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Human Capital, Networks and Segmentation in the Market for Academic Economists

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Abstract: Academic labor markets often exhibit steep hierarchies, with institutions at the top attempting to attract newly minted doctorates from similarly situated institutions in an effort to maintain or improve their reputations. Yet, despite recent research on labor market segmentation in academe, the literature has heretofore been under-theorized. This paper provides a straightforward formal model that generates a three-tiered hierarchy of academic institutions, wherein academic departments affiliated with top-tier universities endeavor to hire only from within the group, while those in the bottom tier are unable to employ faculty with degrees from top departments. The results from statistical tests applied to data from economics departments in the U.S. indicate that top-tier departments employ 3.5 to 3.8 (2.5 to 2.9) more assistant professors from top-tier institutions, ceteris paribus, than bottom (middle) tier departments.

Keywords: academic labor markets; academic networks; labor market segmentation; academic economists

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1. Introduction

The academic labor market is noticeably segmented. Top academic departments often hire faculty with in-house doctoral degrees, while also attempting to attract newly minted doctorates from similarly situated institutions, all in an effort to improve their reputations through publications in leading journals and larger citation counts (see Faria et al. 2016, 2017). This practice follows from the idea that faculty candidates with doctorates from top academic departments are thought, a priori, to be future stars (see Mixon and Upadhyaya 2011, 2012, 2014; Faria et al. 2016, 2017). Moreover, it is well known that the most prestigious academic journals are edited (i.e., managed) by faculty members who are affiliated with these same top academic departments. A recent study by Colussi (2018) found that about 43 percent of the articles published in the top general-interest economics journals are authored by scholars who were connected to an editor at the time of the publication, and that being a doctoral student or departmental colleague of a journal's editor improves one's publication outcomes.[1]

Despite the recent interest in the academic labor market segmentation phenomenon highlighted above, the literature examining this phenomenon has heretofore been under-theorized. This study contributes to filling that gap in the literature. It provides a straightforward formal model that generates a three-tiered hierarchy of academic institutions. In equilibrium, we show that academic departments affiliated with top-tier universities endeavor to hire only within-tier job market candidates. In contrast, departments comprising the second tier hire a mix of faculty with degrees from both the top departments and from lesser-ranked institutions, while those at the bottom (i.e., the third tier) are unable to employ faculty with degrees from top departments, and, as a consequence, only hire candidates from institutions ranked near the median. The specifics of our model are supported by various statistical tests based on data from economics departments at colleges and universities in the U.S. Before turning to the formal model and the empirical explorations, we first provide a brief discussion of the background literature related to our work.

2. The Background Literature: A Brief Review

The noteworthy segmentation of the academic labor market is the subject of prior research. Just recently, for example, Yuret's (2018) analysis of the educational backgrounds of 14,310 full professors from 48 top universities in the United States reveals that 72 percent of the professors obtained their doctorate degrees from only 20 universities.[2] This type of market segmentation is quite profound in the field of law. Segall and Feldman (2019) report that of the 152 tenured or tenure-track law school faculties at Harvard University and Yale University holding domestic academic credentials, 149 hold degrees from among the top 10 institutions as ranked by the *U.S. News & World Report*. Similar results hold for Stanford University, the University of Chicago, the University of Michigan and the University of Pennsylvania.

The economics discipline is, as noted in the introduction above, especially prone to labor market segmentation. For example, both Han (2003) and Wu (2005) report that although the tendency of academic departments to hire from institutions ranked at or above their level is prevalent throughout academe, the top economics departments are more likely to engage in the practice than are top departments in other social sciences (e.g., sociology, political science, psychology), English, history and mathematics. A study by Klein (2005) that utilizes the international departmental rankings from Coupé (2003) reports that between 80 and 90 percent of economics faculty at the top economics departments earned their doctorates at one of the top 35 economics departments. Additionally, the data indicate that these same top 35 economics departments draw 76 percent of their combined faculty from within the group (Klein 2005).[3] Klein supplements these results by reiterating the earlier finding in Kocher and Sutter (2001) that the top 10 institutions conferred the doctorates of about 55 percent of the authors in 15 top economics journals.[4] Relatedly, more recent work by Colussi (2018) reports that between 2000 and 2006, 25 percent of the authors in the top four economics journals were employed at only six universities, while 47 percent earned their doctorates from the same universities. In an update, Heckman and Moktan (2020) found that between 2000 and 2016, about 12 percent of the papers in the *American Economic Review* and about 25 percent of the papers in the *Quarterly Journal of Economics* had at least one author affiliated with Harvard University.[5] Lastly, Wright (2023) discusses the research indicating that the alma mater rankings are statistically significant predictors of the likelihood of publishing in the top five journals.

