

Article

Collective Sense-Making in PhD Employment Discussions: A Topic Modeling Study of Social Media

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Abstract

Social media has become a key venue where PhD graduates seek career information, compare experiences, and negotiate uncertainty. Drawing on information behavior and sense-making perspectives, this study examines how returnee PhDs from non-core study destinations discuss employment challenges in China's academic labor market when credential signals are contested. Using Korean-trained PhDs as a theoretically motivated exemplary case, we collected 1149 publicly available posts from Xiaohongshu, a Chinese social media platform, and applied BERTopic to identify latent themes, followed by qualitative close reading of representative posts to interpret discourse functions. The model yielded ten topics, and semantic association analysis indicates substantial overlap among high-frequency topics, suggesting intertwined concerns rather than neatly separated issue domains. The four most prevalent topics account for 72.06% of the corpus, centering on credential recognition, job-search pathways, informal screening rules, and intersecting age- and gender-related pressures. Qualitative readings further reveal recurring discursive moves, including exposing tacit hiring heuristics, contesting stigmatizing labels (e.g., "water PhD," a derogatory term implying low-quality credentials), and exchanging actionable strategies across regions and career tracks. Overall, the findings point to discursive convergence under evaluation uncertainty: when formal criteria are ambiguous and institutional signals are unreliable, participants turn to social media to stabilize expectations by triangulating cases and iteratively refining shared interpretations of the job market. This study contributes empirical evidence on uncertainty-driven information practices in highly educated labor markets and demonstrates the value of combining topic modeling with qualitative interpretation to capture online collective sense-making.

Keywords: information seeking; uncertainty; collective sense-making; topic modeling; PhD employment; returnee scholars; social media



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1. Introduction

As doctoral education expands, employment opportunities in universities and research institutions have not kept pace, showing that structural tensions are present in the job market. Li [1] found that Chinese working-class PhD students tend to limit their career options and feel more pressure when competition increases in the academic job market. Kim [2] analyzed the academic labor market in Korea, revealing that the emergence of non-tenure-track full-time faculty has established a three-tiered structure in the market, thereby increasing the instability of the academic career market. Furthermore, the value

of doctoral degrees has become increasingly differentiated, and actual returns are heavily influenced by institutional prestige, disciplinary field, and employers' preferences.

The value of overseas study experience is also undergoing a transformation in the domestic job market. Meng and Shen [3] analyzed Chinese PhDs trained in Japan and found that employment stratification to some extent adheres to universalistic principles: pre-graduation research productivity, institutional reputation, overseas stay duration, and supervisor background all have a substantial impact on access to top Chinese universities. However, Li et al. [4] also demonstrated that returnee scholars from regional universities frequently endure resource shortages and weak research infrastructure, and the conversion of transnational capital is conditioned by the institutional settings. Xu and Ou [5] emphasized the "rootlessness" experienced by returnee scholars because they lack sufficient domestic social and cultural capital to establish effective academic networks. Bai et al. [6] conducted a longitudinal study that compared the mental health and career adaptation of Chinese returnee PhDs with that of Korean PhDs who remained in the United States during the post-pandemic period, and their findings showed that both groups underwent racial trauma, career anxiety, and ambiguous loss. These studies suggest that the career development of returnee PhDs involves not only ability and credential-based competition, but also intricate processes of identity negotiation and readaptation.

Employment uncertainty often motivates information seeking as a coping response in ambiguous labor markets. Kuang and Wang's [7] longitudinal study demonstrated that uncertainty discrepancy may induce negative emotion and motivate both information seeking and social support seeking behaviors. Social media has emerged as a key medium for youth to obtain information on career choices and share career experiences. Malik et al. [8] indicated that both social media trust and perception of uncertainty have positive effects on information-seeking behavior, and in turn, influence behavioral intentions. Among PhD graduates experiencing credential evaluation uncertainty, social media discussion channels can serve as an employment information access channel and a platform to share and seek support. However, prior studies have focused mainly on general youth populations or individual-level psychological outcomes. Comparatively little attention has been paid to how PhD graduates from non-core study destinations, who occupy marginal positions in credential evaluation systems, collectively interpret and respond to evaluation uncertainty through online interaction.

Korean-trained PhDs present a theoretically motivated exemplary case for studying collective sense-making under credential uncertainty. They exhibit the core conditions under which sustained online sense-making is likely to emerge: contested credential legitimacy, active stigmatizing discourse (e.g., the "water PhD" label), and a substantial volume of online discussion that enables iterative exchange. We collected related posts from Xiaohongshu, a Chinese social media platform, and analyzed them using BERTopic topic modeling [9] combined with qualitative close reading. We addressed two research questions: (1) What are the discourse structures of online conversations among this group regarding return employment? (2) How do these discourses reflect underlying evaluation uncertainty and collective sense-making processes?

This study advances two interrelated theoretical propositions. First, credential evaluation often remains persistently ambiguous in this context because formal criteria are unclear and institutional signals are unreliable. Under these conditions, PhD graduates are more likely to engage in sustained and iterative information seeking on social media. Such information seeking extends beyond individual gap-bridging and becomes a process of collectively negotiating how the labor market is understood. Second, social media platforms do more than transmit information. Through repeated interaction, recurring discursive anchors (e.g., stigmatizing labels and informal screening thresholds) emerge and become shared interpretive reference

points for evaluating career options. Beyond these theoretical contributions, the study also makes a methodological contribution by integrating BERTopic topic modeling with qualitative close reading. It further contributes empirical evidence on an understudied population in information behavior research: returnee PhDs from non-core study destinations navigating credential uncertainty.

2. Literature Review

The literature informing this study spans three interconnected areas. Section 2.1 reviews research on PhD employment uncertainty and the evaluation mechanisms that shape credential value in academic labor markets. Section 2.2 introduces information behavior theories, particularly sense-making approaches, to explain how individuals and groups respond to uncertainty. Section 2.3 then examines social media information practices and computational approaches to online discourse analysis, which together inform the empirical design of this study. Taken together, these three strands provide the theoretical and methodological foundation for analyzing collective sense-making in PhD employment discussions.

