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The impact of affiliation naming proximity on the retrieval efficiency of Chinese universities-affiliated retractions in the Retraction Watch Database

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ABSTRACT

The Retraction Watch Database (RWDB) is widely used to retrieve retraction data. However, its lack of affiliation normalization hinders the retrieval efficiency of retraction data for specific research-performing organizations. A query for a university name in the RWDB may yield retraction data entries for other universities with similar names, giving rise to the issue of affiliation naming proximity. This study assessed the impact of this issue on the retrieval efficiency of retraction records for 2,692 Chinese university names in English. The analysis revealed that the retrieval efficiency of retraction records for 206 Chinese university names can be influenced by 408 university names. As of 2022, the retrieval efficiency of retraction records for 96 Chinese university names was compromised by the involvement of 402 university names, resulting in an overall retraction inflation rate of 37.9% and an average rate of 45.0%. The findings highlight the importance of curating retraction data through affiliation-specific queries in the RWDB, adhering to the official English names of Chinese universities for scholarly publishing, and adopting the Research Organization Registry system for affiliation disambiguation. Given the significance of this issue concerning the English names of universities in non-English-speaking countries, the identified causes of the problem and proposed solutions can offer valuable insights for improving the retrieval of retraction records for non-Chinese universities in the RWDB.

Introduction

Retraction Watch, a blog launched in August 2010, serves the purpose of monitoring retractions of published research to enhance transparency in the scientific process. Over the years, the blog has gained significant popularity,

as evident from the considerable number of research papers citing it (Retraction Watch, n.d.-a) and the discussions surrounding its impact within the scientific community (Retraction watch n.d.-c). In October 2018, the Retraction Watch Database (RWDB) was officially introduced, offering free public access to its comprehensive collection of retractions. Among the retractions documented by the RWDB, more than half are affiliated with at least one research-performing organization based in China. Chinese universities[1] are major contributors to the retractions documented by the RWDB, given their substantial presence among Chinese research-performing organizations in China. However, there is a dearth of published research specifically focusing on retractions affiliated with Chinese universities, despite the Chinese authorities' efforts to combat retractions in general (Mallapaty 2024). This study emerged from technical preparations for a larger project aimed at creating a national profile of Chinese retractions.

The RWDB currently faces challenges in normalizing affiliations of retracted publications (Retraction Watch n.d.-b). Due to the absence of a standardized format for affiliation information, the RWDB only allows free text search by affiliation, which can result in naming proximity issues. For example, when conducting an affiliation-specific query for *Wuhan University* (武汉大学), the returned retraction data entries include instances that are not actually associated with *Wuhan University* (武汉大学) but other institutions, such as *Wuhan University of Technology* (武汉理工大学) and *Wuhan University of Engineering Science* (武汉工程科技学院). Moreover, the limitation of the RWDB displaying only up to 50 retraction data entries per query makes it challenging to determine retraction counts of some individual Chinese universities. Even though the RWDB dataset in CSV format is freely available for download via CrossRef (Hendricks 2023), filtering out unrelated data entries in some cases requires time and skill. The lack of standardized affiliation information may undermine the online retrieval efficiency of some universities' retraction records and can pose a technical challenge in efficiently compiling comprehensive and reliable retraction records for specific universities. It is, therefore, crucial to be aware of these limitations and exercise caution when utilizing the RWDB for affiliation-specific retrieval of retraction data, especially on Chinese universities. However, it remains unknown to what extent the affiliation naming proximity issue may have influenced the retrieval efficiency of Chinese universities-affiliated retractions in the RWDB.

In the context of retractions, affiliation naming proximity refers to a situation where one affiliation name is fully contained within another one, as illustrated by the case of *Wuhan University* (武汉大学). In this study, a potentially affected Chinese university name refers to the official English name of a Chinese university that is fully contained within another official English name of a university in the world. Conversely, the official

English name of a university that fully contains a Chinese university name is termed potentially affecting university name. When searching for a potentially affected Chinese university name in the RWDB, if at least one retraction data entry involves at least one potentially affecting university name but not the potentially affected university name itself, the potentially affected university name is identified as an affected Chinese university name, and the potentially affecting university name is identified as an affecting university name. The naming shift from potentially affected to affected, and from potentially affecting to affecting, is realized through the availability of retraction records for potentially affecting university names. For example, *Guangxi Normal University* (广西师范大学) was identified as a potentially affected Chinese university name, with *Guangxi Normal University for Nationalities* (广西民族师范学院) being its potentially affecting university name as of 2022. However, in 2023, the latter broke its record of having no retractions, making the former an affected Chinese university name and itself an affecting university name for the former. These examples underscore the dynamic nature of potentially affected Chinese university names and potentially affecting university names.

The official English names of some Chinese universities may assume dual roles as they can be identified as both (potentially) affected university names and (potentially) affecting names. This highlights the complex interplay between Chinese university naming conventions and their English translations. For instance, *South China Agricultural University* (华南农业大学) is not only an affecting university name for *China Agricultural University* (中国农业大学) but also an affected Chinese university name for *Zhujiang College, South China Agricultural University* (华南农业大学珠江学院). Namesakes typically demonstrate the dual nature of some Chinese university names. For example, *Nanchang Institute of Technology* is an official English name shared by two distinct universities located in the same city in China (i.e., 南昌工程学院 and 南昌理工学院). The same official English name for each of the two universities is both an affected university name and an affecting university name. Additionally, affecting university names for affected Chinese university names are considered expected when they are documented in the RWDB in the same manner as they appear on the official website homepages of the referenced universities. In contrast, affecting university names for affected Chinese university names are deemed unexpected when they appear in the RWDB in a format that differs from their official representations. For instance, *Wuhan University of Engineering Science* (武汉工程科技学院) is an expected affecting university name, whereas *Wuhan University of Science and Engineering* is an unexpected affecting name for *Wuhan University* (武汉大学). The scenarios and examples discussed above highlight the complexity of the phenomenon of affiliation naming proximity. However, it remains unknown to what extent the problem exists in the context of retractions associated with Chinese universities.

