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Publish or perish? The increasing importance of publications for tenure

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Tenure decisions depend, among other factors, on a candidate's career age and publication record. We measure publications in units of both Top 5 journals and of the European Economic Review (EER), associating publication output with journals indexed in EconLit. We find that the average age of a professor in the year of his/her first appointment is 38, i.e. approximately 8 years after completing the PhD. Between 1970 and 2006, the average publication record at the time of the first appointment is equivalent to 1.5 standardized Top 5 articles (one co-author, 20 pages) or 2.3 standardized EER articles. Publication records vary across subfields and improve over time. We predict that someone running for a tenured job after 2011 should (average of all fields) aim at an average equivalent of 4 standardized Top 5 articles or 6 standardized EER articles.

Keywords: Academic labour market; Tenure; Germany, Austria and Switzerland
JEL codes: A11, A 14, J4

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1 Introduction

A university career appears to be an attractive option for many successful PhDs. One important question that arises for each post-doc at some point in time is "what does it take to get a tenured job?". Obviously, the number and quality of publications play a role. In addition, the post-doc should have developed teaching skills, certain "soft-skills" and he or she should not be too old. The objective of this paper is to look into the importance of publication records and quantify current and (expected) future averages of the quality of scientific output of those obtaining a first tenured job at a university in Germany, Austria and the German-speaking part of Switzerland.[2] Our goal is to provide results which help post-docs in their career decisions.

In 2006, 703 tenured professors of economics and finance (including econometricians and statisticians) were employed at 87 universities in Austria, Germany and Switzerland. For 74% of these professors, we know how old they are, where and when they have obtained their doctoral degrees, and when they were first appointed to a tenured position. We collect publication records at the year of the first appointment for all those professors who have obtained their doctoral degree in 1970 or later and who have accepted their first professorship from an Austrian, German or Swiss university.

We associate publications with journal articles which are indexed by EconLit, the database provided by the American Economic Association. By aggregating these publications in various ways, we are able to identify average quantity and quality levels of first-time appointees. Our regression analysis also allows to extrapolate these levels in future. Any current post-doc can then assess whether he or she can reach these levels within a reasonable time frame. For this purpose we have designed an internet site - www.HowToGetTenured.de - where, by providing information about their publications, individuals can easily compute their own quality index.[3]

The average age of a first-time appointed professor in Austria, Germany and

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[2]From this point onward Switzerland refers to the German-speaking part only.

[3]As one Referee strongly pointed out, we present descriptive statistics of professors in the year of their first appointment. We do not analyse the process of "how to get tenured" (as the title of previous versions of this paper and this internet site suggest). To do so, one would need information on how appointment committees work and what their members value. See the conclusion for further discussion.

Switzerland is 38 years, which has basically remained constant since the 1980s. Appointment takes place roughly 8 years after completion of the PhD. Since 1974, the youngest new professor is 29 years old, the oldest is 54. In terms of publications, we find a significant increase in quantity and quality over time. While the average newly appointed professor in 1990 had 0.93 standardized EER papers only, this rises to 5.2 papers in 2006 (the reference article is assumed to be 20 pages long and written by two authors). According to our preferred regression specification (see tab. 3 and fig. 5), this is expected to reach almost 6 in 2011. Given our quality weighting scheme, 3 standardized EER papers correspond to 2 standardized Top 5 papers. This means that instead of publishing 6 standardized EER papers it is enough to publish 4 standardized papers in a Top 5 journal (or, say, 7 to 8 lower quality papers). For single-author publications, all numbers can be divided by $\sqrt{2} \approx 1.4$. Keeping the number of authors and quality of journal constant, a paper (half) twice as long counts (half) twice as much.

It should be taken into account, however, that these results vary across fields. Competition is higher in microeconomics and public finance followed by a group consisting of macroeconomics, international trade/ monetary policy, econometrics and economic policy. Whereas the average of 7.6 papers will be required by 2011 in the leading two areas, only 6.3 papers should be expected for the latter group. Finally, economic history and finance constitute the least competitive fields with the expected requirement of 2.5 EER standard articles by 2011.

There exists a well-established literature on publication activities of economists in Germany. Bommer and Ursprung (1998) first ranked departments in Germany on the basis of quality-weighted publications. Their study relies on a ranking of journals. Lists of journals taking quality differences into account date back at least to Diamond (1989) and there was recently a wave of comparisons of departments across Europe (see special issue of the Journal of European Economic Association, 2003). Rauber and Ursprung (2007) and Ursprung and Zimmer (2008) have extend this analysis to control for cohort effects. Finally, Schulze et al. (2008) suggest rankings that include journals published in German and discuss their relative merits. The paper which is closest to ours is by Heining, Jerger and Lingens (2007), who run various Cox regressions to identify determinants of university success. Our results, even though restricted to one particular aspect of tenure decision, are more comprehensive as to

this aspect, because we provide additional information on differences across fields and recommendations on the rate of publication required to gain tenure in a period of 3 to 5 years. We also hope that our results are of more practical use: our website www.HowToGetTenured.de allows individuals to easily position themselves in our ranking.