2.1. PhD Employment Uncertainty and Evaluation

Recent discussions on PhD employment have shifted from attention to aggregate employment rates to attention to employment quality and market structure. Hancock [10] stated that while governments often regard PhD graduates as key talent that drives prosperity, a systematic understanding of their actual contributions remains scarce. Chen [11] noted that China has recently become the world's largest doctorate producer and discussed emerging challenges around quality assurance, internationalisation, and doctoral employment in the early post-pandemic context. The academic labor market also exhibits a definite hierarchical structure. In their study of faculty hiring networks in education disciplines in China, Liu et al. [12] found highly unequal patterns in recruitment, with a Gini coefficient of 0.87, which is much higher than that of similar fields in the United States. Tian et al. [13] documented a shift toward contract-based and other temporary academic positions in the Chinese LIS academic market, and suggested that institutional prestige may contribute to structural mismatch in hiring. A further interview study by Qi [14] suggested that such hierarchy does not only exist as an external market structure, but is internalized as individuals' emotional assessments of competitiveness and informs career planning and job-search practices.

Another analytical approach for understanding the evaluation of credentials in labor markets is signaling theory. Przepiorka [15] systematically reviewed signaling theory in sociology, arguing that it helps to understand employer screening that occurs in conditions of information asymmetry. In the context of PhD employment, credentials may serve as a source of signal for applicants' potential; however, the value of signaling diminishes when the candidates' credentials have relatively low recognition in the labor market. Using résumé data from 802 Chinese universities (159,752 faculty résumés), Lin et al. [16] documented credential inflation in newly hired faculty, particularly in elite institutions, and showed a growing employment premium for overseas education alongside the relative devaluation of domestic credentials. Araki and Kariya [17] made a distinction between "credential inflation" and "de-credentialization": the former suggests a decreasing credential value that is driven by oversupply, whereas the latter proposes that, despite decreasing value in the market, highly skilled individuals might still sustain returns through their demonstrated competence, even as reliance on credentials alone becomes less effective.

Age norms also affect PhD graduates' employment. Horta and Li [18] demonstrated that Chinese PhD graduates appear to have widely internalized age-based "successful career scripts," and individuals who deviate from their expected timelines are more prone to face stigmatization and career anxiety. This type of normative pressure intersects with

uncertainty in credential evaluation, leaving some groups of PhD graduates facing multiple predicaments when it comes to job search. Whereas existing literature has documented labor market stratification and unequal signaling effects in PhD employment, comparatively less attention has been given to how PhD graduates themselves experience the uncertainty and react in terms of cognitive expressions and information-seeking practices.

2.2. Information Behavior in the Context of Uncertainty

Information behavior studies often focus on people's information needs, seeking information, and the way people interpret and utilize information they acquire. Uncertain conditions tend to make many of these processes more obvious. On the one hand, uncertainty enhances one's sensitivity to missing information and ambiguous evidence and prompts people to pursue information seeking more actively. Drawing from uncertainty management theory and motivated information management, Kuang and Gettings [19] found that people are likely to experience tension when their expectations about clarity and control are high but unrealized when instead confronted with uncertainty. This discrepancy can induce anxiety and motivate information seeking. Using panel data from China, Zhang and Fan [20] likewise reported that uncertainty triggered by blocked goals is associated with psychological imbalance, and that information seeking can ease perceived uncertainty. Taken together, these findings suggest that uncertainty is often more than background "noise." It can act as the immediate trigger that shapes when people start searching and what kind of information they pursue.

Sense-making theory offers another perspective to address how people respond cognitively under such conditions. Urquhart et al. [21] showed in their systematic review of sense-making approaches in information science that Dervin's Sense-Making Methodology is one of the most commonly applied qualitative approaches. The core of this view is the assumption that people experience moments of discontinuity—conceptualized as "gaps"—and seek information in order to restore coherence in their understanding of a situation. Sense-making, rather than treating information behavior as a linear process, stresses its contextual and dynamic nature, emphasizing that meaning is created through information practices situated in a specific time and place. Empirical studies also suggest that sense-making cannot be approached as solely instrumental. For instance, in their study on rural older adults during the COVID-19 pandemic, Lund and Ma [22] showed that information seeking was not just useful to address practical uncertainties but could also help to sustain social connectedness and provide emotional reassurance through continuous information exchange.

Sense-making can happen in groups as people interact. Heverin and Zach [23] analyzed microblog discussions during three campus violence incidents and found that information sharing dominated early stages, followed by increased opinion expression. In these threads, people try to sort out what happened for themselves, and their replies also become material that later participants can use. Seen this way, social media does two things when uncertainty is high: it helps users obtain information, and it gives them a place to test, contest, and refine interpretations. This lens is useful for examining PhD groups' online discussions: when standards for credential evaluation are unclear, individuals may seek information and exchange experiences through social media and gradually build shared understandings through interaction.

2.3. Social Media Information Practices and Computational Analysis

With the ease of access to information, social media has become an important platform for youths to seek career information and share their experiences of job seeking. Dillahunt et al. [24] conducted a survey on 768 job seekers in the United States, and found that online employment resources are becoming as important as offline personal networks, but that there are significant differences in the platform use strategy for different income groups, with job

seekers from higher-income groups being more likely to adopt a diversified approach and receiving higher response rates. Zheng and Zang [25] explored Chinese college graduates and found that online community experience was positively associated with career awareness and proactive career behavior, and that social media community participation can help individuals understand and prepare for the job market. These two studies illustrate that, besides being a channel for transmitting information, social media also shapes, to a certain degree, individuals' cognition of and mitigation strategies for the job market.

However, social media's information environment might also cause job seekers to feel more psychologically stressed. Jin et al. [26], based on a survey of 1204 young people in China, found that the intensity of social media use predicted employment anxiety, and that the mechanisms involved the mediating effects of upward social comparison and online social support. Li et al. [27] proposed a "reinforcement paradox" of online support, suggesting that while social media can provide peer-based support, it may also intensify employment anxiety through information overload, dependence, and social comparison. In other words, social media can be both a tool for information risk avoidance and a comparison context that may intensify experiences of uncertainty. For PhD groups occupying marginal positions in credential evaluation, discussion on social media may have simultaneous functions of information exchange and emotional expression.

