

Degrees, Duties, and Dilemmas: Family Expectations and Women's Continuity in STEM Higher Education

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Abstract

India faces a paradoxical situation in the participation of women in STEM education. The enrolment is quite good at the undergraduate level, but most of the women drop out at the doctoral and postdoctoral levels. The work is an analysis of the roles of marriage and family expectations in the academic career of female PhD and postgraduate students at the University of Delhi. It uses six case studies conducted via qualitative interviews to understand the influence of structural, cultural, and institutional pressures on the capacity of women to persist in STEM. The discussion identifies three overlapping dynamics: a marriage penalty- that is, simultaneous timelines of family- building and scholastic achievement put women at risk of dropping out. Institutionalisation and the narrow conception of merit, which pushes women to the periphery of research fields; and policy contradictions, which either recreate stereotypes or are inaccessible. The combination of these dynamics demonstrates that women are constantly compelled to juggle work and personal life, and in many cases, they lose long-term careers. Focusing on women, the research contributes to feminist research in the Sociology of Education and presents the argument that family demands are systemic and not individual inhibitors. It concludes that structural reforms alone can generate an environment where women could join and stay in higher STEM education in the long run.

Keywords

STEM, Social Construction of Gender, Leaky Pipeline, Motherhood, Masculine Culture, Care

Introduction

Women in STEM: National Context and the Continuity Gap

STEM subjects are considered the foundation of technological advancement, and the fundamental part of the objective of the Government of India is to make India a Viksit Bharat by 2047. The concept of gender equity in the above practices is not merely an issue of justice but also a practical

requirement toward sustainable innovation. Higher education institutions like the University of Delhi, which contribute to a significant proportion of enrolments in State Public Universities thus become the point of interest to know whether inclusion promises are being fulfilled or not. Nevertheless, the increase in the number of enrolments has not necessarily resulted in lifetime careers. Women are still focused on those subjects that are perceived to be softer or those that entail fewer resources, whereas the more advanced and research-intensive scientific subjects still remain dominated by men. The statistics at the national level indicate that the situation is quite unbalanced: women constitute a large fraction of postgraduates and doctoral learners, yet only about a quarter of the STEM labor force. According to scholars, this can be seen as an educational cliff edge, where women climb up the ladder of the education system but become disinterested once they reach the stable employment ladder. The most drastic decline is in the doctoral and postdoctoral years, when years of study and research are not followed by stable jobs. The main challenge, however, is not access to STEM education but retention, since the success of women in STEM education cannot be seen in terms of their representation in long-term STEM professions.

Gendered Expectations and Structural Exclusions

The timeline of the doctoral programmes is almost entirely different from the social expectations to marry and have children, and scholarly goals and cultural demands collide dramatically. Some women refer to this as the tension of having two opposing schedules of family-making and one for academic advancement. This is not only the slackening of decisions; it is usually the truncating of careers, as the apprehension about the right moment to get married and have children compounded by the vagaries of precarious academic employment, leads to the unpredictability of academic work. This dilemma is aggravated by institutional cultures. Academic offices are still planned based on the concept of an *ideal worker* (Acker, 1990; Williams, 2000): a model of career founded on nonstop presence, late-night labor and the demands of complete dedication. It is a silent assumption by this model of a worker who is not charged with domestic duties and by doing so marginalizes women who may bear a greater burden of household labour. To many women, this dual burden becomes a care ceiling and as such, the work requirements, household chores and exclusion from the informal male circles combine to limit the chances of promotion. This ceiling is enhanced by the absence of institutional support i.e. reliable childcare, flexible schedules, parental leave and mentoring. Less overt prejudices also persist: female leaders are

commonly evaluated as representatives of their whole gender, and diversity interventions are commonly treated as empty formalities. The net result is a system whereby the exit of women in STEM is seen as normal and expected, as opposed to a structural failure.

Marriage, Gender Scripts, and the Continuity Penalty

The greatest pressures experienced by a good number of the female scholars of the University of Delhi do not arise in academic spaces but in the broader socio-cultural environment where marriage and family are regarded as natural stages of being a woman. Even in patrilocal households, advanced study is not always an individual choice; it is a family decision, relating to honour, respectability, and general welfare. This is reinforced by gendered expectations that associate the value of women with modesty, propriety, and domestic devotion, which do not allow much room to engage in the strenuous research careers. This forms what may be referred to as a continuity penalty. The desire to pursue STEM is often perceived as conflicting with femininity, and women in doctoral programmes are likely to discover that the educational status they hold in the family is less desirable in the marriage market. To most of them, their career identity becomes a burden instead of an asset as marriage and maternity schedules conflict with academic achievements. Doctoral scholars live in a constant fear of time running out as the rush to getting research done and a career takes place against the background of the social norms of marriage and childbirth. By doing so, marriage is not an entirely personal rite of passage, but a kind of structural roadblock that diverts the academic paths of women before their careers could even be put on a safe path.

