Interdisciplinary Faculty Hiring Reveals the Fungibility of Credentials Across Disciplines and Drives Differential Career Outcomes

Ben Aoki-Sherwood[*1] and Daniel B. Larremore[†1,2,3]

[1]Department of Computer Science, University of Colorado Boulder, Boulder, CO 80309 USA
[2]BioFrontiers Institute, University of Colorado Boulder, Boulder, CO 80303 USA
[3]Santa Fe Institute, Santa Fe, NM 87501 USA

Abstract

The transition from PhD to first tenure-track faculty position is a critical juncture in early-career scientists' careers, yet little is known about how doctoral training prepares scientists for positions outside their training discipline. We study interdisciplinary faculty hiring—researchers who receive their PhD in one discipline and secure their first faculty position in another—to understand the fungibility of training and credentials across disciplines in the academic labor market. Analyzing a novel dataset of tenure-track faculty hiring from 2011–2023 across 440 PhD-granting institutions in the US, augmented with publication data from OpenAlex, we find that interdisciplinary hiring is common (38% of faculty) and structured by field-specific patterns of credential fungibility. Interdisciplinary hires experience less downward mobility in prestige when hired and publish more papers than their disciplinary peers, but face extended training periods before placement (taking 1.8 years longer on average to secure positions). Most interdisciplinary hiring represents a change in disciplinary affiliation rather than research topic, suggesting that doctoral training produces skills and credentials that are selectively fungible across related disciplines. These patterns reveal the degree and direction of credential and training fungibility across disciplinary boundaries in the academic labor market, and illuminate the composition of the US scientific workforce.

Note: This submission is a work-in-progress manuscript. Sections representing preliminary or ongoing work are clearly marked and supplemented with outlines and completion timelines (see table below). Figures and formatting are also preliminary and subject to change.

Section	Status	Description
Sec. 2.1	Ongoing	Post-doctoral training department data collection and analysis
Sec. 3.4	Preliminary	Research topic and hiring alignment for interdisciplinary hires
Sec. 5.2	Preliminary	Career classification methods (centroid-based)
Sec. 5.2	Ongoing	Career classification methods (k-nearest neighbors)

[*]ben.aoki-sherwood@colorado.edu
[†]daniel.larremore@colorado.edu

1 Introduction

Hiring a researcher into their first tenure-track position is a high-stakes investment for an academic department representing the department's belief about the future of innovation in their field. Doctoral and post-doctoral training imparts field-specific training, developing skills, credentials, and methods which may or may not be fungible in other fields [1, 2]. Thus *interdisciplinary hires*—early-career scientists who receive their PhD in one discipline and secure their first faculty position in another—provide a window into the fungibility of training and credentials between disciplines in the faculty labor market. Disciplines whose trainees are frequently hired into other disciplines may produce more generalizable skills or credentials, while disciplines that frequently hire faculty from other disciplines may value skills or credentials that they themselves do not produce [3]. Beyond this, interdisciplinarity is widely viewed as a mechanism for the integration of knowledge across scientific disciplines and a driver of innovation, prompting increasing emphasis on interdisciplinary research from funding agencies [4], universities [5], and governing bodies of science [6]. This emphasis highlights the importance of identifying and hiring faculty capable of interdisciplinary research, and more generally how disciplines are shaped by interdisciplinary activity. So, interdisciplinary hiring patterns reveal both the effectiveness of discipline-specific doctoral training across different career paths and how the faculty labor market values interdisciplinary credentials in early-career placements.

At the individual level, securing a first tenure-track position is a critical juncture in a scientist's early career trajectory. Scientists whose interests and skills align better with disciplines outside their training discipline may seek positions in these other disciplines [2, 7]. Such interdisciplinary hires may be rewarded for bringing external perspectives and skills to their new discipline, but they also may face barriers to securing first positions due to the limited fungibility of their credentials. Understanding interdisciplinary hiring has implications for the precarity of early-career scientist placements. If credentials are less fungible between disciplines, interdisciplinary hires may face longer and more uncertain paths to faculty positions, potentially contributing to differential attrition from academic careers [8, 9].

Interdisciplinarity has been studied through multiple lenses, each revealing different facets of how knowledge and researchers cross disciplinary boundaries. One approach examines *field mobility*, the movement of researchers between disciplines, to understand the structure and permeability of disciplinary boundaries. Other approaches focus on the interdisciplinarity of research outputs themselves, examining citation patterns in papers, or organizational structures like interdisciplinary research centers. These different perspectives provide complementary insights into how interdisciplinarity shapes science and scientific careers.

We study interdisciplinarity through the lens of faculty hiring, focusing on early-career researchers who receive their PhD in one discipline and secure their first tenure-track faculty position in another. Our approach is grounded in the literature on field mobility, which addresses interdisciplinarity at the level of entire fields. In the 1970s, Le Pair analyzed the flow of researchers between academic fields in the Netherlands to determine which fields exchanged the most researchers and which fields exerted the most influence on others through these flows [10, 11]. He found that the natural sciences produced a net outflow of researchers to medical sciences, and that physics, chemistry, law, and economics[1] were the largest sources of professors. Hargens went further in the 1980s, using the flows between fields to quantitatively map the field-level structure of science in the US [13]. Another study found that about 25% of Dutch physics PhDs went on to work in non-physics departments, primarily in medicine, engineering, and mathematics [7]. Our data is updated to reflect faculty hiring across many disciplines the US from 2011–2023, enabling us to revisit these questions in a modern context and at a larger scale.

[1]The export dominance of physics and economics is perhaps expected given the influence of physics throughout the natural sciences and engineering disciplines and the centrality of economic thought in the social sciences [12].

It is more common to measure interdisciplinarity through research outputs. Many studies quantify the novelty or interdisciplinarity of individual research papers by examining the distribution of cited journals [5, 14, 15]. The disciplinary tradition has dominated academia historically, so most novel work tends to combine knowledge from different disciplines [16]. Writing these novel interdisciplinary research papers is high-risk, high-reward venture, as papers scoring high on interdisciplinarity are more likely to be among the most cited papers but exhibit higher variance in citations [15] and delayed recognition [17], and are associated with lower productivity [18]. Similarly, highly novel or interdisciplinary grant proposals are less likely to be funded initially [19, 20], but researchers with a history of funding from multiple disciplines accrued more funding in the long term [21]. Also, researchers who win scientific prizes tend to produce more interdisciplinary work prior to winning [22].

Another approach is to identify interdisciplinarity through the organizational structure of universities by examining researchers affiliated with interdisciplinary research centers that bring researchers together across many departments and disciplines [23]. These interdisciplinary centers are positively associated with research productivity, funding acquisition, prominence, and teaching [5, 24].

Despite these varied perspectives on interdisciplinarity, faculty hiring itself remains understudied as a lens for understanding interdisciplinary science. Previous studies on faculty hiring networks have found steep and ubiquitous hierarchies of prestige in intra-disciplinary hiring [25–29] but even studies across many disciplines [8] have omitted interdisciplinary faculty hiring. We address questions about interdisciplinary hiring and research and open questions from the faculty hiring literature using a novel dataset of tenure-track faculty at every PhD-granting institution in the U.S. from 2011–2023. For example, the contradictory findings about the risks and rewards of interdisciplinary research raise the question: do faculty hiring networks recognize and reward the possibility of higher long-term impact, or do they penalize the short-term productivity deficits associated with interdisciplinary research?

Our research questions address both the structure of the academic labor market and the implications of interdisciplinary training for individual career outcomes, revealing how doctoral training effectiveness varies across disciplinary boundaries. At the system level, we characterize the structure of the faculty workforce and labor market by asking:

1. How common is interdisciplinary hiring?
2. What is the disciplinary composition of the interdisciplinary faculty workforce?
3. What do these patterns say about the structure of the faculty labor market and the fungibility of skills and credentials between disciplines?

At the level of individual faculty, we examine career outcomes by asking:

1. Are the careers of interdisciplinary faculty hires different in terms of productivity, prestige placement, or time to secure positions?
2. Do interdisciplinary hires actually produce interdisciplinary research?
3. Does the crossing of disciplinary boundaries for interdisciplinary hires occur before or after postdoctoral training?

2 Data

2.1 Faculty census

To identify interdisciplinary faculty hires, we needed to know both the department from which a professor received their terminal degree and the department into which they were first hired. We started with the latter using a census of tenure-track faculty at 431 PhD-granting institutions in the United States from 2011–2023 obtained via a data-use agreement with the Academic Analytics Research Center (AARC). The dataset includes the institution and year of each professor's terminal degree and the institution, department, year, and rank of each tenure-track position held during the time period covered by the data. However, the dataset lacks the department from which each professor received their terminal degree, which is the key to identifying interdisciplinary hires.

To fill this gap, we augmented the AARC dataset with the department of each professor's terminal degree using dissertation data from ProQuest [30], scholar profiles from ORCiD [31], and publication affiliation data from OpenAlex [32]. The resulting data forms a network in which the directed edge bundle A_{ij} represents the number of faculty who received their terminal degree from department i and were hired by department j, resulting in a directed multigraph with 107,128 edges between 12,833 nodes representing the departments at 431 U.S. PhD-granting institutions. While previous faculty hiring network datasets have either focused on disciplines in isolation [28] or on hiring at the institution level [8], the department-level resolution and academia-wide scale of our dataset enabled us to study interdisciplinary hiring via faculty hiring.

By linking every professor to their degree and hiring departments, we determine their disciplinary affiliations at these two early-career stages. We annotated every department in the dataset according to a disciplinary taxonomy of 10 broad domains and 116 finer-grained fields (Table 2). A key challenge in identifying interdisciplinary hires based on these annotations is multidisciplinarity: 42,360 (39.5%) faculty are affiliated simultaneously with multiple disciplines through either their degree department or their first tenure-track department. To disambiguate, we propose two definitions of interdisciplinarity. We define *fully* interdisciplinary hires as faculty hired into a completely new set of disciplines than those they were affiliated with during their degree and *partially* interdisciplinary hires as those that were hired into at least one new discipline. Under our definitions, a person who was affiliated with the Computer Science field during their PhD and hired into a department affiliated with the fields of Computer Science and Biology is partially but not fully interdisciplinary, while a person who was affiliated with Computer Science during their PhD and hired into a department affiliated only with Biology is both fully and partially interdisciplinary. Throughout the rest of the paper, we perform analyses using the fully interdisciplinary definition (see Sec. D for robustness checks using the partial interdisciplinarity definition) and focus on faculty who cross field boundaries (*inter-field* hires; see Sec. C for analyses of inter-domain hires).

Following prior work that uses patterns in faculty hiring to estimate institutional prestige [8, 28], we used the SpringRank algorithm [33] to infer the prestige scores of departments in each discipline (field or domain) and normalized these scores to the interval [0, 1] for comparison between disciplines (see Sec. 5.3 for details).

Post-doctoral training discipline [ONGOING]

We are collecting the department of post-doctoral training for each faculty member to analyze when the interdisciplinary transition occurs in the career. While we will not achieve perfect coverage, we expect to obtain accurate post-doctoral appointment information for a sufficient fraction of faculty to draw general conclusions.

