process involved use of the Wayback Machine (waybackmachine.org) and hand-collection of curriculum vitae (CVs). We collected a total of 2,763 names, 2,092 of whom are eventually granted tenure at some point prior to 2014. After collecting the set of faculty and their tenure years, we match this database to a database of publications and citations for 51 leading economics and finance journals. More detail, including the list of journals, is provided in the online appendix available with this paper at http://e-jep.org.

Quantity of Research

We begin by evaluating a subset of faculty who are present in our data for at least five years prior to their tenure year and ten years after. We require pre- and

post-tenure data for all faculty. We exclude two other groups, which are people who would mechanically strengthen the increase in observed publication rates prior to tenure and the decrease post-tenure. First, some faculty were granted tenure less than five years from their first appearance in our sample. This was usually because they began their careers at government agencies, where they may not have been expected to publish to the same degree as in academia. Second, some faculty left academia prior to, or less than ten years after, tenure, or received tenure after 2004, and thus were unlikely to publish as often post-tenure. Including these faculty would severely bias downward pre-tenure publication rates relative to post-tenure rates (especially if we were to include faculty who never receive tenure). We therefore drop them.

The final dataset contains 980 faculty, all of whom received tenure prior to 2004. To address the issue of coauthored papers, we define an author's contribution to a publication as $1/N$, where N is the number of authors on the publication. We show in the online appendix that if we do not adjust for coauthorship our qualitative results remain unchanged.

Figure 1 presents the per-capita author-adjusted number of papers published by this subset relative to the year that the academic was first tenured. The year marked "tenure" is the first year in which the researcher was tenured, the year marked "–1" is the year before, and so on. The figure shows annual publications increasing monotonically prior to tenure, peaking in the neighborhood of the granting of tenure and declining steadily thereafter.

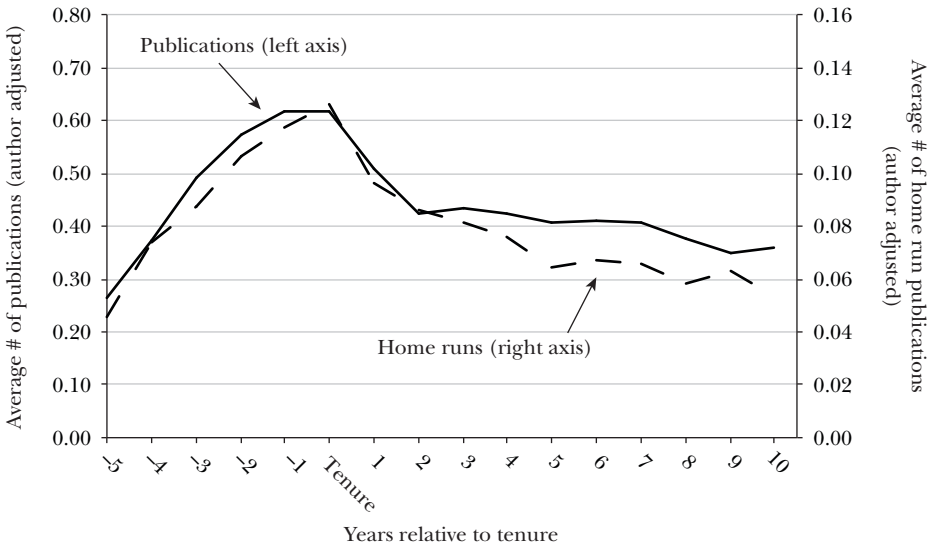
In order to interpret magnitudes, note that the height of the solid line in year –2 is 0.57. This means that our 980 researchers produced, on average, 0.57 author-adjusted papers in solid journals in the year prior to the one in which they were put up for tenure. This number would imply $0.57 \times 980 = 559$ solo-authored papers, $0.57 \times 2 \times 980 = 1{,}117$ dual-authored papers, or higher numbers of three-or-more authored papers. In fact, the number averages across these types of papers.