Extensive research has been conducted on the characteristics and negative effects of affiliation naming proximity in various languages, particularly in assessing institutional research productivity (Aminpour et al. 2010; Mitrović and Protić 2014; Taşkın and Al 2013, 2014; Walther and Melsheimer 2019). However, limited scholarly attention has been paid to the issue of affiliation naming proximity in the context of retractions. While it is crucial to acknowledge and credit research-performing organizations based on their publication outputs (Allen et al. 2014; Brand et al. 2015; Fogarty 2020; Holcombe et al. 2020; Larivière et al. 2016), it is equally important to accurately ascribe retractions to individual research-performing organizations and withdraw recognition, if not discredit them, for their sloppy oversight of research integrity, especially in cases of retractions due to research misconduct.

Various stakeholders have the need to construct comprehensive retraction profiles of individual Chinese universities and keep them up to date. Enabling efficient university-specific retrieval of retraction data can enhance the utility of the RWDB and thus boost its popularity within the scientific community and even beyond. As research-performing organizations are prone to courtesy retraction stigma (Xu and Hu 2022), it is in the interest of specific Chinese universities to deflate their retraction records by dissociating themselves from their affecting university names. Moreover, an accurate up-to-date retraction records can help Chinese universities upgrade their institutional oversight on research and publishing. Having university-specific retraction records in hand, governing bodies of higher education, as well as science and technology, at different levels, can assess and adjust their research administration, and funding agencies at various levels can refine their policies on handling grant applications from researchers with a retraction record. Based on comprehensive up-to-date retraction records, research integrity offices both at the university level and beyond can make informed decisions on sanctioning retractions and in optimizing their guidelines on and flowcharts for handling research misconduct. World university ranking results are at risk of being skewed if university retractions are not taken into consideration or the accuracy of university-specific retraction data cannot be ensured when measuring research productivity and the research impact of Chinese universities. The difficulty in compiling comprehensive retraction profiles of some Chinese universities poses a methodological challenge for researchers seeking to quantify the retractions of Chinese universities.

This study explores the affiliation naming proximity issue regarding Chinese university names, drawing on publications retracted as of 31 December 2022, as documented by the RWDB. Specifically, this study seeks to identify six categories of interrelated university names: potentially affected Chinese university names, their potentially affecting university names, affected Chinese university names, affecting university names, expected affecting university names, and unexpected affecting university names. Additionally, the study

delves into the naming characteristics of unexpected affecting university names. The objective of this study is to highlight the difficulties in efficiently retrieving retraction records for Chinese universities from the RWDB, thereby providing insights into the complexities and underscoring the necessity of managing and standardizing Chinese university names in academic databases.

Methods

We followed a six-step procedure for data collection and coding, as detailed below.

Step 1: Compiling a name list of world universities

To begin our study, we obtained a list of 2,759 Chinese university names from the official website of the Ministry of Education (MOE) of the People's Republic of China (Ministry of Education 2022). In August 2023, we found that 2,695 of these Chinese universities had accessible official websites, and 2,692 of them displayed an official English name on their website homepages. We collected all these official English names to compile an MOE list of Chinese university names. Additionally, we retrieved a comprehensive list of 13,909 world university names from uniRank (n.d.), none of which was in Chinese. We excluded the 940 Chinese university names from the uniRank list, resulting in a list of 12,969 international university names. We merged the name list of international universities with the MOE list to create a name list of 15,661 world universities.

We decided to replace the 940 Chinese university names from the uniRank list with the 2,692 university names from the Chinese MOE list for two reasons. Firstly, the number of Chinese university names on the uniRank list was significantly smaller compared to the MOE list. By including a larger number of Chinese universities, we sought to obtain a more comprehensive understanding of how affiliation naming proximity influences the retrievability of Chinese universities-affiliated retractions in the RWDB. Secondly, we found that the Chinese university names on the uniRank list were not up to date at the time of data collection. Admittedly,[2] by replacing the Chinese university names from the uniRank list with those from the MOE list, we may have inadvertently excluded some Chinese universities present on the uniRank list but absent from the MOE list from our analysis in this study. Given this methodological limitation of our data coverage concerning university names, the (potentially) affected Chinese university names and their (potentially) affecting university names identified in this study were not exhaustive. Consequently, necessary caution should be exercised in interpretating and utilizing the research findings of this study.

Step 2: Identifying potentially affected Chinese university names and their potentially affecting university names

We developed a Python program to identify potentially affected Chinese university names and their potentially affecting university names. To meet our research objective, the program matched each of the 2,692 Chinese university names against all the other 15,660 university names on the list of world universities to determine if the former was fully contained within the latter. If a Chinese university name was found to be fully contained within another on the list of world universities, it was identified as a potentially affected Chinese university name, and any university name from the list that fully encompassed the identified potentially affected Chinese name were coded as a potentially affecting university name.

The Python program conducted 2,692 rounds of matching, enabling the identification of the dual nature of some Chinese university names. Accordingly, some Chinese university names were identified as both potentially affected Chinese names and potentially affecting university names separately. In this article, we use the term "potentially affecting university names" to refer to any university name that fully contain another university name. In specific instances, we use the terms "potentially affecting Chinese university names" and "affecting Chinese university names" when it is necessary to emphasize the Chinese nationality of these university names or to differentiate them from their non-Chinese counterparts (i.e., "potentially affecting non-Chinese university names" and "affecting non-Chinese university names"). A similar rationale is applied when referring to affecting university names in Step 4 below. In a few cases, the word *counterparts* is used to avoid repetition when referring to different categories of university names within one sentence or paragraph.

Given the exploratory nature of this study, we initially identified potentially affected Chinese university names and their potentially affecting university names. We then proceeded to identify affected Chinese university names and their affecting university names (see Step 4). Consequently, the list of potentially affected Chinese university names included those that were ultimately confirmed as affected Chinese university names, and similarly, the list of potentially affecting university names encompassed those identified as affecting university names.

Step 3: Collecting retraction data entries for potentially affected Chinese university names

Recognizing the RWDB's extensive coverage and open accessibility, we selected it as an exclusive source for our retraction data.[3] Our data collection process involved using three query specifications: *Affiliation(s)* (representing

each potentially affected Chinese university name), *Nature of Notice* (restricted to *Retraction*), and *To* (set to 12/31/2022) in the query box of *Retraction or Other Notices*. Given the limitation of the RWDB displaying only up to 50 retraction data entries per query, we partitioned the predetermined time window into smaller intervals by including an additional query specification (*From* in the query box of *Retraction or Other Notices*) when a query for a single potentially affected Chinese university name yielded more than 50 data entries. This adjustment ensured that all the retrieved data entries could be fully displayed. Despite our efforts, we encountered challenges in collecting the complete set of target retraction data entries for two potentially affected Chinese university names at three specific time points. These time points were 5/31/2011 ($n = 58$) for *Tianjin University* and 6/16/2011 ($n = 68$) and 8/15/2011 ($n = 53$) for *Wuhan University*. To address this issue, we devised a solution, which is to be elaborated on in Step 4.