The phenomenon described by Klein (2005) was also found in a study by Combes et al. (2008) that analyzes the determinants of success in the *concours d'agrégation en sciences économiques*, which is a centralized hiring procedure through which professors of economics are selected in France. Using data from 1984 to 2003, these researchers focus in part on the role that candidates' networks, defined as professional links between candidates and the hiring committee members who make the recruitment decisions, play in securing academic employment (Combes et al. 2008). They report that professional connections to hiring committee members are significantly related to the probability of securing employment. In fact, the effect of network connections is sufficiently strong that a substantial improvement in a candidate's publication record is required to compensate for not being linked to the hiring committee (Combes et al. 2008).

Interestingly, there is some evidence that such hiring practices do not necessarily produce the desired outcome. In a study of the research productivity of new graduates from North American doctoral programs in economics from 1986 to 2000, Conley and Önder (2014) found that the rank of the graduate departments themselves provides a surprisingly poor prediction of future research success. For example, at the top 10 departments as a group, the median graduate has fewer than 0.03 *American Economic Review*-equivalent publications six years after graduation, which is a record they characterize as un-tenurable at a top department. They also report that doctoral program graduates of equal percentile rank from certain lower-ranked departments have stronger publication records than their counterparts at higher-ranked departments (Conley and Önder 2014). These results are consistent with an earlier work by Kim et al. (2009) and arguments made in a new study by Wright (2023). They assert that most of the productivity gains that elite universities historically provided have dissipated due to changes in communications technology (Kim et al. 2009; Wright 2023).

An earlier study by Pjesky and Sutter (2011) perhaps explains the disconnect between hiring practices at elite institutions and the same institutions' desire to employ candidates with the greatest potential for future success. The disconnect results from the lack of a profit motive in academia, which, in other settings, was shown to curb forms of prejudice in hiring. Pjesky and Sutter (2011) explored the role of the profit motive in the performance of academic markets by comparing the pedigree of employees of top law schools to those at top law firms. In doing so, they found that top law schools are much more likely to employ graduates of top-ranked law schools than are elite law firms, and the difference exists at both the junior and senior levels. They also fail to report evidence suggesting that, in their roles as professors, the graduates of top law schools outperform those of less prestigious schools in terms publications or citations.[6] When viewed together, these results support the notion that in the absence of a profit motive, hiring in the academy appears more likely to indulge a preference for pedigree.

3. Network Effects in Academic Labor Markets

As a result of the academic labor market practices described in the academic literature reviewed above, the establishment of networks consisting of faculty who are affiliated with higher echelon institutions has a high payoff. However, only a handful of academic departments housed in colleges and universities ranked near the median are able to attract and hire faculty with highly valued doctoral degrees. The lowest-ranking, typically smaller academic departments are generally unable to hire faculty with degrees from the top academic departments. In the relatively rare cases where they are successful, they generally find that the retention of these faculty is very difficult (Wapman et al. 2022). These problems mean that smaller and lesser-known academic departments typically fill faculty vacancies with candidates holding doctoral degrees from universities ranked near the median. Given the labor market and other networks fostered by academic departments at prominent universities (Heckman and Moktan 2020; Wright 2023), and the difficulties in hiring faculty from top-tier institutions faced by academic departments at universities ranked near the median (Yuret 2018; Segall and Feldman 2019), there is typically little change in the various rankings of academic departments. This type of stability is often supported by relatively large and significant correlation coefficients produced in studies that compare various rankings of departments (e.g., see Faria et al. 2016; Qian et al. 2016; Mixon and Upadhyaya 2022a).

Our formal model presents academic departments consisting of two types of faculties, one with degrees from top universities with human capital N, and another with degrees from all other universities with human capital H.[7] It is generally assumed, a priori, that $N \geq H$. A representative academic department benefits from human capital by hiring faculty who are productive in both teaching and research. The academic department also benefits from reputational effects, R, that emanate from the research endeavors of its faculty, which are captured by publications, P, and citations to those publications, C. Both P and C are positively related to R, and the representative academic department's utility function is defined by

$$U = u(H) + v(N) + R(P, C) \tag{1}$$

It is worth stressing, as discussed above, that the most prominent academic journals are usually edited (i.e., managed) by faculty who are affiliated with the top academic departments (Colussi 2018; Wright 2023). This generally benefits graduates from these departments, and these network effects facilitate the hiring of these newly minted PhDs by top academic departments (Heckman and Moktan 2020; Wright 2023). The network effects are captured in the model by assuming that publications and citations are increasing functions of N.[8] Therefore, the reputational effects are a function of N as follows:

$$R(P, C) = R(P(N), C(N)) = R(N) \quad (2)$$

With the other factors constant, the representative academic department always prefers N to H in the academic labor market. Therefore, the academic department's demand for H is derived from its demand for N. Given that the academic department hires several faculties with N, the remaining positions are filled by H and, as a consequence, $H = H(N), H'(N) > 0$. In sum, the working hypotheses of our model are that (1) departments choose to hire faculty based on pedigree (whether they hold a doctorate from the top- or lower-ranked departments) (Kocher and Sutter 2001; Han 2003; Klein 2005; Wu 2005; Bryan 2019; Wapman et al. 2022; Wright 2023), and (2) job market candidates from top departments have an advantage because their professors dominate the main journals of the area (Colussi 2018; Heckman and Moktan 2020; Wright 2023). This network effect translates into more publications, thus increasing their value in the job market (Oyer 2006; Heckman and Moktan 2020; Wright 2023).

