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Reading and Writing Research Based on Surname Group

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Abstract

This study examines the influence of surname on academic performance in higher education. It includes an in-depth analysis of comprehensive book circulation data from the library of Nanjing Normal University, covering the period from 2012 to 2023. The study uses Kendall coefficients to assess the consistency in book circulation and renewal among the top 300 surnames of readers, employs multidimensional scaling analysis to identify differences or similarities between categorical variables through direct distance assessment, uses chi-square tests to measure the correlation between surnames above and below the mean line and various categorical variables, and conducts survival analysis to examine circulation activities related to the top 300 surnames. Results are interpreted in the context of female-dominated education and teacher preparation. The results reveal a consistent pattern in the 12-year borrowing and renewal habits of the top 300 surnames of readers. A hierachical mismatch between the reader, book category, and author reflects complex reading interests beyond academic authority. In the wake of the COVID-19 pandemic, readers with surnames above the average have shown less interest in using the book renewal service. The borrowing and renewal activity for the disappeared surnames changed within two years for foreign language books and six years for Chinese books.

Keywords: surname, library, university, optimal scale, COVID-19

1. Introduction

A surname is a voice from eternity, a gift of ancestral will (Khyripko & Iatsenko, 2019), and a linguistic and geographical marker of the past (Mazières & Roth, 2018). The surname is also an important aspect of social and cultural identity, providing a unique perspective on one's social group and familial ties. Surnames have a fascinating history, with diverse origins and connections to various economic and social changes (Cheshire & Longley, 2012). They are an important bond of kinship and symbolize consanguinity within social structures.

Traditionally, children take their father's surname to ensure the continuation of the family line. Surnames play a role in national cultural psychology, as the Chinese attach importance to surnames representing their family's lineage (Chang, 2010). In China, the concept of feudal patriarchy advocated the clan's supremacy and emphasized the ancestors' glory. Genealogies often record the outstanding achievements of the ancestors of a particular surname and highlight the family's history of tireless struggle.

The research problem of the historical mystery and semantics of surnames has never left the scientific field, as it is an important issue that concerns everyone (Khyripko & Iatsenko, 2019). The considerations for choosing a surname can range from occupation and physical attributes to animal or plant names and seasonal weather. Surnames from cultures such as Palestinian and Chinese often come from a variety of sources, including animals, personal attributes, instruments, natural phenomena, and religious or historical references (Tushyeh & Hamdallah, 1993; Zhang, 2011; Jiang, 2014; Guo, 2013).

This diverse system of surnames encompasses knowledge from history, geography, sociology, psychology, and aesthetics (Sun, 2005). Since surnames are a form of inheritance that reflects a family's identity and history, they can serve as a valuable source of information for researchers studying human identity (Khyripko & Iatsenko, 2019). Researchers can analyze the factors for surname choice to compare cultural knowledge with individual characteristics (Novikova et al., 2019).

Is it possible to identify unique surnames associated with book reading and writing? Statistical analysis of library circulation data can help reveal the network of reading and writing relationships between surnames. Each book borrowed is associated with a reader's surname and an author's surname at a particular time and place. By using surnames as a statistical indicator, we can explore the characteristics of group reading and writing. Examining the relationships and their relative contribution to academic achievement and the consolidation of hierarchy is important to uncover patterns of thought and behavior with practical implications for the educational context.

2. Related Researches

Numerous researchers from different countries have conducted extensive studies on surnames, with most findings focusing on anthropology and population genetics (Cheshire, 2014), geography and genealogy (Cheshire & Longley, 2012), demography and social mobility (Mazières & Roth, 2018), history and migrations (Sousa, 2019), biology and linguistics as a source of information for research. The distribution of surnames shows a different, more fundamental type of mobility. An approach to measure the relative diversity of social groups on a large scale has been investigated (Mazières & Roth, 2018). This analysis provides valuable insights into how populations have spread and changed over time and the unique demographic characteristics of different regions (van Dijk et al., 2020). The research findings confirm that the regional distribution of surnames reflects the particularities of historical settlement routes and ethnic, cultural and religious diversity (Yumaguzin & Vinnik, 2019). Estimating surnames makes it possible to quantify the underlying average social position of families, which is a unique component of social mobility (Clark et al., 2015), as shown by

Fan et al. (2023), who developed a unique index to measure migration intensity based on surname distribution. In addition, researchers have developed an interactive flow map that visualizes how surnames have spread and migrated around the world (Zhang et al., 2013). Chen (2020) looks at members of rural lineages and groups that form cross-local communities in China through alliances with others who share their surname. These alliances, consolidated through various meanings and practices, create the notion of an extended family. Her findings offer a new perspective on the historical migration characteristics of the Chinese.

Biologists have found that the level of relatedness within surnames depends on how common the surname is. The coancestry of the Y chromosome within surnames is influenced by the frequency of surnames and geographical proximity (Martinez Cadenas, 2016). Studies on the genetic makeup of families, communities, and control groups have compared the spread of Y chromosomes with the transmission of surnames through the male line (Rossi, 2013). Meanwhile, sociologists have discovered that women's decisions to change or keep their surnames after marriage do not significantly affect their satisfaction, love, commitment, and intimacy, whether they change, keep, or combine their surnames (Kline et al., 1996).

The practice of alphabetically listing scholars' names in academic journals has been the subject of much research in recent years. According to Kadel and Walter (2015), alphabetical discrimination is often triggered by the alphabetical ordering rule used in scholarly journals. While some researchers have found that scholars with surnames earlier in the alphabet tend to be cited more frequently (Stevens & Duque, 2019), other studies have explored the broader implications of this practice. For example, a recent study by Japanese researchers found that surname order can have an impact on noncognitive skills and life outcomes and that women may be at a disadvantage due to discriminatory listing practices (Yamamura et al., 2024). Contrary to the above beliefs, research conducted by Yuret (2016) found no significant difference in the prevalence of such individuals in alphabetic and non-alphabetic academic fields, nor in the likelihood of those at top-ranked departments having early alphabet initials compared to those in lower-ranked departments. Abramo and D'Angelo (2017) further support these findings, revealing no evidence of an advantage for individuals with earlier alphabet surnames in either broad or specific disciplines. Overall, it is vital for scholars to be aware of the potential biases associated with alphabetical listing and to work towards creating more equitable academic environments.