During our initial data collection phase, we carried out pilot data collections for 11 potentially affected Chinese university names that exhibited atypical name formations. These pilot collections prompted us to implement strategies aimed at maximizing the number of retrieved retraction data entries in three distinct scenarios. Firstly, in cases where Chinese university names contained the ampersand symbol (e.g., *Zhejiang University of Finance & Economics* [浙江财经大学]), we modified the affiliation query specification by replacing the ampersand with the word *and* (e.g., *Zhejiang University of Finance and Economics*). This adjustment was made because the retraction data entries retrieved through the modified query encompassed all the data entries obtained through the original query. Secondly, in instances where a name utilized the punctuation apostrophe (i.e., *Xi'an University* [西安文理学院]), we also included the variant with the typewriter apostrophe (e.g., *Xi'an University*) in our data queries. This approach resulted in duplicate retraction data entries for two out of the six cases. Consequently, we removed these duplicate data entries from our analysis. Thirdly, there was one case where the potentially affected Chinese university name consisted of two initials connected by the ampersand symbol (i.e., *Fujian A&F University* [福建农林大学]). To ensure comprehensive data retrieval, we conducted two separate data queries: one using the name as it was and the other using its variant, which replaced the initials with the corresponding fully spelled words and the ampersand with *and* (i.e., *Fujian Agriculture and Forestry University*).

Step 4: Identifying affected Chinese university names and their affecting university names

To identify affected Chinese university names and their affecting university names, we manually checked the affiliation names in all the retraction data entries retrieved for the identified potentially affected Chinese

university names. If a potentially affected Chinese university name was not found in the affiliations listed in a retraction data entry, it was then identified as an affected Chinese university name, and any potentially affecting names found in the affiliations of that retraction data entry were classified as affecting university names for the affected Chinese university name. In cases of namesakes, we utilized geographic locations at different levels, as needed, to identify a namesake as an affected Chinese university name and an affecting university name separately, using the identification criteria above. The coded data underwent a double-checking process, and any discrepancies in data coding were resolved through further scrutiny and discussion within the research team.

Due to the RWDB's limitation of displaying a maximum of 50 data entries per webpage, we were unable to collect 29 retraction data entries, including 8 for *Tianjin University* (天津大学) and 21 for *Wuhan University* (武汉大学). In order to ascertain whether these two potentially affected Chinese university names were affected ones in the 29 retraction data entries, we collected retraction data entries for the potentially affecting university names of the two potentially affected Chinese university names at the three unbreakable time points. The collected retraction data entries were manually coded to determine whether *Wuhan University* (武汉大学) and *Tianjin University* (天津大学) were affected Chinese university names and to identify their affecting university names, following the identification criteria above.

Step 5: Identifying unexpected affecting university names and their naming characteristics

We compared the identified affecting university names with the potentially affecting university names to classify them as either expected or unexpected. Affecting university names that were identical to their potentially affecting counterparts were categorized as expected affecting university names. Conversely, those that differed from their potentially affecting counterparts were classified as unexpected affecting university names. We then analyzed the unexpected affecting university names to identify their naming characteristics that caused them to differ from their potentially affecting counterparts.

Step 6: Calculating retraction inflation rates of affected Chinese university names

To calculate the retraction inflation rate of an affected Chinese university name, we multiplied the count of its affecting university names by 100 and then divided it by the total number of retraction data entries obtained through a data query in the RWDB for the affected Chinese university name.

Results

Potentially affected Chinese university names and their potentially affecting university names

Our analysis identified 7.8% ($n = 206$) of the 2,692 Chinese university names in English as potentially affected Chinese university names. As indicated in Table 1, 16 Chinese university names had potentially affecting namesakes, with 6 of them being non-Chinese. In addition, another 4 Chinese university names, namely *Sun Yat-Sen University* (中山大学), *Jinan University* (暨南大学), *Kashi University* (喀什大学), and *University of International Relations* (国际关系学院), had at least one potentially affecting non-Chinese university name. As a result, a total of 11 non-Chinese university names were identified as potentially affecting university names. A comprehensive list of potentially affected Chinese university names, along with their potentially affecting university names, is available in the Supplementary Information online.

A total of 408 potentially affecting university names were identified for the 206 potentially affected Chinese university names, averaging almost 2 per potentially affected Chinese university name. The number of potentially affecting university names for the 206 potentially affected Chinese university names varied from 1 to 15, with 182 of the latter having only 1 potentially affecting university name, and 5 having at least 10 potentially affecting university names. Remarkably, *Hubei University* (湖北大学) was associated with the greatest number of potentially affecting university names, totaling 15. Furthermore, our analysis revealed that 44 potentially affected Chinese university names were also potentially affecting university names, bringing the total number of unique potentially affected and potentially affecting Chinese university names to 523, accounting for approximately 19.4% of the MOE name list.

Affected Chinese university names and their affecting university names

Our data queries for the 206 potentially affected Chinese university names in the RWDB revealed that no retraction data entry was retrieved for 6 potentially affected Chinese university names, namely *Anyang University* (安阳学院), *Guizhou University of Traditional Chinese Medicine* (贵州中医药大学), *Jinan Vocational College* (济南职业学院), *Nanyang Vocational College* (南阳职业学院), *Tianjin Foreign Studies University* (天津外国语大学), *and Zaozhuang Vocational College* (枣庄职业学院). As a result, 97.1% ($n = 200$) of the 206 potentially affected Chinese university names had a retraction record.

Table 1. Official English names of Chinese universities with potentially affecting namesakes and their corresponding non-Chinese counterparts.

