The Hazard of Job Switching: The Case of Academic Economists

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Abstract

The market for academic economists, like any labor market, includes some individuals who remain at the same place of employment for their entire careers. Others, of course, change jobs, sometimes more than once. Indeed, the data suggest that about 60% of "full" professors have changed jobs at least once. Jovanovic's 1979 model of job turnover posits that job separation occurs as a result of variations in the quality of worker-employer matches. This paper investigates the determinants of the conditional probability of job separation using a proportional hazards model. The data, gleaned from curricula vitae, comprises about 2,700 academic economists who earned their doctorates since 1980. I investigate effects that research productivity, gender, academic "pedigree," tenure status, and age may have on the job change hazard.

I.   Introduction

Economists have long been interested in the duration of spells of employment (or unemployment) for individuals. This line of research has been used to shed light on a wide variety of issues, including the efficacy of policy efforts to affect unemployment, the effects of pension type on job mobility, the relationship between seniority and productivity, and many others. A number of studies have analyzed academic labor markets, including those involving economists. As Oyer (2008) has noted, studying this particular labor market has some advantages. First, economists tend to be keenly interested in this market given that at some point all academic economists are themselves participants in it. In addition, the theoretical and empirical literature suggests that an individual's productivity affects his or her likelihood of

moving to another position, and for academic economists there are data that can be used to measure productivity (namely publications).

Despite being narrowly focused, analyses of labor markets involving academic economists may offer more generalizable results. It is possible that markets for academics in other disciplines are driven by similar factors. Even idiosyncrasies of the academy such as the tenure system may have analogs in other labor markets. For example, teachers in American public schools in most states may receive tenure after a certain number of years of employment (one to seven years, depending on the state). According to some estimates, as of 2008 some 2.3 million American teachers were tenured.[1]

The previous literature includes quite a few papers that have examined job switching of one sort or another. Meyer (1990) and Tansel and Tasci (2010) are examples of the large literature on the duration of unemployment spells. Haverstick, et al. (2010) examine how pension type affects job tenure. Others study more specifically various aspects of the academic labor market. For example, Moore, Newman, and Turnbull (1998), and Bratsberg, Ragan, and Warren (2003) consider the relationship between seniority and salary among academic economists; Ransom (1993) addresses the same issue using a broader array of disciplines. Heining, Jerger, and Lingens (2007) use the curricula vitae of German academic economists in order to examine time-to-tenure in a duration framework, but no research addresses the hazard of job switching among academic economists using duration analysis.[2]

This paper examines the determinants of job switching among academic economists. The data employed are also noteworthy: I employ a unique data set gleaned from the curricula vitae

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[1] See ProCon.org for these data and a discussion of the history of tenure in American public schools.
[2] Though not their principal focus, in their study of the returns to seniority among academic economists Hilmer and Hilmer (2011) mention estimating hazard functions.

of about 2,700 academic economists in the U.S. Job switching within this group is rather common: nearly 40% of the individuals in the sample have changed jobs at least once in the careers. The data allow an examination of how time-varying productivity affects employment duration. Also notable is the ability to address the fact that some economists change jobs more than once. That is, this paper employs a recurrent event framework.

II.   An Empirical Model

Why do academic economists change jobs? Jovanovic (1979) constructs a theoretical model of job matching and turnover that suggests that the hazard of job separation in general is a function of the quality of the employer-employee match. Of course, measuring job match quality is difficult. Terris (2004) addresses this by equating job match quality with duration of employment. An obvious indicator of job match quality can be taken from the tenure decision, with poor matches resulting in separation. Academics that move after having been granted tenure may move if offered a position at a higher-paying and/or more prestigious institution, with such offers typically being the result of high levels of productivity. There is, of course, any number of largely unobservable factors, such as preferences for particular geographic locations, the presence of particular colleagues, or difficulties in getting along with colleagues. Using duration analysis, this paper considers the probability of changing jobs as a function of productivity, tenure and promotion status, and several characteristics of individuals which arguably may also be measures of job match quality.[3]

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[3] Academic economists tend to be different from other sorts of workers in that when economists move they frequently already have a new position arranged; this means that unemployment spells are typically absent or brief and we can treat an individual who moves as transitioning from one job directly to the next.