In order to simplify the algebra, we assume this process to be explicit in the following form:

$$H = (W - \pi)N + a(N - N^*)^2 \quad (3)$$

where $(W - \pi)$ are the net costs to the academic department of hiring N, and $a(N - N^*)^2$ are the adjustment costs to the academic department of hiring a level of N that differs from its optimal level, N^*.

The number of faculty candidates in the academic labor market who hold degrees from top academic departments is limited because top departments not only hire from other top departments (Wapman et al. 2022; Wright 2023), but they also hire the top candidates from within their own and other top departments (Faria et al. 2016; Bryan 2019). Because of this excess supply, the average department will hire doctoral candidates from a higher-ranked institution so that a rationing process for top candidates occurs, such that

$$\overline{N} \geq N \quad (4)$$

Substituting (2) into (1) and maximizing it with respect to H and N, considering (3) and (4) as constraints, yields the following Lagrangian function,

$$L = u(H) + v(N) + R(N) + \delta\left[(W - \pi)N + a(N - N^*)^2 - H\right] + \mu\left(\overline{N} - N\right) \quad (5)$$

where δ can be interpreted as the marginal utility of the derived demand for H, and μ is the marginal utility of relaxing the constraint in (4). The first-order conditions are,

$$L_H = 0 \rightarrow u'(H) - \delta = 0 \quad (6)$$

$$L_N \leq 0 \rightarrow v'(N) + R'(N) + \delta[(W - \pi) + 2a(N - N^*)] - \mu \leq 0; N \geq 0;\ NL_N = 0 \quad (7)$$

and

$$\overline{N} - N \geq 0;\ \mu \geq 0;\ \mu\left(\overline{N} - N\right) = 0 \quad (8)$$

where (7) and (8) are the Kuhn–Tucker conditions.

Substituting (6) into (7) yields an expression for H as a function of N as follows:

$$u'(H) \leq \frac{\mu - v'(N) - R'(N)}{[(W - \pi) + 2a(N - N^*)]} \quad (9)$$

In order to obtain clear solutions, we assume the following explicit functions:

$$u(H) = u\,lnH; v(N) = vN - 0.5N^2; R(N) = RN \tag{10}$$

Substituting (10) into (9) yields

$$\frac{u}{H} \leq \frac{\mu + N - v - R}{[(W-\pi) + 2a(N-N^*)]} \rightarrow H \geq \frac{[(W-\pi) + 2a(N-N^*)]u}{\mu + N - v - R} \tag{11}$$

In solving the model, the above optimality conditions yield three equilibria. Each equilibrium allows us to classify academic departments on a hierarchical basis according to the type of human capital they hire. These are,

Tier 1 Academic Department

$$L_N = 0 \text{ and } N_1 = \bar{N} = N^* + \left(\frac{W-\pi}{2a}\right) \geq N^* > 0, \text{ and } H_1 = 0 \tag{12}$$

Tier 2 Academic Department

$$L_N = 0 \text{ and } 0 < N_2 = N^* < \bar{N} \text{ and } H_2 = \frac{[(W-\pi)]u}{N^* - v - R} \tag{13}$$

and

Tier 3 Academic Department

$$L_N \leq 0; N_3 = 0 \text{ and } H_3 \geq \frac{[(\pi - W) + 2aN^*]u}{v + R}. \tag{14}$$

Based on the hypothesis that faculty possessing doctoral degrees from top academic departments are paid more than the return they generate to their respective academic departments, given that the net costs are positive (i.e., $W > \pi$), the comparison of the academic departments, according to the conditions in (12) through (14), yields the main result of the model. Namely, a ranking of academic departments in terms of human capital accumulated

$$N_1 \geq N_2 \geq N_3, \tag{15}$$

and

$$H_1 \leq H_2 \leq H_3. \tag{16}$$

According to (15) and (16), top academic departments are of the Tier 1 type, given that they are able fill all of their faculty vacancies with candidates who hold doctoral degrees from top academic departments. In some cases, they may even hire more of these candidates than is optimal (i.e., $N_1 = \bar{N} = N^* + \left(\frac{W-\pi}{2a}\right) \geq N^*$). Additionally, they do not hire candidates who do not possess a doctoral degree from a top institution (i.e., $H_1 = 0$). Next, Tier 2 characterizes the median academic departments, which satisfy their optimal levels of human capital through candidates from top academic departments, $N_2 = N^*$, and then fill the rest of their vacancies with candidates who hold doctoral degrees from academic departments other than those at the top of the academic hierarchy. Lastly, the academic departments occupying the lowest rung(s) of the academic hierarchy are classified as Tier 3 organizations. These academic departments are unable to hire any candidates who possess a doctoral degree from a top academic department (i.e., $N_3 = 0$). Thus, all of their faculty vacancies are filled by candidates who hold doctoral degrees from other academic departments.