2 The data

We use three types of data sources: personal information such as CVs, data from EconLit and weighting schemes. The first contains personal information relating to 703 economics professors at universities in Germany (85.2% of all professors), Austria (8.7%) and Switzerland (6.1%). Data was collected between 2006 and 2007 and adjusted for double entries.

Table 1 shows that if personal information is available, it almost always contains standard information such as when and where the PhD was completed. The age of the median professor in 2006 is 52 years, the 33 percentile is 46 years. We need to exclude those who obtained a PhD before 1970 (due to availability of publication data, see next paragraph), i.e. we are left with a total of 672 professors. The bottleneck for our analysis is the location of first tenure. We can nevertheless work with sample sizes of at least 339 for all of our subsequent analyses.

Data	Coverage	Data	Coverage
Field	99%	Date of birth	76%
Male	94%	Date of Habilitation	74%
Date of PhD	90%	Date of first tenure	74%
Location of PhD	84%	Location of Habilitation	72%
		Location of first tenure	55%

Table 1: Data availability

The second data source is EconLit provided by the American Economic Association which indexes publications in all relevant scientific economic journals. As EconLit started in 1969, we only take journal publications between 1969 and 2006 into account. We found that around 80% of the 672 professors have publications in

journals indexed by EconLit. The number of individuals without any EconLit publications by the year of their first appointment in Austria, Germany and Switzerland is shown in the left panel in fig. 1.
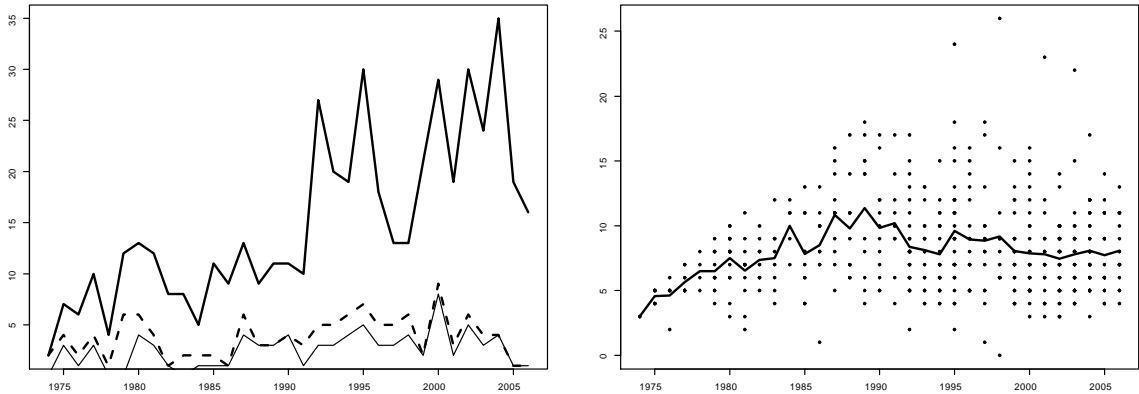
Figure 1 *The number of tenures with and without EconLit publications (left) and academic age (year of first appointment minus year of PhD) (right)*

The thick solid line on top represents the total number of new appointments for a given year. The dashed line shows the number of new appointments without any EconLit publications up to their year of appointment, while the thin solid line presents the number of professors without any publications indexed by EconLit between 1969 and 2006, i.e. also subsequent to their appointment. We see that there is still a considerable number of new jobs offered to and accepted by individuals without EconLit publications even though their share clearly decreases.

Our third data source is a weighting scheme for journals. Our aim is to take into account not only the quantity but also the quality of publications. We use an extended weighting scheme of Combes and Linnemer (2003) to measure the quality of a journal. The original CL scheme provides standardized weights for 798 journals which are divided into six groups. The first group contains five top journals with a weight equal to one. The second group consists of 16 journals with a weight equal to two third. The next 39 journals are weighted one half, 68 journals one third, 138 journals one sixth and the remaining 532 journals one twelfth. The extended version increases the CL number of journals by approx. 30% and gives all those journals

a weight of one twelfth. This extension reflects perception of journal importance in Austria, Germany and Switzerland better.[4]

3 Career factors

We focus on three criteria which we believe affect the probability of obtaining a job: age, academic age and publications. We present not only means but also distributional information. We also focus on changes over time and document how job requirements have increased.

3.1 Age and academic age

What age are professors when they are appointed for the first time? The right panel in fig. 1 illustrates academic age, i.e. the difference between the time of first appointment and the year of PhD completion. This difference is shown on the vertical axis while the horizontal axis shows the year of the corresponding appointment. Each dot corresponds to one appointment. It shows a fairly stable average difference of around 8 years since the 80s.