Survival models are well understood, and have been used to analyze a wide variety of applications. The data include the amount of time that has elapsed between the beginning of the study and a failure event, such as the onset of a certain medical condition or (in an economics context) the onset of a spell of unemployment. In a simple survival model, if d_i is the number of individuals who experience the failure event and n_i is the number of individuals at risk of failure, the simple hazard function at any point in time is d_i/n_i. Survival models are also characterized by censoring. Most commonly, the censoring results from the fact that at the end of the study period some individuals have not yet experienced the failure event. This is known as right-censoring; left-censored observations are also possible in some study designs. In short, at any point in time an individual has either switched jobs and therefore departed the group that is at risk, or he or she has not. In the latter case, we only know that the failure event hasn't occurred yet.

Although an interesting descriptive device, the simple survival model does not allow for the effects of possible determinants of survival. For this, a semi-parametric model is typically used. Cox (1972) described the hazard of the event as the product of an arbitrary function of time (the so-called baseline hazard) and an exponential function made up of possibly time-varying covariates. In particular, the hazard function in this case resembles the following:

$$h(t, x(t), \beta) = h_0(t) \cdot exp(x'(t)\beta) \tag{1}$$

where $h_0(t)$ is the baseline hazard, and $x(t)$ is a vector of covariates. The parameters can be estimated by maximizing the partial likelihood function:

$$l_p(\beta) = \prod_{i=1}^{n} \left[\frac{e^{x'_t(t_{(i)})\beta}}{\sum_{l \in R(t_{(i)})} e^{x'_t(t_{(i)})\beta}} \right]^{c_i} \tag{2}$$

where c_i is a censoring indicator.

In many applications, recurrent events cannot occur. For example, in a medical study the failure event may be the death of an individual, so that for each individual the researcher observes either that the failure event has occurred or that the observation is right censored. In the present paper, the failure event is changing academic jobs. As such, our data are characterized by the possibility of recurrent events (an individual may change jobs multiple times). This complication can be handled in several different ways (see Hosmer, Lemeshow, and May, 2008 for a discussion). We follow the approach first presented by Prentice, Williams, and Peterson (1981) which involves treating the time between failure events for each individual as strata. In this case, the hazard function resembles the following:

$$h_s(t, x(t), \beta) = h_{0s}(t) exp[x'(t)\beta_s], \tag{3}$$

where s is an index of the strata, $h_{0s}(t)$ is the baseline hazard, and x(t) is a vector of covariates. The passage of time can be treated in at least two equivalent ways – as time between the beginning of the study and a failure event, or between the failure event and the previous failure event. We adopt the former approach, although Prentice, Williams, and Peterson (1981) point out that the approaches differ only in the interpretation of results. As before, the coefficient vector β is estimated by maximizing the partial likelihood function:

$$l_p(\beta) = \prod_{i=1}^{n} \left[\frac{e^{x_t'(t_{(i)})\beta_s}}{\sum_{l \in R(t_{(i)})} e^{x_t'(t_{(i)})\beta_s}} \right]^{c_i}, \tag{4}$$

where again c_i is a censoring indicator.

III.   Data Description

Dietz, et al. (2000) discuss the use of curricula vitae (CV) as a data source, describing this avenue as having a great deal of potential for research. Our data come from an examination of the curricula vitae of 2,698 academic economists who received their doctorates since 1980. CVs were gathered from economists working in the top 240 programs; these programs were identified using the rankings constructed by McPherson (2012). Data are complete through the end of 2011. For the most part, the data do not include non-academic economists since such individuals operate in a rather different environment. There are exceptions, however. An individual who began his or her career in academia but who had spells of employment outside of the academy before returning to it are included. Every effort was made to use the CVs of every eligible tenured or tenure-track economist. Most CVs were found online. Professors whose CVs were not available in this fashion were contacted with a request for a CV. Overall, around 70% of eligible individuals are included, and while this response rate is quite good there are certain sorts of individuals who are more likely to be excluded. For example, the response rate is very high for the elite programs but falls off as one moves down the program rankings. Also, certain individuals will escape notice given the manner in which data were collected. For example, suppose an individual is hired in 1990, but moves in 1996. If that person is still in academia at the time of data collection (2010 and 2011) he or she will in principle be included. If instead that person is employed outside of the academy or at a university outside the U.S. at the time data were collected he or she may not have been identified. Nevertheless, the data represent a substantial proportion of academic economists in the U.S.