Accurately identifying scholarly authors is crucial for bibliometric analysis. It can be challenging to distinguish between Chinese author names due to the prevalence of shared surnames and forenames, resulting in numerous homonyms (Kim et al., 2023). Scholars often rely on name initials in large-scale coauthorship network research to resolve name ambiguities. However, it has been found that Asian names are more likely to be misidentified due to common surnames and given name initials (Kim & Diesner, 2016). To address this issue, ORCID numbers allow for the primary, secondary, and auxiliary elements of an author's name to be inputted, removing all ambiguity in the case of any changes to the name or surname during an author's career (Masic & Begic, 2016; Mukherjee & Gangopadhyay, 2021). ORCID IDs not only aid in identifying an author's academic experience but also help

journal publishers recognize their contributions to the academic community (Bhattacharya & Kumar, 2023).

According to historical records, during the Song Dynasty, "*The Hundred Surnames*" collected 504 surnames, including 444 single-character surnames and 60 compound-character surnames. In the Ming Dynasty, Shiyuan Chen compiled "*The Surname Inscription*," containing 3,625 surnames. More recently, "*The Dictionary of Chinese Surnames*," published by the Education Science Press in 1996, listed 11,969 surnames. Yuan et al. (2000) focused on the distributional characteristics of Chinese surnames and the factors affecting their distribution. They found about 3,100 surnames in use for the Han nationality in China. Communities with the same surname are widespread, especially in central and south China. In 2002, "*Chinese Surnames—Population Genetics and Distribution*," published by East China Normal University Press, recorded more than 22,000 ancient and modern Chinese surnames (Zhu, 2014).

The significance of surnames in representing family ties within societal frameworks cannot be overstated. With their unique cultural importance, Chinese surnames offer valuable insights into the historical development of Chinese patriarchal society throughout the millennia. The study of Chinese family name genetics has yielded crucial genetic information about the Chinese population and has confirmed the significant relationship between surnames and genetic inheritance. The selection of the top 300 surnames for research within educational contexts carries substantial implications for educational policy and practice. The process of surname selection necessitates a heightened sensitivity to cultural and social contexts, which embodies the historical contributions of diverse communities. Such an approach fosters an inclusive framework for educational research, which honors the complexity of cultural identities. A thorough analysis of surname implications can assist educational practitioners in identifying groups that may require targeted interventions. The selection of surnames can facilitate longitudinal studies essential for tracking educational outcomes over time. Such studies are indispensable for assessing the long-term effects of educational policies on various demographic groups, thereby aiding in evaluating both past and present educational strategies. Insights derived from surname-related research can serve as catalysts for policy reform. Systemic inequities tied to surname data can prompt policymakers to devise strategies to foster a more equitable educational environment, addressing entrenched societal issues. This research explores the academic correlation between authors' and readers' surnames by analyzing borrowing records and volumes from the past twelve years at the Nanjing Normal University (NNU) Library. Situated in the eastern part of China, the library is committed to the advancement and enrichment of teacher candidates and educators. Most of the university's students and educators are Han Chinese, with minority students primarily from Xinjiang. The research seeks to deepen our understanding of academic familiarity with surnames and fill the current research gap in this field.

3. Date and Methods

3.1 Sample

The researcher collected reader registration and book circulation records from the NNU Library over a span of 12 years. The registration records, which totaled 337,940 entries, were analyzed to determine the frequencies of surnames. Due to similarities in word frequencies, several surnames were ranked in the same positions. In the end, 301 surnames that ranked among the top 300 were selected as the first research sample.

Additionally, the researcher gathered book circulation records from 2012 to 2023, which amounted to the following annual figures: 950,585; 831,501; 820,677; 797,368; 752,874; 648,985; 584,256; 520,480; 216,897; 268,639; 231,219; and 205,058. In total, 638,081 books were borrowed during this period. The researcher then cross-referenced these books with a bibliography to identify individual authors, excluding collective and foreign authors. Using the same methodology, the top 300 individual author surnames were identified as the top reader surnames. These 300 author surnames were chosen as the second research sample and are presented in Figure 1.

Figure 1. The top 300 surnames of readers and authors

Note: *The top left graph displays 301 surnames, with some having the same word frequency (45), which is why they are ranked side by side. The bottom left and bottom right graphs illustrate the pronunciation of these surnames. To enhance differentiation, the pronunciations are accompanied by tonal markings. For the comparison, only the surnames of Chinese authors, including those from ethnic minorities, are sorted, while collective authors and foreign authors are excluded.*

3.2 Method

Calculate the ratio of readers and authors who have the same surname from a selection of 300 surnames. Utilize a box plot to analyze the distribution of surname ratios. Then, compare the common surnames of readers and authors above average. Next, create a scatter plot to visualize the overlap of surnames.

Use the RANK function to establish the borrowing volume rankings for each book category based on surname. Import the ranking table into SPSS, then navigate to analyze nonparametric tests, legacy dialogs, and k-related samples. Select all book categories A to Z as test variables and calculate the Kendall coefficient for the top 300 reader surnames in the categories of borrowed and renewed books.

Using functions such as VLOOKUP, IF, COUNTIF, MATCH, and FIND, extract all the records of the top 300 reader surnames and the top 300 author surnames from the annual book circulation records. Exclude circulation records shared by the top 300 readers and the top 300 authors. Additionally, utilize the TEXT function to extract the month and hour fields. Assign the value of 1 to the spring months (March, April, and May), 2 to the summer months (June, July, and August), 3 to the autumn months (September, October, and November), and 4 to the winter months (December, January, and February). Furthermore, assign the value of 1 to the morning (6:00 to 12:00), 2 to the afternoon (13:00 to 18:00), and 3 to the evening (after 19:00). Select the month and hour as analysis variables and use them to create a joint category plot.

Use the left function to extract the book category from the call number (the leftmost first or second letter). The book circulation records sheet contains information such as the book property number, reader ID number, call number, book language, book category, type of reader, gender of reader, top 300 surnames of readers, book borrowing month, and more. Chinese books are assigned a value of 1, Western language books are assigned a value of 2, Japanese books are assigned a value of 3, Korean books are assigned a value of 4, and Russian books are assigned a value of 5. Males are assigned a value of 1, and females are assigned a value of 2. Book categories A to Z are assigned values 1 to 23 in ascending alphabetical order. The surnames of readers are assigned values 1 to 300 based on their ranking. Import the table into SPSS, select analyze, then dimension reduction and optimal scaling. The researcher selects the language of the book, gender, month, book category, and the top 300 readers' surnames as analysis variables and use them to create a joint category plot.

When examining book borrowing and renewal patterns, it is crucial to distinguish between book borrowing and book circulation data. Each book borrowing record contains specific details about the reader and the author. Combining the surnames of the reader and the author can generate unique surname combinations for each book. Analyzing the frequency of these combinations can help identify recurring borrowing patterns between surnames. Recognizing surname combinations with a frequency of over 100 per year is valuable for identifying enduring borrowing relationships.