Caregiving, Cultural Double Binds, and Silent Attrition

Marriage soon becomes an unequal distribution of housework. Their roles as caregivers of children, the elderly, and the extended family place them under a compounded burden, decreasing the time and energy they are able to devote to research. Within the context of the academic setting, which is influenced by *the ideal worker model*, where nonstop attendance and after-hours work are viewed as the standard, these functions are interpreted as indicators of lesser commitment. According to most literature, this has been referred to as the *maternal wall*: the logic that mothers are less dependable, less productive, and hence do not deserve promotion or attention. This burden is further aggravated by the inability to get formal support i.e. affordable childcare, flexi-time, or meaningful parental leaves. Without such arrangements, women rely on weak, informal

support from parents, spouses, or external domestic employees, which is seldom comparable to the provisions that could be made by institutions. In such circumstances, women are faced with a care ceiling: a structural barrier to promotion that is formed by the collective burden of occupational and unpaid care work. These tensions are intensified by a cultural dilemma. Women who do not get married or have children early are taken to be selfish or unfeminine, whereas those who strictly adhere to gender roles are perceived to be unfit to work in the rigorous scientific jobs. Between these two opposing desires, most women silently exit or accept low-level jobs. This attrition is quiet, which makes their exit mostly invisible, although in the long term, this type of attrition can dramatically decrease diversity and drain the talent pool in the academic community.

Towards Qualitative Understanding

The national statistics help present the extent of the problem quite clearly: women are still a very small minority among the workforce in the field of STEM. Nevertheless, these figures are not able to indicate how schedules, commitments, and institutional constraints clash with the daily life of women. They chart the trend of dropouts, yet they do not chart the real struggle of balancing school performance and societal demands. This research paper addresses this gap by using six descriptive case studies of female undergraduate and doctoral students at the University of Delhi. Their narratives show:

- how familial stress impact marriage and motherhood influences decisive career choices,
- how family expectations combine with the institutional biases, and
- how women plan for persistence when they lack supportive measures.

This type of qualitative depth is necessary. It brings into perspective the subjective tensions that shape women's decisions and redefines discontinuity not as an individual deficiency but as a systemic problem based on cultural norms and institutional structures. This is not solely to document the underrepresentation of women, but to challenge and destabilize the systems that render their departure from scientific careers acceptable.

Theoretical Framework

In order to explain why several women postgraduate and PhD researchers in STEM at the University of Delhi experience gaps in their professional lives, this research relies on a number of theoretical approaches. It integrates structural, organisational, and psychological frameworks

to go beyond mere participation figures and to indicate how socio-cultural norms, institutional practices, and internalised prejudices all interrelate to influence the courses of life of women in science.

Social Constructionist Perspective

Peter Berger and Thomas Luckmann (1966) claim that social reality is constructed in daily practices, and the concept of doing gender proposed by **West and Zimmerman (1987)** indicates how gender is produced and reproduced by these day-to-day practices. Concepts of family honour, chastity, and modesty emerge in the Indian patrifocal setup and directly influence the educational decision-making of women. Early marriage and motherhood are conceptualized not as a choice of individual choice but as a feminine milestone that is socially scripted. This contributes to the understanding that the ambitions of women in STEM are often compromised by the need for familial approval and group norms.

Life Course Perspective

Glen Elder (1974) and Janet Giele (2009) demonstrate how trajectories of life are determined by the sequence of occurrence of events, expectations associated with age and social institutions. When it comes to women in academia, the time of obtaining a doctorate is likely to conflict with social pressure to marry and bear children. Marriage and maternity then, are significant milestones that may forever shift careers. The concept of interconnected lives introduced by Elder is particularly relevant; in this case women's academic paths are connected to family networks where parents and spouses shape their decisions and sometimes steer them in a different direction. By doing so, the life trajectory of female STEM researchers is interpersonal, and is dictated by the ongoing conflict in terms of cultural paths and professional achievements.

Role Congruity Theory and the Maternal Wall

Alice Eagly and Steven Karau's (2002) Role Congruity Theory implicates prejudice as developing when the aspects of women, which are related to the cultural idea of caregiving, modesty, and cooperation, fail to correspond with the attributes of the scientific professions, namely assertiveness, independence, and ubiquitous availability. This felt inappropriateness brings about subtle yet persistent obstacles. **Joan Williams (2005)** advances this concept of the maternal wall that includes the prejudice that mothers, or women who could become mothers, are

less committed and less capable. To women at the PG and PhD levels, this prejudice is the norm: assertive women are considered unfeminine, whereas timid women are perceived as not as serious about science as they should be. It is this cultural binary that creates identity strain when women are supposed to cement their research careers.

Stereotype Threat, Labeling, and Epistemic Exclusion

The concept of stereotype threat by **Claude Steele and Joshua Aronson (1995)** refers to the psychological burden of the fear of becoming a living example of the negative stereotype, e.g., women are not good at science. Such a situational anxiety may hamper the work of even highly able students. Expanding on this, the multi-threat framework of **Shapiro and Neuberg (2007)** differentiates between a threat that is based on personal doubts (self-as-source) and the threats that come about because of worrying about proving other people right (other-as-source).