The majority (61.4%) of individuals in our sample has never changed jobs (that is, they will be considered right-censored). 27.2% have changed jobs once, and 8.5% thrice, and an

additional few changed jobs four times or more. 24.5% of the sample is female, and 28.9% are non-white. Individuals who switch jobs multiple times disproportionately work at top-ranked programs.

In the regressions discussed in the following section we consider a number of covariates. There are a number of these that do not vary over time, including dummy variables for gender and race[4] and for an individual's "pedigree." This latter is a series of dummy variables based on the ranking of the institutions from which each individual received his or her doctorate.[5] We also introduce several time-varying covariates. As noted above, academics are somewhat unusual in that research productivity can be measured in some fashion. Since research output changes over time, we calculate three-year rolling averages publications controlling for publication quality and for the number of co-authors. We use the factors created by Kalaitzidakis, Mamuneas, and Stengos (2010) in discounting for journal impact.[6] The co-author adjustment uses a weighting suggested by Liner and Sewell (2009). Thus, the unit of measurement becomes the equivalent of a sole-authored article in the *American Economic Review* in a year. Publications for each individual were taken from an individual's CV, but this was supplemented with any publications found in EconLit (this is especially important in bringing CVs up to date by adding recent publications). We also control for whether or not an individual is tenured at each period and whether or not he or she has been promoted to full professor. We include a control for an individual's age on the argument that an individual's interest in moving may decrease as he or

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[4] Our measure of race is based on evidence from CVs as well as photographs. It is a crude measure – a dummy taking on a value of one if the person is white.

[5] This ranking is based on McPherson (2012) supplemented by that of Kalaitzidakis, Mamuneas, and Stengos (2003). This is necessary because several individuals in our sample received their doctorates outside the U.S., but McPherson does not rank non-U.S. programs.

[6] These factors are based on citations per article corrected for self-citations. The factors are normalized to an article in the *American Economic Review*. An article in the *Quarterly Journal of Economics*, for example, would be equivalent to 0.759 articles in the AER. Articles not ranked by Kalaitzidakis, Mamuneas, and Stengos were arbitrarily assigned a weight of 0.004.

she advances in age. In some cases, individuals list their year of birth on the CV; for others, we compute age using the year in which the individual was awarded a bachelor's degree, assuming that the age at that time would have been 22. Finally, we use a time varying dummy variable for whether or not the economy was in recession during any part of the calendar year.

IV.   Results

As an initial step, consider only time between hiring and first move (if any). Figure 1 presents the Kaplan-Meier survival function and the smoothed hazard function. As one might expect, the hazard function peaks at about seven years – the traditional duration of a faculty member's probationary period.

Table 1 presents the regression results obtained by maximizing the partial likelihood function in equation (2) above. Since it is possible that the covariates differ in their impact according to the quality of the program in which each individual works, separate estimation is carried out for individuals according to the tier of the university at which he or she was initially hired, as well as for all individuals together. This is based on the 1994-2009 ranking presented by McPherson (2012), and divides programs into the top 19 programs, those ranked 20th through 50th, and all others.