Timeline for completion:

1. **End of February 2026**: Complete data collection of post-doctoral training departments for all faculty in the dataset where available.
2. **Mid-March 2026**: Analysis and interpretation completed and incorporated into manuscript. Results will be included in Section 3.3.

2.2 Publication embeddings

Building on previous work on mapping the structure of science [34–37], we constructed an epistemic space in which to analyze interdisciplinarity using publication embeddings. To do this, we collected the titles, abstracts, and publication years of papers in OpenAlex authored by the professors in our dataset. We filtered these to only publications with English titles and abstracts, and embedded the resulting 30.8M publications as high-dimensional vectors using the SPECTER2 scientific document embedding model [38]. By linking each faculty member to the sequence of embeddings representing their publications, we produced geometric representations of the research trajectories of individual faculty, departments, and entire disciplines. This allowed us to probe whether interdisciplinary hiring implies interdisciplinary scholarship or simply a change in label.

3 Results

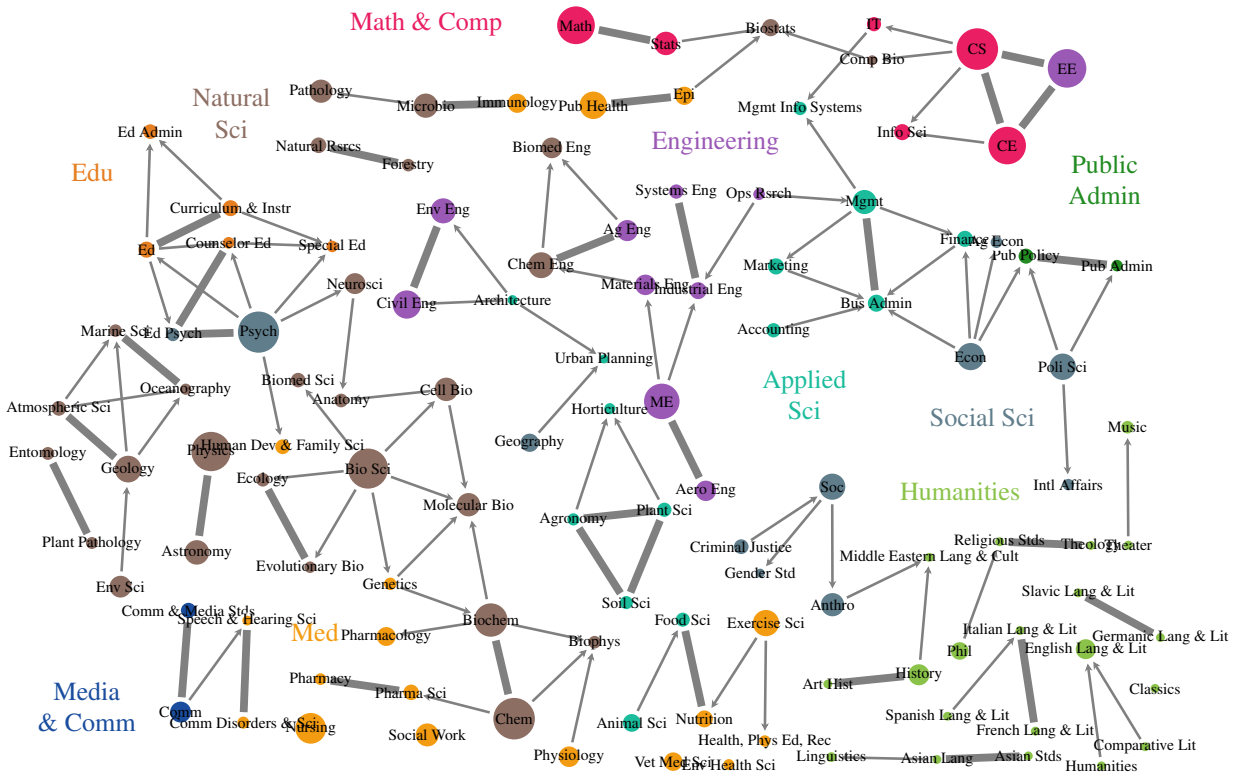
3.1 Heterogeneity, reciprocity, and asymmetry in interdisciplinary hiring

Interdisciplinary hiring is common: 38% of faculty are hired into a different field. While the 116 fields make up the finest level of our discipline taxonomy, the high level of inter-field hiring is not just because the field labels are overly specific. Even at the much coarser level of 10 domains, 18% of faculty are hired into a different domain than their degree. Despite the frequency of interdisciplinary hiring, the large majority of possible field pairs and almost all possible department pairs do not exchange meaningful numbers of faculty, making the faculty hiring network sparse. In fact, when considering only hiring flows that represent at least 10% of a field's faculty hires, the network becomes highly disconnected (Fig. 1a).

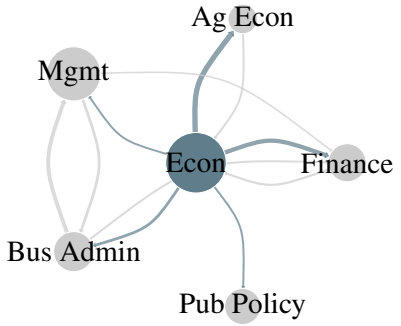
The segmentation of the interdisciplinary faculty hiring market is due to the wide variety in prevalence and direction of interdisciplinarity hiring across fields. We measure each field's directional rates of interdisciplinary hiring using the *import* and *export* rates, defined as the fraction of faculty hired from other fields and the fraction of PhD graduates placed into other fields, respectively (Sec. 5.1). These rates range from nearly complete autarky to complete openness: Nursing exports only 4% of its PhD graduates while International Affairs imports 96% of its faculty (Table 2). Even fields that are widely considered to be rigidly hierarchical and closed such as Philosophy, Mathematics, and Economics [12, 39, 40] import about a quarter of their faculty.

A natural hypothesis to explain the variety in hiring flows is that topically adjacent fields are likely to draw on similar skills and methods and have mutually fungible credentials. The distribution of flows in the faculty hiring network supports this; we observe many sets of fields that are connected by reciprocated hiring flows. Physics and Astronomy contribute sizeable fractions of PhDs to each other's faculty workforce (Fig. 1c), as do Computer Science, Computer Engineering, and Electrical Engineering (Fig. 1d), and Chemistry and Biochemistry.

While reciprocated hiring flows suggest mutual fungibility between disciplines, we also observe strong asymmetric hiring flows which may suggest *directional* fungibility of skills and credentials. A notable example is the field of Economics, which is known to be a source of finance and business faculty [12]. Although Economics has low rates of both interdisciplinary hiring and placement, it is a net exporter of



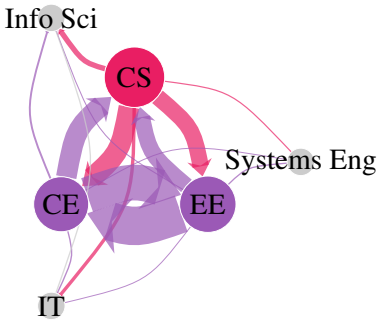
(a)



(b) Economics neighborhood

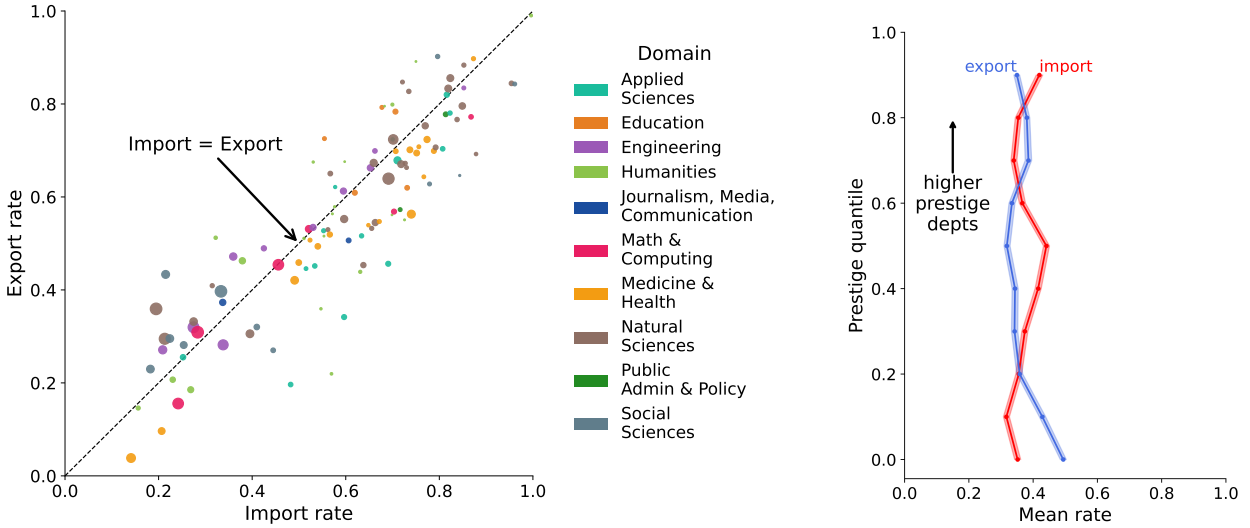


(c) Physics/Astronomy neighborhood



(d) Computer Science neighborhood

Figure 1: **The field-to-field hiring network contains few large flows, but these produce asymmetries and tend to connect related fields.** (a) Nodes are academic fields and edges $i \to j$ represent professors in field j who received their PhDs in field i. We show only edges representing at least 10% of a field's total hires, which represent just 50% of all interdisciplinary hires. We draw reciprocated edges thicker and without arrows. Node sizes are proportional to the total number of faculty hired in each field and nodes are colored according to their parent domain as shown in the annotations. (b-d) Selected graph neighborhoods highlighting the asymmetric flows between Economics and its neighbors, and mutual exchanges of faculty between Physics and Astronomy and between Computer Science, Computer Engineering, and Electrical Engineering.



(a) Export vs. import rates for all fields

(b) Import and export rates by prestige

Figure 2: **Interdisciplinary hiring rates decrease with field size and vary with department prestige.** (a) Export vs. import for all fields. Point sizes are proportional to the number of faculty in each field, and fields are colored according to their parent domain. The dashed line indicates equal export and import. (b) Interdisciplinary hiring (import) and placement (export) rates vs. prestige quantile. Shaded regions represent bootstrapped 95% confidence intervals.

faculty: for every 100 Economics professors, there are about 38 Economics PhDs that are professors in other fields. This constitutes a trade surplus which is concentrated towards the fields of Management, Finance, Business Administration and Public Policy (Fig. 1b). The fields of Comparative Literature and Educational Psychology actually place more faculty outside themselves than they hire, with net outflows of 130 and 108 PhDs per 100 faculty respectively. In contrast, the majority of faculty in Gender Studies, International Affairs, and Computational Biology are from other fields (net inflows of 56, 75, and 61 per 100 faculty, respectively; Table 2). This is perhaps not surprising as these are highly interdisciplinary fields that rely on the integration of knowledge from multiple other disciplines.