The Labeling Theory by **Howard Becker (1963)** is a complement to this framework. When such notions as being not fit or not serious enough are thrown at women repeatedly, they may be internalised and contribute to self-doubt and impostor syndrome.. **Kristie Dotson's (2012)** concept of *epistemic exclusion* reveals the systematic devaluation of knowledge and contributions by women in the academic realm; and the concept of chilly climates by **Hall and Sandler (1982)** covers the minor forms of exclusion by networks and resources that further isolate women. These structures combined can be used to understand how otherwise highly qualified women can learn to internalize exclusion, lose confidence, and ultimately quit scientific careers silently.

Review of Literature

The concept of stereotype threat, as defined by **Claude Steele and Joshua Aronson (1995)** explains that psychological pressure due to fear of affirming a negative stereotype such as women are not good at science. This type of situational anxiety may ruin the performance of even a very competent student. Building on this, the multi-threat framework by **Shapiro and Neuberg (2007)** differentiates between oneself as the source of threats (self-as-source) and other people as the source of threats (other-as-source). The existing literature on gender inequalities in STEM demonstrates repeatedly that it is not the access of women to these disciplines, but their retention and longevity. Based on the previous syntheses (**Blickenstaff, 2005; Adamo, 2013**), newer studies highlight the intersection of time pressures, socio-cultural demands, and institutional work

climates that restrict women's scientific careers, particularly in the research-intensive cultures in India.

Timing, Motherhood, and Career Trajectories

The most common issue repeatedly cited in the literature is that there is a poor fit between academic schedules and family schedules when it comes to women working in STEM. Investigations of female doctoral students in engineering, e.g., present a case of permanent anxiety because of a lack of time to complete the dissertation, as the dissertation timelines alongside employment are aligned with socially imposed age limits to marry and have children (**Paksi, Nagy, and Kiraly, 2016/2022**). The same trend is observed with research on Indian laboratories; the years when women publish the most and get grants usually coincide with times when they are facing strong family responsibilities (**Mukherjee, 2022**). These conflicts reinforce what **Williams (2005)** calls the maternal wall, in which expectations regarding caregiving are construed as indicators of less firm commitment to scientific work.

Socio-Cultural Pressures and Caregiving Burdens

The influence of family and kinship on the educational and career choices of women remains powerful. Previous research emphasized the patrifocal issues where parental control and matrimonial requirements restrict the acceptable options that are acceptable (**Gupta and Sharma, 2003**). Recent studies verify that domestic work without payment is the main cause of female discontinuity in STEM: although the problem has been identified by the government for many decades, the duties of the household have not been significantly reallocated. Research also highlights the importance of family support, from spouses and parents, in the capacity of women to continue with academic careers (**Freedman and Green, 2023; Jagielska, 2024**). In the absence of such support, the lack of institutional childcare and eldercare forces women to rely on informal care, putting a care ceiling in the way of advancing up the career ladder beyond the initial steps. These pressures in India are further exacerbated in the extended family households where more responsibilities towards in-laws and siblings are presented.

Institutional Climate, Bias, and Stereotypes

Emerging research challenges so-called numbers-based solutions that aim to increase the women's numbers but not alter the overall work culture. According to the research, the evaluative

bias still prevails: women usually have to show a greater degree of productivity and be considered legitimate, and they rely on publications and largely rely on publications and conference activity to overcome. (Dhal and Sharma, 2024). There are also stereotypes based on appearance. Women with more feminine traits are rated as less suited to be scientists, and this way a masculine image of a perfect scientist is strengthened (Banchefsky et al., 2016). Studies of media representations studies indicate that such stereotypes are reproduced repeatedly (Freedman et al., 2024). Epistemic exclusion (Dotson, 2012) and chilly climates (Hall and Sandler, 1982) are some of the concepts used to describe the process of devaluing women's contributions and intensifying the sense of isolation when the women are denied networks and resources in subtle ways.

Retention as the Central Challenge

Across these strands, the literature arrives at a similarly conclusion: the critical issue is no longer how to get women into STEM programmes, but how to retain women in long-term research jobs. National reviews have demanded supportive workplaces, more robust care-related infrastructure, and more equitable and transparent recruitment procedures, though these are often interpreted unequally. These studies collectively indicate that discontinuity has become normalised by overlapping time pressures, high care giving demands, and institutional bias. The issue of retention is thus not a matter of personal resilience but a question of whether organisations and policies consider caregiving and culture as structural issues and not merely personal ones.

Rationale and Significance of the Study

This paper begins with a paradox in the knowledge economy of India. About 30-45 percent of the graduates of the doctoral level in science and engineering are women, while only 16.6 percent, transition to full-time research jobs (out of a global average of 29.3 percent). This discrepancy demonstrates that the biggest obstacle is no longer educational access, but the inability to convert academic success into well-paying jobs.

The attrition at the doctoral and postdoctoral levels is most apparent as career-building pressures mix with a high culture of marriage and family. Here, women have to endure a lengthy indecision that questions their ambition and commitment since the tempo and the requirements of professional science do not suit the beats of social life. This stress is not an accidental phenomenon but rather structural and embedded within the organisational setups of Indian

science, where there is a high performance- metric emphasis clashing with significant life transitions.