Coefficients are typically interpreted by converting them to the "hazard ratio," e^{β}. As an example, considering all programs combined economists with tenure have job switching hazards that are exp(-1.4678) = .2304 that of untenured individuals, a finding that is highly statistically

Figure 1:
Kaplan-Meier Survival Estimate and Estimated Hazard
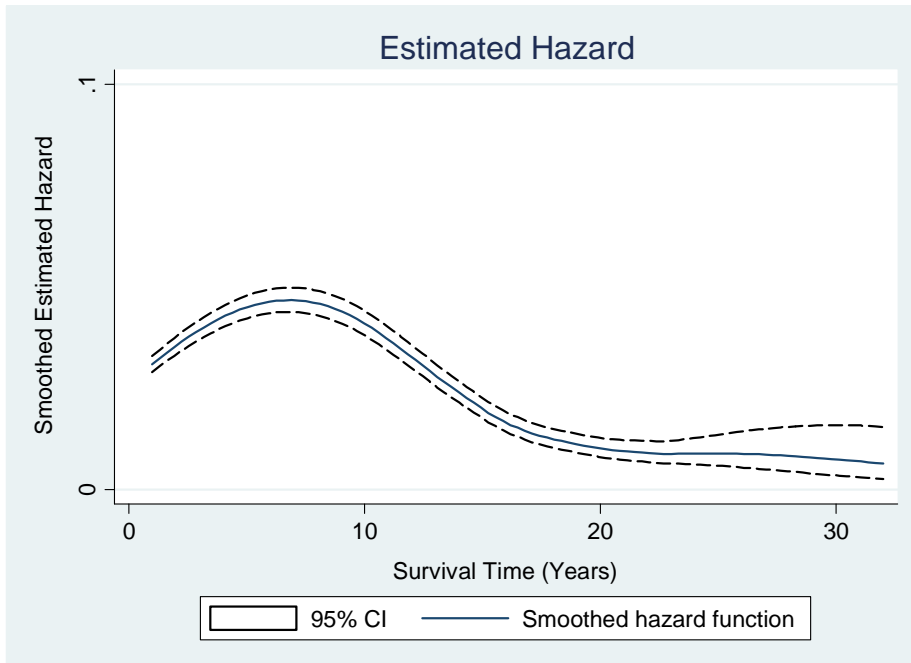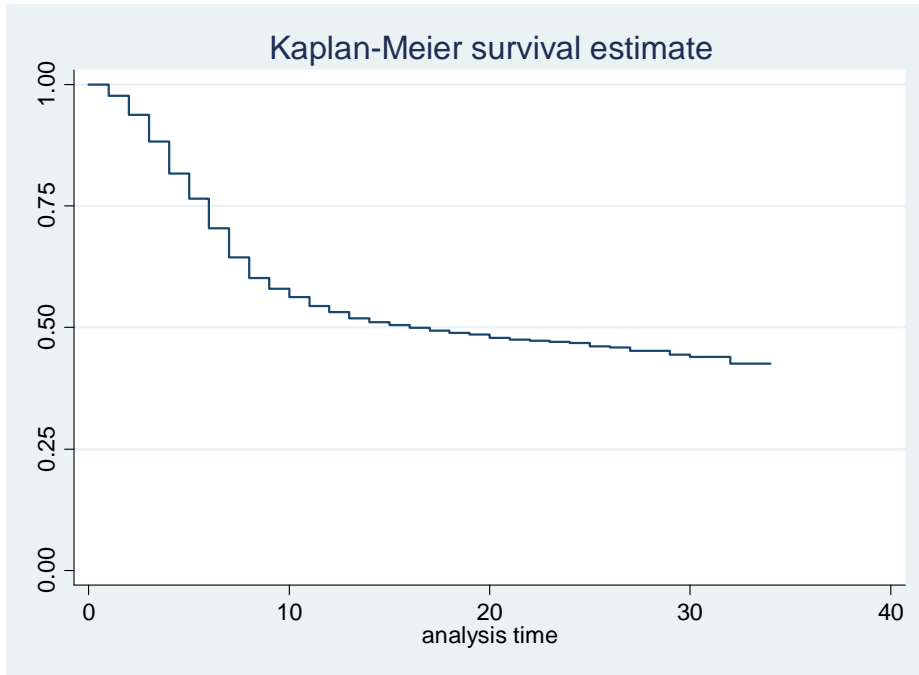
significant. Alternatively, one could say that economists with tenure are 76.96% less likely to change jobs. Tenure reduces the hazard of switching jobs at top-ranked programs and at lower-ranked ones. Interestingly, promotion to full professor also decreases the job switching hazard, but only at top-ranked programs. This may be the result of full professors at top programs perceiving themselves as having fewer palatable options (that is, they are already working at the best programs). Productivity is important, although the overall result is driven by programs outside the top 50. For these programs, the hazard of switching jobs initially increases with productivity but decreases eventually. However, the inflection point occurs at so high a level of productivity that the relationship between productivity and job switching hazard is positive over almost the entire sample range. The large coefficient suggests that an increase in productivity equivalent to one article in the AER makes switching very likely outside of the top 50. The hazard of switching is inversely related to an individual's age, at least at programs outside the top 19. Neither gender nor race nor macroeconomic conditions (as measured by the recession dummy) significantly affect the likelihood of changing jobs once other factors have been controlled for.