Home Runs

We also calculate the number of home run publications, defined as publications that, as of 2015, were among the 10 percent most cited of all papers published in a given year. The plot of the number of home runs shown in Figure 1 is largely similar to the plot of publications, peaking in the tenure year and falling thereafter. The number of home runs is anywhere from 1/7 to 1/5 of the number of publications. These numbers are greater than 10 percent for two reasons. First, the faculty in our sample are mostly associated with prestigious departments and presumably publish more-cited papers. Second, we only include economists who get tenure, and these are likely more cited as well.

We can calculate the ratio of the two plots in Figure 1: home run publications divided by all publications. The series is noisy, but clearly exhibits a substantial decrease over the period two to ten years post-tenure. This decrease will be important in teasing out potential explanations for the patterns we see.

Figure 1
Publications and Home Runs around Tenure



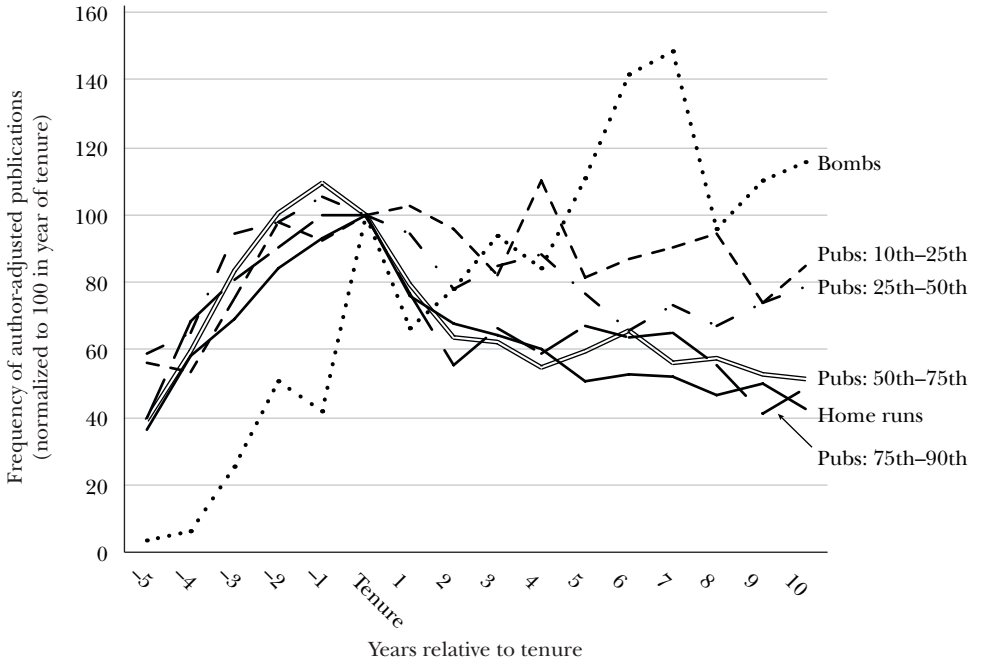
Note: This figure plots the number of publications and the number of those publications that were "home runs" in event time, where the event is tenure. A publication in an economics or finance journal is defined as a home run if it has more citations than 90 percent of all economics and finance publications appearing in the same year. The sample consists of 980 faculty whose publication activity we observe for at least 5 years before tenure and 10 years following tenure. Each author on a publication is credited with the inverse of the number of authors on the publication (for example, an article with four authors counts as .25 of a publication for each author). "Average # of publications (author adjusted)" is the sum of the cohort's publications divided by 980. "Average # of home run publications (author adjusted)" is the sum of the cohort's home runs divided by 980. The height of each curve therefore represents the average number of publications (left axis) and home run publications (right axis) for a member of our sample in each year of his or her career, measured from the year of tenure, where this author only receives $1/N$ credit on an N-authored paper.

Together, these facts provide suggestive evidence that tenure is associated with peak academic production, in terms of the quantity of publications, the quantity of home run publications, and the likelihood that a given publication becomes a home run.

