

Mapping Doctoral Productivity, Gender Dynamics, and Supervisory Influence: A Scientometric Assessment of Chemistry Research Output (1951–2025)

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Abstract

This paper presents a scientometric assessment of doctoral (Ph.D.) research produced by the Department of Chemistry, Savitribai Phule Pune University (SPPU), covering the period 1951 to 2025. Data were collected from Shodhganga, the national repository of electronic theses and dissertations maintained by the INFLIBNET Centre. The study traces the year-wise growth of doctoral output, the gender distribution among research scholars and supervisors, the most productive research guides, and the extent to which supervision has been carried out individually or jointly. A review of earlier scientometric work on doctoral theses, gender participation, and supervisory practice in Indian universities is used to place the present findings within a broader academic context. The results show that doctoral output in chemistry grows steadily from the 1950s to a highest productivity at 2001, after which a decline is observed. It is found that female scholars, as well as supervisors, are outnumbered by males by a wide margin, and that a small group of guides has a higher number of supervisees, most of whom are individually supervised rather than jointly supervised.

Keywords: scientometrics, doctoral productivity, gender dynamics, research supervision, Shodhganga, chemistry research, Savitribai Phule Pune University

1. Introduction

The Ph.D. degree represents the highest formal qualification within the academic system, and doctoral research is widely regarded as one of the driving forces behind the growth of scientific knowledge. Scientometric indicators such as growth rate, authorship pattern, collaboration index, and degree of collaboration are commonly used to understand how research output evolves over time and to identify the patterns that shape it (Garg & Kumari, 2018). While a considerable body of scientometric work exists on published research output, doctoral theses have received comparatively less attention as an independent unit of analysis, even though they represent a substantial and traceable body of scholarly work.

Savitribai Phule Pune University, established in 1949 under the Poona University Act and popularly referred to as the “Oxford of the East,” is one of India's leading universities, housing 46 academic departments along with a large network of affiliated colleges and recognised research institutes. Its Department of Chemistry, founded in April 1950, is among the university's oldest departments and has

been recognised by the University Grants Commission as a Centre for Advanced Studies in Chemistry since 1998, reflecting its long-standing contribution to doctoral training and research in the discipline. Shodhganga, developed by the INFLIBNET Centre in line with the UGC notification of 2009 (later amended in 2016), requires every doctoral scholar in India to deposit an electronic copy of the thesis, which is then made openly accessible. This repository offers researchers a rare opportunity to study doctoral output over a long historical span, to compare gender participation across decades, and to examine how supervisory responsibility has been distributed among research guides. The present study uses this resource to examine 1,706 Ph.D. theses submitted to the Department of Chemistry, SPPU, between 1951 and 2025.

2. Objectives

The study has been designed around the following objectives:

- To study the growth and trends of doctoral research output in chemistry at SPPU.
- To examine the gender distribution among Ph.D. scholars in the department.
- To evaluate supervisory patterns and collaboration trends in doctoral guidance.
- To identify the most productive research supervisors over the study period.
- To assess the overall structural characteristics of doctoral research output.

3. Hypotheses

In line with the stated objectives, the following hypotheses have been framed for testing:

- H1: Doctoral research output shows significant growth over time.
- H2: Male researchers dominate doctoral productivity.
- H3: Supervisory collaboration is limited.
- H4: A small group of supervisors contributes disproportionately to overall doctoral guidance.

4. Review of Related Literature

A number of scientometric studies have been done previously, which are mostly examined research productivity in India, concentrated on published papers rather than doctoral thesis. But the studied those are examined Ph.D. theses have been mainly focus on narrower, dealing with citation patterns or source distribution rather than a combined view of productivity, gender, and supervision over an extended period. The studies reviewed below are grouped according to their focus, and are connected here to show how each contributes a piece of the picture that the present study attempts to bring together.