4. Empirical Evidence

To explore the main implication of the economic model presented in the previous section, we begin with a straightforward econometric test of the human capital ranking described in (15). More specifically, we regress the number of assistant professors employed by an economics department, i, who hold an academic credential from a top-tier economics department (i.e., N_i) on the size of the department, as captured by the total number of assistant professors employed, *TotFaculty*, and *HigherTier*, which is a dummy variable equal to one for higher-tier (i.e., higher-ranking) economics departments, and zero otherwise.[9] In all cases, *TotFaculty* and *HigherTier* are expected to be positively related to the number of assistant professors employed by an economics department, i, who hold an academic credential from a top-tier economics department (i.e., N_i).

The ranking information on economics departments is collected from two sources, *RePEc* and *U.S. News & World Report*. The first of these, *RePEc*, is a widely used source of institutional quality (rankings) by academic economists (e.g., see Bornmann et al. 2018; Gnewuch and Wohlrabe 2018; Wallace and Perri 2018; Baumann and Wohlrabe 2020; García-Suaza et al. 2020; Doleac et al. 2021; Rybacki and Serwa 2021; Zacchia 2021; Chang and Li 2022), while *U.S. News & World Report* is the gold standard for institutional quality (rankings) among American media and the general public. As a consequence, the latter is also widely used in the economics literature (e.g., see Boustan and Langan 2019; Bryan 2019; Lundberg and Stearns 2019; Mixon 2019; Ghosh and Liu 2020; Heckman and Moktan 2020; Bedard et al. 2021; Naven and Whalen 2022). The human capital (i.e., academic credentials) data for each assistant professor are collected from departmental websites. In the case of the *RePEc* ranking, we selected the top 10, middle 10 and bottom 10 economics departments as representatives of the three academic tiers described in the previous section.[10] In terms of the *U.S. News & World Report* ranking, we selected the top 10 and middle 10 academic institutions. Given that this source ranks the bottom 40 academic institutions in the same position, we randomly selected 20 academic institutions from this set to constitute the bottom 10 academic institutions from this source.

The results from the ordinary least squares (OLS) regressions (using SAS) based on three comparisons—N_1 vs. N_2, N_1 vs. N_3 and N_2 vs. N_3—using each data source are presented in Table 1. Beginning with the *RePEc* ranking, *TotFaculty* is, as expected, both positively signed and significantly related to N across all three comparisons. According to the estimates, each additional assistant professor employed raises the number of assistant professors holding human capital N from 0.53 to 0.73, ceteris paribus. As predicted by the tier effect variable in our economic model, the top-tier economics departments employ an average of 2.5 additional assistant professors with human capital N than do their middle-tier counterparts. Compared to the bottom-tier economics departments, the top-tier departments employ 3.5 additional assistant professors with human capital N. Lastly, the middle-tier economics departments employ, on average, about one additional assistant professor with human capital N than do their bottom-tier counterparts. In all three cases, the reported difference between the economics departments, according to the academic tier, is significant.

Moving to the *U.S. News & World Report* data, *TotFaculty* is again positively related to N in each case. With the exception of the third comparison (i.e., N_2 vs. N_3), the coefficient estimate attached to *TotFaculty* is statistically significant. In the two statistically significant cases, the estimate suggests that the employment of each assistant professor raises the number of assistant professors with human capital N from 0.68 to 0.79, ceteris paribus. As predicted by the tier effect variable in our economic model, the top-tier academic institutions employ an average of 2.9 additional assistant professors with human capital N than do their middle-tier counterparts. Compared to the bottom-tier academic institutions, the top-tier institutions employ 3.8 additional assistant professors with human capital N. Lastly, the middle-tier academic institutions employ, on average, about 1.3 additional assistant professors with human capital N than their bottom-tier counterparts. In all three cases, the reported difference between the institutions, according to the academic tier, is significant.

Table 1. Summary of OLS Results.

	RePEc Ranking Tiers			*USNWR* Ranking Tiers		
	N_1 vs. N_2	N_1 vs. N_3	N_2 vs. N_3	N_1 vs. N_2	N_1 vs. N_3	N_2 vs. N_3
Constant	−1.867 *** (−3.54)	−2.038 *** (−3.22)	−1.628 (−1.45)	−2.246 *** (−4.38)	−2.276 *** (−5.21)	−0.059 (−0.15)
TotFaculty	0.731 *** (6.84)	0.628 *** (5.92)	0.530 ** (2.15)	0.785 *** (8.67)	0.683 *** (5.87)	0.083 (0.83)
HigherTier	2.480 *** (3.21)	3.536 *** (6.70)	0.904 * (1.77)	2.896 *** (3.75)	3.804 *** (5.10)	1.250 *** (3.05)
n	20	20	20	20	30	30
F-statistic	54.1 ***	101.7 ***	8.23 ***	57.1 ***	120.6 ***	6.60 ***
R^2	0.864	0.923	0.492	0.870	0.899	0.328

Notes: Numbers in parentheses are robust *t*-ratios (White 1980). ***, ** and * denotes the 0.01, 0.05 and 0.10 level of significance, respectively.