The age of the youngest appointee in our sample was 29 years in 1995 (i.e. this person became 29 in the year of his appointment), the two oldest professors were 54 in 1995 and 1998.[5] The increase in the difference during the 1970s might be due to incomplete coverage of careers for this time period in our data set and an expansion of universities at the end of the 1960s and the beginning of the 1970s.

Concerning post-docs, the right panel in fig. 1 provides a deadline by which the application for a tenured job should start. Given that the delay between sending an

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[4]We are grateful to Heinrich Ursprung for having given us access to this scheme. There are many more weighting schemes and some papers discussing their relative merits and shortcomings are listed in subsection 3.2.1. Following the suggestion of one Referee, we would like to stress that there is considerable uncertainty concerning any weighting scheme (Schulze et al., 2008). One would need information about the decision making process of appointment committees to gain more certainty about the importance of various journals but also about the importance of policy journals, books, reports etc. We are also aware of the fact that dividing by the square root of the number of coauthors is not incentive compatible (see Ursprung and Zimmer, 2006).

[5]One professor having obtained his PhD in 1966 (and therefore is not covered in our sample) obtained his first tenured position at the age of 28.

application and being appointed is at least one year, the average job applicant should start applying 6 years after completing the PhD.[6] For those lying in the typical age range, this would be at the age of 35 or 36. As always, exceptions confirm the rule.

3.2 Publications

3.2.1 How important is a publication?
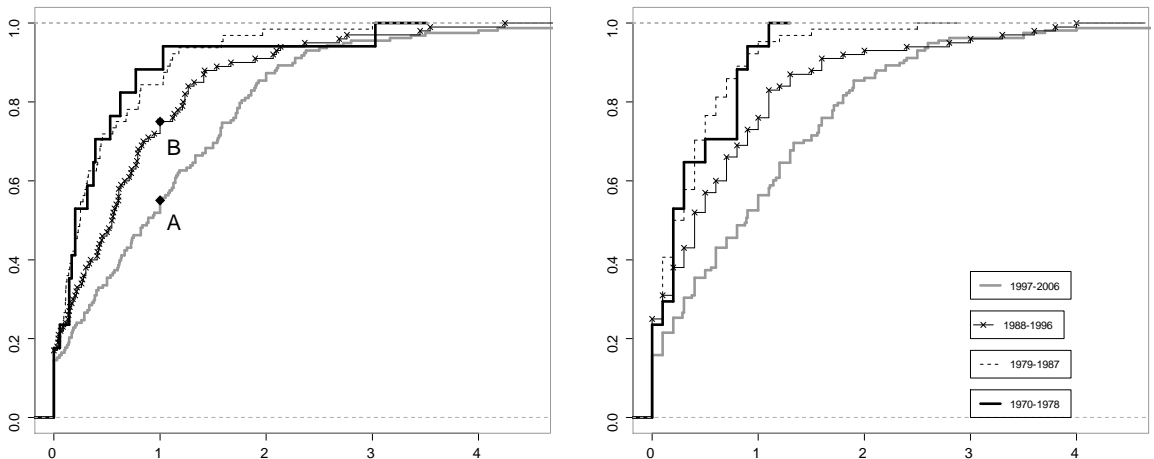
- The number of publications

Any economics professor would probably agree that publications are the most important criterion for judging the scientific quality of a candidate. Most would also agree that this was less important some 2 or 3 decades ago. To sustain this claim, the following figure looks at the distribution of the number of publications by cohorts of currently active professors.

The left panel in fig. 2 shows the distribution of the number of publications per year, looking at the period from the year p_i of the PhD to 2006. With n_i representing the number of publications by individual i, we look at $n_i / (2006 - p_i)$. One could believe in a first step that if publications are more important today than some decades ago, younger professors should publish more per year than old professors. We therefore split our sample into 4 groups by year of appointment (1970 to 1978, 1979/87, 1988/96 and 1997/06). This clearly shows that the youngest group dominates the second youngest which in turn dominates the third and fourth youngest. If we ask for example, how many individuals have one publication or less per year, this is true for approx. 50% for the youngest group (point A), around 75% of the second youngest group (point B) and more than 90% for the two oldest groups. Phrased differently, half of the young publish 1 paper or more per year in contrast to only 25% or even only 10% for the older groups. On average, the youngest publish 1.1 per year, compared to 0.7 for the second youngest and 0.44 and 0.47 for the older groups.

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[6]On average, tenure is obtained two years after Habilitation.

Figure 2 *Annual number of publications - life-cycle vs. cohort effect*

In principle, this finding could be entirely driven by life-cycle effects. If an individual is more productive while young, it is obvious that productivity per year falls over time. Rauber and Ursprung (2007), however, have shown that cohort-effects do play a role: individuals of the same academic age (years since PhD) differ systematically in their publication activity. Individuals who completed their PhD in the 1990s publish more on average, say, 10 years after their PhD than individuals with a PhD in the 1980s did 10 years after their PhD. To rule out that our findings in the left panel in fig. 2 are entirely driven by life-cycle effects, the right panel looks at annual numbers of publications in the first ten years after tenure.[7] We see that the young cohort is more active than the older ones. As life-cycle effects are now excluded (as we are looking only at the first 10 years following the PhD), we clearly see that publications have become more important.