4.1 Doctoral Theses in Chemistry and Related Sciences

Several studies have looked specifically at chemistry-related doctoral output, and their findings offer a useful point of comparison for the present work. Garg and Kumari (2018), studying 809 Ph.D. theses submitted to the Department of Chemistry at Aligarh Muslim University between 1935 and 2014, reported an average growth rate of 6.8 per cent per decade, found that women made up about 28 per cent of Ph.D. awardees while only 12 per cent of supervisors were women, and noted that 82 per cent of these were guided by a single supervisor. A closely related pattern emerges from Naika, Kanamadi, Sutar, and Kadli (2016), who examined 4,268 doctoral theses at the Indian Institute of Technology Bombay and found that nearly three-quarters belonged to science and engineering fields, that joint supervision was comparatively common (with a degree of collaboration of 0.74), and that women contributed about 24 per cent of theses. Taken together, these two large institutional studies suggest that even within technical and science

disciplines, the share of women among doctoral scholars has tended to stay below one-third, while the share of women among supervisors has remained smaller still.

Discipline-specific work from the University of Kerala adds further detail. Sudhier and Dileep Kumar (2010), studying doctoral dissertations in biochemistry, It was found that each and every thesis having an average of 215 references, maximum are from journal literature, and 36% of theses are contributed by women, It shows a higher share of women than observed for chemistry or engineering. Sudhier (2011), examining physics theses at the same university, The study was found 52% of share from women with a moderate collaboration coefficient of 0.63, indicating that gender participation can vary considerably even within closely related science disciplines and institutions. Similarly, Gohain and Saikia (2014), reviewing citation patterns in chemical sciences theses at Tezpur University, found that journal articles accounted for close to 79 per cent of all citations, confirming that journal literature remains the dominant information source underlying chemistry doctoral work a pattern consistent with what Sudhier and Dileep Kumar (2010) observed in biochemistry.

A longer historical view is offered by Schlembach (2023) examined chemistry and physics dissertations during 50 years, It was found that the chemistry dissertations grows approximately 240 per cent during the period studied, with journal literature again making up more than 80 per cent of citations. This finding lends support to treating doctoral output as a field that has expanded considerably over time, though, as later sections of the present paper show, such growth has not always been uninterrupted.

4.2 Gender Participation and Supervisory Involvement

A second cluster of studies focuses more directly on gender participation, both among scholars and among the guides who supervise them. Mukherjee (2022) examined Scopus data on women scientists working in Indian research laboratories, found that women contributed about 27 per cent of total research output and with a increasing trend of inter-institutional collaboration among women researchers, particularly within chemistry-related fields. This broadly matches the pattern reported by Garg, Singh, and Rana (2021) for the Department of Zoology at Aligarh Muslim University, where women accounted for 34 per cent of the 623 theses examined between 1954 and 2018, while only 9 per cent of supervisors were women; the same study also found that collaborative supervision increased noticeably after the year 2000.

More recent department-level studies point to a gradual improvement in women's participation. Kumar and Mahendra Kumar (2025) examined 259 doctoral theses in biological sciences at Doctor Harisingh Gour Vishwavidyalaya, It was found that women contributed 42 per cent of the total theses, a figure noticeably higher than the shares reported in the older chemistry and zoology studies discussed above, even though 69 per cent of supervision in that department was still carried out by a single guide. An even higher share of women's participation was reported by Mishra, Sharma, and Verma (2022) at Banasthali Vidyapith, where women made up 68 per cent of scholars in chemical and biological sciences, and where collaborative supervision increases from 12 per cent to 37 per cent over the study period. Read alongside one another, these studies suggest that women's representation among doctoral scholars has generally improved over recent decades, though the pace and extent of this change differ considerably from one institution and discipline to another, and supervisory roles continue to be held mostly by men even where scholar numbers are more balanced.