A Closer Look at Risk-Taking in Economic Research

In order to gain additional perspective on risk-taking in publication, we also plot the rate of non–home-run publications. In Figure 2, we assign each paper a category based on its citations: if it was in the top 10 percent of citations for papers published in that year, it is called a "home run"; if it is in the lowest 10 percent, it is called a "bomb." We split papers further into 10th to 25th, 25th to 50th, 50th to 75th, and 75th to 90th percentile groups. We calculate the number of papers published by authors from five years before to ten years after tenure. We calculate the number of papers in each citation bucket in the year of tenure, and normalize that value to 100.

Figure 2
Publications around Tenure by Citation Percentile



Note: This figure plots the relative frequency of author-adjusted publications by citation percentile around tenure. Home runs (Bombs) are those above the 90th (below the 10th) percentile of all economics and finance papers in the same year. "Pubs: 75th–90th," "Pubs: 50th–75th," "Pubs: 25th–50th," and "Pubs: 10th–25th" are similarly defined. Each series is normalized to 100 in the year of tenure.

Figure 2 shows that publication rates of all paper types increase in tandem up to the year of tenure, but there is substantial divergence afterward. The one category of paper with consistently higher quantity post-tenure is the "bombs." Indeed, ten years after tenure, the most common category (the highest value) is bombs, the second-highest is publications in the 10–25th percentile, and so on down to the least-common category of home runs.

Table 1 shows the results of regressions, which provide a sense of the statistical significance of the changes in overall and home run publication rates shown in Figure 1. We estimate variants of the following linear model:

$$Pub_{i,t} = \alpha + \beta_t + \gamma_i + \delta_{i,t}^{-5,-1} I_{i,t}^{-5,-1} + \delta_{i,t}^{+1,+5} I_{i,t}^{+1,+5} + \delta_{i,t}^{+6,+10} I_{i,t}^{+6,+10} + \varepsilon_{i,t},$$

where β_t is a year fixed effect designed to capture differential publication rates over time; γ_i is a researcher fixed effect designed to capture differential publication rates across researchers; $I_{i,t}^{m,n}$ is a dummy variable taking a value of 1 if, in year t, researcher i is between m and n years from tenure (with positive values of m and n

Table 1
Publications and Home Runs around Tenure

	Dependent variable					
	Publications	*Publications*	*Publications*	*Home runs*	*Home runs*	*Home runs*
Years -5 to -1 (pre-tenure)	–0.155*** (0.028)	–0.168*** (0.028)	–0.092*** (0.027)	–0.040*** (0.112)	–0.046*** (0.011)	–0.032*** (0.011)
Years +1 to +5 (post-tenure)	–0.178*** (0.028)	–0.153*** (0.028)	–0.226*** (0.027)	–0.046*** (0.011)	–0.038*** (0.011)	–0.052*** (0.011)
Years +6 to +10 (post-tenure)	–0.237*** (0.028)	–0.186*** (0.028)	–0.373*** (0.037)	–0.065*** (0.011)	–0.049*** (0.011)	–0.085*** (0.015)
Observations	15,680	15,680	15,680	15,680	15,680	15,680
Year fixed effects	NO	YES	YES	NO	YES	YES
Researcher fixed effects	NO	NO	YES	NO	NO	YES
R^2	0.0072	0.0233	0.2780	0.0037	0.0161	0.2164
p-value for test: Years +1 to +5 = years +6 to +10	0.0000	0.0167	0.0000	0.0000	0.0260	0.0000

Note: The dependent variable in the first (last) three columns is author-adjusted publications (home runs). Years -5 to -1, Years +1 to +5, and Years +6 to +10 are the 5 years before tenure, the first 5 years after tenure, and the next 5 years after tenure, respectively. The final row reports the *p*-value from a linear restriction test, which tests the equality of coefficients on Years +1 to +5 and Years +6 to +10. Ordinary least squares standard errors are in parentheses.
*, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

representing post-tenure dates and negative values representing pre-tenure dates) and zero otherwise; and $\delta_{i,t}^{m,n}$ is the coefficient on the tenure time dummy variable associated with years m to n after tenure.

The excluded year for any researcher i is the tenure year, so all coefficients are average publication rates relative to a professor's tenure year. Depending on the regression, $Pub_{i,t}$ may represent the overall author-adjusted number of publications, or the author-adjusted number of home run publications for researcher i in year t.