For author and reader surnames ranking 1–50, the highest activity level is assigned a value of 1. Surnames ranked 51–100 are considered to have a high activity level and are assigned a value of 2. Surnames ranked 101–150 are classified as middle to high activity and are assigned a value of 3. Surnames ranked 151–200 are considered to have a middle activity level and are assigned a value of 4. Surnames ranked 201–250 are classified as low to middle activity and are assigned a value of 5. Surnames ranked 251–300 are considered to have a low activity level and are assigned a value of 6.

Regarding book borrowing volume, category I books have the highest borrowing level and are assigned a value of 1. Categories B, G, H, K, T, J, and F have a high borrowing level and are assigned a value of 2. Categories DF, D, O, and C have a middle to high borrowing level and are assigned a value of 3. Categories R, Q, P, A, and Z have a middle borrowing level and are assigned a value of 4. Categories E, X, N, S, V, and U have a low borrowing level and are assigned a value of 5. To analyze the relationships between the top 300 readers' surnames and authors' book categories, import the table into SPSS, select analyze, dimension reduction, and optimal scaling. Then, choose the book category and the top 300 surnames of readers and authors as analysis variables to form a joint category plot.

The chi-square test sample consists of 697,805 book borrowing and renewal records from 2019 to 2023. This test explores the association between surnames falling in the above-average category and the female, literature, and science, technology, engineering, and mathematics (STEM) categories. It seeks to ascertain whether the distribution of sample items in each category matches the expected random distribution and examines differences in multiple rates or composition ratios. Books are categorized as STEM based on their classifications from N to X.

Analyze the borrowing habits of 32 surnames who pressed the pause button for borrowing books in the past years. Use SPSS survival analysis and select life tables. The analysis should be weighted by the number of registered individuals with 32 surnames. Calculate the total borrowing activity year for the 32 surnames and use it as the Time. Display time intervals from 0 through 12 by 1. Note that 18 surnames stopped borrowing books in 2023, while the remaining 14 borrowed foreign language books in 2023. Assign a value of 1 to the 14 existing surnames and 0 to the 18 disappearing surnames, and select "Whether borrowed in 2023" as the status for life tables.

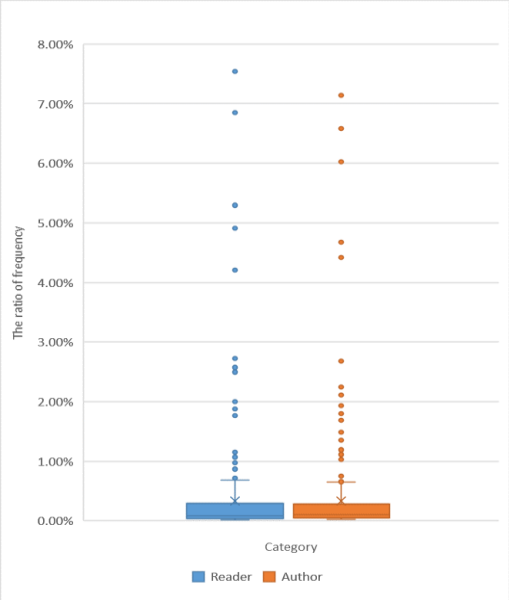
Similarly, the borrowing habits of 293 reader surnames were analyzed, weighted by the number of registered individuals with the 293 surnames. Use SPSS survival analysis and select life tables. Calculate the total borrowing activity year for the 293 surnames and use it as the Time. Display time intervals from 0 through 12 by 1. Note that 171 surnames stopped borrowing foreign language books in 2023, while the remaining 122 borrowed foreign language books in 2023. Assign a value of 1 to the 122 existing surnames and 0 to the 171 disappearing surnames, and select "Whether borrowed in 2023" as the status for life tables.

4. Result

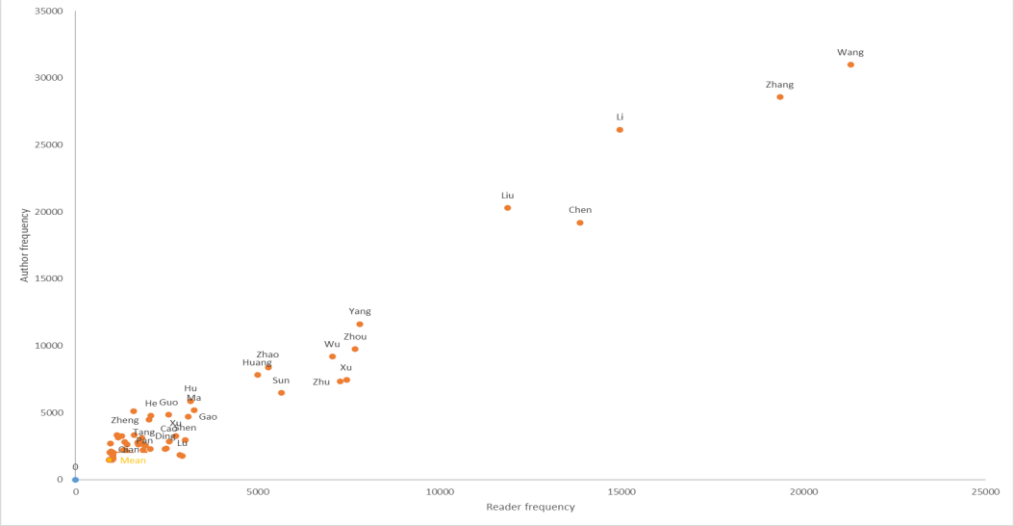
4.1 Surname Distribution

According to statistical data, the most common names used by male readers are Lei Wang, Wei Wang, Lei Zhang, Wei Zhang, Peng Zhang, Tao Wang, Wei Li, Qiang Wang, Chao Wang, and Hao Wu. On the other hand, the most famous names among female readers are Ying Wang, Jing Wang, Jing Zhang, Jing Chen, Jing Li, Ting Wang, Juan Wang, Ting Zhang, Min Wang, and Hui Wang. The top 10 surnames for readers are Wang, Zhang, Li, Chen, Liu, Yang, Zhou, Xu, Zhu, and Wu, and they make up a whopping 96.75% of the total number of readers. The distribution of the top 300 surnames is depicted in Figure 2 (a).