4.3 Institutional and Subject-wise Productivity Studies

A wider set of studies has examined research productivity and collaboration at the level of institutions or subject fields, without necessarily focusing on doctoral theses alone, and these help place supervisory and gender patterns within the broader context of Indian research output. Kademani, Sagar, Kumar, and

Bhanumurthy (2006), studying the Chemistry Division at the Bhabha Atomic Research Centre, reported a high degree of collaboration (0.89) and an average of 3.7 authors per paper, and with 92 per cent of publications produced through collaboration. A similarly high level of collaboration was reported by Bapte and Kherde (2019) for Rashtrasant Tukadoji Maharaj Nagpur University, where the degree of collaboration reached 0.81, although a majority of individual authors (61 per cent) contributed only a single paper each, showing that overall collaboration figures can mask a productivity pattern in which most contributors remain occasional authors.

Two further studies on Indian biochemistry research, both by Sudhier and Dileep Kumar (2019, 2020) study found a degree of collaboration of 0.92 and about 90% of papers are produced through collaboration as an annual growth rate of 8.5 per cent, and highest DC 0.93 is observed in 2020 and a collaboration index of 4.8 authors per paper. Ghosh (2021) examined research productivity of the Indian Institute of Technology Kharagpur for two decade, It was observed a collaboration index of 3.1.

Subject-specific growth studies add further texture to this picture. Dutta and Rath (2013), examining carbon nanotube research between 2000 and 2011, reported a relative growth rate of 0.68 and a doubling time of just over a year, pointing to a fast-expanding research area, while Narzary and Murugan (2017), studying agricultural science research from 2000 to 2014, reported a slower relative growth rate of 0.52 with a doubling time of 1.33 years. Nair and Raja (2018), studying genetic diversity research between 1990 and 2015, found a collaboration coefficient of 0.76 with 85 per cent of publications multi-authored, a level of collaboration close to that reported by Roselin Jahina, Sadik Batcha, and Muneer Ahmad (2021) in their study of brain concussion research, where the collaboration coefficient was also 0.76 and just over half of contributing authors published only once. Gaud, Verma, and Kumar (2019), examining environmental science research between 2005 and 2017, reported a similarly strong degree of collaboration (0.88), while Maity, Teli, and Dutta (2023), studying the Indian Association for the Cultivation of Science between 2000 and 2020, found that the top ten per cent of authors accounted for nearly half of total publications, underlining a recurring theme across these studies: research productivity, whether measured through theses or papers, tends to be concentrated among a relatively small group of highly active contributors.

4.4 Studies Relating to Savitribai Phule Pune University

Because the present study is set within SPPU itself, earlier bibliometric work on the university provides a particularly relevant point of reference. Chaturbhuj and Motewar (2021), analysing 6,449 publications from SPPU between 2001 and 2019 using indicators such as the specialization index, priority index, h-index, and g-index, found that physics was the most specialized subject at the university while medicinal chemistry emerged as the highest priority research area — a finding that underlines the continuing importance of chemistry-related research within the institution. Kumbhar, Pawar, Gadade, and Roha (2024), examining a larger set of 8,602 bibliometric records from SPPU, confirmed steady growth in both publications and citations along with strong national and international collaboration, and identified chemistry as a central and still-developing area of research at the university.

Two department-level studies offer a closer view of chemistry research specifically. Nagarkar (2014), studying 811 research papers produced by the Department of Chemistry between 1999 and 2012, found that these papers received 8,948 citations in total, an average of 11.03 citations per paper, with physical chemistry accounting for the largest share of output and highly cited papers tending to be collaborative in nature. A comparable study of the university's Physics Department by Nagarkar and Kengar (2017), covering 1990 to 2014, reported 1,629 publications and 22,618 citations, along with growing international

collaboration involving the United States, the United Kingdom, Germany, and Japan. Considered together with the present study's focus on 1,706 Ph.D. theses submitted between 1951 and 2025, these SPPU-based studies suggest that chemistry has remained a consistently active and internationally connected area of research at the university across both published output and doctoral training, even though, as later sections of this paper show, the underlying gender balance and supervisory concentration in doctoral guidance have changed only gradually over the same period.