In the face of the large volume of unstructured text generated on social media, topic modeling methods have emerged as an effective tool for public discourse analysis. Egger and Yu [28] conducted a comparison of four topic modeling methods (LDA, NMF, Top2Vec, and BERTopic) on Twitter data, and found that BERTopic and NMF are more effective in processing short-text corpora. Through a combination of semantic embedding, dimensionality reduction, and density-based clustering, BERTopic can effectively capture the latent structures of social media posts in short-text corpora. Gokcimen and Das [29] applied BERTopic for analyzing climate change on social media and found that this method can effectively determine the topic distribution of public attitudes and cognition. Su et al. [30] suggested that the combination of manual reading and machine learning can improve the interpretability of topic modeling results using a semi-supervised method, which can be of methodological value for understanding the discourse expression of specific groups.

In sum, while social media can serve as a platform for career information seeking and a window to observe group cognition formation, topic modeling offers technical support for the analysis of these kinds of texts. However, most studies on social media have been on general youth populations or specific public issues, and there have not been systematic explorations on the online discourse structures around employment for PhD groups occupying marginal positions in the highly educated labor market.

3. Methods

3.1. Data Source

This study examines PhD return-employment discussions involving graduates from non-core study destinations. We treat the Korean-trained PhD case as a theoretically motivated exemplary case. Korean-trained PhDs exhibit the conditions under which collective sense-making around credential uncertainty is most likely to emerge: contested credential legitimacy, active stigmatizing discourse (e.g., the "water PhD" label), and a substantial volume of online discussion that enables iterative exchange. These conditions are not unique to Korea-trained returnees and are likely to appear, to varying degrees, among returnees from other non-core study destinations such as Southeast Asia or Eastern Europe. We focus on Korean-trained PhDs for two practical reasons. First, Korea-related discussions are notably active on Chinese social media, producing sufficient posts for computational analysis. Second, the relatively large number of Chinese doctoral students

in Korea, compared with other non-core destinations such as Southeast Asia or the Middle East, means that return-employment discussions are more sustained and thematically varied, providing richer material for topic modeling.

Data were drawn from Xiaohongshu, a Chinese social media platform primarily used by younger adults and oriented toward the sharing of everyday experiences. In recent years, this platform has gradually evolved into an active space for sharing job-seeking experiences, where many PhD holders and job seekers post employment-related discussions, such as interview experiences and personal reflections on their job search journey.

Data for this study were collected in May 2025 by searching keywords (translated here from Chinese), including “Korean PhD employment,” “Korean PhD discrimination,” and “Korean PhD job seeking” to retrieve relevant posts from the platform. We manually screened the initial dataset, primarily removing advertisements and irrelevant posts, and eliminating duplicates, which resulted in a final corpus of 1149 valid posts. All materials analyzed in this study were publicly accessible and do not involve personal privacy information. As with most keyword-based social media data collection, posts that were deleted, set to private, or not retrieved by the search strategy are not represented in the corpus.

3.2. Text Preprocessing and Analysis Workflow

Before analysis, we cleaned the data by removing non-textual content like emojis and hyperlinks. We then segmented the text using Jieba (version 0.42.1). Additionally, we built a custom dictionary that included terms frequently used in PhD employment discussions, such as “settling-in allowance” and “up-or-out,” to improve segmentation accuracy. We then constructed a study-specific stopword list by combining a general Chinese stopword list with the high-frequency word distribution in our corpus, removing function words that carry limited substantive meaning in this context. Finally, we filtered out tokens shorter than two characters and purely numeric strings. All analyses were conducted in Python 3.12.4.

3.3. Topic Modeling Method

To extract latent topic structures from PhD return-employment discussions, we applied BERTopic (version 0.17.0) [9]. BERTopic is a neural topic modeling framework that combines three computational steps: (1) transforming each text into a numerical vector that captures its meaning (semantic embedding), (2) reducing the complexity of these vectors to make patterns detectable (dimensionality reduction), and (3) grouping semantically similar texts into clusters that represent latent topics (density-based clustering). This approach is well-suited to short-text corpora such as social media posts, where traditional topic modeling methods (e.g., LDA) can face performance and interpretability challenges [28]. The analysis consisted of four steps:

1. Semantic embedding. We used the Sentence-BERT model paraphrase-multilingual-MiniLM-L12-v2 (via the sentence-transformers library, version 4.0.1) to generate semantic vector representations of posts. The model supports multiple languages, including Chinese, and performs reliably on short-text semantic representation tasks;
2. Dimensionality reduction. We reduced the high-dimensional embeddings using UMAP (version 0.5.7) with the following parameter settings: `n_neighbors = 14` (to balance local and global structure), `n_components = 8` (reduced dimensions), `min_dist = 0.0` (allowing tighter clusters), cosine distance metric, and `random_state = 42` (reproducibility);
3. Density-based clustering. We clustered the reduced embeddings using HDBSCAN (version 0.8.40) to identify latent topics, setting `min_cluster_size = 13` and `min_samples = 1`.
4. Topic representation. For topic representation, we used class-based c-TF-IDF (class-based Term Frequency–Inverse Document Frequency). We extracted the top 20 keywords for each topic (`top_n_words = 20`) to improve interpretability.

3.4. Topic Number Selection and Model Validation

We varied the `nr_topics` parameter from 5 to 16 and evaluated each solution using the `C_v` coherence score. As described by Röder et al. [31], `C_v` estimates within-topic semantic association based on word co-occurrence in sliding windows and Normalized Pointwise Mutual Information (NPMI). Prior research has shown that `C_v` aligns reasonably well with human judgments of topic coherence and is widely used for topic model evaluation. In this study, coherence was calculated using the `CoherenceModel` module in Gensim (version 4.3.3), with the original tokenized corpus as the reference text. Results are reported in Table 1.

Table 1. Coherence Scores for Different Numbers of Topics. Coherence scores were computed using the `C_v` measure via Gensim’s `CoherenceModel`, with the original tokenized corpus as the reference text. The bold value indicates the selected 10-topic solution.