The simple proportional hazards model ignores the fact that one can switch jobs more than once. Table 2 presents the regression results obtained by maximizing the partial likelihood function in equation (4).[7] As before, separate estimation is carried out for individuals according to the tier of the university at which he or she was initially hired, as well as for all individuals together. Overall, the likelihood of an academic economist moving seems to be unrelated to gender or age, although academic pedigree does have a statistically significant impact in some of the individual tiers. There is evidence that race affects the likelihood of switching jobs. Overall, whites

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[7] Hosmer, Lemeshow, and May (2008) point out that observations on an individual subject may be correlated. The results present employ the robust variance estimator suggested by Lin and Wei (1989).

Table 1
Proportional Hazards Model: Time Until First Move

Variable	Hazard Ratio (St. Error)			
	Hiring University: Top 19	Hiring University: 20 - 50	Hiring University: All Other	Overall
female	0.9429	1.1519	1.1219	1.0880
	(0.1543)	(0.1845)	(0.1128)	(0.0813)
white	0.9593	0.9971	0.9836	0.9869
	(0.1412)	(0.1634)	(0.0986)	(0.0725)
phd2	1.1464	1.4023	1.2002*	1.0504
	(0.1936)	(0.2059)	(0.1261)	(0.0760)
phd3	0.3566	0.7455	1.3406**	0.9878
	(0.2534)	(0.2721)	(0.1620)	(0.0998)
phd4	0.8674	10.0170***	1.2102	1.0098
	(0.8712)	(4.8003)	(0.2202)	(0.1618)
productivity	1.1870	0.1728	155.5023***	8.7688***
	(0.6354)	(0.1942)	(211.2731)	(3.3006)
productivity^2	0.8589	20.1622*	0.0006**	0.2807***
	(0.4081)	(35.2322)	(0.0021)	(0.1211)
tenure	0.4884***	0.2057***	0.1573***	0.2304***
	(0.0971)	(0.0570)	(0.0332)	(0.0296)
promotion	0.4860**	0.7185	1.6288	1.1100
	(0.1453)	(0.3021)	(0.4874)	(0.1955)
age	0.9737	0.9514*	0.9601***	0.9526***
	(0.0271)	(0.0283)	(0.0139)	(0.0111)
recession	0.9250	1.0845	1.0505	1.0294
	(0.1256)	(0.1576)	(0.1029)	(0.0715)
number of individuals	555	481	1662	2698
Log-likelihood	-1,658.181	-1,232.074	-3,539.406	-7,571.437
LR χ^2	29.11	65.71	113.35	202.29
Prob > χ^2	0.002	0.000	0.000	0.000

are 18.6% less likely to switch, and this effect seems to be relatively constant across quality tiers.

That this covariate is only significant in the recurrent event setting may be the result of the fact

that a larger proportion of whites than non-whites has moved multiple times. The granting of

tenure, as before, dramatically lowers the probability of moving: overall the hazard of switching

is about 60% lower for individual with tenure, ceteris paribus. The promotion to full professor

effect is also similar to the earlier results: promotion only has a discernible impact on the likelihood of moving for those initially hired at the highest ranked programs – such individuals are significantly less likely to change jobs.