Next, we explore some of the individual characteristics of the economic model that are discussed after the introduction of (15) and (16) in the prior section. Table 2 provides the details of the individual economics departments ranked by *RePEc* that are used to perform the first three OLS regressions in Table 1. In this case, each economics department provides a test of some of the strict characteristics of our model discussed above. For example, the first set of tests presented in Table 2 are goodness-of-fit tests that compare the distribution of assistant professors described by our model to each economics department's actual distribution. For the top-tier departments, the former is that $H_1 = 0$ (i.e., N_1 is equal to the total number of assistant professors). As indicated by the goodness-of-fit test statistics shown in the top one-third of Table 2, the actual distribution of human capital for the top-tier economics departments does not significantly differ from that predicted by our model in nine of the ten cases. In this instance, unexpected results are obtained for the economics department at New York University.

The bottom portion of Table 2 presents results from the goodness-of-fit tests for the bottom-tier economics departments. For the bottom-tier departments, our model asserts that H_3 is equal to the total number of assistant professors (i.e., $N_3 = 0$). As indicated in Table 2, the actual distribution of human capital for the bottom-tier economics departments does not significantly differ from that predicted by our model in eight of the ten cases. Here, unexpected results are obtained for the economics departments at CUNY—Hunter College and Wesleyan University.[11] The latter of these two unexpected cases raises the issue of including liberal arts institutions in the sample. Institutions that are more teaching oriented, such as Hamilton College, Amherst College and Wesleyan University, may have different utility functions and, therefore, should be excluded from the analysis. Doing so, in this case, would yield a concordant percent of 85.7, which more strongly supports our formal model. The research by Hartley and Robinson (1997), Bodenhorn (1997, 2003), Qian et al. (2016) and Mixon and Upadhyaya (forthcoming) indicates, however, that top-tier liberal arts colleges in the U.S. have, since the mid-1980s, developed a rather robust research ethos that is in many ways similar to that at research-oriented universities. This literature would support the inclusion of the aforementioned liberal arts institutions in Table 2.

Table 2. Human Capital by the *RePEc* Ranking Tier.

Institutions	Total Faculty	*N* Faculty	*H* Faculty	Goodness-of-Fit Test Statistics	Concordant Percent
Tier 1 Economics Departments					90.0
Harvard University	5	5	0	0.000	
MIT	3	3	0	0.000	
University of California—Berkeley	9	8	1	1.125	
University of Chicago	9	7	2	2.571	
Princeton University	16	13	3	3.692	
Stanford University	8	6	2	2.667	
Columbia University	7	5	2	2.800	
Brown University	10	8	2	2.500	
New York University	9	6	3	4.500 **	
Yale University	10	8	2	2.500	
Tier 2 Economics Departments					80.0
Tufts University	4	3	1	1.000	
University of Missouri	2	0	2	1.000	
Purdue University	9	2	7	2.778	
University of Connecticut	3	1	2	0.333	
University of Illinois	11	9	2	4.455 **	
University of Houston	4	1	3	1.000	
University of Rochester	6	1	5	2.667	
Syracuse University	5	3	2	0.200	
University of California—Riverside	8	3	5	0.500	
Florida State University	5	0	5	5.000 **	
Tier 3 Economics Departments					80.0
Colorado School of Mines	3	0	3	0.000	
University of Maryland—Baltimore County	5	1	4	1.250	
Hunter College, CUNY	2	2	0	**	
University of Richmond	6	0	6	0.000	
University of Nevada—Reno	4	1	3	1.333	
University at Buffalo	4	0	4	0.000	
Hamilton College	4	0	4	0.000	
Amherst College	6	0	6	0.000	
Wesleyan University	6	2	4	3.000 **	
University of Nebraska—Omaha	2	0	2	0.000	

Notes: The numbers in the penultimate column are χ^2 statistics for goodness-of-fit tests of the actual distribution of faculty hires compared to the expected distribution of faculty hires. ** denotes the 0.05 level of significance. In each case, failure of the test statistic to reject the null hypothesis supports elements of the formal model. The numbers in the last column represent the percent of cases for each tier that support the formal model.

The characteristic of the formal model that relates to the mid-tier economics departments is simply that N_2 and H_2 are each greater than zero. In this case, the goodness-of-fit tests compare each economics department's actual distribution of assistant professors to one where N_2 and H_2 are equally represented. These results are displayed in the middle portion of Table 2. In eight of the ten tests, there is no significant difference between these two distributions, which is a result that is consistent with our model. The two unexpected results are obtained for the University of Illinois and Florida State University. The former employs a relatively large number of assistant professors with human capital N, and the latter employs a relatively large number of assistant professors with human capital H.