Number of Topics	Coherence Score	Number of Topics	Coherence Score
5	0.4054	11	0.3937
6	0.4228	12	0.3917
7	0.4139	13	0.3945
8	0.4108	14	0.3887
9	0.4149	15	0.3881
10	0.4089	16	0.3899

We guided topic-model interpretation and selection using quantitative evaluation and diagnostic visualizations, consistent with benchmarking-oriented practices in recent topic-modeling work [32]. Since our goal was to identify more nuanced thematic structures in PhD employment discussions, we compared multiple solutions. We found that a six-topic solution produced categories that were too general to capture the nuances in our data, whereas a ten-topic solution offered clearer semantic distinctions without sacrificing breadth. By examining the Inter-Topic Semantic Distance Map and the Topic Similarity Matrix, we ultimately adopted the 10-topic solution.

To assess topic stability, we conducted a qualitative inspection of nearby topic solutions with both fewer and more topics than the selected 10-topic model. Across these alternative solutions, the four most prominent topics (A through D) remained identifiable, while changes primarily involved the merging or splitting of smaller themes. The coherence scores in Table 1 also show that solutions between 6 and 10 topics all scored above 0.40. Taken together, these patterns support the robustness of the 10-topic solution.

During model refinement, we used `BERTopic`’s `merge_topics` function when substantial overlap was observed in representative keywords and posts. Remaining proximity among several topics in the final model was retained because it reflected substantive co-occurrence in the corpus rather than redundant topic definitions.

Topic labels were assigned through a two-step process. First, we examined the top-20 representative keywords generated by `c-TF-IDF` for each topic (with `top_n_words = 20` in the model settings). Second, we reviewed representative posts with high topic-probability scores for each topic, using both keyword patterns and post content to determine descriptive labels. This dual-reference approach aimed to ensure that the labels reflected both the statistical structure and the substantive content of each topic.

4. Results

4.1. High-Frequency Word Distribution in Social Media Discussions

Based on the word-frequency analysis of the 1149 posts (Table 2), terms such as “PhD,” “Graduation,” “Work,” and “Major” appeared repeatedly. These high-frequency words point not only to where posters hoped to work after graduation, but also to experiences

accumulated during doctoral training. Many posts also described the job-search process in concrete terms, including how applicants felt their abilities were assessed and how institutional background shaped recruitment outcomes. References to personal development and career planning were common as well. Overall, the posts suggest that employment decisions are typically made by weighing multiple considerations, including academic preparation and degree-granting institutions.

Table 2. High-Frequency Keywords in Xiaohongshu Posts on PhD Return Employment. Frequencies represent token counts after preprocessing (segmentation, stopword removal, and short-token filtering). Chinese terms were translated by the authors for readability.

Word	Frequency	Word	Frequency	Word	Frequency
PhD	2499	Domestic	407	Teacher	270
Korea	1423	Employment	397	Master's	268
Graduation	903	Research	375	Choice	261
Work	864	Professor	354	Credentials	260
University (gaoxiao)	701	Thesis	342	Résumé	260
School	565	Pursuing PhD	324	Time	242
Major	526	Job seeking	319	Study abroad	236
University (daxue)	519	Direction	292	Recruitment	231
Application	491	Project	288	Supervisor	227
Interview	442	Student	275	Scientific research	225

4.2. Topic Identification Results Based on BERTopic

We used the BERTopic model to identify thematic patterns in the posts. Through iterative parameter tuning, we arrived at a ten-topic solution that captured the main themes in discussions about PhD return employment. These topics span study-abroad experiences, graduation timing and job search strategies, employment discrimination, position choices, research focus, institutional hiring needs, salary and benefits, as well as concerns related to gender and age. Representative keywords for each topic are shown in Table 3.

Topic A deals with how credentials are valued and what job options exist. Posts describe hitting walls during job searches: “University recruitment, no Southeast Asian PhDs wanted” and “Their attitude changed immediately upon hearing I’m a Korean PhD.” Some note that discipline matters (sports majors reportedly face less resistance), while others consider paths outside traditional university teaching. Topic B addresses when to graduate and how to plan ahead. One poster worries, “Graduating in 2028, it’ll be about the same as a current master’s degree,” capturing anxiety about credential devaluation over time. But success stories also circulate: “I have seven offers in hand” shows what’s still achievable. In Topic C, the label “water PhD” comes up repeatedly. Chinese-taught programs bear particular stigma. As one post puts it, “Chinese-taught programs are synonymous with water PhDs,” creating divisions within the PhD population itself. The supervisor’s reputation also shapes how graduates are perceived. Topic D collects concrete job-hunting accounts. Some describe frustration: “Sent 50 résumés with no response.” Others observe regional patterns: “Southern China is more accepting of Korean PhDs than the North.” Topic G turns to money and policy. Numbers appear frequently, such as “settling-in allowances of 100,000–1,000,000 yuan” and “salaries of 8000–12,000 yuan.” Posts also discuss compensation structures, benefits, and longer-term employment stability.

Figure 1 maps the relationships between topics. Each point represents a post, colored by its primary topic, with closer points indicating semantic similarity. Topic A appears as a dense, isolated cluster in the lower right. It contains the most posts and stands somewhat apart thematically. The other topics occupy the left side of the map and show more overlap, suggesting these employment discussions share common concerns despite their distinct emphases.