This has often been diminished in policy discussions as it is thought that increasing the number of women in science is an indicator of progress. This perspective ignores the institutional logics that are more profound and define who becomes a legitimate scientist. It also conceals the mundane inequalities, such as non-transparent evaluation procedures, opaque evaluation by networks, and overreliance on informal sponsorship, which even after being granted formal access still serve to reproduce inequality.

This study focuses on where the discontinuity is most severe, by targeting postgraduate and doctoral students at the University of Delhi. Its qualitative, case-based research design allows the investigation of how women perceive, bargain, and sometimes rebel against the limitations of the institutional and family arrangements. This strategy shows the invisible science curriculum, the unwritten rules of perpetual access, geographical mobility and competitive self-presentation, which silently work against women.

Significance

- **Unveiling institutional blind spots:** The results indicate that it is not only a cultural byproduct but also perpetuated by organisational practices. By highlighting the discretionary nature of recruitment and excessive dependence on informal mentoring, the study reveals institutional blind spots that most of the time are considered to be one of the areas often deemed outside of so-called pure science.
- **Recasting merit:** The study problematises the definition and recognition of scientific merit. Besides quantifiable products, like publications, career progression heavily relies on symbolic capital visibility, networks, and prestige. This is a key reason why vertical segregation persists, as women are grouped in the lower cadres, and the top ranks are still in the hands of men.
- **Revealing intersectional vulnerabilities:** The paper reveals how caste and community are interrelated with gender to enhance exclusion. The layered disadvantage is common among women belonging to Scheduled Castes and Scheduled Tribes, where the institutional gatekeeping is intertwined with social prejudice and generates barriers that are more severe than those from created by gender alone.
- **Recommending structural change:** Lastly,, the research provides recommendations based on the insights of the participants to create more equitable research setups. Going beyond

conventional equity plans, it requires such tangible action as childcare, eldercare,, and alternate tenure plans on campus. These changes not only endorse the idea of women's involvement but also oppose the notion that scientific success involves uninterrupted, unfeminized availability, imagining research environments that can support diverse life careers.

Research Objectives

- To investigate the impact of cultural expectations of marriage and family on academic life courses of women, the degree to which these issues affect their career decisions and STEM disruptions.
- To examine organisational processes, including biased assessment, poor structural reinforcement, and hierarchical gatekeeping, that support male-based models of scientific performance.
 - To determine whether the effect of spousal and extended family support on stress levels and the women's retention ability to sustain academic engagement is mediated.
- To understand how women scholars employ strategies of resistance, negotiation and persistence in dealing through the dual pressures of cultural requirements and institutional imperatives.

Research Methodology

Research Design

This research employs exploratory, qualitative research design within an interpretivist paradigm, which aims at analyzing the sense that people make of their experiences. The given approach is particularly appropriate to investigate the experiences of women in higher levels of STEM education, where academic demands often conflict with the family demands. Qualitative methods also allow the researchers to obtain detailed descriptions and a first- hand insight into the way these pressures manifest themselves in real life, unlike surveys that focus on breadth.

Sample and Justification

The research was conducted among six postgraduate and doctoral students of the University of Delhi (females). The participants who were chosen by purposive sampling were those whose experiences would bring the most insight into the problem. It was not meant to generate statistics, but to find richness and diversity in the cases. The use of a small number of participants in the

study enabled the analysis of each case in detail as well as highlighting the diverse experiences that females in the field of STEM face.

Techniques of Data Collection

The combination of qualitative approaches helped create a more comprehensive picture of the situation of women in STEM: The main methods were semi-structured and narrative interviews, where the participants could discuss academic and personal issues and express them in their own words. In certain cases, unstructured interviews were incorporated to provide room to discuss contentious matters that may not arise during a structured format. Each of them was then presented as individual case-studies where their educational careers, family background, and the experiences in institutions were gathered; the identities were anonymized under pseudonyms. Secondary sources like government reports, policy documents, institutional records were also examined and assisted in identifying personal accounts against the general context of Indian science and policy. Combined, these approaches enabled the identification of the connections between the personal stories of women and the broader organisational and policy environments that determine their work.

Ethical Considerations

Informal consultation with senior faculty was undertaken to gain ethical approval, and all the participants volunteered for the interviews with informed consent. They were promised that their data would remain confidential and the data would only be used in academic purposes.. All case studies used pseudonyms as a way of safeguarding their identities. Special attention was paid to the establishment of a secure and comfortable interviewing environment, in particular when participants discussed sensitive issues, like family pressures or workplace biases at the workplace.

Data Collection: Case Studies

Case 1: Kavya – Living Against the Academic Clock

As a doctoral student of engineering, Kavya referred to her days as a race she could never win. Her PhD due dates were inflexible and simultaneously while her family would call her frequently reminding her that she was already behind in terms of marriage and motherhood. *“I look as though I was failing at two things simultaneously”*, she thought. *“These are the two choices: either I complete my degree and it is too late to have children; or I make a family decision and will*

squander all the years that I have invested here.” The most disturbing aspect of it to her was that she felt like she lived with two calendars that never went together; one based on seminars and publications and the other on weddings and child bearing expectations. As a coping strategy, she started to avoid the long family meetings where marriage-related inquiries were a given, and she gave her doctorate to her parents as a financial tool to help the family. She realised though that it was half-measures, as it was putting off the confrontation and not ending it. The narration by Kavya illustrates how institutional schedule and the social norms conflict with one another causing a constant feeling of dissonance in doctoral training.