The reason for this is open to speculation: Competition might have increased as many people now go abroad to obtain a PhD and return at some point later and apply for tenured jobs. Related to that, peer-groups might no longer be the immediate neighbor on the same floor but some post-docs working in the same field but being in some "far-away" university. A more research-focused education clearly also plays a role.

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[7]This extends the analysis by Rauber and Ursprung (2007) who look at means and not at distributions as we do.

8

- The quality of publications

Any researcher would probably also agree that a publication is not as good as any other. There are differences in quality. A publication in a frequently cited journal is of higher value than a publication in a journal that does not receive as much attention. Similarly, a publication of 30 pages is worth more than a short note of 4 pages. Accepting these arguments creates many practical problems: How to measure quality and quantity? Should the number of words in a publication be counted, should the number of co-authors be taken into account? What about differences in quality between papers in the same journal?[8]

We solve these problems (or cut the Gordian knot) by adjusting publications in terms of both the quality (which type of journal) and the quantity (number of pages and co-authors). We will therefore not refer to the number of publications of a person but to his or her quality index. We define this quality index q_i by

$$q_i \equiv \Sigma_{k=1}^{n_i} \frac{p_k}{\sqrt{a_k}} w^k. \tag{1}$$

The quality index is a sums over all the n_i articles published by individual i in and before a certain year. An article k has p_k pages, is written by a_k authors (including the author under consideration) and is published in a journal with quality weight w^k. This weight w^k is taken from the extended CL list described in section 2.

As the index q_i will calculate a number but the number per se does not provide much information, we construct standardized quality indexes. We use two standards, the Top 5 standard and the European Economic Review (EER) standard. The idea is to obtain a number that says how many (standardized) articles (20 pages of length, one co-author[9]) an author needs to have published in Top 5 journals or in the EER such that these hypothetical publications correspond in quality to his actual publi-

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[8]All these aspects have been discussed extensively elsewhere and we refer the interested reader to e.g. Diamond (1988), Kalaitzidakis, Mamuneas and Stengos (2003), Bauwens, Lubrano, Kirman and Protopopescu (2003) and Combes and Linnemer (2003). The common factor between these studies is that they are all based more or less on a journal weighting scheme on the basis of citation analysis. A completely different approach to evaluate the quality of journals was applied by Bräuninger and Haucap (2001,2003). Their journal weighting scheme was developed on the basis of a survey among the members of the Verein für Socialpolitik - the German association of academic economists.

[9]The average number of pages in journals with EER quality weight over our sample length is 17.4 pages written by 1.8 authors.

cations.[10] We believe the standardized indexes are more informative than the ones usually applied and therefore we propose

$$q_i^{Top5} = q_i / \left(\frac{20}{\sqrt{2}} w^{Top5} \right),$$

$$q_i^{EER} = q_i / \left(\frac{20}{\sqrt{2}} w^{EER} \right) = \frac{3}{2} q_i^{Top5}. \tag{2}$$

An author having a quality index q_i from (1) would have the same quality index if he had published q_i^{Top5} articles (with 20 pages and one co-author) in Top 5 journals or q_i^{EER} articles in the EER (or journals of similar quality). An article in a Top 5 journal is ceteris paribus worth 50% more than an article in the EER. An index of e.g. $q_i^{EER} = 4$ means that individual i has published papers with a quality equivalent to 4 standardized EER publications or 2.67 standardized Top 5 publications. His quality index on the Top 5 scale would be $q_i^{Top5} = 2.67$. It is lower than on the EER scale as the requirements of the Top 5 scale (the weights) are higher.

Let us now analyze publication patterns of the four cohorts by employing the EER measure. Figure 3 plots a 10-year productivity measure π_i^{ten} against the number of EER articles published during the 10 years following the year of PhD, $\pi_i^{ten} \equiv q_i^{EER}/10$. The curves show again the empirical cumulative distribution functions for the four different cohort groups.