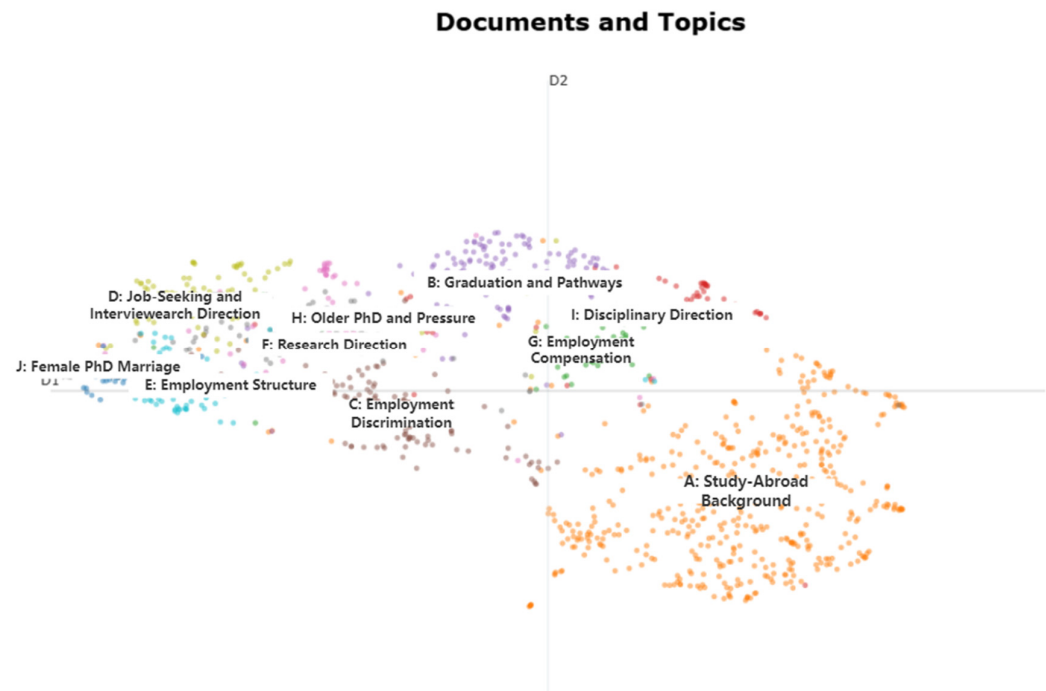


Figure 1. Inter-Topic Semantic Distance Map. Each point represents a post, and colors correspond to the assigned topic labels (A–J), with closer points indicating greater semantic similarity.

Table 3. High-Frequency Keywords in Xiaohongshu Posts on PhD Return Employment. Representative keywords were extracted using c-TF-IDF and translated from Chinese by the authors. The keywords shown are the top 10 of the 20 extracted per topic.

Topic	Topic Name	Representative Keywords (10)
A	PhD Study-Abroad Background and Return Employment	Korea; Southeast Asia; Korean language; study abroad; returning to China; domestic; credential recognition; employment; job seeking; interview
B	PhD Graduation and Job-Seeking Pathways	application; PhD enrollment; supervisor; master's degree; academic credentials; academic track; research; projects; positions; postdoc
C	PhD Employment Discrimination and Supervisor Influence	discrimination; supervisor; overseas; New Zealand; study abroad; scholarship; credentials; domestic; positions; research
D	Job-Seeking Process and Interview Experience	interview; CV; job seeking; preparation; department head; positions; publications; universities; employment; application process
E	PhD Employment Structure and Market Saturation	market saturation; intensified competition; industry; demand; enterprises; career development; employment; credentials; PhD students; female PhDs
F	PhD Research Direction and University Demand	research direction; research; academic output; publications; professors; students; enterprises; CV; positions; biology
G	Employment Compensation and Talent Policies	subsidy; Beijing; Shanghai; social insurance; housing provident fund; annual salary; compensation package; talent programs; home purchase; hukou (residence permit)
H	Older PhD Candidates and Identity Pressure	age; older candidates; screening; life course; discrimination; credentials; supervisor; universities; graduation; employment
I	Disciplinary Direction and Engineering Positions	engineering; projects; technology; application; publications; discipline; chemistry; physics; energy; analysis
J	Female PhD Marriage and Employment	female PhDs; marriage and partner selection; single; dating; family background; “strong match” (high-status pairing); parity in partnership; employment; credentials; peers

4.3. Analysis of Semantic Associations Between Topics

To explore how the identified topics relate to one another, we examined their semantic similarity using a topic similarity matrix. Figure 2 presents the pairwise similarity scores among the ten topics, with darker shades indicating stronger semantic proximity. In general, many topics show relatively close relationships, reflecting the fact that discussions revolve around a shared set of employment-related concerns. This overlap is not unexpected. Across different topics, posts frequently draw on common vocabulary such as “PhD,” “employment,” and “university,” and often refer to similar questions about career outcomes and evaluation standards. At the same time, differences between topics remain visible. Topic J (Female PhD Marriage and Employment), for example, shows noticeably lower similarity with most other topics, suggesting that discussions around gender and family-related issues follow a more distinct thematic trajectory within the broader conversation.

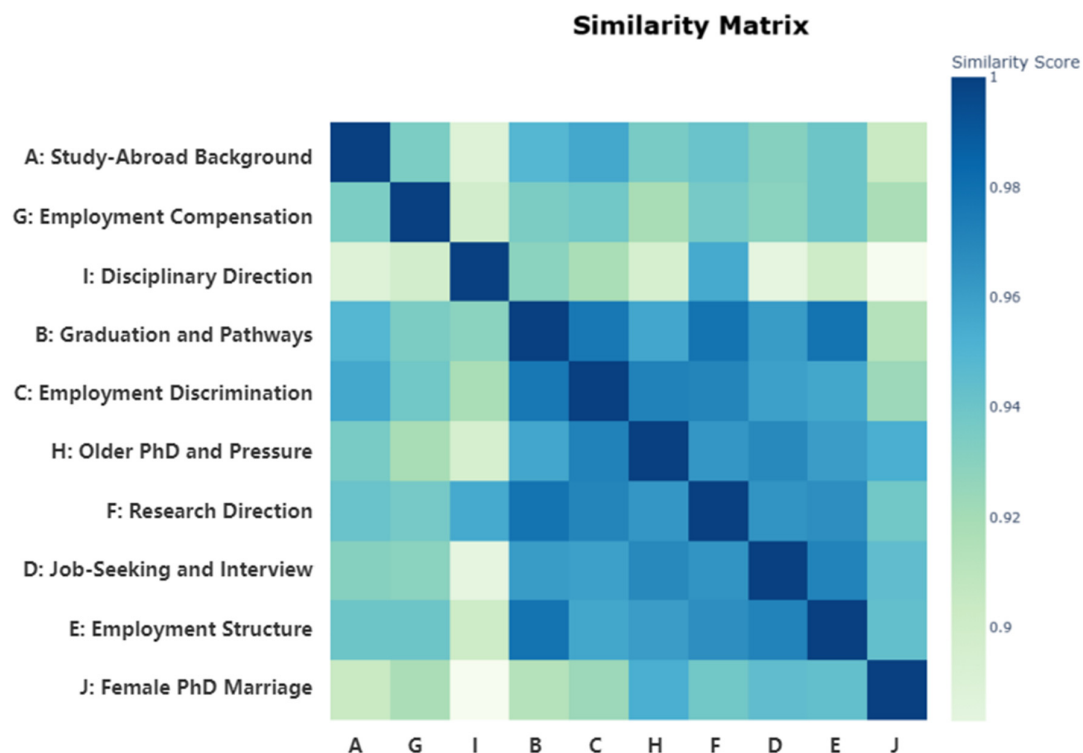


Figure 2. Topic Similarity Matrix.