Case 2: Meera – Struggling for Recognition

The initial months in the academic world were not filled with celebration and instead, those months as a research fellow were filled with scrutiny for Dr. Meera who had just been appointed as a research fellow. *“When a man comes in, people think that he would develop into the role. They waited to watch me last when I joined”*, she recalled. This perpetual doubt caused all success to be short-lived. She explained how non-formal cooperation groups such as tea breaks, after-hours lab sessions were usually shut down for her. *“The doors are not closing with a bang, she said to herself, but you know you are not being admitted”*.. This silent shunning drove her to be more prolific in her work which saw her publish more work and write more conference papers just to be noticed. *“Errors are remembered,,the successes are forgotten”* she said, portraying the feelings of constant underestimation. Meera meanwhile found a way to fight back. She started publishing with women colleagues in other institutions when she was sidelined in major projects and received advice on the same from a retired professor. When the system showed no sign of opening its doors, she said she would go around to another entrance. Her example demonstrates that being in informal networks perpetuates inequality, but it also illustrates that women develop alternative paths for visibility and acknowledgment to remain in science.

Case 3: Anjali – Fear in the Hierarchical Climate

The case of a doctoral student who studied in a male- dominated department of science (Anjali) revealed her research experience as a place where it was better to be silent than to be seen to speak. *“I do not report, most of the time, not because nothing happens, but because I already have an idea of the answer to that question.”* The concerns were caused by her experiences of harassment and indirect intimidation. She however, distrusted the formal grievance mechanisms

though they existed on paper. *“You will notice the posters on complaint cells, she explained, but when something goes wrong no one warns you against ruining your career by complaining.”* This fear was intensified by India’s highly hierarchical academic culture. *“They dictate your recommendation letters, your thesis development and your future. What can you do to go against it?”* she said. The threat of revenge became her primary survival tactic. In order to cope, Anjali formed protective spaces through study groups with other women students. and turned to support of a junior faculty member who reassured her that she was not fantasizing but it was real. Her experience demonstrates that women cannot report or challenge bias in hierarchical structures and power imbalances, so informal solidarity networks can be viewed as the necessary source of resilience.

Case 4: Fatima – Carrying the Weight of Care

Fatima is a postgraduate scholar who was always torn between her academic responsibilities and her responsibility of taking care of home. She said that she wakes up at five in the morning to cook the family meals and by the time she sits down at her desk, she is half drained. To her, there was no distinct separation between home and academic life but the two worlds were conflicting and interconnected. Her problems were worsened when she gave birth to her child. Upon returning, she was transferred to peripheral projects despite the maternity leave providing temporary relief. She explained that this was merely pragmatic, as she was not able to travel in order to perform fieldwork. But she remembered it was like being punished for being a mother. She could not get any institutional support such as affordable daycare, feeding rooms, flexible schedules, and it aggravated her frustration. *“They strive for excellence, yet they do not even give us the essentials of doing so, she said.”* Nevertheless, Fatima was not ready to give up. She used her mother-in-law to help with childcare during exams, rearrange her habits with her husband, and even take her baby to the laboratory. These temporary fixes made her remain in the programme, however, she said, *“it always seems as though I am patching holes so that nothing falls apart.”* Her case demonstrates that the lack of structural support of caregiving compels women to rely on weak, makeshift solutions that in turn restrict their ability to achieve long-term academic advancement.

Case 5: Neha – Strength in Shared Responsibility

Dr. Neha, who is a new PhD student, did not mention her own perseverance as the main cause of success; yet, instead, her partner helped with her persistence. *“Had he not been there, I would*

have been one of the statistics” she said. As opposed to most of her colleagues, Neha’s partner did not embrace strict gender roles but shared domestic duties. She also remembered how he used to cook or even take up childcare so that she could concentrate on preparing a paper for submission. *“The organization will not give me time, but he will”*, she added. He supported her practically and emotionally. *“I have my publication record, you see. He reminds me that I am worth, which is why I sometimes feel encouraged by him and sometimes discouraged by what I do in the office”*. They both organized trips to conferences and timed their engagements in a manner that would enable them to balance their careers. Neha also knew that her case was an exceptional one. *“They compliment me, saying I am ambitious, but what they do not realize is that I have someone who does not believe that ambition is a vice of a woman.”* At least in part, the shortcomings of institutions are filled in her narrative, and the value of considering family relationships as a major determinant in women’s ability to remain in their careers is emphasized.