In Table 1, column 1, we perform the analysis with no year or researcher fixed effects. That is, this regression ignores the facts that publication rates have increased over time and that some authors publish more than others. On average, 0.155 fewer author-adjusted publications occur in the five years prior to tenure, 0.178 fewer in the five years after, and 0.237 fewer in the five years following that. Publications are lower before and after tenure, and even lower the longer after tenure one goes.

In Table 1, column 2, we add year fixed effects to account for the fact that publication rates have increased over time, and in column 3 we add year and researcher fixed effects. The inclusion of year fixed effects increases the R^2 but has a relatively small effect on the coefficients: relative to the first column, the publications before tenure are a little lower and those after tenure are a little higher, but the peak at tenure remains. The inclusion of researcher fixed effects, however, has a substantial effect. It's no surprise that the R^2 is again higher; by design, researcher fixed effects

will absorb variation in across-researcher publication rates. However, the coefficients shift in a way that strengthens the peak at tenure and the decline post-tenure.

In Table 1, columns 4–6, we repeat the analyses of the first three columns using data on home run papers and find substantial reductions in the rate at which authors produce home run papers, in periods both before and after tenure. As in columns 1–3, the number of home runs produced decreases in the five years following tenure and continues to decrease in the five years after that.

We test whether we can statistically differentiate the coefficients on the dummy variables for the periods one to five years and six to ten years post-tenure. We perform a Wald F-test for the equality of the coefficients on the dummy variables for years +1 to +5 and years +6 to +10. In all six cases, we strongly reject the null hypothesis that the coefficients are equal. Not only do the rates of publications and home runs fall in the five years following tenure, but they continue to fall in the five years after that.

Summarizing Patterns

In sum, we have shown that: 1) Publication and home run rates rise to tenure, peaking in the year a researcher comes up for tenure and a researcher's first year as tenured faculty. 2) Publication and home run rates fall markedly in the two years following tenure. 3) Publication and home run rates fall by 15 and 35 percent, respectively, from years two through ten after tenure, while bomb rates increase by 35 percent.

Our interpretation of these facts is: 1) Junior faculty get better at publishing in their first few years, and publication lags are long, leading to an increase in the publication rate of all paper qualities as tenure approaches. 2) Tenure is typically granted when success is achieved. Because of publication lags, this leads to high publication rates in the year that the researcher is coming up for tenure as well as during the following year. 3) As tenured faculty age, there is a decade-long decline in the production of publications and home runs and an increase in the production of bombs. We believe that the most consistent explanation for these two declines is a change in risk-taking by academic researchers.

Alternative Explanations for Productivity Declines Post-Tenure

In this section, we consider five alternative explanations for the patterns shown thus far that could help to explain our findings. We will show that none can fully explain the patterns that we see. While they all may be at work, a reduction in risk-taking by academic researchers seems to be relevant as well.

Perhaps This Is a "Time since PhD" Effect

A number of studies have shown that research productivity follows a hump-shape over age, first rising and then falling (for example, Oster and Hammermesh 1998; Levin and Stephan 1989; Gingras, Larivière, Macaluso, and Robitaille 2008).

This could be because aging directly affects the ability of an academic to produce top-rate research, or it may be because the marginal effect of an additional top publication on an academic's professional outcome decreases as the number of publications increases. These studies have not, however, looked specifically at the timing of tenure. It could be a coincidence that the various factors that lead to the rise and fall of academic productivity over a lifetime just happen to peak at the year tenure was granted. Can we separate out a specific effect of tenure in our data?

To investigate this possibility, we split the sample by the year in which a researcher was granted tenure: fifth year, sixth year, and so on. Naturally, the sample in each case is substantially smaller than for the full sample, adding noise to our plots, so we make several adjustments to boost the sample (details and plots can be found in the appendix).