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[10]Given the journal weights we use, Top 5 journals are the American Economic Review, Econometrica, Journal of Political Economy, Quarterly Journal of Economics and Review of Economic Studies. Journals which have the same weight as the EER are Econometric Theory, Games and Economic Behavior, International Economic Review, Journal of Business and Economic Statistics, Journal of Econometrics, Journal of Economic Theory, Journal of Finance, Journal of International Economics, Journal of Labor Economics, Journal of Monetary Economics, Journal of Money, Credit and Banking, Journal of Public Economics, Journal of the American Statistical Association, RAND Journal of Economics and Review of Economics and Statistics.
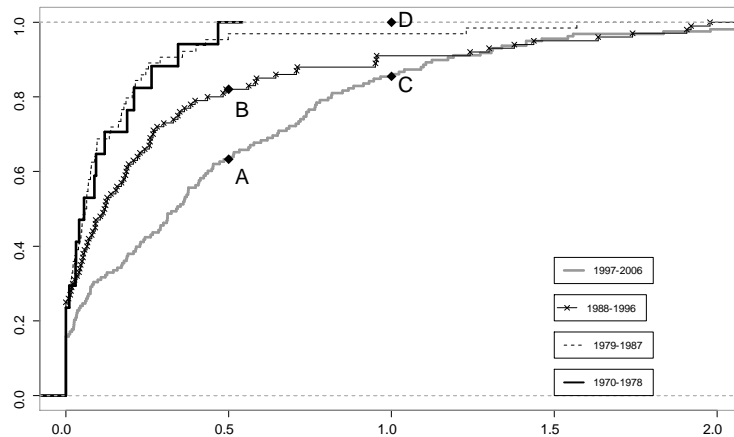
**Figure 3** *EER standard article-productivity of different cohorts*

Our quality measure confirms the findings of fig. 2: the younger cohorts are (almost) everywhere more productive than the older ones. Approx. 40% of the youngest cohort publish more than half an EER standard article per year (point A) in contrast to around 20% (point B), 5% and virtually 0% for the older cohorts. Moreover, around 20 % of the youngest cohort publish more than one EER standard article per year (point C) while basically no-one did so in the oldest age group (point D). On average, a professor belonging to the young cohort published 0.47 EER standard articles per year in the 10 years following his PhD in contrast to only 0.11 EER standard articles for the oldest cohort (and 14% and 31% for the cohorts in between).

Comparing fig. 3 with fig. 2 shows two things. First, the variation in quality is higher than the variation in quantity. Taking the coefficient of variation (CoV) as a measure of inequality, we see that there are larger quality differences between professors than when we look only at productivity captured by the total number of publications. The CoV for quality-productivity for the oldest cohort is 1.2 in contrast to 0.97 for the same group for quantity-productivity. For the youngest cohort, we obtain the same pattern: the CoV for quality-productivity is 1.06 in contrast to 0.99 for quantity. Second, the difference between cohorts increases. While the average productivity in terms of number of publications of the young group was about 180% higher than the productivity of the old group, the average EER standard article productivity is 315% higher.

We conclude that publications became more important over time and that quality adjustment allows for a better distinction between individuals. The latter makes a selection procedure easier and more transparent.

3.2.2 Publications of newly appointed professors

We now turn to our main group of interest, the just-appointed professors. The left panel in fig. 4 plots - to start with - the (unweighted) number of publications on the vertical axis. As can be seen, the first appointment was in 1974, in other words either four years or less following completion of the PhD, given that our sample consists of those having attained their PhD in 1970 or later.
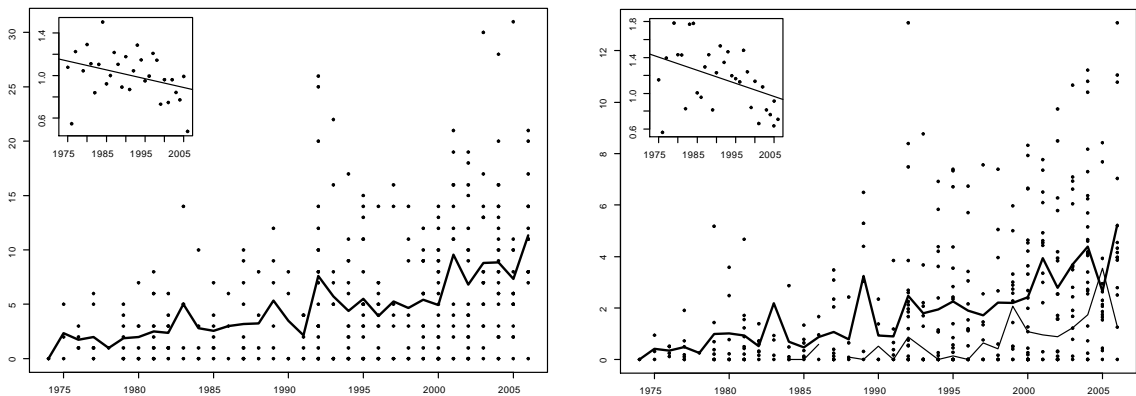
Figure 4 *Number of publications (left) and EER standard articles (right) by year of appointment*

When we look at all new appointments over all the years in our sample, there are 206 professors (nearly 60%) who had 5 or less publications; almost 8 % had 15 publications or more. When we ask whether there is a time trend, the solid line indicates a steady increase over time. The small upper left figure in the left panel in fig. 4 shows that the CoV fell over time. Hence, in terms of the number of publications, heterogeneity falls but the average number rises.