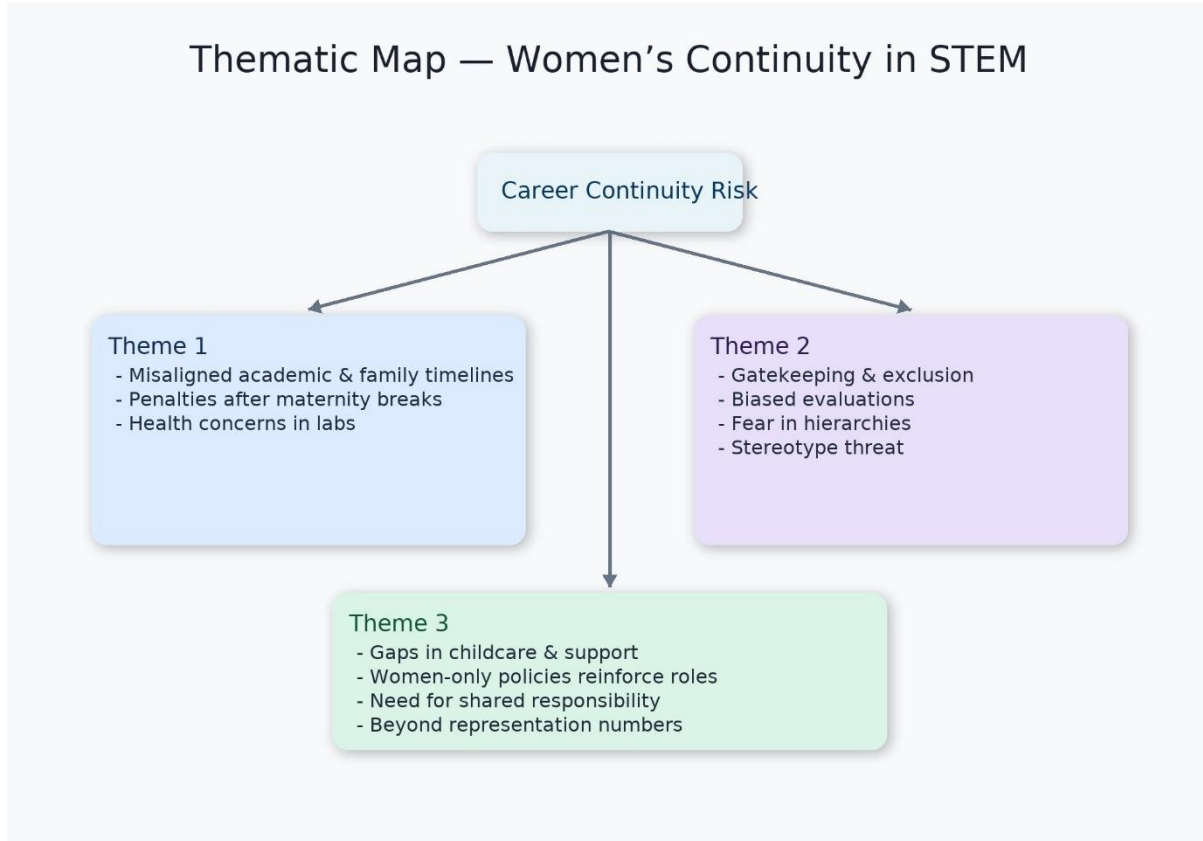
Case 6: Deepa – Living Under the Shadow of Doubt

Deepa, who is a doctoral student was always stressed out under the pressure of stereotypes. *“ I have to prove sometimes that it was not because of reservations or my gender that I had come here,”* she confessed. Her intellectual ability was under constant scrutiny, unlike her male counterparts. She felt that her male counterparts were judged principally on their effort. *“Should I fall behind, it would be the lack of seriousness of women scientists,”* she thought. This uncertainty was exacerbated by the absence of women role models in her department. *“You could hardly imagine yourself at the top when you have never seen any one like you there”*, she said. Despite this, Deepa came up with her own coping mechanisms. She established a network of women scholars whereby they would share drafts amongst themselves, as well as provide feedback and support each other. *“We make fun of each other, saying we are our own lab in the lab,”* she said smiling. This network helped her cope with the stress associated with stereotype threat, although she admitted that the pressure did not completely disappear. Her own experience demonstrates that subtle prejudice, combined with underrepresentation, causes unresolved psychological obstacles while peer solidarity provides a significant, even though partial form of resilience.

Thematic Analysis

The thematic analysis adhered to a six-step model provided by Braun and Clarke, in the context of an interpretivist approach emphasising participants. The six case stories were read repeatedly to develop deep familiarity with the data. Special consideration was paid to repetitive phrases and images, e.g., two calendars held by Kavya, the impression of working three times harder by Meera, the image of a lab within the lab by Deepa, etc. They were taken as starting points for identifying common experiences. Based on that, preliminary codes were created including categories such as temporal pressure, caregiving strain, institutional bias, exclusion from networks, and stereotype threat, being the categories. These codes were then collated into broader and tentative themes that spanned across cases. For example, the competitive calendars of Kavya and the role-switching of Fatima were grouped under the theme of mismatched schedules. The tentative themes were discussed and narrowed down to minimise overlap and ultimately grouped into three broad themes, namely (1) misaligned timelines and uncertainty, (2) institutional hierarchy and denial of merit, and (3) structural deficits and policy contradictions. These themes were then detailed and related to the existing literature on women in STEM in India with inductive insights from the narratives and coupled with deductive links to theory.