The type of analysis referred to above is replicated using the ranking information provided by the *U.S. News & World Report*. The results from this analysis are presented in Table 3. As indicated by the goodness-of-fit statistics displayed in the top one-third of Table 3, the actual distribution of human capital for the top-tier academic institutions does not significantly differ from that predicted by our model in eight of the ten cases. Here, unexpected results are obtained for the economics departments at Columbia University and the University of Pennsylvania.

Table 3. Human Capital by the *U.S. News & World Report* Ranking Tier.

Institutions	Total Faculty	*N* Faculty	*H* Faculty	Goodness-of-Fit Test Statistics	Concordant Percent
Tier 1 Academic Institutions					80.0
Harvard University	5	5	0	0.000	
MIT	3	2	1	1.500	
Princeton University	16	14	2	2.286	
Stanford University	8	7	1	1.143	
University of California—Berkeley	9	9	0	0.000	
Yale University	10	9	1	1.111	
Northwestern University	11	11	0	0.000	
University of Chicago	9	7	2	2.571	
Columbia University	7	4	3	5.250 **	
University of Pennsylvania	8	5	3	4.800 **	
Tier 2 Academic Institutions					80.0
University of Illinois—Chicago	5	3	2	0.500	
University of Kentucky	3	0	3	3.000 **	
University of Wyoming	2	1	1	0.000	
Binghamton University	7	2	5	1.286	
Brandeis University	5	3	2	0.500	
Clemson University	6	4	2	0.667	
Tulane University	7	0	7	7.000 **	
University of Kansas	4	1	3	1.000	
University of Tennessee	4	1	3	1.000	
Louisiana State University	6	1	5	2.667	
Tier 3 Academic Institutions					95.0
Colorado State University	3	0	3	0.000	
Fordham University	4	3	1	12.00 **	
Kansas State University	4	0	4	0.000	
Middle Tennessee State University	3	0	3	0.000	
Mississippi State University	3	0	3	0.000	
New Mexico State University	4	0	4	0.000	
Northern Illinois University	2	0	2	0.000	
Oklahoma State University	3	0	3	0.000	
Suffolk University	2	0	2	0.000	
Temple University	5	0	5	0.000	
Texas Tech University	5	0	5	0.000	
University of Arkansas	7	0	7	0.000	
University of Central Florida	3	0	3	0.000	
University of Hawai'i—Mānoa	4	0	4	0.000	
University of Memphis	2	1	1	2.000	
University of New Hampshire	5	0	5	0.000	
University of New Mexico	6	0	6	0.000	
University of Rhode Island	2	0	2	0.000	
University of Southern Mississippi	3	0	3	0.000	
Wayne State University	4	1	3	1.333	

Note: The numbers in the penultimate column are χ^2 statistics for goodness-of-fit tests of the actual distribution of faculty hires compared to the expected distribution of faculty hires. ** denotes the 0.05 level of significance. In each case, failure of the test statistic to reject the null hypothesis supports elements of the formal model. The numbers in the last column represent the percent of cases for each tier that support the formal model.

The bottom portion of Table 3 contains results from the goodness-of-fit tests for the bottom-tier academic institutions using the ranking information from the *U.S. News & World Report*. As indicated in Table 3, the actual distribution of human capital for the bottom-tier academic institutions does not significantly differ from that predicted by our model in 19 of the 20 cases, resulting in a concordant score of 95 percent, which is up from the 80 percent concordant score for the bottom tier using the *RePEc* ranking. In this case, the only unexpected result is obtained for the economics department at Fordham University.[12]

Lastly, the results for the mid-tier academic institutions are displayed in the middle portion of Table 3. In eight of the ten tests, there is no significant difference between the two distributions that are compared, which again, is a result that is consistent with our model. It also represents a notable improvement over the 70 percent concordance recorded for a similar test using the *RePEc* ranking data. In this case, the two unexpected results are obtained for the University of Kentucky and Tulane University. Each of these universities employs a relatively large number of assistant professors of economics with human capital *H*.

5. Additional Discussion, Implications and Ideas for Future Research

The main result generated by our formal model presented above is a ranking of the academic departments in terms of human capital accumulation. The top academic departments, therein, are able fill all of their faculty vacancies with candidates who hold doctoral degrees from top academic departments, while, conversely, the academic departments occupying the lowest tier are unable to attract job market candidates from the top academic departments. Lastly, the academic departments occupying the middle of the distribution employ some faculty from top departments, and others from departments lower in the hierarchy. Using the *RePEc* data, an analysis of the employment patterns exhibited by U.S. economics departments suggests that the actual employment patterns differ, taking a statistical point of view, from the main result of our formal model in only 10 to 20 percent of cases. When the data from the *U.S. News & World Report* are used instead, the discordance occurs in only 5 to 20 percent of cases. These results support both the prior literature (e.g., Han 2003; Klein 2005; Wu 2005; Bryan 2019; Wapman et al. 2022; Wright 2023) and our formal model.