Also, in line with previous studies of faculty hiring networks that find high levels of self-hiring [8], we find that 7.4% of faculty are hired into the same department from which they received their degree. But like interdisciplinary hiring, rates of department self-hiring vary widely, from 35% and 22% in the fields of Nursing and Epidemiology to less than 1% in the fields of Gender Studies and Religious Studies (Table 2).

3.2 Interdisciplinary hiring rates are structured by field size and department prestige

So far, we have suggested that the variability in interdisciplinary hiring patterns between fields may be driven by topical adjacency and mutual or directional fungibility of skills and credentials between disciplines. Despite this variability, interdisciplinary hiring is also structured by field size and department prestige. Although we documented fields that exhibit asymmetric interdisciplinary hiring, import and export rates for fields are highly correlated (Pearson $r = 0.88, p < 10^{-6}$), so fields that import many faculty also tend to export many trainees (Fig. 2a). Further, import and export rates tend to decrease as discipline size increases: larger fields have lower rates of interdisciplinary hiring and placement relative to smaller fields (import: Spearman $\rho = -0.38, p = 7.8 \times 10^{-5}$ and export: $\rho = -0.30, p = 1.6 \times 10^{-3}$, Benjamini-Yekutieli corrected).

In addition to size, rates of interdisciplinary hiring also vary along prestige lines. We do not assign prestige values to fields themselves, but instead to the departments that make up each field. Aggregating the import and export rates of each department by prestige, we find that departments in the top and middle prestige deciles have higher rates of interdisciplinary import than export—that is, they hire more faculty from other fields than they place into other fields. Departments in the second, third, and bottom prestige deciles have higher rates of import, although rates are fairly consistent at around 40% throughout the prestige hierarchy (Fig. 2b). These results shed light on the structure of the system of interdisciplinary hiring, but this system is composed of individual early-career scientists making consequential career decisions. Next, we examine individual faculty careers and ask, what are the consequences of the structure of interdisciplinary hiring for early-career scientists navigating this system? Do the careers of interdisciplinary faculty hires differ from their disciplinary peers?

3.3 Interdisciplinary hires are different than their disciplinary peers

The early-career outcomes of interdisciplinary hires differ than those of their disciplinary peers in terms of productivity, prestige, and post-doctoral training time. We discuss these three findings in turn. Interdisciplinary hires publish more papers after being hired and experience less downward mobility in prestige at hiring compared to their disciplinary peers. But, these relative boosts come at the cost of increased training time: interdisciplinary hires tend to take longer to be hired into the tenure track compared to disciplinary faculty hires.

Increased productivity

First, inter-field hires publish 4.2% more papers than disciplinary hires in the five years after hiring, controlled for discipline and other covariates ($p = 0.03$, Benjamini-Yekutieli corrected). We already claimed that interdisciplinary faculty tend to be hired later in their careers and join higher-prestige departments than disciplinary faculty. These are possibly confounders of the productivity effect. Higher departmental prestige is positively correlated with productivity [41, 42], and we might expect that researchers at older career ages are more experienced and thus more productive. To control for these factors we match on career age (at hire) and hiring department prestige, and include both as covariates in our regression models. The productivity boost we observe is above and beyond what can be explained by these factors alone (see Sec. 5.5 for regression methods).

Less downward mobility in prestige

Second, interdisciplinary hires are hired into departments ranked 4.2% higher than their disciplinary peers relative to their degree department prestige (Fig. 3). Prior studies have found that single-discipline faculty hiring is steeply hierarchical, with ubiquitous downward mobility in prestige [8]. So although interdisciplinary hires still experience downward mobility, it is less severe than that of their disciplinary peers.

Relative to their degree department prestige, inter-field faculty are hired into higher prestige departments compared to purely disciplinary hires in 99 out of 116 fields and academia overall (43 fields and academia with significantly higher interdisciplinary prestige compared to only 3 with significantly lower interdisciplinary prestige, Benjamini-Yekutieli corrected Mann-Whitney U test). However, this prestige boost is not universal. In fact, some similar fields differ drastically. For example, interdisciplinary hires in many language- and literature-related fields (e.g., French, Spanish, Classics) enjoy relative prestige boosts of between 17% and 29% while those in Near and Middle Eastern Languages and Cultures experience no significant prestige boost. The prestige boost is most pronounced in fields in the Humanities like the afore-

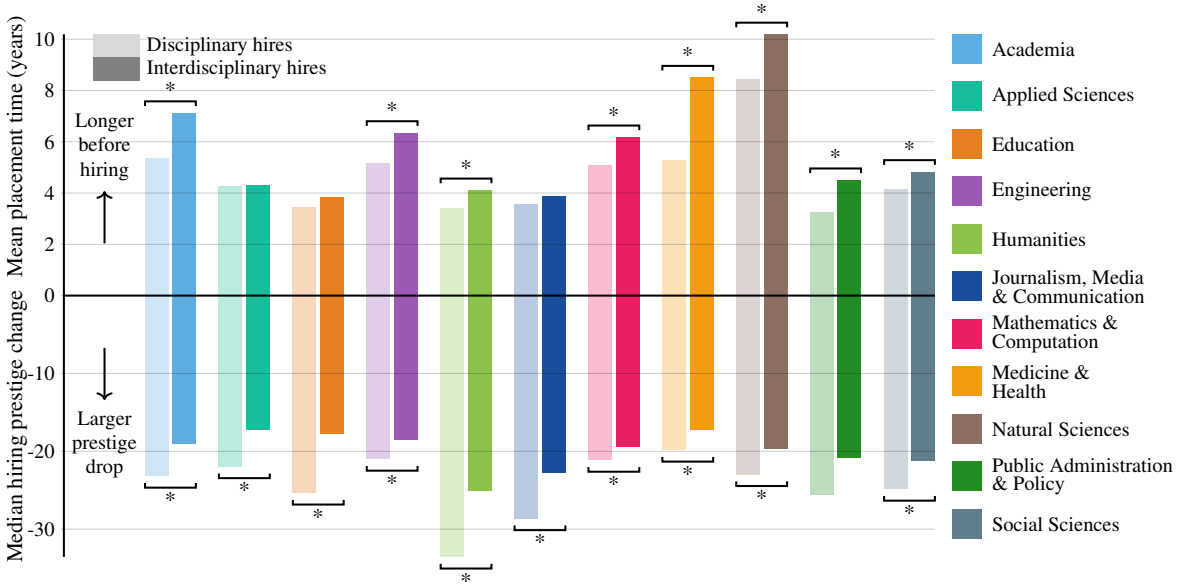


Figure 3: **Interdisciplinary hires lose less prestige when hired but take longer to be hired.** Top: Average time in years between PhD and first tenure-track position for disciplinary (light bars, left) and interdisciplinary (dark bars, right) faculty hires across domains and academia overall. Stars denote domains with significant differences in placement time between disciplinary and interdisciplinary hires (Benjamini-Yekutieli corrected). Bottom: Average prestige change between degree department and hiring department for disciplinary and interdisciplinary faculty hires across domains and academia overall.

mentioned language fields, Gender Studies (+28%), and Religious Studies (+20%),[2] but faculty in some applied fields like Agricultural Economics (+21%) and Marketing (+20%) also experience large prestige boosts. On the other hand, we actually find prestige penalties for interdisciplinary hires in select biomedical fields like Epidemiology (-20%) and Physiology (-11%), and in the brilliance-oriented [40] fields of Economics (-9%) and Physics (-7%).

Despite the variance across fields, the prestige boost holds when averaged across domains. Interdisciplinary hires experience a relative prestige boost in every domain (9 significant; $p < 0.05$, Benjamini-Yekutieli corrected Mann-Whitney U test), with the largest boost of nearly 9% in Humanities. These findings hold for interdomain hires, with the exception of the Natural Sciences domain, in which interdisciplinary hires experience a significant prestige penalty of -8% (Fig. 4).

Longer time-to-hire

Third, interdisciplinary faculty take about 1.8 years longer to secure tenure-track positions compared to their disciplinary peers (Fig. 3), reflecting extended early-career training periods. We measure this time as *placement time*, defined as the difference between the year when a professor first enters the tenure track and the year when they received their degree. Like the findings on productivity and prestige, this effect is widespread but not universal: inter-field hires have longer placement times in 99 out of 116 fields. The difference in placement times is significantly longer in 38 fields and significantly shorter in only 1 field, Finance, by about 0.6 years. Interfield hires have longer placement times on average in all 10 domains

[2]Gender Studies and Religious Studies are also the two fields with the lowest rates of department self-hiring. Self-hiring is known to be more common in high-prestige departments [8], suggesting some reinforcing mechanism.

(7 significant; $p < 0.05$, Benjamini-Yekutieli corrected Mann-Whitney U test). The biggest difference in placement time is in the Medicine and Health domain (+3.2yr), while there is virtually no difference in the Applied Sciences domain. Our findings on productivity, prestige, and placement time are robust to a looser alternative partial definition of interdisciplinary hiring (see Sec. D for details).

3.4 Interdisciplinary hiring is primarily a label change [PRELIMINARY]

Note: This section presents preliminary results. The analysis is being revised to use improved methods (see below).

Preliminary findings

Our preliminary analysis suggests that most interdisciplinary hiring events represent a disciplinary *label change* rather than a substantive change in research topic. The large majority of interdisciplinary hires (84.1%) do not change research topics, but instead display stable research trajectories relative to their degree and hiring disciplines. Most (68.3%) interdisciplinary hires consistently produce disciplinary research, publishing on topics fully consistent with either their degree discipline or their hiring discipline both before and after being hired. This echoes the survey results from a previous study on interdisciplinary hires from physics departments [7].

We classified interdisciplinary hires into five career categories based on two axes: publication locations relative to hiring and degree disciplines in the embedding space and publication trajectory changes after hiring (Table 1; see Sec. 5.2 for details). Only the italicized categories, *topic reversion* and *topic adoption*, represent meaningful changes in research topic after being hired.

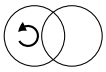
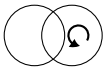
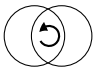
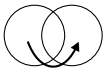
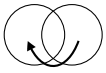
	Career category	Pre-hire	Post-hire	Proportion
	Label adoption	Degree	Degree	28.9%
	Label correction	Hiring	Hiring	39.4%
	Re-labeling	Intersection	Intersection	15.8%
	*Topic adoption*	Degree	Hiring	10.0%
	*Topic reversion*	Hiring	Degree	5.9%

Table 1: **[PRELIMINARY] Interdisciplinary hiring rarely coincides with either changes in research topic or interdisciplinary research.** Categories of interdisciplinary faculty career publication trajectories based on changes in research paper embeddings relative to their degree and hiring disciplines. The columns "Pre-hire" and "Post-hire" indicate whether the faculty member's research papers before and after being hired are more closely aligned with their degree discipline, hiring discipline, or the intersection of both disciplines. Icons on the left represent publication embedding trajectories for each career category: the left circle represents publications closer to the degree disciplines, the right circle publications closer to the hiring discipline, and the arrow represents the displacement between publications written pre- and post-hiring.