When it comes to borrowed author surnames, the top 10 are Wang, Zhang, Li, Liu, Chen, Yang, Zhou, Wu, Zhao, and Huang. There are 250 duplicates between the top 300 surnames of readers and authors, with a similarity rate of around 83.33%. There are 72 reader surnames and 67 author surnames above the average line, with 62 surnames appearing above both the reader and author average lines, as depicted in Figure 2 (b). Additionally, two-character surnames, Ouyang and Shangguan, are within the top 300 readers' and authors' surnames, respectively.



(a) The ratio of frequency distribution



(b) 62 surnames above average

Figure 2. Surnames distribution

Based on the reader optimal scale joint plot of category points in Figure 3, readers with the surnames Wang and Yang tend to prefer biology, Li favors chemistry, and Liu more often have academic backgrounds in society and Marxism. Conversely, those with surnames Chen, Xu, Zhou, and Zhu pursue strengthening cultivation majors and librarian work. Surnames Wu and Zhang also show distinct preferences, with readers with the former surname being more inclined toward women's studies and news media and readers with the latter being more interested in automation and music.

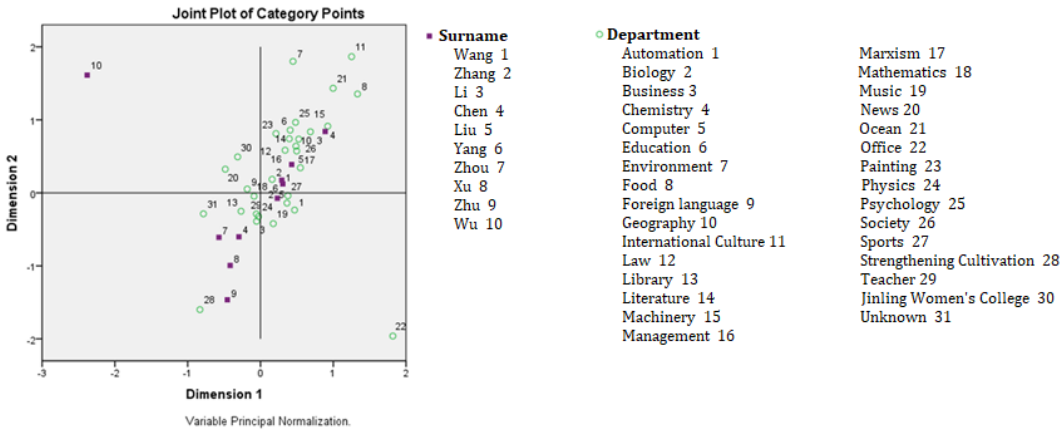


Figure 3. The joint plot of the top 10 reader surnames and departments

4.2 Surnames and Book Categories

The analysis using Kendall's concordance coefficients reveals a significant consistency in 12-year book borrowing and renewing patterns among the top 300 reader surnames. The Kendall's W statistic for book borrowing is 0.878 with a p-value of 0.000 (Chi-Square 5811.665), and for book renewing, it is 0.722 with a p-value of 0.000 (Chi-Square 4779.434).

Notably, the variations in book renewing are more statistically significant than those in book borrowing.

The results of multidimensional scaling show that the language of books consistently appears close to the origin point each year, indicating no significant difference. However, there is an observable imbalance in the distribution of book languages, with Chinese books being borrowed much more frequently than books in other languages. Regarding gender, there are some distinct differences in specific years, but for the most part, there is no significant variation. The ratio of male-dominated surnames to female-dominated surnames (male-dominated surnames refer to surnames with more male readers than female readers, while female-dominated surnames refer to surnames with more female readers than male readers) from 2012 to 2023 is as follows: 1:8, 1:12, 1:12, 1:9, 1:8, 1:9, 1:11, 1:9, 1:7, 1:7, 1:5, and 1:5. This gender imbalance has persisted at NNU for over a decade (Liu, 2024). Both book category and surname demonstrate significant trends in the same direction, while the month and hour factors show similar significance levels but in the opposite direction.

I (literature), G (education and culture), and B (philosophy and psychology) categories of books are the top three for borrowing and renewing. The top borrowed books with 178 surnames (59.3%) are I books, 52 surnames (17.3%) are G books, and 24 surnames (3.3%) are K (history) books. 10 surnames of Bao (保), Chai (柴), Cheng (成), Lang (郎), Li (理), Li (厉), Niu (牛), Wei (威), Wu (武), and Zou (邹) like F(economy) best. 9 surnames of Cong (丛), Fu (付), Hua (华), Ji (计), Jiao (焦), Kang (康), Lou (楼), Ruan (阮), and Weng (翁) loves T (technical and computer) the most. 8 surnames of Zhai (翟), Gong (公), Lao (劳), Qu (屈), Sui (隋). Xi (奚), Ying (应), and Zhuo (卓) like to borrow DF (law) books the most. While the other eight surnames of Bao (鲍), Che (车), Ke (克), Le (乐), Mu (牟), Tang (汤), Tu (涂), and Xing(星) loves borrowing B (philosophy and psychology) books the most. Six surnames of Bo (薄), Diao (刁), Gui (桂), Lai (赖), Shu (束), and Zhong (仲) have a fondness for H (language and writing) books. Surnames of Quan (全) and Wu (巫) have a great interest in J (art). Surnames of Fu (符), Fei (费), and Pu (蒲) prioritize O (mathematics et al.), C (sociology), and D (politics), respectively.

4.3 Surname Hierarchy Correlation

From 2012 to 2023, there were 30 combinations of readers and authors with an annual frequency of over 100 for 12 consecutive years, even during the COVID-19 control period:

a) Wang→Wang, Wang→Chen, Wang→Li, Wang→Liu, Wang→Yang, Wang→Zhang;

b) Zhang→Zhang, Zhang→Chen, Zhang→Li, Zhang→Liu, Zhang→Wang, Zhang→Yang;

c) Li→Li, Li→Chen, Li→Liu, Li→Wang, Li→Yang, Li→Zhang;

d) Liu→Chen, Liu→Li, Liu→Wang, Liu→Zhang;

e) Chen→Li, Chen→Liu, Chen→Wang, Chen→Zhang;