Relative to the results based only on time to first move, productivity has an interesting impact on the likelihood of moving in the recurrent event model. As before, one notices that additional productivity first increases the hazard rate and then decreases it. However, on closer inspection this productivity effect only pertains to those initially hired at top-tier programs – this is the opposite of the results presented in Table 2. This difference is probably due to the fact that a disproportionate number of individuals initially hired at the elite programs move more two or more times.

In the recurrent events model, recessions significantly reduce the hazard of job switching. This too represents a departure from the earlier model. Evidently, while recessions don't significantly reduce the hazard of the first job switch, the hazard of subsequent switches is lower.

V.   Conclusions

The case of academic economists represents a unique opportunity to study a particular aspect of labor markets: the duration of the employee-employer match. This is because for many academics, information about length of employment and dates of any job switches are commonly available in the form of curricula vitae. Furthermore, given economists' traditional interest in ranking professional journals it is relatively simple to construct measures of productivity from CVs. This paper is based on a unique data set: information gathered from the CVs of approximately 2,700 academic economists. I use traditional survival analysis, taking particular

advantage of the fact that some economists switch jobs multiple times. Indeed, roughly 11% of

individuals in my sample have changed jobs at least twice.

Table 2
Proportional Hazards Model: Recurrent Events

Variable	Hazard Ratio (Robust St. Error)			
	Hiring University: Top 19	Hiring University: 20 - 50	Hiring University: All Other	Overall
female	0.9194	1.1345	1.0371	1.0332
	(0.0919)	(0.1252)	(0.0691)	(0.0507)
white	0.8179**	0.8324*	0.8009***	0.8141***
	(0.0710)	(0.0832)	(0.0553)	(0.0387)
phd2	1.1059	1.2356**	1.0977	1.0109
	(0.1227)	(0.1137)	(0.0729)	(0.0461)
phd3	0.4911*	0.7351	1.2742***	1.0125
	(0.1943)	(0.1741)	(0.1059)	(0.0722)
phd4	1.6413	1.8659**	1.2182*	1.0672
	(1.5880)	(0.5856)	(0.1464)	(0.1167)
tenurestatus	0.5403***	0.3312***	0.3774***	0.4009***
	(0.0649)	(0.0486)	(0.0442)	(0.0293)
fullstatus	0.7211**	0.7600*	1.1462	0.9595
	(0.0970)	(0.1236)	(0.1298)	(0.0740)
productivity	2.0150**	0.5505	2.7179	3.9133***
	(0.6605)	(0.3760)	(2.7244)	(0.9421)
productivity^2	0.4430**	4.8442	0.2734	0.3615***
	(0.1457)	(5.3371)	(0.6778)	(0.1027)
age	1.0064	0.9983	1.0024	0.9959
	(0.0182)	(0.0179)	(0.0107)	(0.0079)
recession	0.4489***	0.5577***	0.5068***	0.4999***
	(0.0429)	(0.0596)	(0.0369)	(0.0254)
Number of individuals	555	481	1,662	2,698
Log pseudo-likelihood	-3,403.171	-2,421.070	-6,468.405	-14,902.832
Wald χ^2	149.06	92.50	175.85	403.86
Prob $> \chi^2$	0.000	0.000	0.000	0.000

There are several interesting results. First, more productive economists at the top programs are more likely to move; this effect is largely absent for those at programs outside the top 19. Perhaps unsurprisingly, the awarding of tenure (a strong signal that the job match is of relatively high quality) substantially lessens the probability of moving to another institution. The promotion to full professor has a similar effect for those in top-50 programs. It also seems to be the case that, *ceteris paribus*, non-whites are more likely to switch jobs, perhaps indicating their relative scarcity (although other interpretations are also plausible). As one might expect, recessions diminish the job switching hazard. It is interesting, however, that recessions do not affect the chances of moving for economists at the elite programs.