#	Potentially affected Chinese university name	Name in Chinese	Geographic location		
			Layer 3	Layer 2	Layer 1
1	China University of Geosciences	中国地质大学（北京）	Haidian	Beijing	China
2	China University of Geosciences	中国地质大学（武汉）	Wuhan	Hubei	China
3	China University of Petroleum	中国石油大学（北京）	Changping	Beijing	China
4	China University of Petroleum	中国石油大学（华东）	Qingdao	Shandong	China
5	Nanchang Institute of Technology	南昌理工学院	Nanchang	Jiangxi	China
6	Nanchang Institute of Technology	南昌工程学院	Nanchang	Jiangxi	China
7	Taizhou University	泰州学院	Taizhou	Jiangsu	China
8	Taizhou University	台州学院	Taizhou	Zhejiang	China
9	Wuyi University	武夷学院	Nanping	Fujian	China
10	Wuyi University	五邑大学	Jiangmen	Guangdong	China
11	Northwest University	西北大学	Xi'an	Shaanxi	China
	Northwest University	None	Kirkland	Washington	USA
12	Soochow University	苏州大学	Suzhou	Jiangsu	China
	Soochow University	東吳大學	Chungcheng	Taipei	Taiwan
13	Southeast University	东南大学	Nanjing	Jiangsu	China
	Southeast University	None	Tejgaon	Dhaka	Bangladesh
14	Anyang University	安阳学院	Anyang	Henan	China
	Anyang University	None	Anyang	Gyeonggi	Korea
15	China Medical University	中国医科大学	Shenyang	Liaoning	China
	China Medical University	中國醫藥大學	Beitun	Taichung	Taiwan
16	Northeastern University	东北大学	Shenyang	Liaoning	China
	Northeastern University	None	Boston	Massachusetts	USA

Further analysis identified 46.6% ($n = 96$) of the 206 potentially affected Chinese university names as affected Chinese university names. These 96 affected Chinese university names had an average of 3.0 potentially affecting university names and 4.2 affecting university names. The number of affecting university names for the 96 affected Chinese university names varied from 1 to 23, with 42 having only 1 and 2 having more than 20. Notably, *Xi'an University* (西安文理学院) had the biggest number of affecting university names ($n = 23$).

The 96 affected Chinese university names had a nominal record of 9,331 retractions, including 3,539 inflated retractions, with an overall retraction inflation rate of 37.9% and an average rate of 45.0%. A *post hoc* analysis revealed that 50 nominal retractions for 6 Chinese university names, namely *China Medical University* (中国医科大学, $n = 23$), *Northeastern University* (东北大学, $n = 12$), *Northwest University* (西北大学, $n = 2$), *Southeast University* (东南大学, $n = 3$), *Sun Yat-Sen University* (中山大学, $n = 9$), and *University of International Relations* (国际关系学院, $n = 1$), could be filtered out by setting an additional data query specification of *Country(s)* as *China*.

The 96 affected Chinese university names varied widely in their retraction inflation rates, ranging from 0.7% to 100%, with 20 having a retraction inflation rate of less than 10% and 17 more than 90%. Notably, *Peking University* (北京大学) had the lowest retraction inflation rate (i.e., 0.7%). By contrast, 7 Chinese university names, namely *Guangdong Polytechnic* (广东职业技术学院), *Guilin University* (桂林学院), *Hainan Vocational*

University (海南职业技术学院), *Ordos Vocational College* (鄂尔多斯职业学院), *Shandong Polytechnic* (山东职业学院), *Taizhou University* (泰州学院), and *University of International Relations* (国际关系学院), had a retraction inflation rate of 100%. A comprehensive list of the 96 affected Chinese university names, including their retraction inflation rates and other relevant information, is presented in Appendix.

Our analysis identified 402 affecting university names, with 186 of them being expected ones, which were included on the list of the 408 potentially affecting university names. The 186 expected affecting university names were involved in 2,734 retractions, with an average of 14.7 retractions. The remaining 216 affecting university name were identified as unexpected affecting university names, which did not appear on the list of the 408 potentially affecting university names. The 216 unexpected affecting university names were involved in 819 retractions, with an average of 3.8 retractions. It should be noted that the aggregate of these two types of inflating retractions ($n = 3,553$) for the 96 affected Chinese university names is bigger than the total inflating retractions reported earlier ($n = 3,539$) because 14 retractions involved two affecting university names.

Characteristics of the unexpected affecting university names

Our analysis revealed 13 naming characteristics that distinguished the 216 unexpected affecting university names from their official versions, thereby highlighting the variations and inconsistencies in the presentation of affiliations in retracted publications. The 3 most frequent characteristics were possible name variation or obsoletion (in 75 unexpected affecting university names), *and* or ampersand discrepancy ($n = 66$), and punctuation mark error ($n = 32$) whereas the least frequent 3 were geographic location missing ($n = 2$), exceptional cases ($n = 2$), and name structure changed ($n = 1$). The definitions of the identified naming characteristics, along with illustrative examples from the dataset, are provided below.

And or ampersand discrepancy: The word *and* is replaced with the ampersand (&), and vice versa, making the university English name different from its official one. For instance, as two affecting university names for *Anhui University* (安徽大学), *Anhui University of Finance & Economics* (安徽财经大学), and *Anhui University of Science and Technology* (安徽理工大学) were mispresented as *Anhui University of Finance and Economics* and *Anhui University of Science & Technology*, respectively.

Punctuation mark error: At least one punctuation mark is used incorrectly in the unexpected affecting university name. For instance, as an expected university name for *Beijing Normal University* (北京师范大学), *Beijing Normal University, Zhuhai* (北京师范大学珠海分校) was mispresented as *Beijing Normal University Zhuhai*, with the comma being omitted.

Abbreviation or acronym inconsistency: An abbreviation or acronym is used in the name, which is inconsistent with its official English name. For instance, as an affecting university name for *Chengdu University* (成都大学), *Chengdu University of Traditional Chinese Medicine* (成都中医药大学) was mispresented as *Chengdu University of TCM*.

Name structure changed: A component of the university name is positioned differently from the expected affecting university name. For instance, as an affecting university name for *Beijing Normal University* (北京师范大学), *Beijing Normal University – Hong Kong Baptist University United International College* (北京师范大学-香港浸会大学联合国际学院) was mispresented as *United International College Beijing Normal University-Hong Kong Baptist University*.