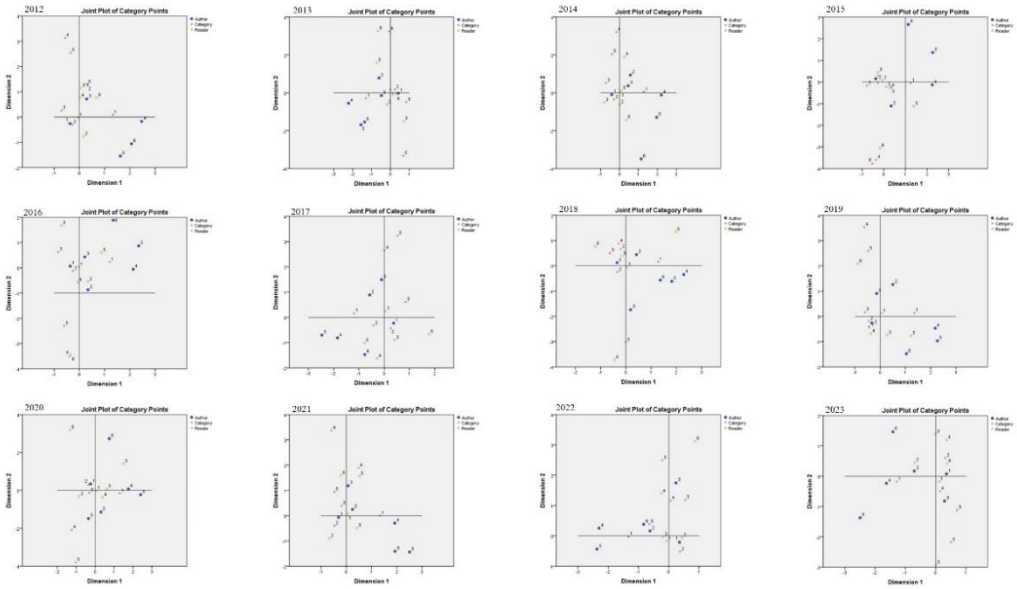
f) Yang→Li, Yang→Wang, Yang→Zhang;

g) Zhu→Wang.

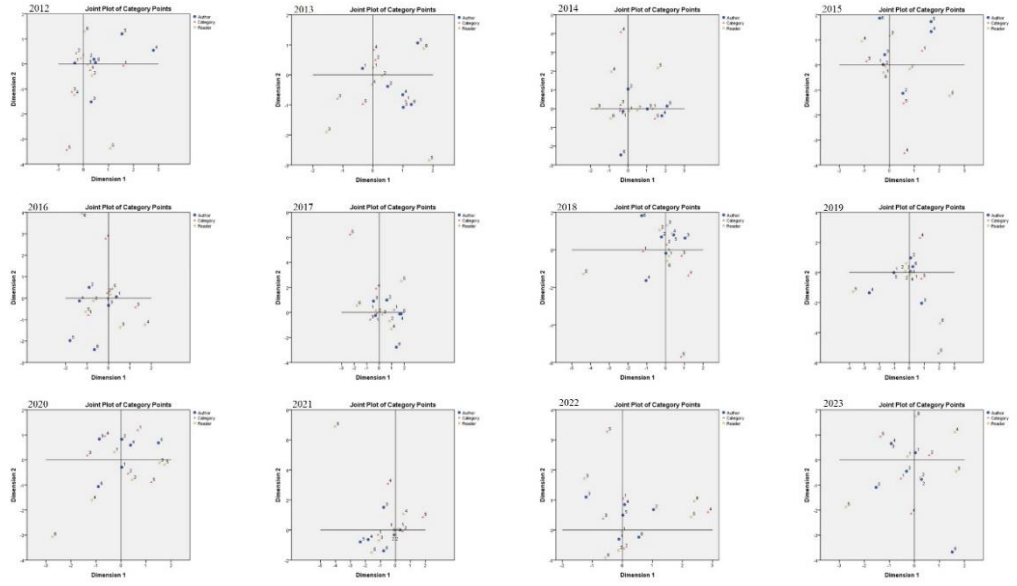
The network of borrowing relationships has remained stable, mainly due to the support of seven prominent surnames: Wang, Zhang, Li, Liu, Chen, Yang, and Zhu. In addition, readers in the top hierarchy show no clear preference for the author or category of the book they borrow. This neutrality indicates a diverse engagement with the available literature, showcasing a broad interest transcending specific genres or authorial reputations. However, readers in the second hierarchy tend to borrow books from authors in the fourth, fifth, and sixth hierarchies. This pattern suggests a deliberate choice to explore works that may not be as widely recognized but offer unique perspectives or subject matter. In the third hierarchy, readers are more inclined to borrow books from authors in the same hierarchy, particularly those in the second hierarchy. This indicates a more insular approach to borrowing, perhaps reflecting their interests or the social circles they identify with.

On the other hand, readers in the fourth and fifth hierarchies are interested in books from authors in the first and second hierarchies, respectively. Readers from the fourth hierarchy show a marked interest in exploring books from the highest tier, indicating an aspiration to engage with more esteemed literature. Similarly, readers in the fifth hierarchy lean towards borrowing from authors within the second hierarchy, which could suggest a quest for knowledge or validation from those they perceive as more authoritative. Lastly, the sixth hierarchy readers enjoy books from the third, fourth, and fifth hierarchies. This suggests a willingness to explore a broader array of voices, reflecting a desire for diversity in reading material (refer to Figure 4 (a)).

Regarding book renewals, authors in the second and third hierarchies are famous among the fifth hierarchy readers for books from the fourth hierarchy. This indicates a selective appreciation for particular works, implying these readers are building on their engagement with familiar content from the fourth tier. Additionally, authors in the first and fifth hierarchies are preferred by the second hierarchy readers for books in the second hierarchy. This finding illustrates a trend of seeking well-respected authors alongside newer or lesser-known voices, perhaps paralleling their pursuit of knowledge with a need for relatable content. In contrast, authors in the fourth hierarchy are favored for the first hierarchy books in the renewal process. This preference illustrates a complex interplay between aspiration and accessibility, as the fourth hierarchy authors seem to provide relatable content for those engaging with top-tier literature (refer to Figure 4 (b)).