The proportions of faculty assigned to each category vary across disciplines, but are generally consistent with the academia-wide proportions (Fig. 5). The proportions are similar for inter-field and inter-domain hires and are robust to the definition of interdisciplinarity used (Table 13).

Preliminary analysis also suggests that these career categories are associated with differential outcomes in productivity, prestige, and placement time. While interdisciplinary hires in general publish more papers than their disciplinary peers, this productivity effect varies across the five categories (Table 1). Interdisciplinary hires who write disciplinary papers and do not change their research focus (label adoption and label correction categories) write an average of 15% and 17% more papers in the five years post-hire than their disciplinary peers, respectively. On the other hand, faculty who do research at the intersection of disciplines (re-labeling category) write about 7% fewer papers, and those who pivot to new research topics (topic adoption) write about 5% fewer papers (Table 14). Thus interdisciplinary hires who do not change their research topics tend to be more productive than their disciplinary peers, while those who change topics or publish interdisciplinary research tend to be less productive.

All five categories of interdisciplinary hires enjoy a prestige boost at hiring but also take longer to be hired as faculty relative to their disciplinary peers. But, like with productivity, the magnitude of these effects varies. The prestige boost varies from 2.1% for label adopters to 4.9% for label correctors. For placement time, faculty in the topic reversion category take less than a year longer to be hired than disciplinary faculty (+0.4 years), while faculty in the label adoption and label correction categories take about 1.6 and 2.3 years longer to be hired, respectively (Table 14).

Methodological revision in progress

The preliminary results above used publication embedding *centroids* for each discipline, averaging all publication embeddings associated with a field or domain (see Sec. 5.2 for details). However, centroids lack interpretability because the embedding space is arbitrarily scaled, and they may not accurately represent the typical publication in a discipline, especially for large or heterogeneous fields, and they do not capture the distributional properties of disciplinary research.

We are revising the analysis to use a k-nearest neighbors (KNN) approach instead. For each faculty member's publications, we identify the k nearest papers in the embedding space and examine the disciplinary affiliations of those neighbors.

The revised analysis will classify career trajectories based on combinations of:

1. **Within-field ratio**: Proportion of k-nearest neighbors in same field as degree/hiring discipline
2. **Discipline distribution shift**: Shift in distribution of neighbor disciplines pre- vs. post-hire
3. **Interdisciplinarity metrics**: Shannon entropy and other distributional measures of neighbor disciplines

Expected contributions

The revised analysis will provide:

- More interpretable classification of whether interdisciplinary hires produce interdisciplinary research
- Quantitative measures of research trajectory stability vs. change
- Field-specific analyses of how research topics align with hiring patterns
- Differential outcomes (productivity, prestige, placement time) by refined career trajectory types

Timeline for completion

- **End of January 2026**: Pre- and post-hire discipline distributions aggregated for every faculty member

- **Mid-February 2026**: Update career classification statistics using KNN methods
- **End of February 2026**: Analyze differential outcomes by career type
- **Mid-March 2026**: Integrate revised analysis into main results and interpret findings
- **April 2026**: Complete manuscript for submission

4 Discussion

Early-career outcomes of interdisciplinary hiring

Taken together, our findings suggest that interdisciplinary faculty hires enjoy a relative boost in productivity and prestige at the cost of additional training overhead from a longer postdoctoral period. This reinforces previous findings from paper-based studies that link interdisciplinarity with higher prominence and prestige [18, 24], but also with cognitive costs and communication barriers that slow development [35]. While our results appear to contradict other findings that link interdisciplinarity with lower productivity [18], we use a different definition of interdisciplinary faculty based on disciplinary affiliations rather than the citation combinations of their papers. In fact, the majority of our sample of interdisciplinary hires write disciplinary papers and thus are likely very different than the researchers studied in prior work.

Several hypotheses could explain the differences in prestige, productivity, and time-to-hire between interdisciplinary and disciplinary hires. The prestige advantage may be driven by departmental risk tolerance and the hierarchical structure of faculty hiring. The most prestigious departments have more resources and firmly established positions at the top of the hierarchy which may embolden them to take more risks by hiring outside their disciplines, overcoming the limited fungibility of credentials from outside fields. On the other hand, departments below the top but in the upper half of the prestige hierarchy may be striving to climb and thus less willing to take the risky move of hiring faculty from other disciplines. This would reduce the number of interdisciplinary hires in these departments compared to the topmost departments. Alternatively, departments at the very bottom of the prestige hierarchy may struggle to attract faculty candidates at all and thus be forced to hire disciplinary faculty to fulfill departmental teaching curricula.

Prestige and productivity are entangled such that working environment prestige is linked to productivity [41, 42]. We control for hiring department prestige in our productivity analysis, so the productivity boost we observe for interdisciplinary hires is not simply due to their being hired into higher prestige departments. However, perhaps there are underlying individual variations that influence both productivity, prestige, and the ability of a scientist to cross disciplinary boundaries. We get a hint of this by separately examining faculty hires who cross domain boundaries. These interdomain hires are even more productive than interfield hires (Sec. C). Because our domains are very broad (e.g. Engineering, Natural Sciences), interdomain hires may bring very different backgrounds to bear as faculty, allowing them to exploit underdeveloped research areas and thus be more productive. Also, they may be enriched for "superstar" researchers who are able to successfully navigate disparate domains and thus are inherently more productive.

The delay in time-to-hire is neatly explained by human capital models: interdisciplinary hires who are trained outside their employment discipline likely experience skill mismatch between their training and their new position, so they need to invest additional time in training specific to the hiring discipline [43, 44]. Our ongoing work on identifying the post-doctoral training discipline of the faculty in our sample will shed light on this hypothesis.

Prior work shows that faculty may pivot to new research topics after major career milestones such as tenure [45] or winning a Nobel prize [46]. Changing research topics is risky because of communication

barriers between research communities [35], as is doing research that is truly interdisciplinary in topic (as opposed to "knowledge-base' interdisciplinary research that simply cites diverse disciplines) [47]. So although hired into a tenure-track position represents a major career milestone, it naturally may not allow for as much risky topic exploration as these other events, because new faculty hires still must vye for the job security of tenure. Given these risks, it makes sense that most of the interdisciplinary hires we identify neither change their research topics or do interdisciplinary research. This finding echoes previous results in which scientists who were trained in one discipline and employed in another exhibit research topic continuity throughout their careers [7, 11].

All three of these effects are modulated by the category of interdisciplinary hire (Table 1). In terms of placement time, those who change research topics (topic adoption) require the most additional training time compared to disciplinary hires, reflecting the time required to learn a new research focus. However, faculty hires in the topic reversion category actually take less time to be hired than other interdisciplinary hires, even those who already conduct research relevant to their hiring discipline (label correction, who also take longer to be hired). While topic reversion represents only a small subset of the sample of interdisciplinary hires, this merits further exploration. Why might faculty who pivot to conduct research relevant to the discipline they were trained in require less training time than those who continue to do research relevant to their hiring discipline, given the same set of labels?

In terms of prestige, those whose post-hire research matches their hiring discipline (label correction and topic adoption) are rewarded with more prestigious placements compared to those whose post-hire research does not match their hiring discipline (label adoption and re-labeling). This suggests that the combination of interdisciplinary credentials and disciplinary research is particularly valued in the faculty hiring market.

Finally, in terms of productivity, those who do disciplinary research (label adoption and label correction) are more productive than their disciplinary peers, while those who do interdisciplinary research or change research topics (re-labeling and topic adoption) are less productive. The productivity penalties experienced by those who do interdisciplinary research (re-labeling) echoes previous findings that interdisciplinarity is associated with lower productivity [18], while the productivity boost for those who do disciplinary research supports the notion that integrating different disciplinary perspectives can enhance research productivity [24]. The reduced productivity for those who change research topics (topic adoption) likely reflects the cognitive costs and communication barriers associated with learning the skills, norms, and language of a new discipline [18, 35].

These differential outcomes have implications for the precarity of early-career scientist placements. The extended training periods required for interdisciplinary hires represent additional years of uncertain career prospects, often in poorly compensated postdoctoral positions. However, those who successfully navigate this extended training period are rewarded with placements in higher-prestige departments, suggesting that the early-career labor market values the combination of interdisciplinary credentials and demonstrated research productivity. Understanding which types of doctoral training produce transferable skills that facilitate interdisciplinary transitions—and which do not—is crucial for improving early-career scientist outcomes and reducing attrition from academic careers.

Implications for training fungibility and early-career labor markets

Despite its prevalence, interdisciplinary hiring occurs only between select pairs of disciplines and is often asymmetric. These patterns suggest that interdisciplinary hiring flows through narrow channels shaped limited fungibility of skills and credentials between disciplines. Naturally, we observe more interdisciplinary hiring between topically adjacent disciplines, which likely share skills, methods, and norms and thus may respect each others' credentials. We also observe that it is rare for a field to have a strong asymmetry between

import and export of interdisciplinary hires, which suggests that fungibility of credentials is often mutual.

In addition to topical similarity, rates of interdisciplinary hiring may reflect disciplinary culture. The five fields with the strongest associations with innate talent (Musics, Physics, Economics, Philosophy, and Mathematics) [40] all import relatively few faculty. Because of their emphasis on innate ability, these fields may view credentials from other disciplines as less legitimate or indicative of ability, leading to lower rates of interdisciplinary hiring.

In general, larger disciplines tend to have lower levels of interdisciplinary hiring, which could be attributed to both supply- and demand-related factors. Larger fields and domains may contain a more diverse set of departments and therefore produce a more diverse supply of skills, credentials, and knowledge in their trainees, leading to less need to import faculty to fill gaps. Conversely, they may have more established norms, methods, and topics of study, leading to fewer imported faculty.

These patterns of selective credential fungibility have implications for doctoral training programs and early-career scientist support. Fields that produce graduates who successfully transition to other disciplines may offer more generalizable training in research methods, problem-solving approaches, and communication skills. Conversely, fields that rely heavily on hiring from other disciplines may benefit from providing additional support and mentorship to interdisciplinary hires during their extended training periods. Funding agencies and universities seeking to support early-career scientists could target interventions toward those navigating interdisciplinary transitions, who face both extended uncertainty and potentially higher payoffs in terms of prestige and productivity.

Limitations and future directions

Our data focus on the PhD to first tenure-track position transition, but future work could explore more complete faculty career trajectories. Extending the analysis to undergraduate training and postdoctoral positions would reveal earlier points at which interdisciplinary transitions occur. For example, the National Center for Science and Engineering Statistics Survey of Earned Doctorates data from 2024 indicates that rates of interdisciplinary migration between bachelor's and PhD degrees are heterogeneous across fields just like interdisciplinary hiring, with Engineering, Mathematics, and the Physical Sciences the least interdisciplinary and Education, Business, and Computer and Information Sciences the most interdisciplinary. Additionally, temporal analysis could reveal whether disciplines have converged over time in their hiring patterns, as previous work has suggested based on paper citation patterns.

Methodologically, the revised k-NN analysis currently in progress (Sec. 3.4) will provide more robust measures of research topic alignment and trajectory changes. Future extensions could also examine collaboration networks to test the hypothesis that interdisciplinary hires have broader networks of collaborators, which may partially explain their productivity advantages.