Figure 1: Thematic Map: Women's Continuity in STEM



Source: Case Studies

Theme 1: Misaligned Timelines and Uncertainty

One of the central themes that emerged was the conflict between academic timeframes and the social demands on marriage and motherhood. Kavya called this cohabiting with two sets of calendars, which, by definition, are never synchronous: the institutional calendar of conferences and submissions, and the social calendar of family formation. This overlap created an impression of always being late, whether in their careers or personal lives. This tension also emerged in Fatima's story. On her re-entry after a maternity leave, she was transferred to peripheral projects, which she interpreted as a way of being punished for being a mother. In her case, it was evident when she experienced a pause, long term opportunities get usually limited and women find themselves in less satisfying jobs. The participants also stated their concerns regarding occupational health risks unique to STEM, e.g. the risk of encountering chemicals during a pregnancy or breastfeeding. This theme, overall, implies that women do not face uncertainty due to personal failings. Rather, it is a product of the structures that have been constructed around

continuous, male-dominated career trajectories that are illogically positioned against cultural demands for marriage and motherhood

Theme 2: Institutional Hierarchy, Bias, and Denial of Merit

The second theme revealed the reinforcement of organisational cultures by undermining women's credibility. The gender-based prejudice that influenced the alleged neutrality of merit was that Meera had to work three times harder than her male colleagues to be taken seriously. The success of women was either diminished or overlooked while the failures were not forgotten. Hierarchical dynamics emerged in Anjali's experience. Her fear of intimidation prevented her from reporting harassment. *"They have a place in your future, you cannot go against that"*, she thought highlighting the power of hierarchies in gendered exclusion. The story by Deepa illustrated stereotype threat. On the one hand, she said, it was the lack of seriousness of women scientists; on the other, her mistakes were generalised to all women, unlike men's. These are experiences that echo what researchers term epistemic exclusion or the systematic marginalization of women's contributions. Combined, these testimonies indicate that exclusion in STEM works in two directions: at a material level, through limited promotions and network access and on the symbolic level, by always doubting the competence of women.

Theme 3: Structural Deficits and Policy Contradictions

The last theme demonstrated that even supporting policies include some contradictions swept under the rug. The lack of daycare and feeding facilities as experienced by Fatima highlighted a mismatch between policy language and daily reality. Even such good intentions as long childcare leave may unwittingly convey the notion that caregiving is exclusively women's work, and this may lead to equity traps as some critics put it. The experience of Neha contrasted this. The fact that she had a partner to share domestic chores with, gave her strength to pursue her academic life: *"The organization will not provide me time, but he will"*, she said. Her case indicates that women alone cannot address policy gaps, and efforts should also be made to normalise the active role of men in caregiving. This theme is linked to the criticism of the numbers-based strategies. Simply put, a push to increase women's numbers in STEM will not achieve much, unless organisational culture is changed. The structural changes that are required include: trustworthy childcare, open and accountable evaluation systems, family-friendly parental leave, and the acknowledgement of nonlinear career trajectories. In the absence of these changes, the chances

of attrition will remain high and work for most of the policies will be more of a show than a true transformation.

Discussion

The analysis reveals that there is no clear-cut case that these dropouts result from individual choices. Instead, they are the product of a interaction among social pressure, day-to-day organisational activities, and official institutional regulations. Viewing the case stories, themes, and national-level data, one can discern three dynamics in particular: the social construction of merit, intersectional barriers, and internal contradictions in policy frameworks.

1. Merit, Exclusion, and the Invisible Tax of Recognition

The research demonstrates that in Indian science, merit is not evaluated impartially, but influenced by hidden biases favoring men. The invisible tax that women pay to be recognised is evident in Meera's statement. when she says that she needed to work three times as hard as her male colleagues. They are prone to receive a sort of two-accounting on their successes, whereby their successes watered down and errors magnified while men are presumed credible in the first place. This trend is supported by institutional rules. As an example, the highest age of recruitment is typically 35, assuming excellence manifests early, which does not favor women who have delayed their careers due to lengthy doctoral studies or childcare responsibilities. In contrast, in other systems, the concept of academic age is increasingly being used, measuring productivity relative to years since PhD rather than chronological age. Other areas where exclusion manifests include visibility. The case of Anjali reveals the influence of old boys networks in invitations to projects and committees, leaving women excluded. This disequilibrium is shown by the available figures: for every three male principal investigators among DST and DBT funding agencies, only one is female, and the difference between professional leadership positions is even greater with even fewer institutions led by women. Psychologically, the fact that Deepa feared confirming stereotypes depicts that women have a shadow CV, which is the record of the interruptions, doubts and exclusion, that institutions do not see, yet it has a strong influence on their decisions and self-esteem. The lack of role models increases the weight of this shadow, and the progress may resemble using a glass ladder, where the foundation is ready to collapse because of the added pressure of expectations.