(a) Book borrowing



(b) Book renewal

Figure 4. The joint plot of surnames and book categories (2012—2023)

4.4 Changes Pre- and Post- COVID-19

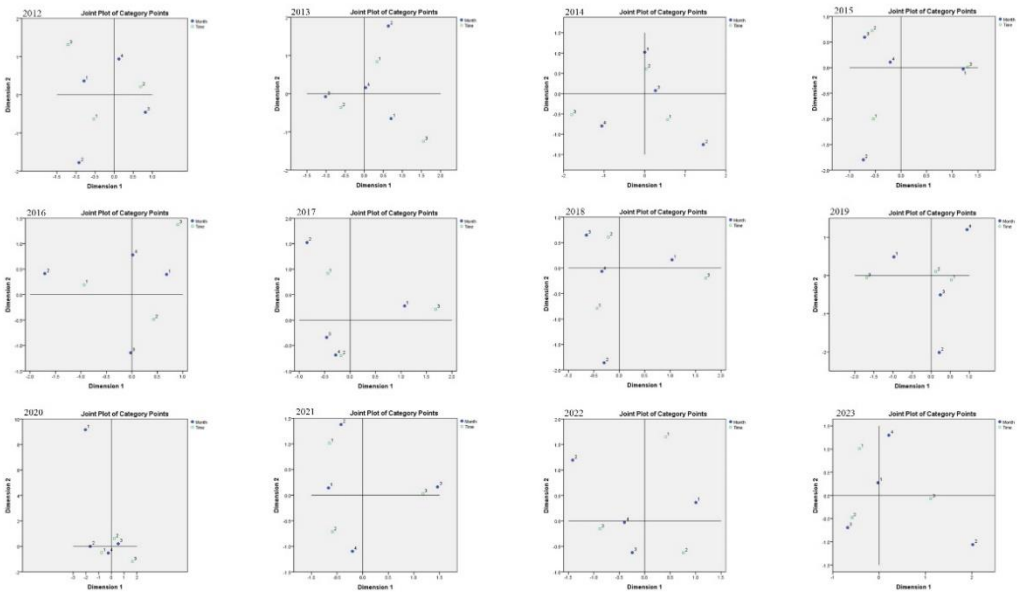
Between 2012 and the onset of the COVID-19 pandemic in 2019, readers with the top 300 surnames exhibited a consistent pattern in book borrowing. They tended to borrow books in the morning during the summer, in the afternoon during the fall and winter, and in the evening during the spring. During the summer, these readers typically sought out books in the morning, likely taking advantage of longer daylight hours and a more relaxed schedule. In the fall and winter seasons, the borrowing tendency shifted to afternoons, possibly reflecting the

shorter days and a preference for indoor activities as the weather turned colder. Spring evenings were the peak times for borrowing, aligning with the season's increasingly pleasant weather and a natural inclination to engage with literature during the vibrant, rejuvenating months of the year.

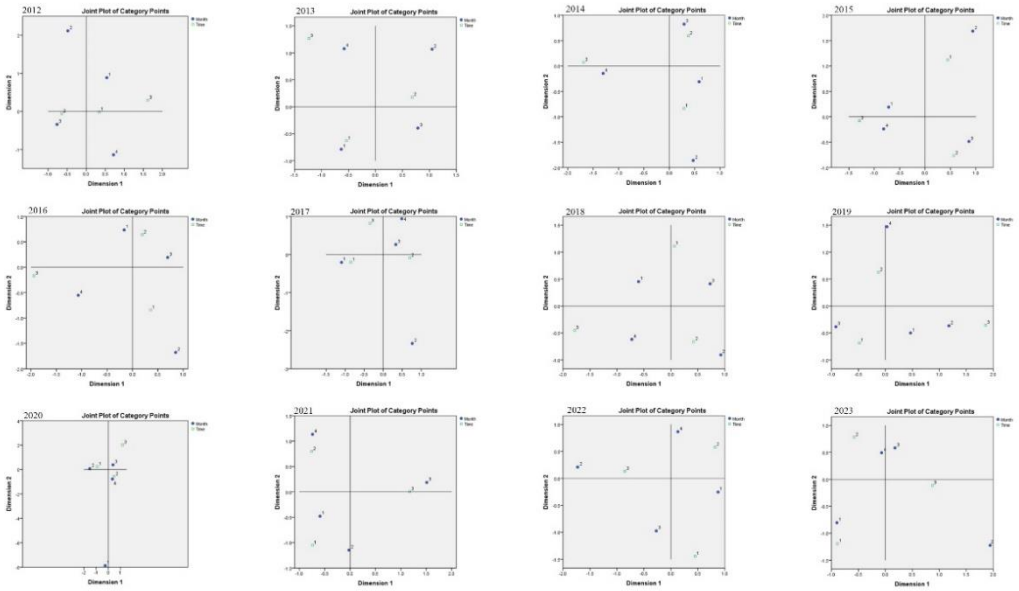
However, the landscape changed drastically in 2020 when libraries implemented stringent epidemic control measures in response to the COVID-19 pandemic. As a result, book borrowing activities plummeted, leading to a sharp decline that lacked the previously discernible cyclical pattern. This marked a significant departure from established norms as readers adjusted to the new realities imposed by the pandemic.

There has been a noticeable shift in borrowing preferences among these readers. Now, books are frequently borrowed in the morning hours during the spring, suggesting a renewed enthusiasm for reading as the weather warms and people seek engaging ways to spend their time. In the autumn months, the afternoon remains the favored time for borrowing, likely reflecting a continuation of the established trend. Once a peak borrowing time, winter evenings have transformed, with readers now favoring afternoon sessions instead, possibly favoring the daylight as a more welcoming time for library visits or reading.

In summary, the patterns of book borrowing among these top surname groups have evolved remarkably due to the pandemic. Renewals that were historically popular during winter evenings have now given way to a preference for afternoon borrowing in winter and morning borrowing in spring, indicating a significant shift in both behavior and preference (See Figure 5(a) and 5(b)). The changes reflect adaptations to new constraints and emerging interests as readers navigate the post-pandemic landscape of public libraries.



(a) Book borrowing



(b) Book renewal

Figure 5. The joint plot of months and hours (2012—2023)

4.5 The Relationship Between Categories

The Chi-square test correlation coefficient approaches 0, indicating the absence of a linear relationship between classified variables in the past five years. This observation suggests that, while some form of relationship might exist between the variables under consideration, the linkage between surnames and STEM fields does not reach statistical significance. Crosstabulation of surnames above average and other categories as demonstrated in Tables 1, 2, and 3. Furthermore, the analysis reveals a Pearson correlation coefficient of -0.018 between the occurrences of surnames and the continuous variable representing the frequency of book renewals, accompanied by a statistically significant p-value of 0.000. This statistical outcome suggests a negative correlation, indicating that individuals with surnames above the median tend to exhibit a lower frequency of book renewals than those whose surnames fall below the median threshold.

Table 1. Surname above average * gender crosstabulation

		Gender		
		0	1	Total
Surname above average	0	39069	99089	138158
	1	155160	404487	559647
Total		194229	503576	697805

Note: *Contingency coefficient: 0.005. Approx. Sig. 0.000.*

Table 2. Surname above average * literary books crosstabulation.