Theoretically, our finding that interdisciplinary hires maintain stable research trajectories partially contradicts the hypothesis that interdisciplinarity drives diffusion of ideas between fields [48]. A promising avenue for future work would be examining whether disciplinary peers change their research topics after an interdisciplinary hire joins their department, testing whether interdisciplinary faculty serve as conduits for cross-disciplinary knowledge transfer even when their own research remains stable.

Conclusion

This study provides a comprehensive analysis of interdisciplinary faculty hiring in the United States, examining both the system-level structure of hiring flows and the individual-level outcomes of early-career sci-

entists who cross disciplinary boundaries. We find that interdisciplinary hiring is common (38% of faculty), structured by field-specific patterns of credential fungibility, and consequential for early-career trajectories.

Our findings contribute to understanding the early-career scientist labor market in several ways. First, we demonstrate that interdisciplinary credentials are selectively valued: interdisciplinary hires secure positions in higher-prestige departments and are more productive than their disciplinary peers, but face extended training periods before placement. Second, we show that most interdisciplinary hiring represents a change in disciplinary affiliation rather than research topic, suggesting that doctoral training produces skills and credentials that are fungible across related but not distant disciplines. Third, we reveal systematic patterns in which fields produce generalizable training (high export rates) versus which fields value external perspectives (high import rates), with implications for understanding training effectiveness and labor market structure.

These findings have broader significance for the science of science and labor economics. The selective fungibility of credentials across disciplines reveals fundamental constraints on how knowledge and human capital flow through the academic system. Understanding these flows is crucial for improving early-career scientist outcomes, designing effective doctoral training programs, and targeting interventions to support scientists navigating interdisciplinary transitions. As funding agencies and universities increasingly emphasize interdisciplinary research, our results provide empirical grounding for policies aimed at supporting early-career scientists in this critical career transition.

5 Methods

5.1 Discipline-level labor market metrics

We quantify faculty hiring flows at the level of disciplines using several useful metrics. To measure the outwards and inwards porosity of a single discipline's boundaries, we define *export and import*.

Formally, we define the number of exports (exported trainees) as $\sum_{j \neq i} A_{ij}$ and the *export* (ratio) of a discipline j as the ratio of faculty trained in j and hired in a different discipline to the total number of faculty produced by j:

$$\text{export}(j) = \frac{\sum_{i \neq j} A_{ji}}{\sum_i A_{ji}}, \tag{1}$$

where A is the adjacency matrix representing the directed faculty hiring network coarse-grained to the discipline level. In other words, the entry A_{ij} represents the number of faculty who received their degree in discipline i and were first hired in discipline j. We can define the oppposite quantity ($1 -$ export) as *investment*, which measures the proportion of faculty produced within j that are first hired within j.

Similarly, we define the number of imports (imported faculty) as $\sum_{j \neq i} A_{ji}$ and the *import* ratio of a discipline j as the ratio of faculty hired in j from a different discipline to the total number of faculty hired by j:

$$\text{import}(j) = \frac{\sum_{i \neq j} A_{ij}}{\sum_i A_{ij}}, \tag{2}$$

and similarly define the opposite quantity ($1 -$ import) as *closure*, which measures the proportion of faculty hired by j that were trained within j.

We measure the net production of a discipline with the *net export per capita*, defined as the difference between exports and imports divided by the total number of faculty hired in j:

$$\text{net export ratio}(j) = \frac{\text{exports} - \text{imports}}{\sum_i A_{ij}} \tag{3}$$

This metric indicates whether a discipline is a net producer (> 0) or consumer (< 0) of faculty, and by how much relative to its size.

5.2 Career classifications using publication embeddings [PRELIMINARY]

To analyze the research topics of individual faculty and disciplines, we construct a high-dimensional epistemic space using publication embeddings generated by the SPECTER2 scientific document embedding model [38], yielding a 768-dimensional vector for each publication. Then, we map each publication to the set of disciplines that the authors were affiliated with at the time of publication. Because a single department may be affiliated with multiple fields or domains, a single publication may be linked to multiple disciplines by having multiple authors or by authors affiliated with multi-disciplinary departments, or both. This process produces 58M publication-discipline annotations.

Centroid-based classification [PRELIMINARY]

We aggregate publication embeddings at both the faculty and discipline levels by averaging over all embeddings belonging to the relevant unit of analysis. This yields a publication centroid for each faculty member and discipline.

Using these publication embeddings, we classify interdisciplinary faculty into career categories based on whether they change research topics at the time of being hired into a new discipline. To do this, we compute the cosine distances between each interdisciplinary hire's pre-hire and post-hire publication embeddings and their degree discipline centroid and hiring discipline centroid. If they are affiliated with multiple disciplines at either time, we take the mean cosine distance. Then, we condense these pairs of cosine distances into a single value on the interval $[0, 1]$ representing the projection of the pre- and post-hire publications along the degree-hiring axis according to the formula

$$\text{degree-hiring projection} = \frac{d_{\text{hire}}}{d_{\text{degree}} + d_{\text{hire}}} \in [0, 1],$$

where d_{degree} and d_{hire} are the cosine distances between the publication embeddings and the degree and hiring discipline centroids respectively. We then we partition each interdisciplinary hire's publications into pre-hire and post-hire sets based on the year of their first tenure-track hire, and compute bootstrap confidence intervals for the mean degree-hiring projection of each subset.

We classify a subset of publications as aligned with the degree discipline if its confidence interval lies entirely below 0.5, aligned with the hiring discipline if its confidence interval lies entirely above 0.5, and aligned with the intersection of both disciplines if the confidence interval captures 0.5. We only bootstrap confidence intervals for faculty with sufficient publications in each period (at least 3 publications). Using the pre- and post-hire publication topic classifications, we assign each interdisciplinary hire to one of the five career categories described in Table 1. Because of the noise inherent in this process, any faculty whose publications fall in the intersection category at only one time (either pre- or post-hire) are assumed to have not changed research topics and are assigned to the label correction or label adoption categories accordingly.

k-Nearest neighbors classification [ONGOING]

We characterize each faculty member's research trajectory using a k-nearest neighbors (KNN) approach. For each faculty member's publications, we identify the k nearest papers in the embedding space using FAISS [49] and compute the distribution of disciplinares for each of those neighbors. Each publication is assigned a distribution of disciplines weighted by the number of authors and each author's number of disciplinary affiliations at the time of publication. We then aggregate these distributions across all publications in the pre- and post-hire career stages of each faculty member and compute the following at each stage:

1. **Within-field ratio**: Proportion of k-nearest neighbors affiliated with the degree or hiring discipline
2. **Distribution shifts**: Changes in the distribution of neighbor disciplines pre- vs. post-hire
3. **Diversity metrics**: Shannon entropy and other measures of interdisciplinarity based on neighbor disciplines

We quantify the interdisciplinarity of each person's research using the diversity metrics and the extent and direction of their research topic shifts using the first two metrics. We then assign each interdisciplinary hire to a career category based on combinations of these metrics, using thresholds determined by permutation test null models.

5.3 Prestige analysis

As described in Sec. 2.1, we used the SpringRank algorithm [33] to infer prestige rankings of departments in each discipline, producing continuous prestige scores $\pi_{i,x}$ for each discipline i that a department x belongs to. To compare prestige values across disciplines, we normalized the prestige scores to the interval [0, 1] within each discipline according to the formula

$$\pi'_{i,x} = \frac{\pi_{i,x} - \min\limits_{y}(\pi_{i,y})}{\max\limits_{y}(\pi_{i,y}) - \min\limits_{y}(\pi_{i,y})} \in [0, 1].$$

Then, for each faculty hire, we computed the prestige change at hiring as the difference between the mean hiring department prestige and the mean degree department prestige. Finally, we compared the median prestige changes of interdisciplinary hires to that of disciplinary hires within each discipline using Mann-Whitney U tests and corrected for multiple comparisons using the Benjamini-Yekutieli procedure (Fig. 3, Table 8).

5.4 Time-to-hire analysis

We defined the *time-to-hire* of a faculty hire as the difference between the year in which they secured their first tenure-track position and the year in which they received their terminal degree. We determined the former as the first year in which they were recorded as faculty in our dataset. Because our dataset only includes tenure-track appointments starting from, we excluded all appointments in 2011 because we cannot know whether these reflect the true hiring year or faculty with appointments predating our dataset. This filtering resulted a sample of 62,430 faculty. Due to noise in the faculty appointments data (e.g. older faculty missing appointments in 2011), we still observed 2,939 (4.7%) faculty with placement times greater than the 0.95 quantile value of 24 years; we winsorized [50] these observations to 24 years to reduce their influence on the analysis. Then, we compared the distributions of placement times for interdisciplinary and disciplinary hires hired into each discipline using Mann-Whitney U tests and corrected for multiple comparisons using the Benjamini-Yekutieli procedure.

5.5 Productivity regression

We quantified faculty productivity via the number of publications produced in the five years after being hired into their first tenure-track position. We limited to five years post-hire to better capture the productivity of faculty during their pre-tenure period, which is more consistent across faculty than later career stages [51]. Similar to the placement time analysis, we excluded all faculty whose first appointment is recorded in 2011, as this is the first year of our dataset. Researcher productivity is known to depend on career age (years since PhD) [51, 52], hiring department prestige [42], and gender [40].

We controlled for these factors using a matched regression approach. First, we performed a coarsened exact matching, matching each interdisciplinary hire to disciplinary hires with the same gender, at least one shared hiring discipline, career age within five years, and normalized hiring department prestige scores within 0.1. This procedure resulted in matches for almost all interdisciplinary and disciplinary faculty (Table 12), and we performed all subsequent analyses on only faculty hires who were matched.

After matching, we performed a Negative Binomial regression of productivity on interdisciplinary status (interdisciplinary vs. disciplinary) with career age at hire, hiring department prestige, gender, and multi-hot hiring discipline indicators as covariates. We corrected the regression coefficient p-values for multiple comparisons using the Benjamini-Yekutieli procedure. The distribution of 5-year productivity is right-skewed, with a handful of observations exceeding 1000 publications. To reduce the influence of these outliers, we winsorized 375 (field-level; 447 at the domain level) productivity values outside the 0.025 and 0.975 quantiles before performing the regression. We performed this regression separately at the field and domain levels, and checked robustness to the alternative partial definition of interdisciplinarity; see Sec. D for details.

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A Discipline-level faculty hiring statistics

We aggregated the faculty hiring network to the level of fields and domains to compute discipline-level statistics. For each field and domain, we computed the total numbers of faculty placed and hired, the proportion of interdisciplinary hires (import rate) and placements (export rate), the net export per faculty hire, and the proportion of department self-hires (Table 2). The domain-level statistics may differ than the aggregation of the field-level statistics because some departments are affiliated with multiple fields within a domain.