As indicated above, the actual numbers found in Tables 2 and 3 are also applied to regression-based testing. Based on the OLS models, using the *RePEc* data (see Table 1) for eight-member departments occupying the top two tiers, a top-tier department is predicted to employ 6.46 faculty with human capital *N*, and 1.54 faculty with human capital *H*, while a second-tier department is predicted to employ 3.98 faculty with human capital *N*, and 4.02 faculty with human capital *H*. According to the data in Table 2, Stanford University employs eight assistant professors of economics, comprising six with human capital *N* and two with human capital *H*. These are quite close to the predicted values for the top-tier departments. Table 2 also indicates that the University of California—Riverside employs eight assistant professors of economics, with three having human capital *N* and five having human capital *H*. These are consistent with the predictions for the second-tier departments noted above, and, combined with the comparisons for the top tier, support both the prior work (e.g., Han 2003; Klein 2005; Wu 2005; Bryan 2019; Wapman et al. 2022; Wright 2023) and our formal model.

Much like that in the study by Wapman et al. (2022), the main implication of the formal model and empirical analyses presented in this study relates to the hiring and retention of university faculty, both of which rely upon efforts to improve the organization, composition and scholarship of the academic workforce (Wapman et al. 2022). As Lan et al. (forthcoming) point out, the employment outcomes and career prospects of employment in higher education are increasing in importance to job market prospects and to the general public, which consumes and funds higher education. In most cases, the advancement from assistant professor to professor requires experience in teaching and a substantial publication record (Lan et al., forthcoming). These accomplishments take considerable time, perhaps 10 or more years. Both our formal model and the empirical analyses concern the prestige factor involved in matching job market prospects and higher education institutions. For those who do not matriculate into the professorate from top departments, the prestige factor in hiring is compounded by Oyer's (2006) finding that job market prospects who initially place into tenure-track jobs are 55 percent more likely to secure tenure in a later year, and that candidates who are initially employed by a top 50 department are 60 percent more likely to be at a top 50 department later in their careers. These results hold, as Oyer (2006) shows, because a better initial job market placement increases one's research productivity, which helps to offset some of the uncontrollable risks that one may face during promotion and merit raise processes, and future job searches (see also Mixon and Upadhyaya forthcoming).

Going beyond Oyer's (2006) analysis, other prior research indicate that economists affiliated with top-ranked institutions benefit from their institutional affiliation with regard to the receipt of research grants (Murray et al. 2016), membership in the National Bureau of Economic Research (Kleemans and Thornton 2021), invitations to give professional presentations (Doleac et al. 2021), invitations to collaborate on research projects (Jones et al. 2008) and, most importantly, favorable judgments by journal editors (Blank 1991; Oyer 2006; Fourcade et al. 2015; Ersoy and Pate, forthcoming). Additionally, the research by Hoover and Svorenčík (2023) indicates that economists holding doctorates from, or employed by, one of only six universities have dominated the 'electoral pool' of the American Economic Association (AEA) since its inception.[13] This organization is not only influential in its own right, but it also sponsors some of the most influential journals in economics, including, but not limited to, the *American Economic Review*, the *Journal of Economic Literature* and the *Journal of Economic Perspectives* (see Mixon and Upadhyaya 2022b). The first of these journals, according to Card and DellaVigna (2013) and Card and DellaVigna (2018), is responsible for publishing between 35 and 41 percent of the top five papers in economics each year. Lastly, the AEA also sponsors the John Bates Clark Medal, which is arguably the second-most prestigious award in economics (Mixon and Upadhyaya 2014; Chan et al. 2018; Cherrier and Svorenčík 2020).

Although empirical tests generally support the facets of our formal model, our study is not without limitations. The quality of the predictions discussed above and the size of the accompanying R^2 statistics notwithstanding, the models examined in Table 1 are rather parsimonious. Thus, any future attempt to explore the impacts of additional regressors on academic departments' hiring patterns would represent a useful extension of the literature on networks and labor market segmentation in academe. A further extension of our empirical work might also go beyond the studies by Hartley and Robinson (1997), Bodenhorn (1997, 2003), Qian et al. (2016) and Mixon and Upadhyaya (forthcoming), and conduct tests to explore the possibility that research universities and liberal arts colleges have different utility functions. This could be performed by replicating our analyses using separate samples for research universities and liberal arts colleges. The counterfactual approach in Mixon and Upadhyaya (forthcoming) perhaps provides a template for such analysis.

There are also other avenues for extending the formal model in this study. For example, our effort to show in (15) and (16) that $N_1 \geq N_2 \geq N_3$ and $H_1 \leq H_2 \leq H_3$, respectively, could be accomplished without most of the assumptions made regarding the functional forms. Instead, our main result could be derived from several monotonic conditions. This would provide a more technical approach to the formal analysis. Additionally, our formal model tends to show a one-way selection process that focuses on academic departments' preferences. Future research could model the choices and behavior of PhD candidates applying for, and accepting, offers from academic departments. Although our formal model is general enough to be applied to all categories of academic departments, one obvious avenue for future research would be to extend the formal model, and the empirical tests supporting it, to other disciplines. Perhaps law, which is discussed above, would be a useful place to start. Following Conley and Önder (2014), more sophisticated analyses might also integrate class rank into the hiring process. Such an undertaking would, of course, be relatively costly to subject to empirical verification. Additionally, extending a model like the one presented here to various outcome measures of the sort examined by Conley and Önder (2014) and described in Klein (2005) would be less costly, yet perhaps still generate useful insights into the inner workings of academic labor markets across disciplines. Lastly, this study does not deal with the important topic of academic inbreeding, which is detrimental to research aspirations, innovativeness, risk-taking and the multi-disciplinary nature of the engagement of academics' research agendas (Horta et al. 2022; Loewenstein et al. 2001;