4.5 Research Gap

Despite this substantial body of work, most existing scientometric studies remain publication-based and give comparatively limited attention to doctoral theses as a primary unit of analysis, particularly within chemistry. Where theses have been studied, the emphasis has largely fallen on citation patterns and source distribution rather than on a combined assessment of productivity, gender participation, and supervisory influence over an extended period. Few studies, moreover, trace doctoral output across a span as long as seven decades, and none of the studies reviewed here brings productivity trends, gender dynamics, and supervisory patterns together within a single framework specifically for the Department of Chemistry at Savitribai Phule Pune University. The present study attempts to address this gap by offering an integrated, long-term scientometric assessment of doctoral research in chemistry at SPPU covering the period 1951 to 2025.

5. Data Source and Scope of the Study

Data for this study were collected from Shodhganga, the national repository of electronic theses and dissertations maintained by the INFLIBNET Centre. The scope of the study is confined to Ph.D. theses submitted to the Department of Chemistry, Savitribai Phule Pune University, as uploaded on Shodhganga, and covers the period from 1951 to 2025.

6. Research Methodology

The study follows a quantitative scientometric approach. Theses were located on Shodhganga by browsing university and department listings, after which Savitribai Phule Pune University and its Department of Chemistry were selected and the upload-date filter applied. Since the results page displays a maximum of 100 records at a time, data on upload date, thesis title, researcher, and guide were extracted in batches and compiled in a spreadsheet until all relevant records had been captured. As the year of completion is not displayed directly on the results page, each thesis title was opened individually to retrieve its citation details, from which the year of completion was recorded. The compiled data were then examined using descriptive scientometric indicators covering growth trends, gender distribution, guide productivity, and supervisory collaboration patterns.

7. Data Analysis and Interpretation

The collected data is analyzed based on key indicators, including year-wise growth, gender distribution, the most prolific supervisors, and supervisory collaboration, among others

7.1 Year-wise Growth of Ph.D. Theses in the Department of Chemistry

The timeframe for the present study spans 75 years; therefore, the researcher has grouped the data into decade-wise intervals for simplicity of presentation. Each interval is labeled by its starting year (for example, 1951 represents 1951–1960, and 2021 represents 2021–2025).

Table 1: Year-wise Productivity of Ph.D. Theses, Department of Chemistry, SPPU

Year of Completion	Total Ph.D. Theses Completed
1951	50
1961	155
1971	201
1981	328
1991	333
2001	427
2011	166
2021	46
Total	1706

Table 1 presents the overall output of Ph.D. theses produced by the Department of Chemistry at Savitribai Phule Pune University (SPPU) from 1951 to 2025, totaling 1,706 awards. The detailed decade-wise breakdown is provided in the same table. As observed, the interval represented by 2001 was the most productive, with 427 theses completed, followed by 1991 and 1981 with 333 and 328 theses, respectively—marking a sustained period of high research output. Production rose steadily from 50 theses in the 1951 interval to 155 in 1961 and 201 in 1971, before accelerating through the 1980s and 1990s to peak in 2001. A subsequent decline occurred, with output dropping to 166 in 2011 and further to 46 in 2021. However, this lower figure for 2021 reflects a shortened five-year window (2021–2025) and includes 14 theses lacking recorded completion dates. Overall, this pattern supports Hypothesis H1 regarding consistent growth from 1951 to 2001, while highlighting a recent deceleration that may stem from shifting academic policies, changing enrollment trends, or incomplete administrative records rather than an actual drop in research productivity.

7.2 Gender-wise Distribution of Research Output

A total of 1,706 Ph.D. theses were completed in the department, with 1,323 produced by male researchers and 383 by female researchers. The indicators below summarize this distribution.