Word misspelled: A word in the unexpected affecting university name is misspelled. For instance, as an expected affecting university name for *Liaoning University* (辽宁大学), *Liaoning University of Technology* (辽宁工业大学) was mispresented as *Liaoning University of Technoligy*, with the word *Technology* being misspelled as *Technoligy*.

Word translated incorrectly: A word in the university name is mistranslated. For instance, as an expected affecting university name for *Anhui University* (安徽大学), *Anhui University of Finance & Economics* (安徽财经大学) was mispresented as *Anhui University of Finance & Economy*, with the word *Economy* being translated incorrectly.

Word deleted or added: At least a word is missing from or added to the university name. For instance, as an expected affecting university name for *Shanxi University* (山西大学), *Shanxi University of Chinese Medicine* (山西中医药大学) was mispresented as *Shanxi University of Traditional Chinese Medicine*, with the word *Traditional* being added. By contrast, in the case of *Zhejiang University of Technology* (浙江工业大学), its expected affecting university name *Zhijiang College of Zhejiang University of Technology* (浙江工业大学之江学院) was mispresented as *Zhijiang College Zhejiang University of Technology*, with the word *of* being omitted.

Space deleted or added: A space between the words in the university name is deleted or added. For instance, as an expected affecting university name for *Shaanxi University of Science & Technology* (陕西科技大学), *Haojing College of Shaanxi University of Science & Technology* (陕西科技大学镐京学院) was mispresented as *Hao Jing College of Shaanxi University of Science & Technology*, with the word *Haojing* being separated by a space into *Hao Jing*.

Affiliation mistakenly upgraded: The name of a unit of a university is misrepresented as the name of an institution independent of the university. For instance, *Jinan University of Medical Sciences* (暨南大学医学部) was mispresented as an unexpected affecting university name, but it is very likely the name of a medical faculty affiliated to *Jinan University* (暨南大学).

Possible name variation or obsoletion: The name is correct in both language and format but different from any of the expected affecting names. For instance, *Henan University of Agriculture*, as an unexpected affecting university name for *Henan University* (河南大学), was likely to be a variant of *Henan Agricultural University* (河南农业大学), which is not a potentially affecting university name for *Henan University* (河南大学). As an unexpected affecting university name of *Harbin University* (哈尔滨学院), *Harbin University of Finance* may actually refer to a university that used to exist before the data collection of this study. As an affecting university name for *Peking University* (北京大学), *Peking University of Foreign Studies* may very likely be a name variant of *Beijing Foreign Studies University* (北京外国语大学).

Geographic location missing: The geographic location of the university is missing, making it impossible to identify the affecting university name. For example, it is impossible to tell which university the name *Taizhou University* refers to because both the zip code and the names of city and provinces are missing.

Erroneous indexing: The affecting university name differs from the one in the byline of the retracted publication. For instance, in the case of *Hebei University* (河北大学), one of its unexpected affecting university names was *Hebei University of English*, which contradicted our common sense. A check with the retracted publication showed that it should have been *Hebei University of Engineering* (河北工程大学).

Exceptional cases: The unexpected affecting university name is fully included in its affected university name, which occurred for unknown reason.[4] For instance, a query for *Shandong University of Finance and Economics* (山东财经大学) in the RWDB returned a retraction data entry with *Shandong University of Finance* as its affiliation. Notably, *Shandong University of Finance* did not appear on the MOE name list. If it had, *Shandong University of Finance and Economics* (山东财经大学) should have been its expected affecting university name.

Discussion

Potentially affected Chinese university names and their potentially affecting university names

This study identified 523 Chinese university names as unique potentially affected and potentially affecting university names, which accounts for 19.4% of the total 2,692 Chinese university names analyzed, highlighting the prevalence of the affiliation naming proximity problem with Chinese university names. This finding can be explained by the positive association between the status of potentially affected Chinese university names and the number of its

potentially affecting Chinese university names, excluding potentially affecting non-Chinese university names. As indicated in the MOE name list, of the 206 potentially affected Chinese university names, 38 were ministry-level ones, 156 province-level ones, and 5 provincial-department-level ones. These categories had 110, 281, and 5 potentially affecting Chinese university names, respectively. A Kruskal-Wallis test determined a significant difference in the numbers of the potentially affecting Chinese university names across the three types of potentially affected Chinese university names, $x^2(2) = 8.57$, $p = .014$, $\epsilon^2 = .043$. A *post hoc* comparison using Dwass-Steel-Critchlow-Fligner test revealed that the ministry-level potentially affected Chinese university names had significantly more potentially affecting Chinese university names than the province-level potentially affected Chinese university names did, $W = -3.86$, $p = .018$.

The prevalence of names of independent Chinese colleges identified as potentially affecting university names offers another explanation for the observed phenomenon.[5] An *ad hoc* examination showed that 170 potentially affecting Chinese university names are those of independent colleges, which fully include the names of their parent or collaborative (usually higher-ranking) universities. For instance, *Shaanxi University of Science & Technology* (陕西科技大学) was originally listed as the parent/collaborative university of *Haojing College of Shaanxi University of Science & Technology* (陕西科技大学镐京学院). This practice contradicts the MOE guidelines on naming independent colleges (Ministry of Education 2020).

The identification of 11 non-Chinese university names as potentially affecting university names for 10 potentially affected Chinese university names signifies the internationalization of the issue of affiliation naming proximity among Chinese university names. Although the percentage of potentially affected non-Chinese university names is relatively low, caution should still be exercised for three reasons when compiling retraction records of Chinese universities through a combination of *Country* and *Affiliation(s)* queries in the RWDB. First, the name list of world universities, including the MOE list in English, were not exhaustive or up to date. This can result in missing or outdated information that impacts the accuracy of retraction lists. Second, both the official English names of Chinese universities and their international counterparts may undergo variations. Therefore, caution should be exercised when compiling an RWDB-based retraction list for any Chinese university name, regardless of whether its official English name is identified as a potentially affected one or not. For instance, *Wuhan Textile University* (武汉纺织大学) was renamed from *Wuhan University of Science and Engineering* (武汉科技学院) in 2010 and *Wuhan Institute of Textile Engineering* (武汉纺织工学院) in 1999. Although these three names refer to the same university, the second name is a potentially affecting university name for *Wuhan University* (武汉大学). Third, the accuracy of affiliation

data in the RWDB might not be guaranteed. During our manual examination of all the collected retraction data entries for this study, we identified seven cases of inconsistent affiliation information regarding nationality and/or region.[6] For instance, one retraction data entry associated with *Anhui Medical University* (安徽医科大学) was documented in the RWDB as being affiliated with Democratic Republic of the Congo, which contradicts the actual nationality of the affiliation (i.e., China). In another case, *Hebei University* (河北大学) was displayed in the RWDB as an affiliation for a retracted article,[7] whereas it should have been *Hehai University*, as indicated in the retracted article. It is important to note that *Hehai University* was actually a misrepresentation of the official name *Hohai University* (河海大学), which is a telling example of name variation.