APPLIED SCIENCES						
Field	**Faculty placed**	**Faculty hired**	**Import**	**Export**	**Net export/fac**	**% self-hire**
Agronomy	512	541	0.55	0.53	−0.05	19.4%
Food Science	578	680	0.53	0.45	−0.15	14.0%
Finance	480	844	0.69	0.46	−0.43	1.4%
Marketing	524	855	0.60	0.34	−0.39	1.2%
Accounting	453	703	0.48	0.20	−0.36	1.4%
Architecture	420	387	0.70	0.72	0.09	4.1%
Animal Sciences	1011	1007	0.25	0.26	0.00	17.0%
Management	1544	1714	0.71	0.68	−0.10	1.8%
Soil Science	461	609	0.63	0.52	−0.24	14.3%
Horticulture	406	464	0.52	0.45	−0.13	13.6%
Plant Sciences	452	695	0.81	0.70	−0.35	8.5%
Business Administration	961	940	0.82	0.82	0.02	2.8%
Management Information Systems	501	621	0.82	0.78	−0.19	1.4%
Urban and Regional Planning	375	336	0.58	0.62	0.12	5.1%
Applied Sciences	**8279**	**9706**	0.35	0.23	−0.15	**6.5%**

EDUCATION						
Field	**Faculty placed**	**Faculty hired**	**Import**	**Export**	**Net export/fac.**	**% self-hire**
Education Administration	518	733	0.73	0.62	−0.29	6.7%
Curriculum and Instruction	816	838	0.62	0.61	−0.03	8.5%
Special Education	805	496	0.55	0.73	0.62	13.3%
Counselor Education	786	505	0.68	0.79	0.56	7.9%
Education	1155	851	0.71	0.78	0.36	7.4%
Education	**4134**	**3726**	0.30	0.37	0.11	**7.8%**

Table 2: Field-level and domain-level faculty hiring statistics (Part 1 of 6). For each of the 10 disciplinary domains, we show the constituent fields followed by the domain-level summary (in bold). Statistics include the number of faculty produced (out-degree) and hired (in-degree), import and export rates, net exports per faculty, and the percentage of department self-hires.

ENGINEERING						
Field	**Faculty placed**	**Faculty hired**	**Import**	**Export**	**Net export/fac.**	**% self-hire**
Materials Engineering	1358	1299	0.60	0.61	0.05	7.6%
Industrial Engineering	1044	927	0.43	0.49	0.13	7.0%
Aerospace Engineering	1291	1279	0.53	0.53	0.01	12.3%
Systems Engineering	784	699	0.66	0.70	0.12	9.6%
Mechanical Engineering	3200	3471	0.34	0.28	−0.08	7.6%
Agricultural Engineering	1405	1365	0.65	0.66	0.03	8.6%
Operations Research	447	501	0.85	0.83	−0.11	3.4%
Civil Engineering	2475	2280	0.21	0.27	0.09	8.9%
Electrical Engineering	4305	4038	0.27	0.32	0.07	11.1%
Environmental Engineering	2236	1844	0.36	0.47	0.21	8.9%
Engineering	**15369**	**15429**	0.23	0.23	0.00	**9.1%**

JOURNALISM, MEDIA, COMMUNICATION						
Field	**Faculty placed**	**Faculty hired**	**Import**	**Export**	**Net export/fac.**	**% self-hire**
Communication	1415	1338	0.34	0.37	0.06	2.5%
Mass Communications and Media Studies	620	777	0.61	0.51	−0.20	4.2%

Table 3: Field-level and domain-level faculty hiring statistics (Part 2 of 6). Continued from Part 1.

Mathematics and Computing						
Field	**Faculty placed**	**Faculty hired**	**Import**	**Export**	**Net export/fac.**	**% self-hire**
Statistics	1670	1635	0.52	0.53	0.02	3.8%
Information Science	584	849	0.70	0.57	−0.31	4.6%
Computer Engineering	3827	3840	0.46	0.45	0.00	10.2%
Mathematics	3490	3887	0.24	0.16	−0.10	2.8%
Computer Science	4813	4642	0.28	0.31	0.04	6.0%
Information Technology	404	696	0.87	0.77	−0.42	2.9%
Mathematics and Computing	**13059**	**13032**	0.16	0.17	0.00	5.9%

Humanities						
Field	**Faculty placed**	**Faculty hired**	**Import**	**Export**	**Net export/fac.**	**% self-hire**
Germanic Languages and Literatures	95	103	0.55	0.52	−0.08	1.9%
Classics and Classical Languages	123	223	0.57	0.22	−0.45	2.2%
Comparative Literature	221	96	0.75	0.89	1.30	3.1%
Asian Languages	152	151	0.58	0.58	0.01	4.0%
Art History and Criticism	452	303	0.70	0.80	0.49	1.3%
Slavic Languages and Literatures	57	83	0.70	0.56	−0.31	2.4%
Near and Middle Eastern Languages and Cultures	127	82	0.68	0.80	0.55	2.4%
Italian Language and Literature	108	87	0.60	0.68	0.24	3.4%
French Language and Literature	110	112	0.57	0.56	−0.02	1.8%
Religious Studies	221	336	0.63	0.44	−0.34	0.9%
Humanities	103	265	1.00	0.99	−0.61	0.0%
Philosophy	957	986	0.23	0.21	−0.03	1.8%
English Language and Literature	1106	1232	0.27	0.19	−0.10	3.0%
Theological Studies	128	181	0.55	0.36	−0.29	14.4%
History	1567	1356	0.38	0.46	0.16	1.2%
Asian Studies	186	186	0.51	0.51	0.00	5.4%
Linguistics	531	382	0.32	0.51	0.39	5.0%
Music	562	569	0.16	0.15	−0.01	4.0%
Spanish Language and Literature	237	164	0.53	0.68	0.45	1.8%
Humanities	7268	7190	0.13	0.14	0.01	2.8%

Table 4: Field-level and domain-level faculty hiring statistics (Part 3 of 6). Continued from Part 2.

Medicine and Health						
Field	**Faculty placed**	**Faculty hired**	**Import**	**Export**	**Net export/fac.**	**% self-hire**
Human Development and Family Sciences	716	737	0.71	0.70	−0.03	6.8%
Genetics	692	559	0.87	0.90	0.24	3.9%
Public Health	1286	2163	0.74	0.56	−0.41	10.4%
Social Work	1390	1583	0.21	0.10	−0.12	8.8%
Pharmacology	910	1119	0.75	0.69	−0.19	8.8%
Environmental Health Sciences	300	459	0.77	0.64	−0.35	12.2%
Physiology	1060	1295	0.77	0.72	−0.18	8.8%
Pharmaceutical Sciences	568	808	0.79	0.70	−0.30	7.8%
Immunology	1008	1145	0.74	0.70	−0.12	8.1%
Epidemiology	958	1055	0.54	0.49	−0.09	21.9%
Nursing	2373	2657	0.14	0.04	−0.11	34.9%
Veterinary Medical Sciences	996	1077	0.50	0.46	−0.08	18.1%
Communication Disorders and Sciences	382	527	0.67	0.55	−0.28	9.1%
Nutrition Sciences	834	924	0.57	0.52	−0.10	14.8%
Speech and Hearing Sciences	293	384	0.65	0.54	−0.24	9.6%
Pharmacy	491	508	0.52	0.51	−0.03	19.5%
Medicine and Health	16347	19652	0.38	0.25	−0.17	14.3%

Table 5: Field-level and domain-level faculty hiring statistics (Part 4 of 6). Continued from Part 3.

Natural Sciences						
Field	**Faculty placed**	**Faculty hired**	**Import**	**Export**	**Net export/fac.**	**% self-hire**
Plant Pathology	489	525	0.56	0.53	−0.07	9.5%
Environmental Sciences	1062	1438	0.85	0.80	−0.26	4.6%
Anatomy	454	654	0.84	0.77	−0.31	9.6%
Molecular Biology	1988	1626	0.82	0.86	0.22	3.9%
Cell Biology	1769	1631	0.82	0.83	0.08	4.9%
Chemistry	5832	4640	0.19	0.36	0.26	4.7%
Atmospheric Sciences and Meteorology	915	739	0.57	0.65	0.24	9.2%
Natural Resources	576	813	0.79	0.71	−0.29	9.5%
Computational Biology	156	395	0.88	0.69	−0.61	8.1%
Biomedical Sciences	212	721	0.95	0.84	−0.71	3.2%
Neuroscience	1243	1334	0.77	0.75	−0.07	6.1%
Biophysics	730	576	0.85	0.88	0.27	9.5%
Physics	4680	4194	0.21	0.29	0.12	7.0%
Entomology	682	588	0.31	0.41	0.16	13.4%
Astronomy	1591	1765	0.60	0.55	−0.10	5.2%
Biomedical Engineering	969	1309	0.66	0.54	−0.26	9.9%
Ecology	983	641	0.73	0.83	0.53	3.6%
Biological Sciences	3710	4336	0.69	0.64	−0.14	3.6%
Chemical Engineering	2121	1954	0.27	0.33	0.09	5.2%
Oceanography	380	474	0.73	0.66	−0.20	8.9%
Biochemistry	3352	3102	0.70	0.72	0.08	4.7%
Marine Sciences	473	568	0.73	0.67	−0.17	7.0%
Microbiology	1806	1734	0.66	0.67	0.04	7.7%
Forestry and Forest Resources	417	566	0.66	0.53	−0.26	12.5%
Evolutionary Biology	903	495	0.72	0.85	0.82	3.8%
Biostatistics	633	955	0.64	0.45	−0.34	11.0%
Pathology	1375	1609	0.72	0.67	−0.15	11.9%
Geology	1796	2062	0.40	0.31	−0.13	4.2%
Natural Sciences	**33802**	**32909**	0.18	0.20	0.03	**6.6%**

Table 6: Field-level and domain-level faculty hiring statistics (Part 5 of 6). Continued from Part 4.

Public Administration and Policy						
Field	**Faculty placed**	**Faculty hired**	**Import**	**Export**	**Net export/fac.**	**% self-hire**
Public Administration	330	497	0.72	0.57	−0.34	3.6%
Public Policy	639	762	0.81	0.78	−0.16	4.3%
Public Administration and Policy	**741**	**984**	0.74	0.65	−0.25	**3.9%**

Social sciences						
Field	**Faculty placed**	**Faculty hired**	**Import**	**Export**	**Net export/fac.**	**% self-hire**
Educational Psychology	1267	609	0.80	0.90	1.08	5.6%
Gender Studies	65	147	0.84	0.65	−0.56	0.0%
Sociology	2197	1995	0.22	0.30	0.10	1.9%
Agricultural Economics	301	507	0.78	0.63	−0.41	4.3%
Anthropology	1670	1608	0.25	0.28	0.04	3.7%
Psychology	5054	4572	0.33	0.40	0.11	4.9%
Economics	2963	2139	0.22	0.43	0.39	2.3%
Criminal Justice and Criminology	559	735	0.44	0.27	−0.24	2.6%
Geography	915	1054	0.41	0.32	−0.13	5.9%
Political Science	2146	2022	0.18	0.23	0.06	1.5%
International Affairs	121	489	0.96	0.84	−0.75	1.6%
Social Sciences	**17770**	**15489**	0.15	0.26	0.15	**3.7%**

Table 7: Field-level and domain-level faculty hiring statistics (Part 6 of 6). Continued from Part 5.