Table 2: Gender-based Scientometric Indicators

Indicator	Formula	Value
Total Research Output (T)	Male + Female	1706
Male Percentage	$(\text{Male} / \text{Total}) \times 100$	77.55%
Female Percentage	$(\text{Female} / \text{Total}) \times 100$	22.45%
Gender Ratio (M:F)	Male / Female	3.45 : 1
Gender Gap	Male – Female	940
Participation Index (Male)	$\text{PI}_m = \text{Male} / \text{Total}$	0.7755
Participation Index (Female)	$\text{PI}_f = \text{Female} / \text{Total}$	0.2245
Gender Parity Index (GPI)	Female / Male	0.289
Female Share in Total Output	$(\text{Female} / \text{Total}) \times 100$	22.45%
Male Dominance Index	Male / Female	3.45

The table 2 illustrates the gender-based scientometric indicators, it was observed from the table that the Gender Parity Index of 0.289 confirms a large imbalance, and the gender ratio of 3.45:1 shows that male

scholars have historically outnumbered female scholars by a wide margin, with a gender gap of 940 theses over the study period. This directly supports Hypothesis H2, that male researchers dominate doctoral productivity in the department. It suggesting that gender participation in doctoral research in chemistry at SPPU has followed a more traditional trajectory than in some other institutions and disciplines.

7.3 Most Prolific Research Guides in Ph.D. Supervision

All theses were completed under the guidance of a recognised research supervisor, with a small number of exceptions where no guide could be identified from the record. The following table lists the most productive guides, ranked by the number of Ph.D. scholars supervised, out of a total of 395 supervised theses considered for this ranking.

Table 3: Most Productive Research Guides, Department of Chemistry, SPPU

Rank	Name of Research Guide	Ph.D. Supervised	Percentage (%)	Cumulative %
1	Narasimhan, N. S.	29	7.34	7.34
2	Rao, T. S.	24	6.08	13.42
3	Arnikar, H. J.	23	5.82	19.24
4	Rama Rao, A. V.	22	5.57	24.81
4	Sivaram, S.	22	5.57	30.38
5	Kulkarni, B. A.	20	5.06	35.44
5	Pandey, Ganesh	20	5.06	40.50
6	Bhattacharyya, S. C.	19	4.81	45.31
7	Ranjekar, P. K.	18	4.56	49.87
8	Chaudhari, R. V.	17	4.30	54.18
8	Ghatge, N. D.	17	4.30	58.48
8	Joshi, P. N.	17	4.30	62.78
8	Sinha, A. P. B.	17	4.30	67.09
9	Gurjar, M. K.	15	3.80	70.88
9	Kulkarni Jatkar, S. K.	15	3.80	74.68
9	Kulkarni, S. B.	15	3.80	78.48
9	Mali, R. S.	15	3.80	82.28
10	Biswas, A. B.	14	3.54	85.82
10	Dedgaonkar, V. G.	14	3.54	89.37
10	Kulkarni, M. G.	14	3.54	92.91
10	Marathe, K. G.	14	3.54	96.45
10	Patil, S. F.	14	3.54	100.00

Narasimhan, N. S. ranks first with 29 Ph.D.s supervised (7.34 per cent of the ranked total), followed by Rao, T. S. (24 Ph.D.s, 6.08 per cent), Arnikar, H. J. (23 Ph.D.s, 5.82 per cent), and Rama Rao, A. V. and Sivaram, S. (22 Ph.D.s each, 5.57 per cent). Several guides share the same rank because they supervised identical numbers of scholars, which is why the table lists more than ten names under the “top ten” ranking. By the eighth rank, the cumulative share already exceeds 54 per cent of the ranked total, and so the leading group of guides accounts for more than half of the supervision among the ranked guides (the 395 ranked

theses are about 23 per cent of all 1,706) before the remaining guides bring the cumulative share to 100 per cent. This pattern supports Hypothesis H4: a comparatively small group of supervisors has carried a disproportionate share of doctoral guidance, though the table also shows a fairly broad middle tier of guides with fifteen to twenty scholars each, indicating that supervisory responsibility, while concentrated at the top, has not rested with only one or two individuals.

7.4 Guide Collaboration Pattern in Ph.D. Supervision

A total of 1,705 Ph.D. degrees completed during the study period were supervised either by a single guide or jointly by more than one guide. The table below sets out this distribution by supervisory pattern, coded so that 'm' represents a male guide and 'f' represents a female guide.