4.4. Topic Distribution and Core Topic Proportions

Table 4 summarizes the number of posts associated with each topic and their relative proportions. Topic A accounts for the largest share of the dataset (42.99%), indicating that discussions related to study-abroad background and return employment occupy a central position in the corpus. Topics B and C represent 11.14% and 9.49% of the posts, respectively, showing that job-search pathways and credential evaluation are also frequent points of attention. Together, the four most prominent topics make up 72.06% of all posts. This concentration suggests that much of the discussion centers on employment outcomes, job-search processes, and the ways in which qualifications are assessed. Other topics appear less frequently, but they broaden the scope of discussion by addressing issues such as compensation policies, research direction, institutional demand, and gender- and age-related concerns.

Table 4. Topic Distribution and Post Proportions in the 10-Topic Solution. Counts reflect the number of posts assigned to each topic after outlier reduction. Proportions are calculated against the total corpus of 1149 posts.

Topic	Topic Name	Count (n)	Proportion (%)
A	PhD Study-Abroad Background and Return Employment	494	42.99
B	PhD Graduation and Job-Seeking Pathways	128	11.14
C	PhD Employment Discrimination and Supervisor Influence	109	9.49
D	Job-Seeking Process and Interview Experience	97	8.44
E	PhD Employment Structure and Market Saturation	69	6.01
F	PhD Research Direction and University Demand	58	5.05
G	Employment Compensation and Talent Policies	56	4.87
H	Older PhD Candidates and Identity Pressure	49	4.26
I	Disciplinary Direction and Engineering Positions	47	4.09
J	Female PhD Marriage and Employment	42	3.66

4.5. Discourse Analysis of Representative Texts

To complement the topic modeling results, we conducted close readings of seven posts drawn from the corpus. Cases were selected through purposive sampling guided by two criteria: (a) coverage of the major discursive functions identified across the corpus (narrating setbacks, disclosing screening rules, contesting labels, describing intersecting pressures, sharing strategies, describing policy environments, and articulating gendered pressures), and (b) diversity of employment-related concerns, so that the selected posts collectively addressed themes across the major topic clusters. This approach was intended to ensure that the qualitative analysis did not merely illustrate the topic-modeling results, but engaged with them analytically by revealing discursive dynamics that topic-level statistics alone could not capture.

Case 1: Immediate experience of job-search obstacles

“I’ve sent out many résumés recently, but none received a response. I tried calling several deans for advice, and every one of them changed their attitude as soon as they heard I’m a Korean PhD. . . Some were willing to discuss further after hearing about my publications, but once the words ‘Korean PhD’ came up, they said ‘let’s wait for internal discussion’ and did not add me on WeChat.”

In this post, the writer walks readers through what was said in calls and messages, conveying both the factual outcome and the sting of being turned down. These details resonate with the credential-barrier concerns that dominate Topic A. The close reading also reveals a dimension that topic keywords cannot capture: the social cues (e.g., refusal to add on WeChat) that signal informal exclusion beyond formal hiring criteria.

Case 2: A recruiter’s internal viewpoint

“I’ve worked in faculty recruitment for three years and watched PhD employment become harder every year. . . Age: under 32 is fine, over the limit—directly pass. Overseas PhDs: Europe, the U.S., Japan might still be considered. Southeast Asia? Korea? Directly pass.”

From an insider perspective, this post presents informal screening rules that echo the concerns identified in Topics D and H. While the topic model identifies “age” and “screening” as co-occurring keywords, the qualitative reading shows that these criteria often operate as hard cutoffs (“directly pass”) rather than flexible considerations.

Case 3: Questioning dominant credential labels

“People keep saying publishing in KCI is useless and not recognized domestically. Many universities clearly say they don’t hire Korean-trained PhDs. I have reservations about this. . . In many cases, the decisive factors are not the institution or the publications themselves.”

Rather than simply reinforcing the dominant view, this post engages with the credential-evaluation debates central to Topic C and shows that collective sense-making involves contestation as well as convergence. The author's hesitation toward prevailing views illustrates how shared understanding can emerge through disagreement, not only agreement.

Case 4: Overlapping pressures in job searching

"I know someone with bachelor's and master's degrees from 985 universities, plus a Korean PhD in sports. They sent out 50 résumés with no response. When they finished their master's, they could still enter a vocational college, but now even with a PhD, they can't. . . Honestly, don't come to Korea for a PhD. If you're in your first semester, transfer or withdraw; if you've studied for two years, hurry up and graduate."

This account brings together concerns across multiple topics, including credential recognition (Topic A), graduation timing (Topic B), and age-related pressure (Topic H). It shows how multiple disadvantages interact in a single job-search narrative, consistent with the semantic overlap shown in the Topic Similarity Matrix (Figure 2).

Case 5: Success experience and strategy sharing

"I graduated from an average Korean university with a PhD in humanities and social sciences. I now work at a university in Guangdong and things have been going smoothly. . . Current trends are that country-based discrimination is declining, institutional ranking matters more, and research output matters more. . . What you can do now: transfer to another developed country; if that's not possible, publish more in core journals; pay more attention to non-university jobs."

As a success narrative, this post reflects the strategy-sharing orientation visible in Topics A and D. It shows how success stories can serve as shared reference points that counterbalance pessimistic accounts and provide actionable benchmarks for peers.

Case 6: Regional talent policies and compensation information

"2025 Hangzhou PhD Talent Recruitment Subsidy Policy: Living allowance: newly recruited PhDs receive a one-time subsidy of 100,000 yuan. Rental subsidy: eligible PhDs receive 5000 yuan every six months for up to three years. District-level subsidy: PhDs in western districts receive an additional 100,000 yuan one-time subsidy after three years of work. E-class talent recognition: PhD holders are directly classified as E-class, with a housing purchase subsidy up to 400,000 yuan, priority access to housing lotteries, rental discounts, children's school enrollment priority, and household registration."