B Individual-level statistics

APPLIED SCIENCES				
Field	**Prestige Change**		**Placement Time (yrs)**	
	Inter	Intra	Inter	Intra
Ag Econ	**-0.25**	**-0.46**	3.25	3.62
Agronomy	-0.14	-0.04	6.26	6.40
Animal Sci	-0.07	-0.05	**6.95**	**5.83**
Architecture	-0.22	-0.28	3.63	2.78
Food Sci	**-0.07**	**-0.15**	**7.68**	**5.88**
Forestry & Forest Rsrcs	-0.10	-0.08	5.75	5.71
Horticulture	-0.06	-0.10	6.60	6.62
Natural Rsrcs	-0.18	-0.10	6.86	5.72
Soil Sci	-0.15	-0.14	6.54	6.79
Urban Planning	-0.22	-0.32	**6.32**	**2.92**
Applied Sciences (avg)	**-0.17**	**-0.23**	4.30	4.26
(interdomain)	**-0.12**	**-0.20**	**4.91**	**4.07**

EDUCATION				
Field	**Prestige Change**		**Placement Time (yrs)**	
	Inter	Intra	Inter	Intra
Counselor Ed	**-0.18**	**-0.30**	3.39	3.38
Curriculum & Instr	**-0.17**	**-0.28**	3.52	2.73
Ed	**-0.15**	**-0.24**	4.17	4.00
Ed Admin	-0.25	-0.30	3.74	3.23
Ed Psych	-0.23	-0.26	3.47	3.81
Special Ed	-0.16	-0.24	4.03	4.10
Education (avg)	**-0.18**	**-0.28**	3.84	3.44
(interdomain)	**-0.14**	**-0.26**	**4.54**	**3.42**

Table 8: Individual-level statistics by field and domain (Part 1 of 4). Prestige change is the mean change in normalized prestige between degree department and hiring department. Placement time is the mean number of years between PhD and first tenure-track position. Inter = interdisciplinary hires, Intra = intradisciplinary hires. Bold values indicate statistically significant differences between interdisciplinary and intradisciplinary hires (Benjamini-Yekutieli corrected Mann-Whitney U test, $p < 0.05$). Domain (avg) rows show statistics for interfield hires averaged across all fields in the domain. Domain (interdomain) rows show statistics for interdomain hires.

ENGINEERING				
Field	**Prestige Change**		**Placement Time (yrs)**	
	Inter	Intra	Inter	Intra
Aero Eng	-0.24	-0.23	6.29	5.12
Ag Eng	-0.15	-0.17	**7.87**	**4.97**
Biomed Eng	**-0.16**	**-0.19**	**9.46**	**6.29**
Chem Eng	-0.26	-0.24	**8.01**	**6.18**
Civil Eng	**-0.14**	**-0.22**	**6.01**	**4.47**
EE	**-0.14**	**-0.18**	**7.21**	**5.31**
Env Eng	**-0.15**	**-0.22**	**6.48**	**4.21**
Industrial Eng	**-0.16**	**-0.23**	**4.54**	**3.96**
Materials Eng	**-0.19**	**-0.25**	7.50	6.93
ME	**-0.19**	**-0.23**	6.22	5.80
Systems Eng	-0.20	-0.22	**5.43**	**3.26**
Engineering (avg)	**-0.18**	**-0.21**	**6.35**	**5.17**
(interdomain)	**-0.14**	**-0.18**	**7.12**	**5.27**

HUMANITIES				
Field	**Prestige Change**		**Placement Time (yrs)**	
	Inter	Intra	Inter	Intra
Art Hist	-0.46	-0.49	3.47	3.67
Asian Lang	-0.36	-0.45	4.51	2.35
Asian Studies	-0.37	-0.46	3.39	2.21
Classics	**-0.30**	**-0.47**	3.03	2.31
Comparative Lit	-0.36	-0.36	2.78	2.71
English Lang & Lit	**-0.20**	**-0.32**	4.04	3.32
French Lang & Lit	**-0.07**	**-0.36**	2.95	2.39
Germanic Lang & Lit	-0.17	-0.33	3.36	3.00
History	**-0.25**	**-0.39**	3.91	3.48
Humanities	-0.22	-0.26	**5.08**	**2.16**
Italian Lang & Lit	-0.11	-0.36	2.08	2.67
Linguistics	-0.26	-0.28	3.85	3.87
Music	**-0.24**	**-0.38**	5.11	3.22
Middle Eastern Lang & Cult	-0.47	-0.44	4.30	3.09
Phil	-0.27	-0.32	5.67	4.01
Religious Stds	**-0.25**	**-0.45**	4.46	3.41
Slavic Lang & Lit	-0.12	-0.40	3.96	2.67
Spanish Lang & Lit	**-0.17**	**-0.43**	2.96	2.61
Theater	-0.21	-0.36	4.26	3.20
Theology	-0.32	-0.40	4.50	3.25
Humanities (avg)	**-0.26**	**-0.36**	**4.11**	**3.41**
(interdomain)	**-0.27**	**-0.32**	**5.41**	**3.46**

JOURNALISM, MEDIA, COMMUNICATION				
Field	**Prestige Change**		**Placement Time (yrs)**	
	Inter	Intra	Inter	Intra
Comm	**-0.22**	**-0.30**	4.19	3.73
Comm & Media Stds	**-0.25**	**-0.33**	3.44	3.11
Journalism, Media, Communication (avg)	**-0.23**	**-0.31**	3.86	3.57
(interdomain)	**-0.17**	**-0.32**	**4.54**	**3.50**

Table 9: Individual-level statistics by field and domain (Part 2 of 4). Continued from Part 1.

Mathematics and Computing				
Field	**Prestige Change**		**Placement Time (yrs)**	
	Inter	Intra	Inter	Intra
Comp Bio	-0.24	-0.25	**9.96**	**4.72**
CE	-0.15	-0.18	**7.18**	**4.98**
CS	-0.19	-0.19	**5.95**	**4.89**
Info Sci	-0.20	-0.26	**6.21**	**4.18**
IT	-0.20	-0.21	**5.77**	**4.21**
Math	-0.22	-0.25	6.57	5.87
Operations Research	-0.32	-0.33	3.28	2.68
Stats	-0.23	-0.26	5.59	4.79
Mathematics and Computing (avg)	**-0.19**	**-0.21**	**6.18**	**5.08**
(interdomain)	-0.18	-0.20	**7.03**	**5.11**

Medicine and Health				
Field	**Prestige Change**		**Placement Time (yrs)**	
	Inter	Intra	Inter	Intra
Biomed Sci	-0.17	-0.25	**12.58**	**7.80**
Biostats	-0.25	-0.31	**8.28**	**5.02**
Comm Disorders & Sci	**-0.16**	**-0.34**	4.71	3.94
Env Health Sci	-0.19	-0.18	**9.41**	**5.16**
Epidemiology	**-0.24**	**-0.04**	**8.44**	**6.28**
Exercise Sci, Kinesiology, Rehab, Health	**-0.14**	**-0.21**	**6.50**	**4.70**
Health, Phys Ed, Rec	**-0.15**	**-0.27**	4.16	3.24
Nursing	**-0.05**	**0.00**	**7.71**	**4.51**
Nutrition	**-0.05**	**-0.13**	**7.59**	**5.17**
Pharma Sci	-0.16	-0.21	**11.36**	**8.04**
Pharmacology	-0.16	-0.11	12.12	11.18
Pharmacy	-0.20	-0.06	10.06	8.39
Public Health	-0.26	-0.20	**8.07**	**5.15**
Speech & Hearing Sci	**-0.08**	**-0.25**	5.28	3.49
Vet Med Sci	-0.17	-0.13	**9.04**	**6.42**
Medicine and Health (avg)	**-0.18**	**-0.15**	**8.51**	**5.27**
(interdomain)	**-0.09**	**-0.16**	**8.54**	**6.10**

Table 10: Individual-level statistics by field and domain (Part 3 of 4). Continued from Part 2.

Natural Sciences				
Field	**Prestige Change**		**Placement Time (yrs)**	
	Inter	Intra	Inter	Intra
Anatomy	-0.15	-0.11	11.54	9.89
Astronomy	-0.27	-0.25	10.24	9.07
Atmospheric Sci & Meteorology	-0.22	-0.25	**10.59**	**6.21**
Biochem	-0.27	-0.26	10.58	10.84
Bio Sci	**-0.19**	**-0.26**	**10.66**	**9.32**
Biophys	-0.18	-0.10	10.94	9.38
Cell Bio	-0.28	-0.26	**11.65**	**10.10**
Chem	-0.23	-0.26	9.28	9.22
Ecology	-0.23	-0.27	6.59	6.31
Evolutionary Bio	-0.22	-0.27	7.13	6.39
Genetics	-0.22	-0.26	10.43	10.10
Geology	**-0.21**	**-0.26**	**8.37**	**5.81**
Immunology	-0.19	-0.16	12.63	11.07
Marine Sci	-0.19	-0.24	9.39	7.95
Microbio	-0.19	-0.17	11.44	10.58
Molecular Bio	-0.27	-0.26	10.90	10.48
Neurosci	-0.20	-0.20	**12.43**	**9.22**
Oceanography	**-0.15**	**-0.24**	**11.04**	**7.00**
Pathology	-0.15	-0.02	12.00	10.99
Physics	**-0.31**	**-0.24**	9.66	9.85
Physiology	-0.21	-0.10	11.29	10.80
Plant Pathology	-0.21	-0.28	7.04	7.54
Plant Sci	**-0.17**	**-0.22**	6.95	6.97
Natural Sciences (avg)	**-0.20**	**-0.23**	**10.19**	**8.43**
(interdomain)	**-0.27**	**-0.18**	9.52	9.18

Public Administration and Policy				
Field	**Prestige Change**		**Placement Time (yrs)**	
	Inter	Intra	Inter	Intra
Crim Justice & Criminology	**-0.09**	**-0.32**	4.44	3.56
Public Admin	-0.22	-0.24	4.58	3.20
Public Policy	-0.21	-0.24	**4.60**	**3.09**
Public Administration and Policy (avg)	-0.22	-0.25	**4.50**	**3.25**
(interdomain)	**-0.19**	**-0.24**	**4.66**	**3.42**

Social Sciences				
Field	**Prestige Change**		**Placement Time (yrs)**	
	Inter	Intra	Inter	Intra
Accounting	-0.33	-0.26	2.88	2.52
Anthro	**-0.18**	**-0.29**	4.87	5.07
Bus Admin	**-0.16**	**-0.23**	2.77	2.62
Econ	**-0.37**	**-0.27**	3.64	3.15
Finance	**-0.22**	**-0.30**	**3.27**	**3.91**
Gender Std	**-0.25**	**-0.53**	5.49	2.87
Geography	**-0.15**	**-0.30**	**5.84**	**4.64**
Human Dev & Family Sci	**-0.12**	**-0.22**	4.65	3.95
Intl Affairs	-0.29	-0.25	4.74	4.16
Mgmt	**-0.22**	**-0.33**	3.74	3.22
Mgmt Info Systems	**-0.21**	**-0.28**	4.58	3.38
Marketing	**-0.15**	**-0.34**	3.82	4.63
Poli Sci	-0.22	-0.26	3.38	3.03
Psych	-0.19	-0.21	6.47	5.67
Social Work	**-0.09**	**-0.29**	**4.70**	**3.24**
Sociology	-0.28	-0.29	**5.10**	**3.71**
Social Sciences (avg)	**-0.22**	**-0.26**	**4.83**	**4.16**
(interdomain)	-0.21	-0.22	**5.04**	**4.24**

Academia				
Level	**Prestige Change**		**Placement Time (yrs)**	
	Inter	Intra	Inter	Intra
Academia	**-0.19**	**-0.23**	**7.12**	**5.36**

Table 11: Individual-level statistics by field and domain (Part 4 of 4). Continued from Part 3.