Table 4: Distribution of Ph.D. Supervision by Guide Collaboration Pattern

S. No.	Pattern	Description of guide	Frequency	Percentage (%)	Cumulative Percentage (%)
1	m	Single Male	1,467	86.04%	86.04%
2	f	Single Female	93	5.45%	91.50%
3	mm	Two Male	91	5.34%	96.83%
4	fm	One Male and One Female	30	1.76%	98.59%
5	ff	Two Female	14	0.82%	99.41%
6	mmm	Three Male	1	0.06%	99.47%
7	fmm	One Female and Two Male	1	0.06%	99.53%
8	0	No Guide Recorded	8	0.47%	100.00%
		Total	1,705	100.00%	-

A single male guide supervised 1,467 theses (86.04 per cent), making this by far the most common supervisory arrangement in the department. Single female guides supervised 93 theses (5.45 per cent), while joint supervision by two male guides accounted for 91 theses (5.34 per cent). Mixed-gender joint supervision (one male and one female guide) was recorded for 30 theses (1.76 per cent), and supervision by two female guides for 14 theses (0.82 per cent). All remaining patterns, including three-guide arrangements and theses completed without a recorded guide, together made up less than one and a half per cent of the total.

7.5 Summary of Supervisory Indicators

Based on Table 4, several summary indicators help describe the overall supervisory pattern in the department.

Table 5: Summary of Supervisory and Collaboration Indicators

Indicator	Calculation	Value
Single-guide supervision rate	$(1467 + 93) / 1705 \times 100$	91.50%
Collaborative supervision rate	$(90+30+13+1+1+1+1) / 1705 \times 100$	8.04%
Male guide participation rate	$(1467+90+30+1+1+1) / 1705 \times 100$	93.26%
Female guide participation rate	$(93+30+13+1+1) / 1705 \times 100$	8.09%
Degree of Collaboration (DC)	Multi-guide theses / (Single + Multi-guide theses)	0.08

Indicator	Calculation	Value
Collaboration Index (CI)	Total guide count / Total theses	1.08

Only about 8 per cent of theses were completed under joint supervision, against a single-guide rate of 91.5 per cent, giving a low Degree of Collaboration of 0.08 and a Collaboration Index of 1.08, meaning that, on average, only slightly more than one guide was associated with each thesis. This finding supports Hypothesis H3, that supervisory collaboration in the department has been limited. It also stands in contrast to the much higher collaboration levels reported for published research output elsewhere in the literature reviewed in Section 4 — for instance, the degree of collaboration of 0.89 reported by Kademani et al. (2006) for BARC's Chemistry Division, or the figures above 0.9 reported by Sudhier and Dileep Kumar (2019, 2020) for Indian biochemistry research — indicating that while published chemistry and biochemistry research in India is often highly collaborative in authorship, doctoral supervision itself has remained a largely individual responsibility. The male guide participation rate of 93.26 per cent, compared with a female guide participation rate of only 8.09 per cent, further confirms the gender imbalance already observed among scholars in Section 7.2, and mirrors the low share of female supervisors reported by Garg and Kumari (2018) for AMU chemistry (12 per cent) and by Garg, Singh, and Rana (2021) for AMU zoology (9 per cent).

8. Discussion

Read together, the findings of this study align closely with the wider pattern described in the literature reviewed in Section 4. Doctoral output in chemistry at SPPU grew steadily for five decades before slowing in recent years, a trajectory broadly consistent with the long-term growth reported by Schlembach (2023) for chemistry dissertations elsewhere, even though the direction reverses in the most recent interval covered here. Gender participation among scholars (22.45 per cent women) sits closer to the lower end of the range reported across the studies reviewed, resembling the figures reported for AMU chemistry (Garg & Kumari, 2018) and IIT Bombay (Naika et al., 2016) rather than the considerably higher shares found in biochemistry, physics, or the more recent department-level studies at Banasthali Vidyapith and Doctor Harisingh Gour Vishwavidyalaya (Sudhier & Dileep Kumar, 2010; Sudhier, 2011; Mishra et al., 2022; Kumar & Mahendra Kumar, 2025). The share of women among supervisors (8.09 per cent) is lower still, echoing the pattern of women being under-represented in supervisory roles even where they are reasonably well represented among scholars, a pattern also noted by Garg, Singh, and Rana (2021) and by Mukherjee (2022) in her review of women scientists' research performance. Finally, the concentration of supervision among a relatively small number of highly productive guides, alongside a low overall degree of collaborative supervision, reflects a structural feature common across several of the studies reviewed (Bapte & Kherde, 2019; Maity et al., 2023), even though collaboration in published chemistry and biochemistry research in India tends to run considerably higher (Kademani et al., 2006; Sudhier & Dileep Kumar, 2019, 2020).