Following our belief that the quality index is more important, each dot in the right panel in fig. 4 stands for the standardized quality index q_i^{EER} from (2) of a newly-appointed individual i. By comparing the left and the right panels we see that there is also an increase in average quality over time. While before the 1990s the typical

newly-appointed had around 0.98 EER papers, after this period the average number of standardized EER papers is 2.8. The thick line shows the average standardized EER papers of newly appointed professors in the year of their appointment. This is contrasted by the thin line showing the average number of standardized EER papers of applicants who have yet to obtain a job ("Privatdozenten") and who are also 8 years after their PhD. This shows that on average, and as can be expected, successful applicants have a higher research index than those who are unsuccessful.

Given the relatively large differences within a year with respect to quality-adjusted output, one might want to know what are the strategies employed by "the stars". If we look at appointments in 2004 and compare the top three appointments in this year (all over 10 standard EER papers) we also find heterogeneity there. At the risk of overstating the differences, there seem to be clear differences in strategy: One person had many articles with average quality and thereby obtained a quality index of over 10 mainly through quantity, i.e. this person had 28 articles before appointment. Other people had nearly half the papers (16 and 14) but they included one or more articles in Top 5 journals.

The increase in average quality came along with a decrease in heterogeneity among the newly-appointed (although not among all professors as shown in fig. 3 above). The small upper left figure to the right of fig. 4 also shows that the CoV fell over time. The rise in average quality is therefore not the result of one or two individuals who are outstanding in each year but the result of an upward shift of the entire distribution.

4   The future

So far we have focused mainly on averages over the entire period of observation or on quantities in certain years. What is more important for a post-doc today is to know how the world will look in 2, 3 or 5 years from now. Below we consider an econometric model capable of providing an answer.

4.1   The estimation approach

The easiest way to predict future values of the quality index is to consider a linear regression equation $q_i = \mathbf{x}_i'\beta + \varepsilon_i$ that formalizes the quality index as a function of a year of appointment and of the rest of the individual characteristics of a newly

appointed professor. However, considering the distribution of the quality index, we can see that q_i permits both zero and non-zero outcomes, and that the zero count is substantial, making approx. 20% of the entire sample. This fact suggests a hurdle model instead of a simple linear one.[11] Within the framework of a hurdle model, zero outcomes of the index can be viewed as a strategic decision of a post-doc not to pursue publication in the range of EconLit journals. Observing $q_i = 0$ means that a post-doc rather concentrates on the rest of academic and policy-oriented journals, investing more time in other activities relevant for the prospective tenure (e.g., enhancing the quality of own teaching). Otherwise, in case the decision to concentrate on EconLit publications is made, the zero-hurdle is crossed and we observe a positive value of the index.[12]

To write down the likelihood function for this model, let us define the indicator function d_i which takes the value "1" if the quality index q_i is positive, and the value "0" otherwise. Assuming that the decision to pursue EconLit publications and the distribution of positive outcomes of the quality index q_i are governed by two independent processes, we get the following individual contribution to the likelihood function

$$\ell_i = \left[F\left(q_i = 0 | \mathbf{x}_i, \theta_1\right)\right]^{1-d_i} \left[\left[1 - F\left(q_i = 0 | \mathbf{x}_i, \theta_1\right)\right] g\left(q_i | q_i > 0, \mathbf{x}_i, \theta_2\right)\right]^{d_i}. \qquad (3)$$

In the individual contribution above, $F\left(q_i = 0\right)$ is a probability of being absent from publishing in the EconLit range and $g\left(q_i | q_i > 0\right)$ is a probability density of positive outcomes of the index. Without loss of generality, the publication decision can be described by a simple Probit. As to $g\left(\cdot\right)$, this can be a probability density of any positive-valued random variable. In the present application, we experiment with lognormal and gamma distributions for the positive part of the quality index. To decide which of these distributions best fits the data, we apply the Andrews (1988) chi-square goodness of fit test.

The dependent variable in our analysis is the EER standardized quality index

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[11]The model was originally introduced by Cragg (1971) and since then has been applied widely in many other fields.

[12]The next logical step in extending the model would be to try accounting for possible selectivity, as there may be post-docs who had initially started but then subsequently stopped searching for a tenured job. However, in the absence of data on the career intentions of non-tenured post-docs we are forced to assume that, even if exists, the selectivity bias is negligible.

q_i^{EER} from (2). The set of explanatory variables comprises the year of appointment, the age of a newly appointed professor, the difference between the year of appointment and the year in which the PhD was completed, gender and the dummy variables for the country in which the postgraduate degree was attained (one for Germany and one for Austria/Switzerland). Finally, the set of explanatory variables includes dummy variables that indicate the area of academic affiliation.

We start by estimating the conditional model under both lognormal and gamma assumptions for the distribution of the positive part of q_i^{EER}. Model selection results are shown in Table 2.[13] We see that the gamma distribution provides a more accurate fit than the lognormal distribution, with the latter being rejected by the test, which therefore makes it our distribution of choice. Furthermore, the fact that the model with the gamma distributed positive part of q_i^{EER} passes the Andrews test underlines its very high explanatory power.