For those tenured in five years, the year of peak production of both papers and home runs is the tenure year. For those tenured in six years, the publication rate is highest in the year before tenure and the tenure year; the home run publication rate peaks in the tenure year and the year after. For those tenured in seven years, both publications and home runs peak in the year the candidate is up for tenure. As the data become noisier (fewer people are tenured each year after seven), the peaks are less clear but the general shape persists: people publish more and better papers in the run-up to tenure and fewer after.

These patterns suggest that it is not simply aging that is causing the patterns observed in Figures 1 and 2. The year of tenure itself is special, not just the number of years since graduate school.

Perhaps It's the Rise in Service, Teaching, and Nonacademic Obligations Post-Tenure

It is possible—even likely—that many faculty in our sample experience increased expectations of university service after tenure, including advising, department chairing, serving as a dean, and other administrative and committee member responsibilities. Indeed, these additional administrative and service responsibilities are one of the aforementioned justifications for tenure, and thus generally consistent with a tenure-based explanation for the data. Also, tenured faculty often have more opportunities for outside opportunities after tenure, like consulting or book-writing. These factors tend to reduce publication rates, even if the researcher's aggregate effort over all activities increases post-tenure.

To investigate this explanation for our findings, we return to Figure 2. Suppose that authors have some ability to distinguish between projects likely to be successful and those likely to fail. A researcher who experiences an increase in nonresearch obligations post-tenure would presumably seek to reduce effort on low-impact projects. Thus, one might expect the number of publications to fall, but the number of home runs to remain similar and the share of home runs to rise. We do not see this result.

Instead, the likelihood that a given publication becomes a home run falls from 20 percent the tenure year, to 15 percent ten years later. This decline is substantial. Moreover, this reduction is not due solely to mean reversion and the endogenous

timing of tenure. The decline begins in earnest three years after the tenure year, which is four years after the researcher is up for tenure. Any papers that led the researcher to get tenure would likely have been published before then.

We can also point to Figure 2 to show that the production of bombs actually rises in the ten years following the granting of tenure. Service obligations should not drive an *increase* in the production of low-citation papers! These patterns suggest that while nonresearch post-tenure obligations may affect productivity, there is more to the story.

Perhaps Tenure Encourages Researchers to Branch Out

Tenure may not lead to an increase in home run publications, but it may lead to an increase in interdisciplinary work, which may take time and perhaps not lead to papers with high citations counts but still help ideas to germinate in important ways. There are several ways in which branching out could appear in our data: choosing new coauthors, publishing in new journals, and publishing in new areas.

To consider this possibility, consider the set of faculty in our dataset who eventually received tenure and for whom we can observe their first 15 years in academia. Then, for those 15 years, we estimate variants of the following linear probability model, in which each observation is a single publication:

$$Y_{i,t,r,s} = \alpha + \beta_t + \gamma_r + \delta_s + T_r + X_i + \varepsilon_{i,t,r,s}$$

where $Y_{i,t,r,s}$ is a dummy variable measuring whether paper i written at time t by researcher r, who has been a professor for s years, represents branching out (defined in three ways below); β_t is a year fixed effect designed to capture differential tendencies to branch out over time; γ_r is a researcher fixed effect designed to capture differential tendencies to branch out across researchers; δ_s is an event-time fixed effect designed to measure different tendencies to branch out as a researcher ages; and T_r is a dummy variable indicating whether the researcher has tenure.

In the first regression in Table 2, a paper is defined as branching out (that is, $Y_{i,t,r,s} = 1$) if it involves a new coauthor. In this case, X_i represents a "coauthor count" fixed effect, which accounts for the fact that researchers with more prior coauthors tend to add new coauthors more rarely.[2]

In our second regression, a paper is defined as branching out if it is published in a journal in which the researcher has never before published. For example, if a researcher has published only in finance journals and then publishes a new paper in the *Journal of Labor Economics*, then $Y_{i,t,r,s} = 1$ for this paper. In this case, X_i represents a "prior journal count" fixed effect, which accounts for the fact that it is more difficult to publish in a new journal when one has already published in many different journals previously.

[2] A coauthor count fixed effect is actually a set of fixed effects. The first takes a value of one if the author has never had a coauthor on any of her prior papers, and zero otherwise. The second takes a value of one if the author has only ever worked with one other coauthor previously, and zero otherwise, and so forth.