		Literary books		
		0	1	Total
Surname above average	0	101007	37151	138158
	1	404078	155569	559647
Total		505085	192720	697805

Note: *Contingency coefficient: 0.008. Approx. Sig. 0.000.*

Table 3. Surname above average * STEM books crosstabulation

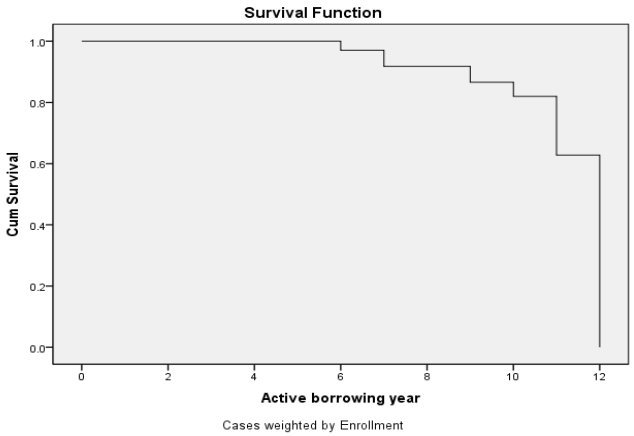
		STEM books		
		0	1	Total
Surname above average	0	127786	10372	138158
	1	516464	43183	559647
Total		644250	53555	697805

Note: *Contingency coefficient: 0.003. Approx. Sig. 0.009.*

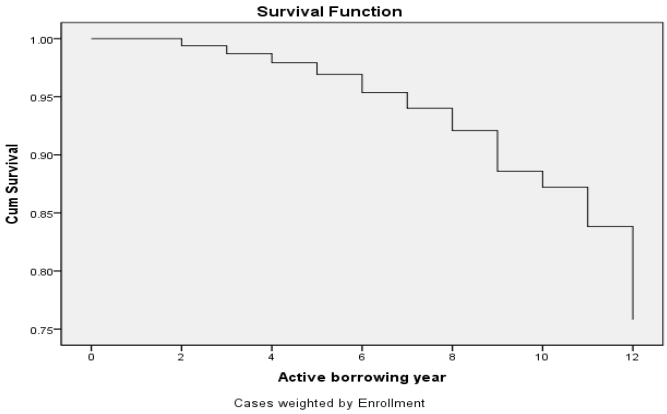
4.6 Disappearance of Reader Surnames

269 surnames of readers, accounting for approximately 89.4%, have been active in book borrowing from 2012 to 2023. Moreover, 32 surnames of readers, accounting for about 10.6%, have suspended book borrowing for one or several years. The 32 surnames include Ju(鞠), Ji(姬), Ouyang(欧阳), Zhu(诸), Tu(屠), Qiang(强), Shi(侍), Wen(闻), Feng(封), Yin(印), Gong(贡), Kan(阚), Tong(仝), Jing(荆), Chao(巢), Ge(戈), Gao(郜), Lang(郎), Xun(荀), Cheng(承), Ben(贲), Ming(明), Yan(阎), Pu(朴), Wu(巫), Lian(连), Nan(南), Niu(钮), Yun(恽), Jing(经), Quan(权), Zhen(甄). The changes in book borrowing and renewal activity of these 32 surnames have occurred over six years (See Fig 6 (a)).

Only 61 surnames of readers, accounting for approximately 20.3%, have been active in foreign language books (Western languages, Japanese, Korean, and Russian) borrowing for 12 years. Undergraduates account for 46.53%, postgraduates account for 38.91%, staff account for 11.39%, and others account for 3.17%. As time goes by, the activity of readers borrowing and renewing foreign language books continues to decline. The borrowing and renewal of foreign language books by different surnames changed over two years (See Fig 6 (b)).



(a) Books in Chinese



(b) Books in foreign languages

Figure 6. Surname activity in borrowing and renewing books

5. Discussion

5.1 Large Number Advantages

The top 300 surnames represent 96.75% of all readers, with an 83% similarity rate among NNU's top 300 author surnames. Approximately 20% of surnames are above the mean line, with famous names such as Smith, Johnson, Brown, and Miller being the most common in Britain and America. In the United States, fifty popular names cover ten percent of the population (Bauer, 1960). The prevalence of numerous surnames contributes to the use of ranking algorithms on scholarly platforms to evaluate academic work based on metrics like relevance, time, and citation counts (Wu et al., 2016). However, issues relating to the accuracy of the listing and the abbreviation of author names are a global concern (Gasparyan et al., 2016). The increasing volume of literature leads to many duplicate names shared by an unknown number of real-life authors. This ambiguity significantly impacts the assessment of researchers' academic abilities and other statistical indicators (Li et al., 2020).

Furthermore, the internalization of surnames within the academic community is also a factor. Authorship, co-authorship, and multiple authorship all involve issues of power, responsibility, and creation (Hick, 2014). It has been observed that authors sharing a kinship often hold influential positions within their collaborative networks, leveraging their resources (Prosperi et al., 2016). This is partly due to individuals with the same surname exhibiting similar reading and writing preferences, leading to a powerful brand preference effect (Howard & Kerin, 2013). Studies have shown that readers are more likely to favor books authored by someone with the same surname as themselves, enhancing their affinity for the material.

5.2 The Uniqueness of Long Tail Surnames

Cheshire and Longley's 2012 study on surname distribution in Great Britain found that most surnames are rare, yet most people do not have rare surnames. However, individuals with rare surnames represent a unique category and may require additional social support, especially those on the fringes of social networks (Prosperi et al., 2016). People with surnames below the mean line are more likely to utilize overdue book renewal services. These fewer common surnames often have distinct preferences for types of books and exhibit different patterns in type statistics. Moreover, rare author surnames are crucial for historical inference. The results of the multidimensional scaling analysis reveal a complex hierarchical misalignment among the reader hierarchy, book category hierarchy, and author hierarchy, leading to a staggered correspondence. This outcome provides further insight into the implications of the law of large numbers.

The ranking method is utilized to classify books based on authors' surnames. Not all of the author's published entries are retrieved when conducting a bibliographic search for a Chinese author in the Cambridge structural database using the "surname" or "author" option. This discrepancy may be attributed to the original publication's formatting of the surname and first name, including variations such as the presence or absence of a hyphen in the first name (De Ridder & Wang, 2003). The extraction of book author information adheres to the CNMARC cataloging rules established by the China Academic Library & Information System. Nevertheless, some older books may not feature the author's information on the title page but instead on the cover, spine, or other locations (Pi, 2021).