Weber et al. 2002; Conley and Önder 2014; Akerlof 2020; Heckman and Moktan 2020; Wright 2023). Thus, the bias that academic inbreeding introduces in hiring is an additional element of inefficiency in the academic labor market that could be integrated into the formal model.

6. Conclusions

The segmentation of the academic labor market on the basis of elite pedigree is a subject of much study and debate. Despite this interest, however, the academic literature examining the phenomenon has heretofore been under-theorized. The straightforward formal model presented above, wherein a three-tiered hierarchy of academic institutions exists, addresses this void. More specifically, the model indicates that academic departments affiliated with top-tier universities endeavor to hire only within-tier job market candidates, while those in the bottom tier are unable to employ faculty with degrees from top departments. The remaining middle tier is, unlike the departments populating the third tier, able to employ some faculty with degrees from the highest-ranking institutions in the field, although the degree to which this occurs falls far short of that exhibited among the top departments.

The statistical tests based on the ranking information on economics departments or institutions that are collected from the *RePEc* and *U.S. News & World Report* support the main element of our formal model. For example, the results from the OLS regressions based on three comparisons—top-tier economics departments and second-tier economics departments, top-tier economics departments and bottom-tier economics departments and second-tier economics departments and bottom-tier economics departments—indicate that, while holding the department size constant, top-tier economics departments employ 2.5 to 2.9 additional assistant professors with doctoral degrees from top departments compared to their middle-tier counterparts. Compared to bottom-tier economics departments, top-tier departments employ 3.5 to 3.8 additional assistant professors that hold doctoral degrees from top departments. Lastly, middle-tier economics departments employ, on average, about 1 to 1.3 additional assistant professors that hold doctoral degrees from top departments compared to their third-tier counterparts.

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Notes

1 Laband (1985) finds that articles published by authors from the same school as a journal's editor are significantly longer than other articles, which is a result that could lead to bias in department rankings based on pages published. Similarly, Mixon (1998) reports that the ordering (placement) of articles in printed issues of top economics journals is influenced by editorial connections. There is, however, a body of work indicating that editorial connections lead to efficient outcomes in the publishing process (e.g., see Laband and Piette 1994; Medoff 2003; Hilmer and Hilmer 2011; Coehlo et al. 2014).

2 Yuret's (2018) study is confined to undergraduate and graduate degrees attained within the U.S.

3 As indicated in Bryan (2019), these data trends are only accentuated when the analysis is confined to "star" students, as defined by the quality of institutions offering in-person job market interviews, in economics. See Wapman et al. (2022) for evidence that a large majority of U.S. faculty across all fields are trained by a small minority of universities.

4 Klein (2005) also reiterates the finding in Coupé (2004) that the top departments have disproportional influence with book publishers, foundations and government grant-making organizations.

5 This process also extends to major awards in economics. Cherrier and Svorenčík (2020) point out that of the 40 winners of the John Bates Clark Medal (up to 2018), which is a strong precursor to winning the Nobel Prize (Chan et al. 2018), 25 percent earned their undergraduate degrees from Harvard University, 50 percent earned their doctorates from either Harvard University or MIT and almost 90 percent were employed by a small group of institutions including Harvard University, MIT, the University of Chicago, Princeton University, Stanford University and the University of California—Berkeley. Updated data examined by Wright (2023) produce similar results.

6 See also Klein (2005) for a discussion of other, more philosophical, kinds of problems with the type of academic labor market segmentation described here.

7 In the context of our formal model, a department's human capital, following Faria et al. (2016, 2017), is represented by the quality of the institutional affiliations of the doctorate degrees held by the department's assistant professors.

8 See evidence of institutional oligopoly in the editorship of economic journals in Hodgson and Rothman (1999).

9 Data are collected from economics faculty rosters at the end of the 2020–2021 academic year.

10 Although Lehigh University is home to one of the bottom 10 economics departments, it was replaced by the next available institution because its website does not provide information on the education credentials of its economics faculty.

11 It is perhaps unsurprising that an unexpected result is found for Hunter College, which is located in New York City, given that its location affords it access to individuals with human capital N who have locational preferences favoring such an institution.

12 Again, we encounter an unexpected result associated with a New York City-based institution (i.e., Fordham University), which is perhaps explained by its locational advantage to many scholars with N human capital.

13 The six universities include the University of Chicago, Columbia University, Harvard University, MIT, Princeton University and Stanford University (Hoover and Svorenčík 2023).

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