Affected Chinese university names and their affecting university names

As of 31 December 2022, the retrieval efficiency for retraction records of 96 Chinese university names in the RWDB was impacted by 402 university names, resulting in an overall retraction inflation rate of 37.9% and an overage rate of 45.0%. This finding clearly highlights the severity of the issue of affiliation naming proximity among Chinese university names. Considering the continuously increasing number of retractions (van Noorden 2023), it is expected that the count of affected Chinese university names will rise. Given the high average retraction inflation rate, it is important to exercise caution when constructing a retraction profile for any of the 206 potentially affected Chinese university names, using the RWDB dataset. The anticipated significant increase in the number of affected Chinese university names and their affecting university names further emphasizes the need for careful consideration. To ensure data accuracy, it is necessary to thoroughly search for all the potentially affecting university names identified in this study prior to or after collecting retraction data from the RWDB for any potentially affected Chinese university name. This comprehensive approach will ensure the accuracy of the affiliations involved in retractions concerning the 206 potentially affected Chinese university names.

The study identified 402 affecting university names, with 216 of them being unexpected. This large number of unexpected affecting university names can be attributed to several factors, including specific naming characteristics of the unexpected affecting university names, inadequate information on affiliation addresses, erroneous indexation of affiliations, and exceptional cases. These findings highlight the need for collaborative efforts from various stakeholders to minimize the occurrence of unexpected affecting Chinese university names. Chinese researchers have an obligation to consistently use in their publications the official English names of their affiliated universities and provide detailed

affiliation address information. Although the MOE of China (2020) does not currently require registration of official English names of Chinese universities, it is recommended that Chinese universities proactively establish institutional policies mandating the use of their official English names by their employees for scholarly publishing. Furthermore, Chinese universities should maintain a record of any changes to their official English names and make this information publicly available to facilitate name disambiguation for various purposes. It is equally important that Chinese universities themselves use their official English names consistently across all platforms.[8] A case in point is Anhui University of Finance & Economics (安徽财经大学), which inconsistently uses both *Anhui University of Finance & Economics* and *Anhui University of Finance and Economics* on its official website. If a university itself does not use its official English name consistently on its official website, its employees may be unsure which version to use when identifying their affiliation in academic publishing. Consequently, this variability can lead to discrepancies in how affiliations are recorded in academic journals, databases, and other platforms.

Journals and publishers should also enforce the requirement for researchers to provide sufficient affiliation information, including addresses and zip codes where applicable. This requirement is particularly necessary in cases of namesake universities like *Nanchang Institute of Technology*, where the two namesake universities (i.e., 南昌工程学院 and 南昌理工学院) are located in the same city but (fortunately) have different zip codes, which can help differentiate them. Additionally, it is advisable to mandate provision of a structured three-layer geographic location plus a zip code (if any) of each affiliation, as indicated in Table 1. It is worth noting that providing sufficient accurate affiliation information can also aid in disambiguating authors with identical or similar names (Huang et al. 2014; Morillo, Santabárbara, and Aparicio 2013; Wu et al. 2014). Furthermore, bibliographic databases should try their best to minimize inaccuracies in indexing affiliation data of retracted publications. To this end, they can consider collecting online feedback on bibliographic data inaccuracy and making corrections accordingly.

Conclusion

This study has identified 206 potentially affected Chinese university names, with 96 of them being affected to varying extents as of 31 December 2022. These findings underscore the necessity for manual curation and verification of the retraction data entries retrieved from the RWDB for the 206 Chinese university names. The process of manual curation and verification will help filter out irrelevant retraction records and ensure the accuracy of the retrieved information. The list of potentially affected Chinese university names can serve as a valuable resource for constructing retraction profiles for Chinese universities. However, it is important to exercise caution when

profiling retractions of Chinese universities due to the limitations in the comprehensiveness of the list of potentially affected and potentially affecting Chinese university names. These limitations stem from the data available on the official English names of both Chinese and international universities. The uniRank list of international universities, for example, is selective (uniRank, n.d..). Additionally, the MOE list of Chinese university names does not account for any diachronic change in Chinese university names. Moreover, the list of the official English names of Chinese universities collected for this study may be incomplete since some Chinese universities do not publicize their official English names on their official websites. Given these limitations, it would be worthwhile for future research to compile a comprehensive list of official English names and their chronicled versions for all Chinese universities. Such a list can be useful for standardizing Chinese university names, which in return could enhance the efficiency of university-specific data queries not only in the RWDB but also in bibliographic databases.

The study identified 402 affecting university names, out of which 216 were unexpected for various reasons. While affiliation addresses and/or zip codes can verify some of the unexpected affecting university names, as suggested by the RWDB (Retraction Watch n.d.-b), this approach may not be feasible for others due to missing affiliation information. Consequently, some Chinese retractions in the RWDB cannot be attributed to any specific Chinese university on the MOE name list. To minimize such undesirable scenarios, joint efforts from various stakeholders are required, as discussed earlier. It is important to note that although each Chinese university on the MOE list is assigned a unique code (Ministry of Education 2022), the usefulness of this identification system at a national level is limited when dealing with the affiliation naming proximity issue at an international level. Lastly, the characteristics of unexpected affecting university names identified in this study can be leveraged to develop and refine algorithms aimed at standardizing Chinese university names, thereby improving the accuracy and consistency of data in academic databases.