This post resonates with the compensation and policy concerns in Topic G. Unlike the personal narratives in earlier cases, it compiles specific policy details into a format that job seekers can directly compare across regions. Such posts function less as emotional accounts and more as shared reference documents, representing a distinct form of information practice in the corpus.

Case 7: Gendered pressures in PhD employment

"I have a 985 PhD degree, rich project and conference experience, and overseas experience. . . But you're female. Being female apparently means you can't travel for work or lead projects independently. Being female and older: if married, they worry about maternity leave; if single, they worry you'll focus on dating instead of publishing. . . I witnessed a dean sigh in front of three female candidates, 'why are they all women'; I received calls from administrators who kept asking about my marital status. . . I was so shocked that I blurted out: 'What's wrong with being female? Women can write papers and travel for work too!'"

This post engages with the gender-related concerns central to Topic J. The author lists specific scenarios where gender becomes a disqualifying factor, from assumptions about productivity to direct questioning about marital status. While Topic J appears as

a relatively distinct cluster in the similarity matrix, the qualitative reading shows that gendered pressures compound rather than merely parallel the credential-based and age-related barriers identified elsewhere in the corpus.

Taken as a set, the seven posts capture recurring discursive practices in return-employment discussions: emotional accounts of setbacks, insider rule-sharing, challenges to dominant labels, narratives shaped by overlapping pressures, strategy sharing grounded in successful outcomes, collective curation of policy information, and articulation of gendered barriers. These posts do not merely reflect the topics identified by BERTopic; they reveal the interactional mechanisms through which those topics are constituted. Through back-and-forth exchanges of narrating, questioning, comparing, and advising, participants test interpretations against new cases and gradually revise their shared understanding of the employment landscape.

5. Discussion

5.1. Group Information Seeking Under Uncertainty

More than 72% of the posts fall into Topics A–D. Topic A tends to form a relatively distinct cluster, whereas Topics B, C, and D show substantial semantic overlap. This pattern suggests that discussions of return employment repeatedly converge on a few shared concerns—especially how credentials will be judged—and Xiaohongshu becomes a place to compare notes. This is in line with Zhang et al. [33]: using three-wave tracking data, they show that career-focused social media use is associated with higher career anxiety and more career exploration, and that social comparison helps reinforce this link. A similar pattern appears in our corpus: when standards are unclear, users repeatedly draw on others' stories to make the situation feel more predictable. This concentration echoes broader concerns about academic precarity. Tian et al. [13] found that faculty positions in China have increasingly shifted toward contract-based and temporary arrangements, creating structural uncertainty in the academic labor market. Qi [14] further showed that institutional hierarchy is not only an external market structure but is internalized as emotionally charged perceptions that shape how graduates assess their competitiveness and plan their careers. Our data suggest that when these structural conditions intersect with ambiguous credential evaluation, social media becomes a key site for collective information seeking.

Words such as “credentials,” “background,” and “recognition” appear again and again, and some posts state the uncertainty very directly—for example, “University recruitment: no Southeast Asian PhDs wanted.” Mao and Zhao [34] suggest that as job-search pressure rises, graduates are more likely to seek social support, and social media makes that support easy to reach. Topic B shows another layer of uncertainty tied to timing. Comments like “If I graduate in 2028, it may be similar to a current master's degree” are not just about personal ability; they reflect anxiety that the market may shift and degrees may lose value over time.

5.2. Strategy Negotiation and Perceived Risk in Information Behavior

Strategy negotiation and multiple, overlapping risk perceptions appear across Topics C, D, H, and J. In Topic C, the “water PhD” label and related debates reveal internal differentiation in how credential value is judged. Wollney et al. [35] observed that uncertainty can trigger multiple, coexisting information-management strategies, and a similar plurality is visible here. From a signaling perspective, this plurality is expected. Przepiorka [15] argued that signaling theory helps explain how people deal with uncertainties about others' attributes in contexts of information asymmetry. When credential signals are weak or contested, as in the case of degrees from non-core study destinations, no single information source is likely to be sufficient, and individuals turn to multiple channels to assess their

standing. Topic D includes detailed strategy sharing and failure accounts, such as “Sent 50 résumés with no response,” along with region-specific judgments like “Southern China is more accepting of Korean PhDs than the North.” These posts illustrate how strategy negotiation operates in practice.

Topics H (Older PhD Candidates and Identity Pressure) and J (Female PhD Marriage and Employment) show that age and gender intersect with credential evaluation. Bartoszek et al. [36] found that individuals with higher intolerance of uncertainty engage in more information seeking even when threat relevance is low. In our corpus, semantic overlap among these topics indicates that position, age, gender, and other constraints are often weighed together in real job searching, producing compound risk perceptions rather than a single isolated concern. This multidimensional information likely needs to increase the intensity of negotiation and experience exchange on social media.

5.3. Social Media as a Collective Sense-Making Platform

Although Topics F, G, and I appear less frequently, they remain semantically linked to the core topics, suggesting that job seekers tend to connect policy conditions, disciplinary backgrounds, and available opportunities rather than viewing employment information in isolation.

This connecting process often takes shape through a back-and-forth exchange. As Shen et al. [37] observed, social media users build understanding over time as they share information and react to others’ posts. A similar process appears in our data: participants point to others’ experiences, comment on concrete recruitment practices, and interpret institutional requirements. At the same time, social media does not operate as a purely positive space. Jin et al. [26] reported that heavier social media use is associated with higher employment anxiety, partly through social comparison. Li et al. [27] call this an “intensification paradox”: talking with peers can make uncertainty feel more manageable, but constant comparison can also raise the pressure. In our dataset, the overlap across topics may help job seekers trade practical tips, but what this does to their well-being over the longer run still needs closer study.

5.4. Implications for Sense-Making Theory

At the heart of Dervin’s sense-making approach is the notion that people seek information at cognitive “gaps” to “fill” them [38]. This view casts sense-making predominantly as a bottom-up, individualistic process of cognitive repair. Our findings point to a more collective and iterative process.