References

Bratsberg, Bernt, James F. Ragan, Jr., and John T. Warren. 2003. "Negative Returns to Seniority: New Evidence in Academic Markets," *Industrial and Labor Relations Review* 56: 306-323.

Cox, D.R. 1972. "Regression Models and Life Tables (with Discussion)," *Journal of the Royal Statistical Society: Series B* 34: 187-220.

Dietz, James S., Ivan Chompalov, Barry Bozeman, Eliesh O'Neil Lane, and Jongwon Park. 2000. "Using the Curriculum Vita to Study the Career Paths of Scientists and Engineers: An Exploratory Assessment," *Scientometrics* 49: 419-442.

Haverstick, Kelly, Alicia H. Munnell, Geoffrey Sanzenbacher, and Mauricio Soto. 2010. "Pension Type, Tenure, and Job Mobility," *Journal of Pension Economics and Finance* 9: 609-625.

Heining, Jörg, Jürgen Jerger, and Jörg Lingens. 2007 "Success in the Academic Labour Market for Economics - The German Experience," No 422, University of Regensburg Working Papers in Business, Economics and Management Information Systems from University of Regensburg, Department of Economics.

Hilmer, Michael J. and Christiana E. Hilmer. 2011. "Negative Returns to Seniority and Job Mobility across the Program Quality Distribution: Are Top Public PhD-Granting Programs Different?" *American Economic Review Papers and Proceedings* 101: 466-470.

Hosmer, David W., Stanley Lemeshow, and Susanne May. 2008. Applied Survival Analysis: Regression Modeling of Time-to-Event Data, Hoboken, NJ: John Wiley & Sons.

Jovanovic, Boyan. 1979. "Job Matching and the Theory of Turnover," *Journal of Political Economy* 87: 972-990.

Kalaitzidakis, Pantelis, Theofanis P. Mamuneas, and Thanasis Stengos. 2010. "An updated ranking of academic journals in economics." Working Paper WP-10, Remini Center for Economic Analysis.

Kalaitzidakis, Pantelis, Theofanis P. Mamuneas, and Thanasis Stengos. 2003. "Rankings of Academic Journals and Institutions in Economics." *Journal of the European Economic Association* 1: 1346-1366.

Lin, D.Y. and L.J. Wei. "The Robust Inference for the Cox Proportional Hazards Model." *Journal of the American Statistical Association* 84: 1074-1078.

Liner, G.H. and E. Sewell 2009. "Research Requirements for Promotion and Tenure at PhD Granting Departments of Economics." *Applied Economics Letters* 16: 765-768.

McPherson, Michael A. 2012. "Ranking U.S. Economics Programs by Faculty and Graduate Publications: An Update Using 1994-2009 Data," *Southern Economic Journal* 79 (1), pp. 71-89.

Meyer, Bruce D. 1990. "Unemployment Insurance and Unemployment Spells," *Econometrica* 58: 757-782.

Moore, William J., Robert J. Newman, and Geoffrey K. Turnbull. 1998. "Do Academic Salaries Decline with Seniority?" *Journal of Labor Economics* 16: 352-366.

Oyer, Paul. 2008. "Ability and Employer Learning: Evidence from the Economist Labor

    Market," *Journal of the Japanese and International Economies* 22: 268-289.

Prentice, R.L., B.J. Williams, and A.V. Peterson. 1981. "On the Regression Analysis of

    Multivariate Failure Time Data," *Biometrika* 68: 373-379.

ProCon.org. "Should Teachers Get Tenure?" retrieved from http://teachertenure.procon.org/.

Ransom, Michael R. 1993. "Seniority and Monopsony in the Academic Labor Market,"

    American Economic Review 83: 221-233.

Tansel, Aysit and H. Mehmet Tasci. 2010. "Hazard Analysis of Unemployment Duration by

    Gender in a Developing Country: The Case of Turkey," *Labour* 24: 501-530.

Terris, Kristin L. 2004. "Job Matching: The Effects of Job Search on Match Quality," draft

    paper, Georgetown University.