Table 2
Other Forms of Risk-taking

	Dependent variable:					
	New Coauthor (1)	*New Journal (2)*	*New Area (3)*	*New Coauthor (4)*	*New Journal (5)*	*New Area (6)*
Tenure	−0.006	−0.053***	−0.041***	0.005	0.012	0.009
	(0.011)	(0.011)	(0.008)	(0.014)	(0.014)	(0.010)
Observations	16,280	16,280	16,280	16,280	16,280	16,280
Year fixed effects	YES	YES	YES	YES	YES	YES
Event year fixed effects	YES	YES	YES	YES	YES	YES
Coauthor count fixed effects	YES	NO	NO	YES	NO	NO
Journal count fixed effects	NO	YES	NO	NO	YES	NO
Area count fixed effects	NO	NO	YES	NO	NO	YES
Researcher fixed effects	NO	NO	NO	YES	YES	YES
R^2	0.060	0.131	0.098	0.235	0.272	0.307

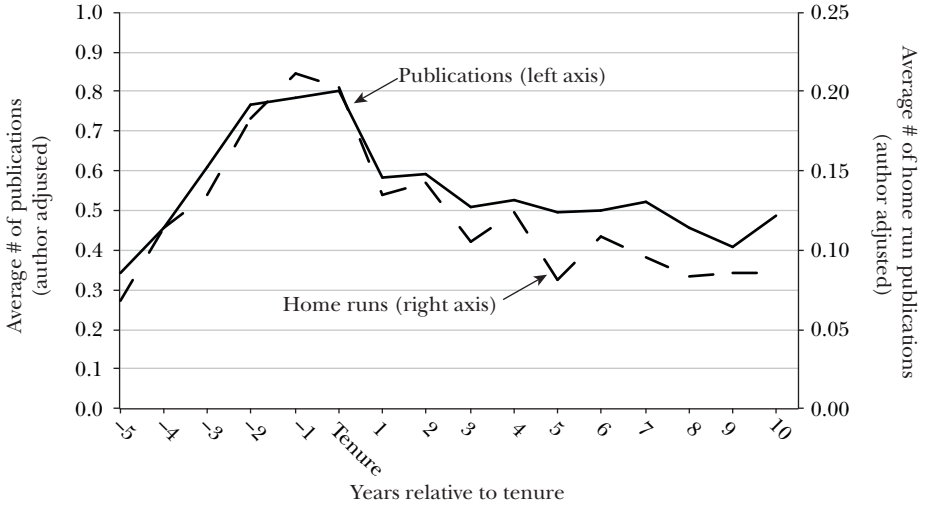
Note: Each observation is a professors' publication. The dependent variable in the first and fourth columns is a dummy variable equal to one if the publication is with a new coauthor and zero otherwise. In the second and fifth columns, it is a dummy variable equal to one if the publication is in a new journal for the professor, and in the third and sixth columns, it is a dummy variable equal to one if it is in a new subject area for the professor. Subject areas are grouped into accounting, econometrics, finance, general interest, industrial organization, international economics, labor economics, law and economics, macroeconomics, microeconomics, monetary economics, and public economics. Each professor's first publication is excluded (because "new" is trivially equal to one). Ordinary least squares standard errors are in parentheses.
*, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent, respectively.

In our third regression, a paper is defined as branching out if it is published in a new subject matter area. For example, the *Journal of Labor Economics* is defined as being in the area of labor economics, whereas the *Journal of Financial Economics* is defined as being in the area of finance. General interest journals are more difficult to categorize, so we define them to be in their own area.[3] In this case, X_i represents a "prior areas count" fixed effect, which accounts for the fact that it is more difficult to publish in a new area when one has already published in many areas previously.