Regarding the first proposition, the concentration of over 72% of posts in four closely related topics indicates that participants are not simply filling individual information gaps. Instead, they are collectively and repeatedly working through a shared set of concerns about credential evaluation, job-search pathways, and screening criteria. This pattern differs from the crisis-driven collective sense-making described by Heverin and Zach [23], where microblogging activity was triggered by a specific event and progressed from information sharing to opinion expression within a bounded time frame. In our data, there is no triggering event. The discussion is sustained by ongoing structural uncertainty in how overseas PhD credentials are evaluated, and participants return to the same core concerns over time.

Regarding the second proposition, certain recurring expressions in the corpus, such as the “water PhD” label, specific age thresholds (e.g., “over 32, directly pass”), and references to institutional hierarchies, appear to function as shared reference points that participants use to anchor their interpretations. These expressions are not simply reported as facts; through repeated use and discussion, they become widely used interpretive standards for

evaluating career prospects. Shen et al. [37] observed a similar process in which social media users build shared understanding through accumulated exchanges. Urquhart et al. [21] emphasized the situational nature of sense-making, and our results extend this idea by suggesting that interaction on social media platforms does not merely reflect existing understandings but also helps shape them.

The repercussions of such collective sense-making, however, are not always positive. Lund and Ma [22] found that, during the pandemic, older adults' information seeking served both cognitive needs and social connection; this pattern is also likely to apply to the PhD groups examined here. Nevertheless, this supporting role coexists with a more ambivalent one. Zhang et al.'s [33] tracking study showed how career-focused social media use can escalate anxiety through social comparison. Although such a mechanism could not be directly tested in this study, the repeated categorizing expressions and mutual differentiation evident in the corpus suggest collective sense-making may forge new cognitive pressures alongside resolving old uncertainties. Unpacking this tension will be a task for future work.

These patterns also point to practical concerns. The informal screening rules reported in the corpus (e.g., country-based filtering and rigid age cutoffs) suggest a gap between formal hiring criteria and actual screening practices. Making evaluation standards more transparent and specific, particularly for credentials from non-core study destinations, could reduce the ambiguity that sustains much of this online discussion. For PhD graduates, the findings suggest that social media offers valuable peer-based information but also carries risks: the repeated circulation of stigmatizing labels and constant comparison of outcomes may heighten rather than ease anxiety over time.

5.5. Limitations and Future Directions

Several limitations should be noted. First, our data were collected only from Xiaohongshu. Platforms differ in user composition and discourse style, and reliance on a single source may limit representativeness. Discussions on other platforms such as Weibo or Zhihu may differ in length, tone, and user demographics, and future studies should examine whether the patterns identified here hold across platforms. Second, BERTopic does not guarantee perfectly crisp topic boundaries; topic labels were assigned by the researchers, and although BERTopic labeling is interpretive rather than document-level coding, we did not conduct a multi-coder validation step for label assignment. Third, online discourse does not map straightforwardly onto offline outcomes: discussion intensity cannot be treated as a direct measure of job-search difficulty. Finally, because we focused on Korean-trained PhDs as a case, the extent to which the findings generalize to other non-core study destinations requires further testing. At the same time, the present results allow us to distinguish between likely generalizable mechanisms and context-specific manifestations.

Some findings may generalize beyond the Korean case, especially the core mechanism identified in this study: persistent ambiguity in credential evaluation can drive collective sense-making on social media. The discursive practices identified here (e.g., exposing tacit screening rules, contesting stigmatizing labels, and sharing strategies) may also characterize discussions among returnees from other non-core destinations such as Southeast Asia or Eastern Europe. However, certain aspects are context-specific: the particular salience of the "water PhD" label, the intensity of Korea-related discussions on Xiaohongshu, and the specific screening thresholds reported in the corpus (e.g., age limits, country-based filtering) reflect the particularities of China's academic labor market and its evaluation norms. Future comparative studies across different training destinations would help clarify the boundary conditions of these findings.

Several directions for future research follow from these limitations. Examining discussions on Weibo or Zhihu would help assess whether similar discourse patterns emerge across platforms with different user compositions. Adding surveys or interviews alongside post analysis would allow comparisons between online accounts and actual job-search behavior. Longitudinal tracking of posts around policy shifts could reveal how collective sense-making evolves over time.

6. Conclusions

This study applied BERTopic topic modeling to analyze social media discussions about PhD return employment among graduates from non-core study destinations. The results show that the discourse is highly concentrated in four core topics, including study-abroad background and return employment (Topic A), graduation and job-search pathways (Topic B), employment discrimination and supervisor influence (Topic C), and job-search process and interview experience (Topic D). These four topics account for most of the corpus (over 72%) and are closely connected in semantic space. When standards for credential evaluation are unclear and reliable information is difficult to obtain through formal channels, PhD graduates are more likely to turn to social media, sharing cases and exchanging experiences to reduce uncertainty.

From an information behavior perspective, social media functions here as a way to “fill the information gap.” When official channels fail to provide stable and verifiable signals about the value of credentials, users repeatedly seek confirmation and compare notes online. They not only pay attention to job postings, compensation and policy arrangements, and regional differences, but they also continually discuss which credentials are more recognized and which pathways seem more feasible. Through replying, supplementing, questioning, and summarizing each other’s accounts, they gradually develop a shared understanding of the employment environment. Combining topic modeling with qualitative analysis of representative posts makes this collective sense-making process—“exchanging, judging, and revising”—more visible.

These findings support the two propositions advanced in this study: persistent ambiguity in credential evaluation drives sustained collective sense-making beyond individual information seeking, and repeated interaction on social media helps shape shared interpretations through recurring discursive anchors.

This study yields three main conclusions. First, at the theoretical level, responding to structural uncertainty involves not only individual cognitive adjustment but also collective clarification and negotiation; social media serves as a key space where such shared understandings are formed. Second, methodologically, integrating BERTopic with topic association analysis helps identify what a group cares about most and how different concerns are connected. Third, the strong attention to uncertain evaluation standards points to a perceived mismatch. The discussions suggest that participants view the labor market as highly stratified, with returnee PhDs from different destinations evaluated unequally. Clearer and more detailed evaluation criteria could help candidates trained through different routes obtain a more reliable benchmark.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/info17030268/s1>, Dataset S1: De-identified Xiaohongshu posts (titles, text content, posting time) and topic assignment results.

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