Furthermore, discrepancies in author names in cited journal references, including inaccuracies in first names and surnames, misspellings in first names, and omissions of first names or initials, have been documented (Gupta, 2021). Due to the rarity of particular surnames, these errors can significantly impact statistical accuracy. In addition, when analyzing group-affiliated entities such as "The Compilation Group of this Book" or "The Editorial Committee of this Book," or when the title of the book references an editorial committee or research group, no further detailed analysis was carried out, as it lacked statistical significance in individual comparisons in this study.

5.3 Impact of COVID-19

The rise of digital reading and the implementation of COVID-19 safety measures have transformed the reading habits of many students and teachers. In line with the "*Notice*

regarding the suspension and resumption of large-scale sports activities and gatherings during COVID-19", gatherings have been restricted or suspended during infectious disease outbreaks. Consequently, university students had to study from home, limiting their access to city and country resources (Yıldırım et al., 2021). Academic libraries faced budget cuts, staff shortages, and decreased reference requests (Dong & Mabry, 2024). Furthermore, borrowing records indicate a decrease in the use of resources by individuals with less common surnames during the pandemic. Analysis of borrowing and book renewal patterns pre- and post-epidemic shows significant variations, shifting from stable winter evening borrowing and renewing habits to winter afternoons and spring mornings. This change can be attributed to the increased closure of libraries in the evening during the pandemic.

Individuals with surnames above the mean line tend to be more cautious about avoiding overdue risks. They are more likely to associate chance fluctuation, such as renewal services for expired books, with bad luck and are hesitant to relinquish control for potential benefits of chance (Johnson & Kang, 2013). Research has shown that decisional procrastination is closely linked to academic self-efficacy and intolerance of uncertainty, both prospective and inhibitory. Additionally, it has been confirmed that prospective intolerance of uncertainty plays a mediating role in the relationship between self-efficacy (specifically self-engagement and self-oriented decision-making) and decisional procrastination, as outlined in a study by Sagone and Indiana in 2023.

5.4 Differences in Foreign Language Reading

The borrowing of Chinese books far surpasses that of Western books by several times. Borrowing activity for foreign language books among readers is notably lower and decreasing rapidly. It has been observed that teachers and teacher candidates at NNU with high-frequency surnames tend to exhibit more active borrowing behavior than those with low-frequency surnames. Among the 32 surnames with years of no borrowing activity, 27 surnames also have no borrowing activity for foreign language books, indicating a coincidence rate of 84.4%. Research indicates that students often experience anxiety when reading in a second language due to unfamiliar scripts, topics, and concerns about comprehension. Apart from gender, factors such as first-language achievement and second-language aptitude can complicate the relationship between language anxiety and second-language achievement, raising questions about the causal role of language anxiety (Sparks & Alamer, 2023).

6. Limitation

Several potential limitations must be considered when selecting the 300 most important surnames for research. Limiting the data set to only 300 surnames might not adequately capture the complexity and diversity of the entire population. Such a limitation could lead to the inadvertent exclusion of important data and relevant nuances associated with less common surnames. The results may not reflect the entire population if the surnames are from a geographically limited area or a specific demographic group. Such limitations could result in certain cultures or ethnicities being over- or under-represented. Limiting a select group of surnames may prevent researchers from identifying unique variations.

It is also important to note that the popularity of surnames is subject to fluctuations over time. A list based on current trends may not accurately reflect historical patterns or shifts in naming conventions, which could skew the research results. Surnames are not static; they can change over time. Data collected at one point in time may not capture changes in societal trends, migration patterns, or the decline of certain naming practices. This temporal limitation poses a challenge for studies that require a dynamic understanding of surnames and their effects in different contexts.

Recognizing that different cultures possess distinct naming conventions, each with nuances and meanings associated with surnames, is crucial. Surnames might bear distinct meanings or significances that vary across different sociopolitical contexts. This variance can influence data interpretation, mainly when particular names are associated with specific historical events or demographic groups. Chinese surnames show characteristics of regional cultural clusters. For example, the cultural dominance of the Hu family from Jixi, Anhui has significant educational advantages and academic achievements that are not comparable to those of most other families. Moreover, the effects of the differences between the surnames and the population have not been eliminated. Inadequate consideration of these cultural contexts during the data collection could lead to misinterpretations or insufficient depth in understanding the significance of specific surnames within their communities.

The implications of surname representation in research can profoundly influence the interpretation and presentation of data. For instance, overrepresenting or underrepresenting specific surnames could lead to biased conclusions concerning academic performance, resource accessibility, or participation rates in educational programs. Policymakers should ensure that the selected surnames encompass diverse backgrounds, including racial, ethnic, and socioeconomic dimensions. This diversity is crucial in understanding the impact of educational policies on various demographic segments. Awareness of these potential biases can facilitate more nuanced analyses and discussions.

If the sourced data predominantly stems from particular databases or regions that do not reflect a broader perspective, there exists a risk of perpetuating stereotypes or stigmatizing specific names based on their inclusion in the selected list. There is a noticeable trend of women being more likely to pursue a teaching career than men, which has led to a significant gender imbalance at NNU that has persisted for over a decade. The prevalence of a predominantly female culture in teacher training programs remains widespread, leading to the collection of factual data that inevitably reflects gender differences and feminine traits. Despite several attempts by researchers to analyze the data through restructuring and dimensionality reduction, clustering has yet to yield ideal results. The majority of large classes and a lack of small classes indicate a pattern of significant convergence, which is typical of women. Unfortunately, this also obscures the diversity of male candidates and reinforces a one-sided perspective. Conclusions derived from a non-representative sample may lack validity and fail to encapsulate the complexity of the population’s sociocultural dynamics. By acknowledging these limitations, researchers can better contextualize their studies and develop more robust methodologies encompassing a broader array of surnames and the diversity they signify.

To extend the 300 surname study, researchers should consider diverse methodological approaches that cover various geographic locations and historical contexts. Rather than focusing solely on one nation, scholars could analyze surname distributions internationally, examining differences between urban and rural areas to understand better how cultural influences shape naming conventions. Investigating surnames within ethnic minority communities can reveal the impact of historical events, such as colonization and immigration, on naming practices. Tracking surname trends from the early 20th century can show how globalization and technology influence contemporary naming. A longitudinal approach to surname changes within families could provide insights into cultural assimilation and identity evolution. Combining quantitative analyses with qualitative interviews would enhance understanding of the significance individuals place on their surnames while leveraging online databases, which could facilitate the collection of extensive data on surname usage patterns. Collaborations with libraries and cultural organizations can further enrich the research through access to archival materials. By comparing studies from different countries, researchers can explore how historical contexts influence naming practices and investigate the relationship between surnames and given names to deepen insights into identity. Expanding the scope of surname studies offers valuable perspectives on individual identities and broader societal trends.

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