Specification	χ^2 Test Stat.	DF	p-Value
Lognormal	25.810	9	0.0022
Gamma	12.089	9	0.2084

Table 2: Model selection

Given the above model selection results it is easy to show that the conditional mean of our hurdle model will be expressed by

$$E(q_i^{EER}|\mathbf{x}_i) = \alpha e^{\mathbf{x}_i'\beta_2} \Phi\left(\mathbf{x}_i'\beta_1\right), \tag{4}$$

where α is a shape parameter and $\exp\{\mathbf{x}_i'\beta_2\}$ is a conditional scale parameter of a gamma distribution. Knowing the estimated values of β_1, β_2 and α, we can use equation (4) to track the evolution of the expected value of the index in the near future.

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[13]To perform the test we partition the data according to 0.2, 0.5 and 0.8 cutoff points of the distribution of the quality index and 1/3 and 2/3 cutoff points of the distribution of the duration between graduation and appointment. The relevant test statistic is given in the Equation 3.18 in Andrews (1988), p.1435.

4.2 Results

Estimation results are presented in Table 3. The results are perfectly in line with the earlier discussion of the behaviour of the quality index. First of all, for the year of appointment we see that the estimates of both β_1 and β_2 are positive and significant at the 5% level. This means that the expected value of the index increases with time and one needs to be prepared to publish more in the future (this is the effect of β_2). In addition, more and more people in the future will opt for pursuing publication in the journals encompassed by EconLit (this is the effect of β_1). Interestingly, if we consider the effect of the difference between the year of appointment and the year in which the PhD was completed, at the 5% level the estimated value of β_2 is negative significant, but the estimated value of β_1 is not significantly different from zero. Insignificance of β_1 implies that the duration of the spell between the year of completing the PhD and the year of appointment has no impact on the decision of pursuing the EconLit publication strategy. This result is logical because in the framework of the model, individuals do not revise their decisions. At the same time, considering the expected value (4) of the q_i^{EER} index we see that the insignificance of β_1 still does not imply that the marginal effect of the difference between the year of completion and the year of appointment is zero. With the negative significant value of β_2, it follows that among any two otherwise identical applicants the one who graduated earlier is expected to have a lower value of the EER standardized index.

Looking at the country in which the PhD degree was attained, one can see that besides the negative and insignificant coefficient for Austria and Switzerland the coefficient for Germany is negative and significant. The reason for that is that in the zero-category, which corresponds to the remaining foreign countries (11% of the sample), more than 3/4 belong to the US, the UK and Canada. Finally, both the gender and age of the applicant have no effect on the performance by the time of first appointment.

The estimates of area-specific dummy variables further adjust the position of the expected value of the index. When reading these estimates one always has to consider both β_1 and β_2 simultaneously. To illustrate the point, we may notice that the estimate of β_2 for "Finance" is quite high, which can make us think that in Finance one needs to publish a lot more than, for instance, in Economic History. However, the negative significant value of β_1 for Finance shows that in fact not much importance

is placed on publications in this field. Consequently the expected value of q_i^{EER} in Finance in 2006 appears to be smaller than the one in Economic History (1.55 vs. 2.16, to be precise).[14]

	β_1	p-Value	β_2 [(a)]	p-Value
Year of appointment[(b)]	0.049	0.000	0.052	0.000
Age at appointment	0.040	0.201	0.007	0.747
Difference[(c)]	-0.070	0.067	-0.058	0.016
PhD in Germany	-0.040	0.874	-0.641	0.000
PhD in AUT or SUI	0.301	0.408	-0.190	0.326
Gender	-0.555	0.102	-0.228	0.245
Microeconomics	1.286	0.001	1.537	0.000
Macroeconomics	1.390	0.000	1.376	0.000
International/ Monetary Econ.	1.486	0.001	1.306	0.000
Economic Policy	0.898	0.010	1.215	0.000
Public Economics	1.140	0.003	1.474	0.000
Statistics / Econometrics	0.632	0.102	1.392	0.000
Economic History	0.319	0.498	0.586	0.136
Finance	-1.137	0.002	1.092	0.009
intercept	-1.913	0.054	-1.244	0.108

(a) The estimate for α is 1.492 with p-Value 0.000

(b) Year of appointment is the actual year minus 1970   (c) Year of appointment minus year of PhD

Table 3: Estimation results for the EER standardized quality index

4.3 Looking ahead

Now, let us use the results in Table 3 to predict the number of EER standard articles for every field in the near future. Figure 5 shows the results of a five years ahead prediction (i.e., up to 2011). As one can see, the requirements for getting tenured

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[14]Care should be taken when looking at the estimates concerning these area-specific dummies. Chair names were used as indicators for the area. In a previous version of this paper, a different grouping was used and results seem to be sensitive to classification of chairs to areas.

increase and can be expected to continue to differ across the fields, as suggested already by fig. 4. On average, however, by 2011 a newly appointed professor is expected to have nearly 6 EER standard articles. In the most competitive areas, such as Microeconomics and Public Economics, this number can even exceed 7.