Results are displayed in Table 2. In the first three columns, we do not include researcher fixed effects, and in the last three we do. Based on regressions in columns 1 and 4 there do not appear to be substantial differences in the tendency to add new coauthors pre- and post-tenure. Based on regressions in columns 2 and 5, it does not appear to be more common for researchers to publish in new journals post-tenure. If anything, regression 2 suggests a weak tendency to publish in new journals less often. Importantly, this is not because tenured faculty have been out longer; this is accounted for with event-time fixed effects. It is also not because tenured faculty have already published in more journals, making it harder to publish in a new one; this

[3] Interested readers can find the assignment of journals to areas in Table 2a in the online Appendix.

Figure 3
Publications and Home Runs around Tenure in Elite Schools



Note: This figure plots the number of publications and the number of those publications that were "home runs" in event time, where the event is tenure. A publication in an economics or finance journal is defined as a home run if it has more citations than 90 percent of all economics and finance publications appearing in the same year. The sample consists of 333 faculty whose publication activity we observe for at least five years before tenure and ten years following tenure, and who initially placed at one of the following schools: University of California–Berkeley, University of Chicago, Columbia University, Harvard University, Massachusetts Institute of Technology, Northwestern University, University of Pennsylvania, Princeton University, Stanford University, and Yale University. Each author on a publication is credited with the inverse of the number of authors on the publication (for example, an article with four authors counts as .25 of a publication for each author). "Average # of publications (author adjusted)" is the sum of the cohort's publications divided by 333. "Average # of home-run publications (author adjusted)" is the sum of the cohort's home runs divided by 333. The height of each curve therefore represents the average number of publications (left axis) and home run publications (right axis) for a member of our sample in each year of his or her career where the author only receives $1/N$ credit on an N-authored paper.

is accounted for with journal count fixed effects. Finally, based on regressions 3 and 6, there is no evidence that tenured faculty branch out more by publishing in a new area. If anything, there is weak evidence of a tendency to branch out less.

Risk-Taking May Decline on Average, But Perhaps Not for Elite Faculty

The preceding results are averages. Perhaps faculty at the most prestigious departments, who produce the lion's share of truly influential papers, exhibit a different pattern of publication after tenure.

In Figure 3, we perform the same analysis as in Figure 1, and plot publications and home runs for five years pre- to ten years post-tenure, but restrict the sample to faculty who begin their careers at a subset of particularly prestigious schools: University of California–Berkeley, University of Chicago, Columbia University, Harvard University, Massachusetts Institute of Technology, Northwestern University, University of Pennsylvania, Princeton University, Stanford University, and Yale University.

As in each of our subsamples thus far, publications and home runs peak in the year the researcher is up for tenure and in the first year of tenure. Both fall markedly in the first two years post-tenure and then consistently from years two through ten post-tenure. The smaller sample size means that there is more noise than for the full sample, but the pattern is striking. Faculty who begin their careers at elite schools have the same publication pattern as those who begin elsewhere. Indeed, from years two through ten post-tenure, the drop in the publication rate is 15 percent and the drop in the home run rate is 35 percent—precisely the same as in the full sample. The patterns we identify are present for faculty at both higher- and lower-ranked schools.

Perhaps It Takes Time for Truly Novel Research to Gain Traction

Perhaps truly influential papers take time to become known and cited. Perhaps Manso (2011) is correct in suggesting that the type of innovation for which tenure seeks to provide incentives is precisely the riskier type, which may take more time to catch on. To analyze whether this is the case, we restrict our sample to faculty who were tenured by 1994, and therefore papers published no later than 2004. As we evaluate the citations as of 2014, this allows at least ten years for a paper to catch on. As in other subsample analyses, there is more noise, but the pattern is still present. In fact, we once again see a 15 percent reduction in the publication rate, and a 35 percent reduction in the home run rate, in years two through ten post-tenure. The persistence of these ratios is surprisingly stable.

Perhaps This is True Only for Faculty at Schools with Poor Post-Tenure Contracting

It may be the case that some schools employ contracting techniques that encourage their faculty to swing for the fences, but the positive outcomes at these schools are outweighed by faculty at schools with poor contracting. We cannot observe the quality of contracting at every school at our sample, but one natural decomposition would be to separate public and private universities in the United States. Public institutions are subject to a variety of laws governing the compensation, hiring, and retention of state employees. Private institutions are largely free to design compensation programs at will.