2. Intersectionality and the Multiplication of Barriers

Even though gender bias is prevalent, the influence of this bias becomes more pronounced when intersecting with caste, class, and geography. Respondents observed that education among women is usually appreciated if it enhances their chances of marriage, but Scheduled Caste/Scheduled Tribe women face compounded barriers like poverty alongside this pressure. According to the available reports, the elite institutions operate within the culture of upper castes and create double barriers of marginalization for women. These drawbacks start at a tender age. Underprivileged girls tend to lose interest in STEM in their teenage years, being demoralized by the use of English instruction in post-high school and continue to believe that boys are more adept at science. By the doctoral level, the pipeline is not only leaky, but actively blocked by the time the women reach it, not to mention limited opportunities at key stages like recruitment or fellowship eligibility. Fatima's experiences depict how early-life disadvantages, combined with caregiving duties create layered exclusion.. These divisions are further reinforced by geography. Assessments of the Vigyan Jyoti programme have indicated that even though the programme has been extended to smaller cities, access to laboratories, mentoring and resources, is still focused on metropolitan centres. The outcome is a systematic loss of talent not necessarily caused by leakage, but by systematic exclusions which operate simultaneously on many axes.

3. Structural Deficits and Policy Contradictions

The policy landscape appears abundant on paper, whether it is the KIRAN, WOS, or the Mobility Scheme, but the manner in which most such programmes are framed only reinforces traditional gender roles. The Mobility Scheme, in particular, rests on the assumption that the primary cause of women's career breaks is the relocation of their spouses and in the process, normalises the notion that their careers should be followed and not led. Similarly, in prolonged childcare leave, caregiving is considered to be women's primary responsibility. These can act as unidirectional doors; once a woman leaves to manage family matters, it is extremely hard to go back to a similar job. These contradictions are even more evident with institutional gaps. The lack of daycare and feeding centres is a common issue for Fatima and it can be seen as an example of a bigger trend; national surveys indicate that the majority of women scientists do not have the opportunity to use basic care facilities. In most OECD countries, on the contrary, these supports are viewed as a component of the research environment itself. The experience that Neha went through contradicts

this. Having a partner to share day-to-day chores enabled her to remain in academia and this proved that when support is redistributed, women are able to thrive despite rigid systems. Her example shows the significance of shared responsibility patterns where caregiving is regarded as a shared experience, not a task that women bear alone. Ultimately, the issue lies in organisational culture. In the absence of clear promotion policies, truly gender-neutral parental leave, and actual accountability, the policies will be reduced to mere window dressing. The surveys conducted by national reviews of science and technology institutions suggest that leadership diversity improves when fundings and rankings are associated with gender equity. Without such incentives, change is largely cosmetic, and much work remains to address these inequalities.

Recommendations

The results indicate that reforms need to be undertaken urgently in three areas:

- **Reform entry and progression:** Recruitment and promotion should be based on scholastic age and not on the rigid chronological limits, and exit interviews should identify institutional failures.
- **Increasing the number of women in leadership positions** and the distribution of funds should be directly linked to gender equity outcomes..
- **Institutionalise collective responsibility:** The policies of parental leave should be made couple-friendly instead of just female-friendly, childcare and feeding facilities should be made available on-site by institutions, and shared care centres established at key research centres.
- **Enhance culture and transparency:** Gender sensitisation and redressal of harassment should be mandatory and disaggregated data as required by the Anusandhan Act should be made compulsory. Meanwhile, the schemes such as Vigyan Jyoti and KIRAN must be extended to smaller cities.

Conclusion

The paper demonstrates that career interruptions among highly-educated women in the Indian STEM workforce are not caused by individual frailty or ambition, but by the institutional, structural, and cultural constraints that operate collectively in their educational and professional lives. Families can encourage daughters to continue their studies, and such support is usually undermined by the need to marry, have children and conduct household chores, which conflict with doctoral schedules. The least obvious conflict is the shattered bridge between the high investment in women's education and the lack of professional results. Institutions are still guided

by an ideal worker model which presumes that one has no domestic responsibilities and women play a second shift of unpaid care work that is seldom considered by formal appraisals. Without good childcare, flexible working conditions, and safe working environments, women have to improvise and their success will be measured against standards ignoring their realities.. The exclusion is also psychological, as the stories of Deepa and Anjali indicate that the exclusion is reinforced by a culture of silence in which it is too dangerous to discuss bias or harassment. Even many policy initiatives are full of contradictions. Plans that include leave or relocation assistance are aware of the challenges facing women; however, they also enforce the notion that caregiving is women's natural role. They do little to disrupt the unwritten law of academia, the informal rules that penalize interruptions and discount nonlinear career paths. Consequently, the numerical representation can become better on paper, whereas the deeper cultural change are not changed; and this results in a constant brain drain in the field of science. The argument of the present research is that it is time to stop talking about the numbers and start realistic transformation. Responses should be based on a lifecycle approach of establishing confidence among school-aged girls, providing caregiving support at doctoral/postdoctoral levels, and creating organisational structures that acknowledge and reward discontinuous career trajectories instead of punishing them. Women should no longer be driven out at marriage and parenthood. It is only under these circumstances that India can retain the talent of its women scholars effectively and mend the crippled bridge between education and employment.

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