Of course, as time goes by, the model becomes less accurate in its prediction. This is because positive significant coefficients for the year of appointment will always imply an increasing convex dependence between the time and the expected value of the index. Re-evaluation of the model in the next five to seven years may reveal the reverse trend and show at which value the quality index actually levels off. Nevertheless, the benchmark of 6 EER standard articles for the near future, which corresponds to 4.2 single-authored EER articles or 2.8 single-authored Top 5 articles, is unlikely to be reverted and should be taken seriously.
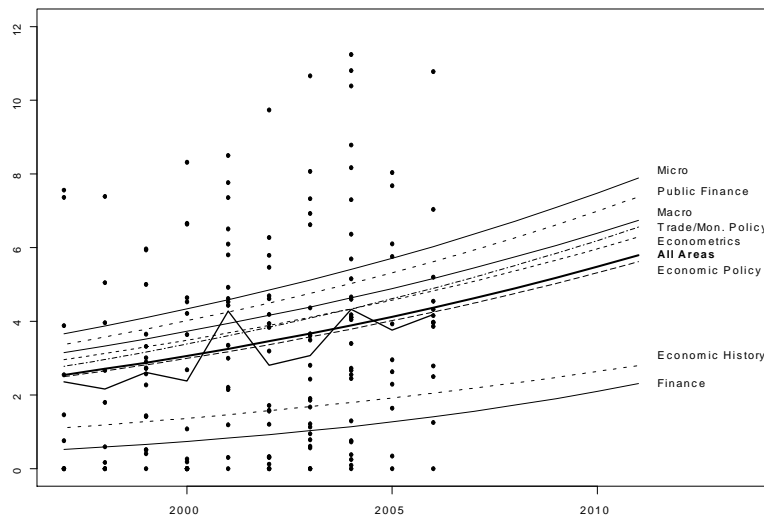
Figure 5 *Future requirements expressed in EER-standard articles*

Any post-doc who would like to check whether he or she exceeds the average, or how much is still missing, can make use of our website www.HowToGetTenured.de. Post-docs can easily calculate their individual quality index q_i^{EER} from (2) by simply typing in individual publications. This will allow each post-doc to position him or herself in fig. 5.

5 Conclusion

The objective of this article is to quantify the publication patterns of those obtaining their first tenured position in economics in Germany, Austria and the German-speaking part of Switzerland.

We find that publishing around 6 EER standard articles is a reasonable benchmark for an ambitious post-doc. It is advisable to start applying by the age of 35 - 36 (or 5-6 years following completion of the PhD) with a quality index of 1 or 2 points below the average valid in the relevant field in the year in which he wishes to be appointed. It should be kept in mind, however, that we look at papers which are published in the year of appointment. As there is often a delay between the application and the year of appointment, the numbers given here are higher than the numbers at which we would expect applications to start (or the "Habilitation" to be handed in). Papers that are accepted for publication should be counted as publications as they will in most cases be published by the time of the appointment.

If one mostly works alone, the numbers given so far can all be divided by $\sqrt{2}$. Longer papers count more. Needless to say, however, that this is only a rough indication. Ultimately, the general view of the appointing committee is what counts. Future work could try to remove some of the limitations of the existing study. One might want to extend the data and include "unsuccessful" candidates, to account for sample selection bias. The inherent difficulty with such data, however, is that it is not easy to classify a post-doc as unsuccessful because it is in no way announced that a post-doc has given up looking for a tenured job. Consequently, the determinant of the selection rule becomes unobservable itself, which will substantially complicate identifiability of the corresponding econometric model. We also acknowledge that including books, reports on economic policy and fund-raising is useful for future work. Finally and maybe most importantly, our analysis might overestimate the importance of publications due to missing values. If CVs on the internet are made available by those who publish mainly in EconLit outlets, then our averages on number and quality of publications is too high. Though, if we assume that all those without CV have zero EconLit publications in the year of their tenure, the index numbers (e.g. in figure 5) should be reduced via downsizing of the time effect in the zero-part of a hurdle model by about 10% only. This shows that even with this extreme assumption, we

should not overestimate the future averages by much more than 0.5 EER papers and our findings are still of relevance.

Those interested in knowing where they stand exactly, how far they are away from or by how much they exceed the average, can make use of our internet site www.HowToGetTenured.de. By typing in the name of the journal, year of publication, number of co-authors and number of pages, the personal quality index q_i and the individual productivity will be calculated. This might encourage post-docs to enhance the quality of their work and also possibly attract individuals from abroad to apply for jobs in Germany, Austria or Switzerland.

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