9. Significance of the Study

- It provides a long-term scientometric assessment covering roughly 75 years of doctoral research.
- It draws on a national repository (Shodhganga), offering data that is verifiable and openly accessible.
- It brings attention to gender participation and supervisory practice within Indian academic chemistry.
- It offers findings that can inform institutional and policy-level academic planning.

10. Limitations

- The data are limited to a single department at a single university.
- The findings depend on the completeness and accuracy of the Shodhganga repository.
- The study does not include a citation-impact analysis of the theses examined.

11. Scope for Future Research

- Comparative studies of doctoral productivity across multiple universities and chemistry departments.
- Inclusion of citation-based indicators to assess the scholarly impact of doctoral theses.
- Subject-wise, micro-level analysis within chemistry sub-disciplines such as organic, inorganic, and physical chemistry.

12. Conclusion

This study has traced the growth, gender composition, and supervisory pattern of the 1,706 Ph.D. theses submitted to the Department of Chemistry, Savitribai Phule Pune University, between 1951 and 2025. Doctoral output grew from 50 theses in the 1951–1960 interval to a peak of 427 in 2001–2010, an increase of more than eight times, with the 1981 (328) and 1991 (333) intervals already marking a sustained high level of output. Output then fell to 166 in 2011–2020 and 46 in 2021–2025; this recent decline is partly explained by the shortened five-year window and by 14 theses with no recorded completion date. Hypothesis H1 is therefore supported for the period up to 2001, but not for the most recent decades.

The gender gap is pronounced. Of the 1,706 theses, 1,323 (77.55 per cent) were produced by male scholars and 383 (22.45 per cent) by female scholars, giving a gender ratio of 3.45 : 1, a gender gap of 940 theses, and a Gender Parity Index of only 0.289, which supports Hypothesis H2. The imbalance is sharper among supervisors: male guides were involved in 93.26 per cent of theses, against 8.09 per cent for female guides. The share of women among scholars is close to that reported for chemistry at Aligarh Muslim University (about 28 per cent) and IIT Bombay (about 24 per cent), and well below the 42 per cent and 68 per cent reported in more recent studies at Doctor Harisingh Gour Vishwavidyalaya and Banasthali Vidyapith.

Supervision is concentrated both in a few guides and in a single-guide model. The 22 most productive guides supervised 395 theses, led by N. S. Narasimhan (29 scholars, 7.34 per cent of the ranked total), T. S. Rao (24), and H. J. Arnikaar (23); the first nine guides alone account for 49.87 per cent of this ranked total, supporting Hypothesis H4. At the same time, 91.50 per cent of theses (1,560 of 1,705) were completed under a single guide, of which single male guides accounted for 1,467 (86.04 per cent), while only 137 theses (8.04 per cent) were jointly supervised. The resulting Degree of Collaboration of 0.08 and Collaboration Index of 1.08 confirm Hypothesis H3, and stand in sharp contrast to the collaboration levels of 0.89 to 0.93 reported for published chemistry and biochemistry research in India.

Taken together, these figures show a department whose doctoral output expanded rapidly until 2001 but has since declined, and whose research supervision has remained overwhelmingly male-led, individual, and concentrated among a few guides. The study therefore offers both a department-specific record of doctoral productivity and a point of comparison for future scientometric work on doctoral education in India.

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