If we split the sample into those faculty first tenured at US private schools and those first tenured at US public schools (and drop those first tenured elsewhere), we find that, at public schools, publication rates fall 36 percent in the two years following tenure, and a further 16 percent, in the subsequent eight years. At private schools, publication rates fall 30 percent in the two years following tenure, and a further 12 percent in the subsequent eight years. If we focus on home runs, the publication rate at public schools falls 43 percent in the two years following tenure, and a further 44 percent in the subsequent eight years. At private schools, the home run rate falls 25 percent in the two years following tenure and a further 32 percent in the subsequent eight years. If we focus on the likelihood that a publication becomes a home run, at public schools it falls by 11 percent in the two years following tenure and a further 33 percent in the subsequent eight years. At private

schools, the likelihood that a publication becomes a home run actually rises by 7 percent in the two years following tenure but then falls 22 percent in the subsequent eight years.

In sum, the patterns are similar at public and private schools. Publication rates fall by similar amounts at both types of school, but home run rates fall substantially less at private schools, providing weak evidence that contracting might help schools avoid this problem. (Figures and additional discussion on these points can be found in the online Appendix.)

Perhaps Our Definition of Home Run Is Too Generous

In our sample, approximately 1/7 of papers become home runs. Are there that many papers that are truly impactful? Perhaps researchers are publishing fewer above-average papers, but really are producing more spectacular papers.

Choosing a cutoff for home runs is a balancing act. Increasing the cutoff selects for papers that are more influential, but it reduces the number of papers defined as home runs and thus injects noise. We choose the top 10 percent as our threshold as a balance between the objectives of accurately measuring influence and minimizing noise. But perhaps we choose incorrectly.

We therefore consider an alternative to the home run, which we call the grand slam. A paper is defined to be a grand slam if it is in the top 5 percent of all papers published in its publication year, measured by citations as of 2014. We find that the rate of grand slams is approximately half of the rate of home runs, which is to be expected, and the pattern is similar. The rate of grand slam publications falls by 29 percent in the two years following tenure, and falls a further 32 percent in the subsequent eight years. These numbers closely align to those for home runs. (Again, further discussion and the associated figure can be found in the online Appendix.)

Conclusion

This paper should not be read as an indictment of the institution of tenure. As noted at the start of the paper, tenure has an array of costs and benefits. In this paper, we consider only one aspect of tenure, and only for researchers in economics and finance. However, focusing on that one aspect, it does not appear that academic economists respond to the greater professional and intellectual freedom that tenure should provide by sustaining their earlier research effort or by taking the chances that lead to more home run research. Among academic economists at research-oriented institutions, rates of publication and home run publications rise up to the year of tenure and fall for a decade thereafter.

From one point of view, our paper contributes to a small empirical literature on the effect of tenure on academic output. Holley (1977) evaluates the productivity, both in terms of quantity and quality, of 97 sociologists surrounding their tenure dates. He finds decreased performance on both dimensions post-tenure. Li and Ou-Yang (2010) focus on economics and finance faculty from the top 25 schools

and find no statistically significant difference in impact pre- and post-tenure. The difference between their result and ours seems due to the substantial increase in statistical power that we achieve by including more faculty from more schools and a wider set of journals. Yoon (2016) analyzes the publication and citation rates for US law school professors and finds that those rates rise to tenure and fall slightly thereafter. He analyzes only the first ten years of a professor's career, little of which is post-tenure, so he cannot separate the effect of endogenous timing of tenure from the longer-run effects on productivity or effort.

We also believe that our findings raise some practical questions for academic economists and their institutions. For economists, the findings suggest that they should be wary of allocating their research time in a way that seems likely to lead to low-impact papers, and instead consider if there is a way for them to continue their earlier research efforts—at least in terms of quality, if not necessarily in quantity. When making a tenure decision, departments of economics and their home institutions should be aware that the research productivity of the person receiving tenure is likely to decline, in both quantity and quality terms, over the following decade. Thus, institutions should consider whether there are methods to sustain (or at least not to impede) high-quality research efforts.

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