Discipline level	Interdisc. definition	Interdisciplinary			Disciplinary		
		Total	Matched	w/ pub. data	Total	Matched	w/ pub. data
Field	Full	20943	19631 (0.94)	18720 (0.89)	34815	33521 (0.96)	31695 (0.91)
Field	Partial	27725	25593 (0.92)	24363 (0.88)	28033	27192 (0.97)	25699 (0.92)
Domain	Full	11017	10955 (0.99)	10373 (0.94)	51387	51085 (0.99)	48251 (0.94)
Domain	Partial	15133	15059 (1.00)	14344 (0.95)	47271	47101 (1.00)	44392 (0.94)

Table 12: Sample sizes for interdisciplinary and disciplinary faculty hires before and after matching and filtering for publication data. Matching was performed for every combination of discipline levels (field and domain) and definitions of interdisciplinarity (full and partial). Table shows counts, with proportions of the total in each category in parentheses.

C Interdomain hires

While we focus on faculty hires who cross field boundaries in the main text, our discipline taxonomy also includes 10 broad domains at its coarsest level. Despite the breadth of these domains, 18% of faculty are hired into a different domain than the one in which they were trained. Because every field belongs to exactly one domain, interdomain hires are a strict subset of interfield hires. Like interfield hiring, interdomain hiring is not distributed evenly, but instead concentrated between related fields within related domains, such as Computer Science (Mathematics and Computing domain) and Computer Engineering (Engineering domain) or Chemistry (Natural Sciences domain) and Pharmaceutical Sciences (Medicine and Health domain).

The same individual-level effects described for interfield hires in the main text also apply for interdomain hires. Averaged across academia, interdomain faculty hires experience 3.2% less downward prestige mobility at hiring and produce 12.8% more publications in the 5 years post-hire compared to disciplinary hires ($p < 1 \times 10^{-6}$, Benjamini-Yekutieli corrected). Inter-domain hires are hired into relatively higher prestige departments in all domains except the Natural Sciences and academia overall (7 domains and academia with significantly higher interdisciplinary prestige compared to only Natural Sciences with significantly lower interdomain prestige, Benjamini-Yekutieli corrected; Fig. 3). Social Sciences exports almost twice as many faculty as it imports (driven largely by the exports of Economics and Psychology), while the opposite is true for the domains of Medicine and Health and Applied Sciences.

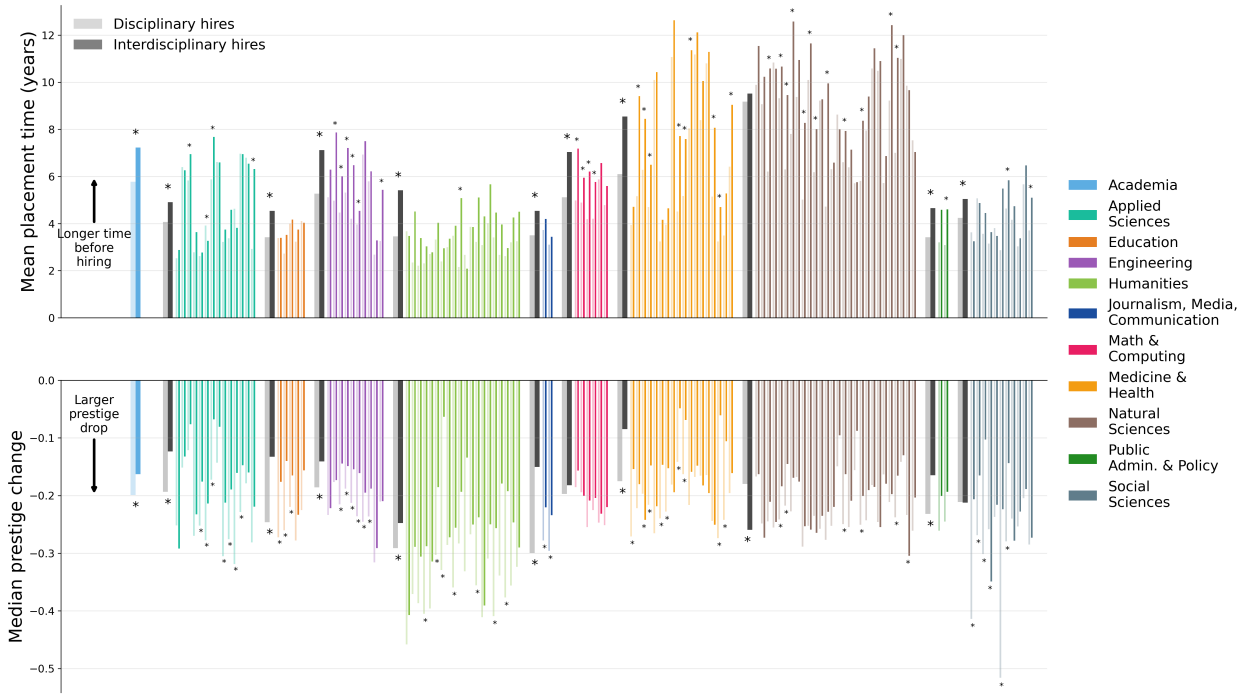


Figure 4: (Top) Average time in years between PhD and first tenure-track position for disciplinary (light bars, left) and interdisciplinary (dark bars, right) faculty hires across fields, domains, and academia overall. Thick gray bars represent the placement times of interdomain hires compared to non interdomain hires while thin colored bars represent the placement times of interfield hires compared to non interfield hires. Stars denote domains with significant differences in placement time between disciplinary and interdisciplinary hires (Benjamini-Yekutieli corrected). (Bottom) Average prestige change between degree department and hiring department for intradomain/intrafield hires (light bars, left) and interdomain/interfield hires (dark bars, right) across fields, domains, and academia overall.

D Robustness to partial definition of interdisciplinarity

In Sec. 2.1, we defined fully interdisciplinary hires as faculty who do not retain any affiliation with their degree disciplines after being hired into a new discipline and partially interdisciplinary hires as faculty who retain at least one affiliation with their degree disciplines after being hired into a new discipline. While all results presented in the main text are for fully interdisciplinary hires, we repeated all analyses using partially interdisciplinary hires to test the robustness of our findings. The results are qualitatively similar to those presented in the main text. Like fully interdisciplinary hires, partially interdisciplinary hires tend to take longer to be placed into tenure-track roles, write more papers post-hire, and are hired into higher-prestige departments compared to their disciplinary peers. However, the magnitude of the productivity and prestige boosts are attenuated for partially interdisciplinary hires compared to fully interdisciplinary hires.

For the productivity analysis, our matching procedure yielded similar sample proportions for partially interdisciplinary hires as for fully interdisciplinary hires (Table 12).

The distributions of career types are also similar between fully and partially interdisciplinary hires (Table 13).

Career Classification	**Field (full)**	**Field (partial)**	**Domain (full)**	**Domain (partial)**
Label correction	39.4%	37.9%	39.9%	39.5%
Label adoption	28.9%	33.3%	30.6%	32.2%
Re-labeling	15.8%	13.9%	14.3%	13.8%
Topic adoption	10.0%	8.9%	8.7%	8.0%
Topic reversion	5.9%	6.0%	6.5%	6.4%

Table 13: Career classification proportions for interdisciplinary faculty across different levels definitions of interdisciplinarity. Full interdisciplinarity requires that the intersection of degree and hiring disciplines be empty, while partial interdisciplinarity requires at least hiring discipline to be new.

E Career classifications: differences at the levels of fields and individuals

Career Category	**Δ Prestige (%)**	**Time-to-hire (yrs)**	**Productivity (%)**
Label adoption	**-0.01**	**1.00**	**12.00**
Label correction	**0.05**	**2.00**	**21.20**
Re-labeling	**0.03**	**1.00**	**-8.00**
Topic adoption	**0.04**	**2.00**	**-12.20**
Topic reversion	0.01	1.00	-10.30

Table 14: Career outcome differences by category. Bold values indicate statistically significant differences.

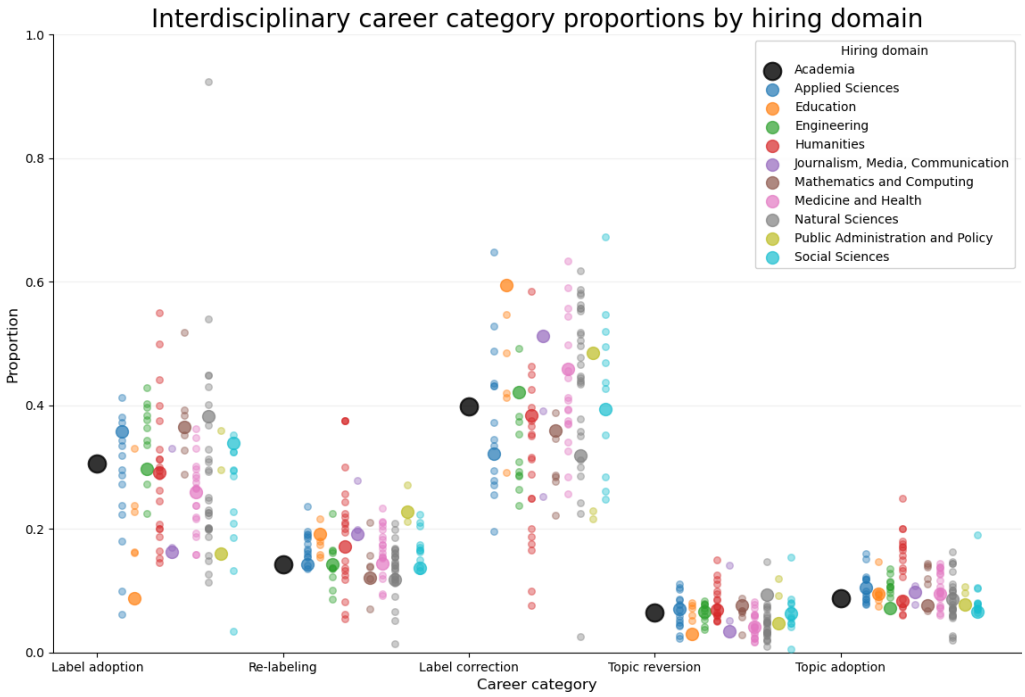


Figure 5: Proportions of interdisciplinary hires in each career class for each domain (large circles), field (small circles), and academia overall (black).

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