The issue of non-standardized author affiliations in the RWDB hampers the effective retrieval of retraction data. This problem is particularly pronounced in the case of Chinese universities but is very likely also relevant to universities in other countries, especially those where English is not the primary language. In response to the challenge of disambiguating names of research-performing organizations and establishing connections between them, researchers, and research outputs, the Research Organization Registry (ROR) identification system has been developed (n.d.). The ROR system can facilitate the name disambiguation process and enhance the accuracy of attributing retractions to specific research-performing organizations. Notably, CrossRef's acquisition of the RWDB may have resulted in the availability of ROR IDs for some affiliations of retracted publications through

the CrossRef API.[9] As our study primarily focused on the retraction data available on the RWDB rather than through the CrossRef API, follow-up research in the future should explore the extent to which the ROR system can be utilized to solve the affiliation naming proximity issue with Chinese university names. It would be beneficial for the ROR IDs to become publicly accessible as additional retraction metadata in the RWDB, either sooner or later, once sufficient resources are available for Retraction Watch to enable this enhancement.

Notes

1. Chinese universities in this article refer to only the regular higher education institutions located in Mainland China, excluding all the universities in Macau, Hong Kong, and Taiwan.
2. The authors would like to express their gratitude to the reviewers from Retraction Watch for highlighting this methodological limitation of the study.
3. Our data collection and coding were completed before the RWDB dataset was acquired and made publicly available for free access by CrossRef.
4. It is important to clarify that the RWDB systematically records the affiliations of retracted publications based on information provided directly by the authors of those publications. As disclosed by Retraction Watch reviewers, over 99% of these affiliations are copied directly from the publisher's or journal's website, or from the PDFs of the retracted publications when the website does not provide the information. Less than 1% of affiliations are sourced from related PDFs featuring the same authors. If affiliation data is missing or cannot be verified, "unavailable" is noted in the Affiliation(s) field of the database. Therefore, any discrepancies in the affiliation data documented by the RWDB stem from the information provided by the authors or how it is presented on the journal or publisher's HTML or PDF page.
5. According to a document issued by the Ministry of Education of China in 2003, an independent college, which results from collaboration between educational resources of a regular university and financial investments of social entities, should have an independent campus and basic school-running facilities, implement relatively independent organization and management of teaching activities, enroll students independently, issue academic certificates independently, remain independent in financial accounting, and bear civil liabilities as an independent legal entity. (Source in Chinese: http://www.moe.gov.cn/s78/A03/s7050/201206/t20120628_138410.html)
6. DOIs are used in this article to refer to retracted publications to avoid citing them. The DOIs of the retracted publications in the 7 cases are 10.3164/jcbn.2007018, 10.3892/mmr.2017.6748, 10.1177/0020720919833048, 10.1038/s41598-020 68,951-x, 10.1007/s12144-020 00,855–5, 10.1109/ICAMS.2010.5552879, and 10.1002/hfm.20348. Three of the seven cases initially attributed a retracted publication to China/Taiwan, a classification complicated by political disputes, as described by the reviewers. Following the reviewer feedback on an earlier draft of this manuscript, these affiliations were revised by the RWDB to list only Taiwan. In the other four cases, the identified affiliation country errors were confirmed and corrected by the RWDB.
7. The DOI of the retracted publication is 10.1109/EDT.2010.5496547. It is important to clarify that the RWDB compiles information on retracted publications and their respective retraction notices from publicly accessible sources. In this instance, *Hebei*

University was recorded in the RWDB based on data available on the HTML page, although the affiliation listed in the paywalled retracted publication itself was *Hehai University*. This discrepancy in affiliation should be attributed to inconsistencies in the journal or publisher's metadata documentation, rather than to any error on the part of the RWDB.
8. The authors thank the reviewers from Retraction Watch for highlighting this important implication of our research findings.
9. The authors would like to thank one anonymous reviewer for sharing this information.

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Ethical statements

This article does not contain any studies with human participants performed by any of the authors.

Statement of author contributions

SBX conceived the research idea, developed the research design, collected, coded and analyzed the data, and drafted and revised the manuscript. YC and HL conceived the research idea, developed the research design, collected and coded the data, and revised the draft manuscript. EX analyzed the data and revised the draft manuscript. GH refined the research design and revised the draft manuscript.

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Appendix

List of Affected Chinese University Names

The list below includes the identified 96 affected Chinese university names in both English and Chinese, as well as descriptive statistics on their potentially affecting university names (PAUNs), affecting university names (AUNs), expected affecting university names (EAUNs), unexpected affecting university names (UAUNs), nominal retractions (NRs), inflated retractions (IRs), and inflation rates of retraction records (IRRRs in %). All the retraction data involved were manually retrieved from the Retraction Watch Database (http://retractiondatabase.org) in August 2023, with the retraction date being set at as of December 31, 2022.

Affected Chinese university name	Name in Chinese	PAUNs	AUNs	EAUNs	UAUNs	NRs	IRs	IRRRs
Guangdong Polytechnic	广东职业技术学院	6	4	2	2	16	16	100.0
Gulin University	桂林学院	3	7	3	4	43	43	100.0
Hainan Vocational University	海南职业技术学院	1	1	1	0	1	1	100.0
Ordos Vocational College	鄂尔多斯职业学院	1	1	1	0	1	1	100.0
Shandong Polytechnic	山东职业学院	1	1	1	0	3	3	100.0
Taizhou University	泰州学院	1	1	1	0	11	11	100.0
University of International Relations	国际关系学院	2	1	1	0	1	1	100.0
Henan Polytechnic	河南职业技术学院	2	4	2	2	119	118	99.2
Xi' an University	西安文理学院	8	23	4	19	149	146	98.0
Changsha University	长沙学院	2	2	1	1	37	36	97.3
Harbin University	哈尔滨学院	2	5	2	3	60	57	95.0
Anhui University	安徽大学	7	11	4	7	70	66	94.3
Taiyuan University	太原学院	2	3	2	1	78	73	93.6
Chengdu University	成都大学	4	4	3	1	126	117	92.9
Shijiazhuang University	石家庄学院	1	2	1	1	11	10	90.9
Changchun University	长春大学	7	7	3	4	63	57	90.5
Hubei University	湖北大学	15	13	10	3	135	122	90.4

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Affected Chinese university name	Name in Chinese	PAUNs	AUNs	EAUNs	UAUNs	NRs	IRs	IRRs
Inner Mongolia University	内蒙古大学	4	6	3	3	56	50	89.3
Hefei University	合肥学院	2	1	1	0	63	56	88.9
Wuhan Polytechnic	武汉职业技术学院	1	1	1	0	25	22	88.0
Hebei University	河北大学	11	14	7	7	225	197	87.6
Nanchang Institute of Technology	南昌理工学院	1	1	1	0	30	26	86.7
Nanchang Institute of Technology	南昌工程学院	1	1	1	0	30	25	83.3
Kunming University	昆明学院	2	2	1	1	59	48	81.4
Dalian University	大连大学	5	4	3	1	127	103	81.1
China University of Geosciences	中国地质大学(北京)	1	1	1	0	110	88	80.0
Wuyi University	武夷学院	1	1	1	0	9	7	77.8
Shandong University of Finance and Economics	山东财经大学	2	1	0	1	10	7	70.0
Nanjing University	南京大学	12	17	6	11	268	183	68.3
Shenyang University	沈阳大学	2	5	2	3	71	44	62.0
Henan University	河南大学	7	16	7	9	239	146	61.1
Hebei Normal University	河北师范大学	3	4	2	2	38	23	60.5
Shanghai University	上海大学	9	21	7	14	182	101	55.5
Guangxi University	广西大学	6	8	3	5	78	43	55.1
Wuhan University	武汉大学	5	12	3	9	581	306	52.7
Chongqing University	重庆大学	5	15	5	10	135	71	52.6
China University of Petroleum	中国石油大学(北京)	1	1	1	0	62	32	51.6
Fuzhou University	福州大学	2	1	1	0	33	17	51.5
Guangdong University of Finance	广东金融学院	1	2	1	1	12	6	50.0
Hebei Geo University	河北地质大学	1	1	1	0	2	1	50.0
Heilongjiang University	黑龙江大学	4	4	3	1	36	18	50.0
Tianjin University	天津大学	9	13	7	6	308	153	49.7

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Affected Chinese university name	Name in Chinese	PAUNs	AUNs	EAUNs	UAUNs	NRs	IRs	IRRs
Shanxi University	山西大学	2	8	2	6	23	11	47.8
China University of Political Science and Law	中国政法大学	1	1	1	0	17	8	47.1
China University of Petroleum	中国石油大学(华东)	1	1	1	0	62	29	46.8
Hunan University	湖南大学	14	14	10	4	134	61	45.5
Guangzhou University	广州大学	1	4	1	3	55	22	40.0
Southwest University	西南大学	2	7	2	5	87	34	39.1
Taizhou University	台州学院	1	1	1	0	11	4	36.4
Yunnan University	云南大学	4	5	1	3	39	14	35.9
Liaoning University	辽宁大学	4	6	2	4	42	15	35.7
Shijiazhuang Tiedao University	石家庄铁道大学	1	1	1	0	3	1	33.3
Suzhou University	宿州学院	2	1	1	0	16	5	31.3
Shandong University	山东大学	10	7	5	2	472	147	31.1
Chengdu University of Technology	成都理工大学	1	5	1	4	88	27	30.7
China University of Mining and Technology	中国矿业大学	2	10	1	9	153	45	29.4
Lanzhou University	兰州大学	4	3	3	0	82	24	29.3
Northwest University	西北大学	3	4	0	4	35	10	28.6
Zhejiang University	浙江大学	6	11	4	7	358	99	27.7
Ningbo University	宁波大学	3	3	2	1	58	16	27.6
Guizhou University	贵州大学	5	4	2	2	35	9	25.7
China Agricultural University	中国农业大学	2	1	1	0	63	14	22.2
Hunan University of Technology	湖南工业大学	1	1	1	0	9	2	22.2
Wuyi University	五邑大学	1	1	1	0	9	2	22.2
China University of Geosciences	中国地质大学(武汉)	1	1	1	0	110	23	20.9
Northeastern University	东北大学	1	1	1	0	79	15	19.0
China Medical University	中国医科大学	1	1	1	0	169	29	17.2

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Affected Chinese university name	Name in Chinese	PAUNs	AUNs	EAUNs	UAUNs	NRs	IRs	IRRRs
Xinjiang University	新疆大学	3	1	0	1	12	2	16.7
Zhejiang University of Technology	浙江工业大学	1	4	0	4	55	8	14.5
Central South University	中南大学	2	3	1	2	290	41	14.1
Yangtze University	长江大学	1	1	0	1	29	4	13.8
Zhengzhou University	郑州大学	6	3	3	0	280	38	13.6
Qingdao University	青岛大学	2	3	2	1	172	23	13.4
University of Science and Technology Beijing	北京科技大学	1	2	0	2	86	11	12.8
Sichuan University	四川大学	6	8	3	5	214	24	11.2
Zhejiang University of Finance & Economics	浙江财经大学	1	1	1	0	9	1	11.1
Shaanxi University of Science & Technology	陕西科技大学	1	3	1	2	33	3	9.1
Xiamen University	厦门大学	2	2	2	0	101	9	8.9
Jiangsu University	江苏大学	4	2	2	0	97	8	8.2
Tianjin University of Technology	天津理工大学	1	1	1	0	74	6	8.1
Weifang University	潍坊学院	1	1	1	0	32	2	6.3
Sun Yat-Sen University	中山大学	1	1	1	0	215	12	5.6
Fujian Normal University	福建师范大学	1	1	0	1	19	1	5.3
Beijing Normal University	北京师范大学	2	3	1	2	73	3	4.1
Jiangxi Normal University	江西师范大学	1	1	1	0	29	1	3.4
Southeast University	东南大学	2	2	1	1	110	3	2.7
University of Electronic Science and Technology of China	电子科技大学	2	2	0	2	84	2	2.4
Anhui Medical University	安徽医科大学	1	1	1	0	47	1	2.1
Xi' an Jiaotong University	西安交通大学	1	1	0	1	144	3	2.1
Jilin University	吉林大学	3	4	2	2	523	10	1.9
Hebei University of Engineering	河北工程大学	1	1	0	1	83	1	1.2

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Affected Chinese university name	Name in Chinese	PAUNs	AUNs	EAUNs	UAUNs	NRs	IRs	IRRRs
Dalian University of Technology	大连理工大学	1	1	1	0	100	1	1.0
Soochow University	苏州大学	2	1	1	0	111	1	0.9
Jinan University	暨南大学	1	1	0	1	121	1	0.8
Nanjing Medical University	南京医科大学	1	1	1	0	132	1	0.8
Peking University	北京大学	1	1	0	1	134	1	0.7